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GPs' Readiness to Develop Capabilities for Telehealth Medical Services

by Brett Sukara

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under the supervision of
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Certificate of Original Authorship

I, Brett Sukara declare that this thesis is submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the Faculty of Business at the University of Technology Sydney. This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis. This document has not been submitted for qualifications at any other academic institution.

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Abstract

Telehealth is an emerging healthcare field that holds promising solutions and benefits for many healthcare issues especially those related to chronic and acute aged care conditions. While governments have started to recognise its potential through investment in telehealth infrastructure, as in every novel concept, forces of resistance try to hold back and uphold the so-called status quo or no change which directly affects acceptance levels. Health workforce players, the subjects of this thesis namely; general practitioners (GPs) are a central patient reference point in Australia and internationally. GPs represent a substantial proportion of the health workforce and predominantly practice within professional silos. Long-standing systemic divisions alongside opposing interests, values, loyalties, practices and needs impact on their readiness to develop cross-disciplinary telehealth capabilities. Telehealth could become an important platform in tackling some of the most burdening chronic and acute medical conditions amongst Australian aged care population. As telehealth initiatives are highly dependent on clinicians‘ motivation, it is therefore vital to comprehend the matters of importance or value creation that relate to their readiness to become engaged and actively participate in cross-collaborative telehealth facilitated interactions to be capable to explore and measure those factors that may impact on implementation and utilisation of technology-based services.

To the best of the researcher‘s knowledge, there is a lack of research that has examined a telehealth service value network with GPs at the centre, which has focused on telehealth essential operational service value network factors particularly when treating distant aged care conditions for which adequate capabilities are indispensable. To address gaps in the literature, this thesis has developed and empirically tested and validated a model that addresses the identified knowledge gaps in our current understanding of GPs‘ readiness to develop telehealth capabilities. These have been validated through GP clinicians‘ role viewpoint. This project has used a mixed methods methodological approach with qualitative interviews and quantitative surveys.

This study has made theoretical contribution to the service operations management and management literature by creating a means to define and measure levels of readiness for telehealth services through the establishment of a set of variables and units of measurement that are highly contextual, very unique and that can be applied across all health service sectors in addition to other important contributions. The study has produced multiple recommendations and outlined associated implications to GP practitioners, software developers and service providers and policy makers based on empirical data in the way that the telehealth platform is likely to affect them, how it should be run, particularly in terms of essential negotiations on safeguards, protocols, cross-collaborative resource distribution and workload management, knowledge sharing, relationship management, process phases, value drivers, enablers and essential capabilities amongst many other important factors. Detailed implications and recommendations to key stakeholders are provided in the final section of this thesis.

Keywords: Telehealth Technologies, General Practitioners, Readiness, Capabilities, Chronic and Acute Conditions, Value Creation, Telehealth Medical Services

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Chapter 1 Introduction

1.1 Research Background

Telehealth is a recent phenomenon which has a promising future. Its use is manifold, and it possesses the capacities that can complement conventional medical treatment methods for a variety of medical conditions. Even though, it is still in its infancy, in some case scenarios, it may even fully replace some conventional approaches such as providing essential timely health consultations to distant patients (Health Workforce Australia, 2012). However, similarly to other forms of service value networks, telehealth care networks are inevitably challenged with their developmental difficulties. These are typically derived from technological, cultural, organisational (both intra and/or inter-organisational) and other evolving issues (Health Workforce Australia, 2012).

A specific issue that relates to this thesis is the acceptance of telehealth services by GPs. By default, and their very design, telehealth is a cross-disciplinary service network proposition whose effective functioning depends on the contribution of multiple stakeholders. According to Jang-Jaccard et al. (2014), these are health practitioners, platform developers, governments and patients. Of all of the above stakeholders, health practitioners hold the key to telehealth success or failure as these technologies target their practices (Taylor, 2013).

It thus goes without saying that the way in which organisational resources are utilised and particularly the way that health practitioners interact with each other in relation to pursuing any potential *cross-disciplinary telehealth* initiatives are likely to influence varying levels of success or failure of those initiatives. This PhD thesis therefore targets most centrally positioned healthcare practitioners, namely; general practitioners (GPs) and aims to explore factors influencing GPs‘ readiness to develop telehealth capabilities that could be effectively implemented in the treatment and management of aged care chronic and acute conditions.

These are exerting a lot of pressure on the Australian health system (Australian Institute of Health and Welfare, 2014; 2017, MENA Report, 2013). Australian GPs are often overwhelmed with multiple patient conditions and due to their scope of practice, expertise level and resources available can only provide certain services. Those conditions that cannot be served by GPs are referred to specialists or other practitioners. GPs‘ work routines also limit their levels of technical and collaborative capabilities through limited exposure to other practitioners. However, distant chronic and acute aged care conditions that GPs face could be more holistically served under a telehealth platform and act as driving forces for cross-disciplinary telehealth engagement between GPs and other health practitioners involved in the provision of care. Clinically owned guidelines, procedures, processes and back-up systems would support such capacities (Anderson, 2010).

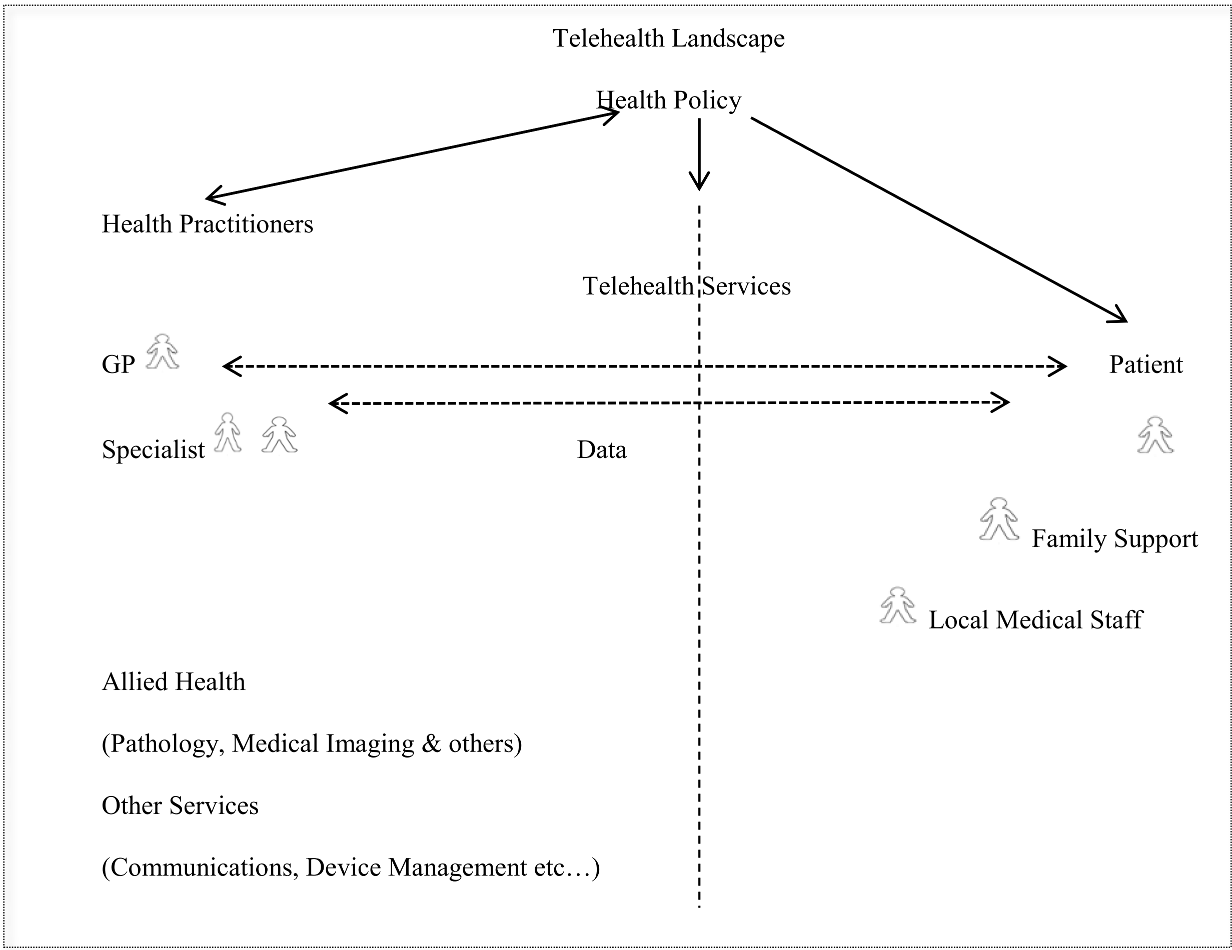


Figure 1: Telehealth Landscape

1.2 Research Problem / Gap / Framework

General practitioners (GPs) are central patient reference points in Australia positioned between patients and the rest of the health system and represent a substantial proportion of the health workforce who still and predominantly practice within professional silos separated from other healthcare practitioners. Long-standing and current systemic divisions between health professions are alongside opposing goals, values, loyalties, practices and needs. These slow the acceptance of telehealth technologies into the mainstream healthcare system as well as block needed reform and inevitably affect care delivery (Health Workforce Australia, 2012).

These professional divisions are seen as significant barriers to cross-disciplinary collaboration initiatives‘ successes even in conventional medical delivery, not to mention a telehealthcare delivery model, which this thesis is exploring. As such, this issue requires special research consideration. To start with, this thesis is employing a unique approach never attempted before that utilises some of the most burdening and increasing chronic and acute medical conditions amongst Australian aged care population.

These are utilised in addition to the proposed non-rivalling close-knit patient-centred and complementary cross-disciplinary clinician collaborations as context and key drivers in the evaluation of GPs‘ readiness for cross-collaborative initiatives facilitated by telehealth technologies. This process in turn is expected to influence not only GPs‘ readiness to develop telehealth capabilities to use telehealth technologies, but also other healthcare professionals such as pathology, medical imaging and specialist practitioners with whom GPs interact amongst many others.

Current low acceptance and even lower utilisation levels (Taylor, 2013; 2015; Wade, Eliott and Hiller, 2014) amongst GPs are likely to at least have a degree of influence on other practitioners such as pathology, medical imaging and specialist practitioners. These practitioners have a point of contact through interactions in their clinical and professional activities such as patient referrals, test result exchanges, follow ups and occasional cross-disciplinary seminars and conference attendances. The more of these interactions take place, the more they learn of each other‘s expertise, contribution to their field, potential and real patient health outcomes.

As telehealth initiatives are highly dependent on healthcare practitioners‘ motivation, it may be cultivated by mutual understanding and trust that is likely to lead to commitment through collaboration. These factors are likely to have a significant impact on these initiatives‘ outcomes through GP practitioner readiness to commit and stay committed. It is therefore vital to comprehend the matters of importance or value creation that relate to their readiness to become engaged and actively participate in cross-collaborative interactions and explore and evaluate their impact on the process of implementation of telehealth medical services.

According to the author‘s best knowledge, telehealth service value networks that target management of distant chronic and acute aged care conditions with GPs at the centre have never been considered before. Thus, identified factors will be researched by this project. These factors are in fact key constructs of the proposed telehealth value network model, namely; 1) practitioners‘ use of telehealth technology considerations, 2) knowledge sharing, 3) relationship management and 4) process management as essential operational elements of a telehealth service value network.

These factors may influence and drive GPs‘ understanding as by-products of communication and collaboration which may lead to trust and commitment towards telehealth initiatives such as for instance in the caring process of chronic and acute aged care patients‘ conditions currently burdening the health system through the explosion of health expenditure (Health Workforce Australia, 2011). While many studies have tried to uncover factors that may stimulate or impede clinicians‘ technology acceptance in general (Brewster et al. 2014; Davis et al. 2014; Eden et al. 2016; Jang-Jaccard et al. 2014; Taylor et al. 2015; Wade and Hamlyn, 2013), this thesis‘ major emphasis is to understand the factors that influence the formation of GPs‘ readiness in a service value network context.

In a report by Health Workforce Australia (2012, p.3), one of the key recommendations emphasised the significance ―of bridging the divide between physicians, nurses, allied health staff and hospital administration" that is standing is in the way of innovation and sustainability. Such divisions have been further exacerbated by the actions of healthcare industry lobbyists - currently 34 lobbyists per 1 government minister in Canberra, according to Health Workforce Australia (2012). These represent special interest groups which purposefully distort healthcare innovation and sustainability that can be achieved through needed collaboration, integration and alignment initiatives. According to Menadue (2010 in Health Workforce Australia, 2012, p.47), ―they are major contributors to our dysfunctional federation in health. Different programs and different interests have produced what Tony Abbott has called a ‗dog‘s breakfast".

In order to provide a possible alternative, this thesis project is first considering both nationwide and chronic and acute conditions that are currently and have been for some time burdening the health system, patients, carers and communities and utilising them as key drivers for cross-collaborative actions and expected concrete outcomes. This outcome driven approach starts with chronic and acute conditions that affect many communities and families in need. The reason that GPs have been chosen as central carriers of this project is their significance in population health research due to large volumes of patients that they see in their local communities. This provides them with a wide array of opportunities and involvement to experience first-hand dealings with a multitude of health conditions inclusive of chronic and acute types. Some patients may present with one condition, however some on the other hand with multiple conditions, which GPs follow from first point of contact throughout the rest of the ongoing treatment management, control and intervention process and follow up checks.

Thus, GPs‘ and patients need to maintain their relationship as many retirees move out of cities or into aged care facilities. Moreover, aged care facilities, though eligible for telehealth services continue to be underserved due to workforce shortages. Traditionally and in the current legal context, aged care facilities are mainly staffed by assistants in nursing, enrolled nurses and at least one registered nurse and facility management (Gaffney, 2017). There is rarely a resident doctor such as a GP on the premises or even one allocated general practice to look after a particular facility. This thesis intends to propose a novel approach in order to help overcome this service delivery gap through general practices and their practitioners‘ readiness to be involved in the delivery of telehealth medical services. Well managed and well-resourced government coordination could go a long way here. It is also believed that grassroots level research that targets distant chronic and acute aged patients‘ conditions-driven cross-disciplinary interactions between primary healthcare providers has a strong opportunity for wider acceptance of telehealth technologies later on in other health sectors (McLean et al. 2013).

Furthermore, it is believed that current inadequate and weak collaboration efforts could generate significant discrepancies, or gaps amongst different players in healthcare networks (e.g., GPs, pathology, medical imaging and specialist practitioners amongst others) that might produce unwanted inconsistencies leading to unsustainable performance gaps, especially in novel and still fragile telehealth initiatives that to this date have not received wide enough acceptance by clinicians. Weak collaborations are particularly evident in areas where practitioners‘ interests collide as opposed to situations where rivalry is minimal or non-existent. These relationships are usually driven by needs for each other‘s expertise, particularly in circumstances such as in the case of chronic and acute medical conditions for distant aged and in some cases disabled patients where patient outcomes depend on practitioners‘ combined and cumulative collaborative efforts. That is why this research considers chronic and acute medical conditions as strong drivers in telehealth technology uptake by GPs whose services are not rivalling but instead complementing specialists, pathology and medical imaging practitioners. Hence, **the research problem** is the:

- Evaluation of GPs‘ readiness to develop cross-disciplinary telehealth capabilities that could be effectively implemented in the treatment and management of chronic and acute aged care conditions. The following conditions have been utilised as context due to their prevalence among Australian aged care population (cardiovascular - heart failure, respiratory - COPD, renal- kidney failure, diabetes and hypertension).

The below shown model (figure 1) is a pioneering quest. It considers the following phases as central elements that can be utilised if GPs and other clinicians adopt the telehealth delivery platform.

1) Collaboration with medical imaging, pathology and specialist practitioners viewed through GP‘ role prism driven by the need to manage distant chronic and acute aged conditions;

2) Integration through deployment of integrated information and communication systems driven by the need to manage chronic/acute aged care conditions;

3) Proposed alignment through small close-knit coordinated cross-disciplinary process management steps driven by the need to manage chronic and acute aged conditions backed up by necessary resources and programs. Shown below is ***the combined research and solutions framework*** that is employed by this thesis.

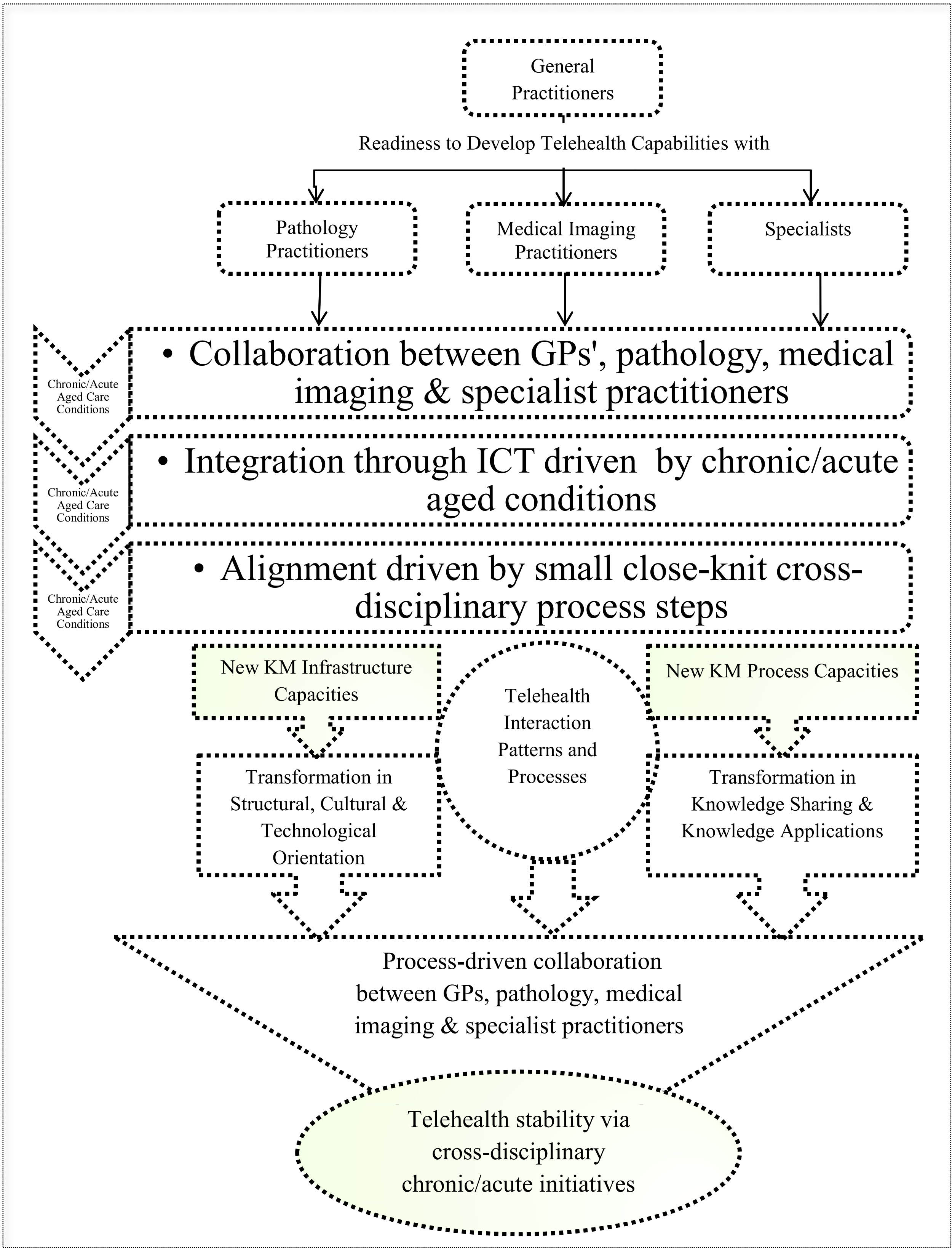


Figure 2: Combined Research and Solutions Framework

The first steps are always the hardest, and thus the collaboration phase is going to be the hardest to master as it includes the management of change for the key healthcare players researched by this thesis (GPs and their intended telehealth interactions with pathology, medical imaging and specialist practitioners). Key practitioner concerns that electronic delivery models entail need to be first evaluated. In that context, this thesis evaluates essential data security, telehealthcare standards and workload dimensions as crucial telehealth use considerations. These are followed by knowledge sharing concerns and benefits, relationship and process management dimensions. Consequently, due to the different perceptions of gains and losses among the health disciplines (Health Workforce Australia, 2012), a new collaborative telehealth framework which sets clear priorities and guidelines that focus on overcoming differences through non-rivalling arrangements will have to be created and agreed upon by all of the key stakeholders. It is expected that the general consensual process will take considerable effort and time. That change will have to be structural, technological and most importantly cultural out of which new knowledge capacities and capabilities are anticipated to emerge. The abovementioned approach could directly influence practitioner readiness to develop telehealth capabilities through experiences, knowledge and value creation as well as telehealth system's ultimate results and reputation. Other significant by-product from the proposed model and its cross-disciplinary process is the making of tacit knowledge more explicit and its enormous cost saving likelihood not only in the health sector by potentially in other sectors too. Therefore, this project starts with considerations of factors related to the use of telehealth technologies in primary care, followed by elements relevant to knowledge sharing between practitioners, and importantly management of relationships and care delivery processes.

1.3 Research Question

Consequently, the key research question that may be utilised in the formulation of the research problem is:

Research Question: Are essential operational service value network elements likely to influence GPs' readiness to develop telehealth capabilities with the aim to treat chronic and acute conditions of aged care patients?

Corresponding to the above mentioned overarching research question, the following sub-questions will be pursued, namely:

1) What are the essential operational elements for telehealth medical services from a service value network perspective?
2) Are there relationships between the essential operational elements for telehealth medical services from a service value network perspective?

3) Are there relationships between essential operational elements and GPs‘ readiness to develop telehealth capabilities with the aim to treat and manage aged chronic and acute medical conditions?
4) What is the impact of ‗Value Creation‘ on GPs‘ readiness to develop telehealth capabilities with the aim to treat and manage aged chronic and acute medical conditions?

The above research question and sub-questions will be explored through a newly developed and expandable model that recommends investigating it in a number of healthcare network organisations. Outcomes from this thesis project are hoped to present healthcare network organisations with highly precious insights that might upon proper implementation, considerably improve telehealth sustainability prospects and overall healthcare network performance.

1.4 Research Objectives

In order to assist the above inquiry, this research proposes a number of further assessable factors which are directly related to the key research question. These are factors associated with and/or related to a) essential operational service value network factors, b) the evaluation of whether relationships between them exist, c) the evaluation of whether relationships exist between these factors and practitioner readiness and d) the influence of value created from a practitioner angle on their readiness to develop necessary capabilities for telehealth medical services.

As each key element in the process with its central constructs and sub-constructs influences the other elements, the research questions and hypotheses development and testing will accordingly be pursued in a similar order.

Therefore, **the objectives** of this thesis are:

1) To explore essential operational elements for telehealth medical services from a service value network perspective.
2) To measure the relationships between essential operational elements for telehealth medical services from a service value network perspective.
3) To investigate the relationships between essential operational elements for telehealth medical services from a service value network perspective and GPs‘ readiness to develop telehealth capabilities that could be implemented in the treatment and management of aged chronic and acute medical conditions.

4) To assess the impact of _Value Creation‘ on GPs‘ readiness to develop telehealth capabilities that could be implemented in the treatment and management of aged chronic and acute medical conditions.

1.5 Summary of main expected contributions

This thesis hopes to make theoretical and practical contributions both from its empirical data, conceptual model and ideas herein presented. These may help healthcare network organisations assess current GP practitioners‘ readiness for telehealth medical services, and point to essential steps that can be pursued to enhance readiness levels. As a result of this thesis project and the proposed model, the participating healthcare network organisations will also be able to self-assess, evaluate and measure the value of the contribution of the identified important unidisciplinary and cross-disciplinary collaboration factors. As this thesis is a new research endeavour, its empirical testing on a sufficiently significant scale will make the following theoretical and practical contributions.

1. To the best of the researcher‘s knowledge, the proposed project will be the first study of its kind and this research is of cross-disciplinary significance with GPs at the centre to deal with the phenomenon in question. This is a new cross-disciplinary contribution to knowledge.

2. Secondly, this thesis is taking a unique approach to improve telehealth technology acceptance levels amongst clinicians by utilising chronic and acute conditions currently overburdening the health system as key drivers among other factors. This is a new thinking paradigm that starts with critical patient needs and outcomes facilitated by non-rivalling / complementary cross-disciplinary clinicians‘ efforts. As such, it is a novel and higher health service proposition and new contribution to knowledge.

3. Thirdly, this thesis identifies new theoretical and practical factors affecting the delivery of telehealth services from SVN and telehealth perspectives;

4. The fourth contribution is also theoretical to the SOM literature by creating a means to define and measure levels of acceptance for telehealth services through the establishment of a set of variables and units of measurement that are highly contextual, very unique and that can be applied across all health services sectors;

5. The fifth is a likely practical contribution to the field of management where GPs‘ readiness to develop telehealth capabilities to use technology based services & telehealth technologies will be evaluated through GPs‘ roles;

6. The sixth expected contribution is the application of the model that provides practitioners with a new set of measures for levels of acceptance and probable implementation of new technologies.

7. The seventh contribution lies in the potential derived from cross-disciplinary collaboration encounters and efforts facilitated by telehealth technologies which may enable the transfer of tacit medical expert knowledge into more explicit forms and support GPs' paths to independence.

8. The eight contribution lies in the way the Unified Theory of Acceptance and Use of Technology and Communities of Practice theories' combined effort under a Multi-Grounded Framework allows for a potential generation of new knowledge.

1.8 Thesis Structure

Chapter 1 introduces the study, its background, research gaps, problem and framework. Fixed research question with sub-questions guides the steps which are supported by objectives, expected contributions and ethical principles.

Chapter 2 introduces the telehealth phenomenon in more detail and with regard to chronic and acute distant aged care conditions. It evaluates essential elements in terms of the current literature, builds a theoretical framework and justifies theories utilised and explains relationships between the service value network core elements and key predictor, moderator and dependent variable.

Chapter 3 justifies the research paradigm, methods and design. Furthermore, it clarifies respondent selection criteria, sample size, strategy, data collection, statistical tools and analysis process.

Chapter 4 analyses qualitative field data and produces comprehensive research framework for the final quantitative data collection and measurement and structural model evaluations.

Chapter 5 theorises on each construct and sub-construct and proposes associated hypotheses for empirical testing. It also introduces quantitative survey instrument with all of its elements.

Chapter 6 analyses quantitative data, evaluates measurement and structural model.

Chapter 7 discusses outcomes through individual hypothesis evaluation and their implications.

Chapter 8 presents concluding remarks and future research directions.

Chapter 2 Literature Review and Theory Progression

2.1 Introduction

Due to the rapid speed of evolving new technologies, healthcare networks have been undergoing many technological developments and changes in recent times. On the contrary in the same period, health workforce factors have received considerably less attention and thus considerably less is known about their interactions and implications with these new technologies (Health Workforce Australia, 2011; 2012). One particular evolving development in the health sector where this is of specific interest is a novel introduction of telehealth medical services in general practice. That is why the importance of this thesis in trying to explore and understand essential factors that may affect the uptake of this innovation by general practitioners (GPs) from a service value network perspective as GPs are centrally positioned clinicians at the interface between the patients and the rest of the health system. Specifically, this thesis‘ focus is the evaluation of telehealth technology use considerations, knowledge sharing, relationship and process management as key service value network elements in a telehealth context that may impact GPs‘ readiness to develop technical and collaborative capabilities with the aim to treat and manage chronic and acute conditions of aged care patients.

After a lengthy reading of literature in the field of health management, medicine, knowledge management, collaboration, leadership, general management, general technology acceptance and telehealth acceptance studies on health practitioners and especially physicians, highly regarded and validated theories emerged. These two key existing theories are; UTAUT – Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003) and Communities of Practice theory (Lave and Wenger, 1991) which will be utilised under a multi-grounded theoretical approach (Goldkuhl and Cronholm, 2003) that allows for a potentially novel theory to emerge in due process. Five most pressing nationwide chronic and acute conditions (heart failure, COPD, kidney failure, diabetes and hypertension) currently burdening the healthcare system especially in the aged care sector have been utilised as context (Australian Institute of Health and Welfare, 2014; 2017, MENA Report, 2013).

The main onus of this PhD thesis project is consequently going to be on GPs‘ views or perspectives as one community of practice which are likely to make a contribution towards and eventually blend with another community of practice. In doing so, it may have a direct impact on wider telehealth stakeholder relationships, implementation and sustainability through a specific cross-collaborative physician & data-led approach. The central theoretical framework in this project is based on the concept of service value network and its key constructs, being; technology, knowledge, relationship and process management (Walters and Rainbird, 2007, Walters, 2009, 2012) as well as the utilisation of the above mentioned theories under a multi-grounded approach. In today‘s markets inclusive of the healthcare sector, human activities are mainly driven by value creation objectives. Value creation motivates individuals and networks to work towards these necessary and crucial ingredients for survival and success as well as resultant differentiators from competitors.

The same principles are expected to apply in the telehealthcare sector, which is still in its infancy. The agenda in this thesis project employs a very specific approach to value creation in telehealth as perceived from GPs‘ angle, through aged care patient-driven demand caused by chronic and acute conditions for GPs‘ control and intervention services under the proposed cross-disciplinary (McCartney et al. 2012; Wenger‘s, 2006; O‘Sullivan, Stoddard and Kalishman, 2010) collaborative telehealth framework with pathology, medical imaging and specialist practitioners. Presented below is a diagram indicating key areas in this study‘s literature review.

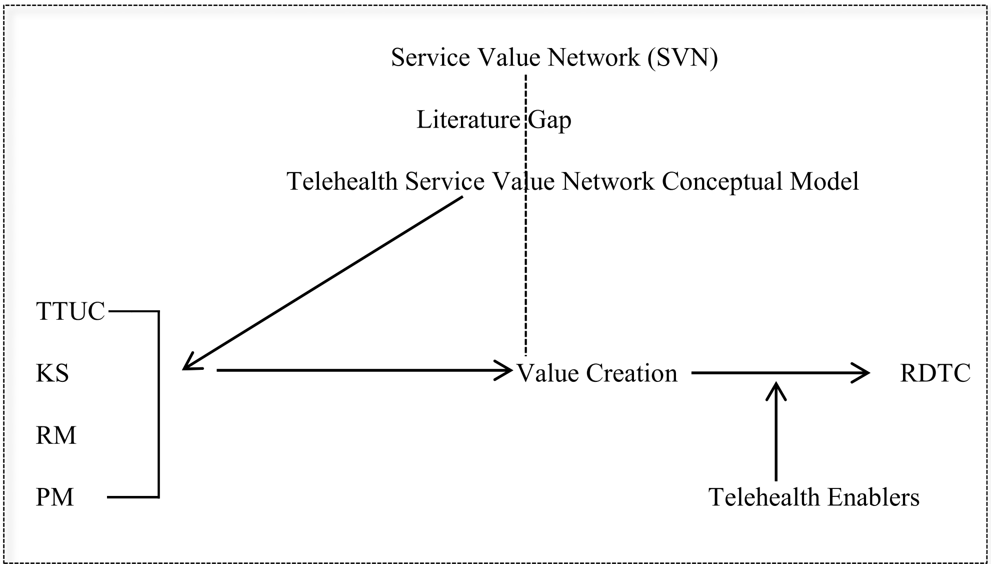


Figure 3: Literature review elements

2.2 Importance of Telehealth Services

It is important to mention that many authors interchangeably make use of telecare, telehealthcare, telehealth, virtual health and telemedicine to mean the same thing. Telemedicine however usually refers to direct face to face clinical provisions of services, whereas telehealth indicates a wider range of non-physical services such as distant monitoring, care of patients, information and education amongst other health aspects (Schwamm, 2014). Telehealth‘s early beginnings were instigated by the evolving information technology developments and the need to provide help to the chronically ill and the elderly as well as distant patients in underserved areas, who could be assisted to live independently in their own homes and thus bring about the reduction in costs associated with hospital visits and treatments. Many governments and medical providers quickly recognised the potential of telehealth and its benefits (Barlow et al. 2007). The above aim however, is far from realisation at this stage. The Australian Government introduced its own telehealth initiative in May 2011 as part of ~~–th~~e National Digital Economy Strategy which sets out a vision for Australia to realise the benefits of the National Broadband Network and position Australia as a leading digital economy by 2020" through the utilisation of information technology aimed to enhance its citizens' quality of lives and aged healthcare (Australian Nursing Federation, 2013, p. 5).

According to Audit Commission (2004 in Barlow et al. 2007, p.172) _"there are three broad functions of telecare systems for frail elderly people and for patients with chronic conditions:

- safety and security monitoring in the home, for example, fall detectors;
- monitoring of vital signs;
- information and support provided via telephone and the Internet."

Telehealth benefits can be seen across various chronic and acute conditions such as: depression, hypertension, asthma, COPD (chronic obstructive pulmonary disease), frail elderly, chronic back pain, dementia, arthritis, diabetes and heart disease amongst many others (Barlow et al. 2007).

Australian chronic and acute conditions demand large health resources and are causes for a substantial increase in health expenditure. Many are of the view that the NBN network is worth building to serve elderly patients alone, especially those who are chronically and acutely ill and that savings derived from these services would pay back the entire NBN investment (MENA Report, 2013). A number of particular chronic and acute medical conditions in the elderly have been dominating the health landscape for some time. Amongst these are commonly known heart failure, COPD (chronic obstructive pulmonary disease), kidney failure, diabetes and hypertension (Australian Institute of Health and Welfare, 2014; 2017).

For this reason and due to their commonalities amongst the wider Australian population and GPs that frequently encounter them in their patients, these conditions have been chosen as central conditions to evaluate telehealth technology uptake amongst GPs and their allied health counterparts (pathology and medical imaging practitioners) as well as appropriate specialists who have specialised in both conventional methods and are now contemplating telehealth delivery of care.

Heart failure and COPD often coexist together and present simultaneously similar symptoms in adults (Wade and Stocks, 2017; Gellis et al. 2012). These conditions require long-term treatments and in many cases until the end of life and as such exert an enormous burden on the patients, their families and the health system affected. They are also some of the most common causes of mortality in Australia (Wade and Stocks, 2017; Australian Institute of Health and Welfare, 2014; 2017). Telehealth studies have shown consistencies in improved living quality for patients suffering from chronic heart failure and COPD as well as lowered hospitalisations. Importantly, patient families and patients have been accepting of the technology. This particular study was carried out in New Zealand in both non-Maori and the Maori communities (Venter et al. 2012). Similar findings were also obtained by Gellis et al. (2012) where telehealth showed positive improvements to the quality of COPD and heart failure patients' lives as well as proved their feasibility. Additionally, it enabled improvements in social activities, inclusion and well-being and reductions in depression. However, no study so far has been carried out with GPs at the centre of a telehealth service value network, with pathology, medical imaging and specialist practitioners as key cross-disciplinary contributors that this thesis is set out to explore. Wade and Stocks (2017) have suggested that GPs face enormous challenges in dealing with chronic long-term conditions for which reason telehealth intervention may be essential.

GPs find it very challenging to manage chronic conditions amongst aged care populations which are exacerbated by the growth and complexities of conditions themselves as well as the number of patients suffering from them (Haines et al. 2016). One such chronic condition is diabetes type 2 (T2D), which is believed to have a serious impact on about 20% of aged care residents. Rising empirical ―evidence suggests that of those diagnosed with T2D, many are not optimally managed" (Haines et al. 2016, p. 908). According to Speight et al. (2013) and Haines et al. (2016, p. 910) ―older people with diabetes have a higher likelihood than their counterparts without diabetes to have dementia, reduced functional status and an increased risk of institutionalisation".

Amongst the typical challenges are ―regular monitoring of blood glucose level (BGL) and blood pressure, dietary management, insulin injection, and assessment of skin integrity which represent a large and growing burden of care, given the increased incidence of T2DM predicted in the ageing Australian population" (Haines et al. 2016, p. 908). Other studies show that diabetes telehealth services contribute very positively to the patients' well-being and overall health outcomes and increasing acceptance of telehealth services particularly by distant aged care patients (Gellis, Kenaley and Have, 2014).

Furthermore, telemonitoring through video conferencing has also been used successfully in aged care kidney failure patients who have undergone dialysis treatments or the so called haemodialysis and results have shown reduction in hospitalisations by close to 70% as well as reduced time spent in hospitals by almost 80% (Berman et al. 2011). However, when it comes to real-time haemodialysis with patient data recording and reviewing from a distant location, this service delivery area is not yet utilised as it still needs to undergo further developments and empirical testing (Nicdao et al. 2016). A rare study which looked into the impact of screening of patients suffering from diabetes and hypertension by GPs for the purpose of identifying those at risk of kidney failure was conducted by di Benedetto et al. (2010). The eight-year long project evaluated collaboration between GPs and nephrologists which was very successful in the process of identification and early referrals of affected patients, thus improving patient outcomes and saving costs to the health system and the patients concerned.

Hypertension or high blood pressure, on the other hand represents one of the most common acute conditions in the aged care population (Hovey et al. 2011). According to these authors, inadequate management of hypertension amongst this population group cannot only lead to increased hospitalisation and the loss of independent living as a result, but may also lead to life threatening acute events and institutionalisation as well as rising health costs. Seniors who are suffering from hypertension are quite frequently suffering from other acute or chronic diseases such as renal (Luo et al. 2017), respiratory, cardiovascular or blood glucose conditions.

Some important areas for the implementation of telehealth hypertension services in the aged care populations have been identified by Hovey et al. (2011). These are improvements in the experience of users through the provision of evident benefits such as convenience, affordability and service familiarity, reliable internet connectivity and service accessibility, IT support and very significantly practitioners‘ readiness to develop capabilities for telehealth medical care delivery model.

Nonetheless, no study has attempted to include GPs at the centre of a service value network supported by pathology, medical imaging and specialist practitioners to deal with chronic and acute aged care conditions. As previously introduced, the central theoretical framework in this project is based on the concept of service value network and its key operational constructs, evaluated next, being; technology, knowledge, relationships and process management (Walters and Rainbird, 2007, Walters, 2009, 2012), from the perspectives and angles not attempted ever before in one combined study.

2.3 Service Value Network Concept (SVN)

The world in the nineteenth century was in long-distance visual and communication darkness. Nikola Tesla, my great great grandfather, the greatest inventor of all times in recorded human history and an engineer who emigrated to the US in late 19^{th} century brought the world we are living in today out of darkness through electricity and electrical light via the inventions of the three-phase AC alternating electrical circuit power exchanges used today in all industrial, domestic and commercial devices, machines, all motors and engines such as transportation vehicles (airplanes, trains, trucks, buses, cars) and electrical appliances, computers, phones, medical instruments and numerous other devices and applications such as for instance stream machines (steam trains, steam ships, etc…), unidentified flying objects, radiation-free x-ray machines and countless other inventions that have been the precursors for the enablement of e-commerce powering supply and demand chains, value chains and service value networks as we know them today (Siddalingaiah, 2006). There are also many of his formulas that no human brain has been able to decipher to this very day. Since then, more widespread adoption of global trading and commerce models amongst other developments began, that were made possible and spearheaded by faster transportation modes but mainly by various inventions amongst which the most vital ones transfer of audio and video data through instant information and communications technologies, cable and wireless telephony, the internet, the intranet, radio, TV, RFID, remote control of all devices and moving objects (underground, on land, in the water and in the air), robotics and all other forms of cable and wireless communications, conveyed to us by, you guessed it, Nikola Tesla from The One and Only True Owner of All Visible and Invisible watching all of us from within.

Consequently, exchanges of goods and services have been enabled to be offered through these trading modes and scholars and professionals have employed the concept of service value networks in various conceptual and empirical projects in both industry and academia.

Service value network (SVN) has been defined by Agarwal and Selen (2011, p.1167) as:

> ―a network of value chains, which vibrates its essence from the combined core competencies of the stakeholders in the chain, mobilises the creation and reinvention of value of its assets, requires strategic focus and revives roles and responsibilities amongst different stakeholders. Through the use of relationship, technology, knowledge and process realignment and management, a SVN connects to the customer via the channel of choice, heightens the transformation of the nature, content, context and scope of the service offerings, opens up new market opportunities, keeps the social infrastructure intact and secures competitive advantage".

Walters and Rainbird (2007) have explored service value network challenges posed to the Australian economy by the growing Asia-Pacific economic region through operational and strategic reforms based on technology, knowledge, relationship and process management based commerce and its industries. They have developed a novel entrepreneurial model that produces value through strategic economical advantage derived from the interaction of technology, knowledge, relationship and process management resource fusion.

Moreover, Agarwal (2008) has explored service value network concept in the then novel proposition of enhanced service offering through collaborative partnerships between key stakeholders propelled by its essential operational factors of technology, knowledge, relationship and process elements. These are seen as powerful facilitators of commercial growth as well as enablers of new market opportunities in the services sector. Similarly, Agarwal and Selen (2009) have employed the concept of service value networks and its essential elements in the evaluation of empirical findings derived from the telecommunications industry, whereas Scerri (2015) has utilised it in her PhD thesis on services and service value networks‘ productivity measures. Additionally, Agarwal and Selen (2011) and Agarwal and Selen (2013) have operationalised the concept again and showed the significance of technology, knowledge, relationship and process management in the pursuit of innovation in services and strategic partnerships performance.

Lusch, Vargo and Tanniru (2010) have likewise explored both supply chain management and marketing efforts to move towards the so called service dominating thinking. This is based on service value networks and creation of value driven through information technology, knowledge sharing, human resource relationships and associated processes in growing and complex networks including various stakeholders. Furthermore, Walters (2012) has examined organisational network structure based on the new proposition of value-driven operations and service provisions centred on efficient and effective solution provisions to the end users.

Understanding drivers of value and associated costs for both suppliers and consumers became key precursors for the creation of value networks. In addition, Walters and Bhattacharjya (2013) have sought to evaluate business responses to consumer demands in an effort to maintain and sustain advantages by coordinating and aligning marketing and management activities. The key ideas employed revolve around consumer-centred thinking driven by value network propositions powered by technology, relationship, and knowledge and process management in the digital age.

Due to the above developments and very competitive nature of today's markets, organisations have been competing as members of collaborative value networks (Vargo, Wielend and Akaka, 2015) which increasingly focus on service differentiation, innovative propositions of value (Vargo and Lusch, 2004; 2008; Skalen et al. 2015) for market gains and growth as opposed to product differentiation, thus the significance of innovation and delivery of services and service value networks grows (Barrett et al. 2015). Based on literature review, table 1 below summarises key service value network elements that are most commonly cited in literature.

Table 1: Key Service Value Network Operational Elements

Name of pillar		**Sources**
1	Technology Management	Barrett et al. 2015; Lusch, Vargo and Tanniru, 2010; Walters and Rainbird, 2007, Walters and Bhattacharjya, 2015; Walters, 2012; Agarwal, 2008; Agarwal and Selen, 2009; Agarwal and Selen, 2011; Agarwal and Selen, 2013; Scerri, 2015; Skalen et al. 2015; Vargo and Lusch, 2004; 2008; Vargo, Wieland and Akaka, 2015.
2	Knowledge Management	Barrett et al. 2015; Lusch, Vargo and Tanniru, 2010; Walters and Rainbird, 2007, Walters and Bhattacharjya, 2015; Walters, 2012; Agarwal, 2008; Agarwal and Selen, 2009; Agarwal and Selen, 2011; Agarwal and Selen, 2013, Scerri, 2015; Skalen et al. 2015; Vargo and Lusch, 2004; 2008; Vargo, Wieland and Akaka, 2015.
3	Relationship Management	Barrett et al. 2015; Lusch, Vargo and Tanniru, 2010; Walters and Rainbird, 2007, Walters and Bhattacharjya, 2015; Walters, 2012; Agarwal, 2008; Agarwal and Selen, 2009; Agarwal and Selen, 2011; Agarwal and Selen, 2013; Scerri, 2015; Skalen et al. 2015; Vargo and Lusch, 2004; 2008; Vargo, Wieland and Akaka, 2015.
4	Process Management	Barrett et al. 2015; Lusch, Vargo and Tanniru, 2010; Walters and Rainbird, 2007, Walters and Bhattacharjya, 2015; Walters, 2012; Agarwal, 2008; Agarwal and Selen, 2009; Agarwal and Selen, 2011; Agarwal and Selen, 2013; Scerri, 2015, Skalen et al. 2015; Vargo and Lusch, 2004; 2008; Vargo, Wieland and Akaka, 2015.

Furthermore, in the light of telehealth, different authors have utilised various constructs in an attempt to address the telehealth challenge and predict its adoption outcomes by clinicians.

Importantly, Dunnebeil et al. (2012) have targeted security of data; documentation and IT use intensity, comprehension of telehealth, standardisation, and orientation to processes, usefulness, ease and intention. Gagnon et al. (2014) have used usefulness, ease of utilisation, self-efficacy, result demonstrability, individual identity, social and professional norms, information and change resistance and intention. Moreover, Rho, Choi and Lee (2014) have evaluated one‘s efficacy, clinical records and patient accessibility, ease, usefulness, incentives and usage intention. Jennett et al. (2003) have assessed core, engagement and structural factors. Legare et al. (2010) likewise have engaged these in the context of individual practitioners (17 item scale) and organisations under inquiry (28 item scale); that is core, planning and engagement, workplace structural and technical preparedness. Similarly, Yusif et al. (2017) have evaluated core motivational, engagement, societal, technological and learning aspects. Philips et al. (2017) on the other hand have explored healthcare teams‘ readiness through external dimensions such as policies and procedures and team, patient and technological capabilities.

Finally, Khoja et al. (2007) have developed four e-health readiness categories and tested them in the context of the developing world in Pakistan. The first one is core and it has evaluated overall future needs, status quo challenge, awareness, comfort, trust, project planning, general satisfaction and technological integration. The technological level has targeted quality of the internet and data speed, support services, software and hardware availability, affordability and organisational access to internet education. The learning category has explored web education for clinicians, internet utilisation for clinicians‘ educational purposes and clinicians‘ involvement in telehealth initiatives. The societal level has targeted external communications, institutional content sharing, and collaborative provision of patient care in communities and clinicians‘ sociocultural aspects. Finally, the policy level has evaluated information and communications regulations, liability and licensing, reimbursement, political and policy makers‘ support.

It is important to mention that the proposed model in this thesis has incorporated most essential aspects of the abovementioned commonly cited elements and those identified as important gaps in the literature, however arranged as sub-constructs and dimensions under service value network categories of telehealth technology use considerations, knowledge sharing, relationship and process management. A very particular emphasis has been paid to gaps found in the literature. That is why the model herein proposed also intends to address these found gaps. This is to be achieved through a survey instrument and its measures that will fill the gaps in literature and in our current understanding of telehealth acceptance phenomenon by clinicians, in particular general practitioners. Practical contributions and implications to general practitioners, management, policy, service providers and patients and their carers are likewise expected.

What is relevant to this thesis, that is, healthcare and associated services through the use of telehealth technologies and their complexities will be explored in more depth through key SVN elements of technology, knowledge, relationship and process management. These constructs have been renamed as *telehealth technology use considerations, knowledge sharing, relationship and process management* and their contents entirely represent the telehealth context to suit the telehealth platform through sub-constructs not previously addressed and/or not addressed in one study from the proposed service value network perspective by any research into telehealth acceptance by healthcare practitioners. These higher order constructs with their sub-constructs will be reviewed in the next section. They are particularly important and most relevant from a telehealth service value network perspective, a new healthcare delivery system and a personalised health service delivery approach (Schartinger et al. 2015) that promises to increase access to care especially to underserved populations, enhance care quality and cross-disciplinary collaborative efforts and transparency and serve as a preventative tool through its monitoring and reporting mechanisms (Traficanti, 2016) that are deployed in a timely service manner. Based on literature review, table 2 below summarises key telehealth service value network operational elements.

Table 2: Key Telehealth Service Value Network Operational Elements

Name of element		**Sources**
1	Telehealth Technology Use Considerations	Dunnebeil et al. (2012); Khoja et al. (2007); Jennett et al. (2003); Legare et al. (2010); Philips et al. (2017); Yusif et al. (2017).
2	Knowledge Sharing	Jennett et al. (2003); Khoja et al. (2007); Legare et al. (2010); Rho, Choi and Lee (2014); Yusif et al. (2017).
3	Relationship Management	Gagnon et al. (2014); Khoja et al. (2007); Jennett et al. (2003); Legare et al. (2010); Philips et al. (2017); Yusif el al. (2017).
4	Process Management	Khoja et al. (2007); Philips et al. (2017);Schartinger et al. (2015); Traficanti (2016); Yusif et al. (2017).

Services are heterogeneous, intangible and perishable, that is, consumed at the point of delivery. It is well known that healthcare services are heavily labour-intensive and dependable on tacit (intangible) assets of healthcare practitioners. The key challenge, though for telehealth networks is how to effectively utilise tacit practitioner knowledge and in due process make it more transferrable or explicit for future workforce generations. As telehealth crosses multidisciplinary boundaries, it creates a new service delivery system with added risks and benefits to its stakeholders. Consequently, barriers remain to be dealt with as well as opportunities to be utilised (Han et al. 2015). In addition to infrastructural, structural and cultural issues, clinicians‘ telehealth technology use considerations challenges remain some of the top key reasons for low telehealth adoption and utilisation. Thus the importance of telehealth technology use considerations, serves as a prerequisite and foundational element for the rest of the proposed model.

2.4 Telehealth Technology Use Considerations (TTUC)

Technology is one of the central communication mediums besides direct, physical face to face and paper data retrieval system in the distribution, analysis, utilisation, and reuse of information and data in today‘s healthcare environment. As speed of access, accessibility, availability, flexibility (Van Alstin, 2016), consumer demand, personalisation and convenience (Simon, 2015) continue to drive technology adoption, on the other hand, a lack of understanding of technology and perceived negative impact on changes in healthcare service delivery, patient-healthcare provider relationships (Brewster et al. 2014), compatibility, interoperability, technophobia, perceived increase in practitioner workload and consequently reduced physical patient visits, data security, patient privacy and safety (Yarmand, Sartipi and Down, 2012) in addition to many other unexamined factors work against the adoption of telehealth technologies. Telehealth technology field is multifaceted in nature and as such multidimensional. It covers technology itself, organisational and human as well as economic factors (Pan American Health Organisation, 2016; Roig and Saigi, 2011). However, research on its use and the impact of the factors herein named as *Telehealth Technology Use Considerations* has been largely neglected by the literature. Amongst key technological considerations in telehealth studies, there is very scarce literature that has examined physicians‘ or any other healthcare professionals‘ concerns regarding the impact of data security on the actual use of telehealth technology. Moreover, no article in the literature could be found that has measured essential organisational protocols in evolutionary telehealthcare delivery and its inevitable impact on practitioners‘ workload. Thus, the first service value network element; **telehealth technology** will be assessed in the context of ***telehealth technology use considerations*** *by* ***GPs*** and evaluated through the Unified Theory of Acceptance and Use of Technology and Communities of Practice theory and under a multi-grounded theoretical approach. Key abovementioned sub-constructs that will be examined in this element are portrayed in the following table.

Measurement Dimensions	References
Data Security	Daker-White et al. (2015); Dunnebeil et al. (2012); Greenhalgh et al (2015); Hsu, Lee and Su (2013); Huang, Lee & Lee (2012); Jin (2011); Kumar, Durai & Vinotha (2013); Wilkowska and Ziefle (2012, p. 194).

Telehealthcare Protocols	Clarke et al. (2017); Cottrell et al. (2015); French et al. (2015); Krupinski & Bernard (2014); Knight et al. (2016); May et al. (2011); Taylor (2015); Taylor et al. (2013); Telehealth Quality Group (2017); Wade and Hamlyn (2013).
Workload	Blount and Gloet (2015); Brewster et al. (2014); Raven, Butler and Bywood (2013); Rosenzweig and Baum (2013); Van Alstin (2016).

Table 3: Telehealth Technology Use Considerations Measurement Dimensions

We are of the belief that these key elements are core sub-constructs of the higher telehealth technology use considerations construct in this telehealth acceptance model. We are also of the belief that more comprehension of these factors will lead to better understanding of acceptance outcomes.

Data Security

Security of patient data is of paramount importance and needs to be safeguarded and guaranteed prior to any telehealth network building steps, during its implementation, use and reuse and storage archival process (Kumar, Durai & Vinotha, 2013). Wilkowska and Ziefle (2012) have empirically tested perceptions towards data security and patient privacy matters among patients using assistive telehealth medical technologies and found them critically important. Data security was measured by ―1)the highest possible data protection in general; 2) the self-determination of data storage and transfer & 3) the strict data access control" (Wilkowska and Ziefle, 2012, p. 194). According to Kumar, Durai & Vinotha (2013) telehealth technologies' objectives are enhanced efficiencies and care quality, lowered errors through more accurate and transparent data. They have highlighted the following data security areas that various healthcare practitioners, providers and other stakeholders have found particularly challenging: data authorisation and personal authentication, healthcare provider and patient identification, security of data transmission, as well as physical and administrative protections and safeguards in place. Jin (2011) on the other hand had discussed health consumers' dilemmas of what and how much health data to disclose in an electronic form for various privacy reasons. She suggested that a systematic comprehension of motivational dimensions driving consumers (e.g. stigmatised conditions vs. non-stigma groups) represents key to the design of a successful health website. Thus, consumers' needs to withhold or even falsify private health information in order to protect it, needs to be weighed when utilising provided data.

Dunnebeil et al. (2012) have examined a range of variables that may impact on telehealth technologies acceptance among physicians. In a study of one hundred and seventeen physicians, they have found ―the perceived importance of standardisation and current IT utilisation as the most significant drivers for accepting electronic health services in their practice‘ besides ‗information security and process orientation, documentation intensity and e-health-related knowledge" (Dunnebeil et al. 2012, p.746). On the other hand, Huang, Lee and Lee (2012) have discussed the concerns of linked sensitive patient medical information with privacy which is currently inadequately secured. They have proposed a scheme whereby patient data is not linked with patient identity while at the same time being anonymous unless authorised for viewing. A simulated experiment underwent security evaluation and has demonstrated data efficiencies and cost savings through this approach.

Hsu, Lee and Su (2013) have proposed a framework that improves data privacy through its role in the concerned health information system. Its three key elements are ―privacy protection, access control, and secure transmission" (Hsu, Lee and Su, 2013, p.1). Experimental results have shown that social and facilitating dimensions, expected performance and perceptions that data is secure serve as adoption drivers.

Daker-White et al. (2015) have focused on the interconnection between electronic data and health consumers‘ safety in primary environments. While evaluating electronic sources and protocols, both negative and positive healthcare staff and patients‘ viewpoints were considered. However, potential psychosomatic consequences caused by electronic mediums‘ safety compromises that may affect patient/provider relationships and care delivery were identified as a threat which may primarily be overcome through direct physical communication. Whereas the above authors have discussed important data security dimensions, none of them have evaluated them in the context of telehealth service value networks as proposed in this thesis. Next important issue relates to telehealthcare standards.

The key components of the telehealth system are in fact its technological infrastructure, supported by structural and cultural (human) components. According to Greenhalgh et al. (2015, p.1) ―the sector requires: (1) a shift in focus from product (‗assistive technologies‘) to performance (‗supporting technologies-in-use‘); (2) a shift in the commissioning model from standardised to personalised home care contracts; and (3) a shift in the design model from ‗walled garden‘, branded products to inter-operable components than can be combined and used flexibly across devices and platforms". This shift needs to be supported by adequate telehealthcare protocols.

Telehealthcare protocols

Telehealthcare protocols are the necessary prerequisites and essential factors that guide users, and particularly practitioners and patients as protocols provide direction, clarify roles and accountabilities in relation to various aspects of the use of telehealth technologies. French et al. (2013) have reviewed literature that deals with implementation issues in telestroke networks for the purpose of identifying key challenges with creating routine/standard practice. They have identified engagement and maintenance of commitment by network stakeholders, ―addressing clinicians perceptions of evidence, workload, and payback; managing clinical and technical workability across diverse settings; and monitoring how the system is used and reconfigured by users" (p.1) as central challenges. Standards were also identified as crucial in supporting the telestroke system's utilisation.

Taylor (2015) has reviewed current national and international protocols on potential telehealth standards, explained specific and recent guidelines and presented a case. Importantly, ―standards have a role in overcoming barriers to the sharing of knowledge and placing the promotion of community interest ahead of sectional interests" (Taylor, 2015, p. 87). The author has concluded with a need to undertake additional research in the process of evaluation of the role of telehealth standards.

Furthermore, Clarke et al. (2017) have reiterated the need for proper guidelines or standards in caring for chronically ill outpatients by using telehealth technologies or the so called ―mobile integrated healthcare" that utilises a ―technologically sophisticated, physician-led interprofessional team to manage care transitions and chronic care services on-site in patients' homes or workplaces" (p.23). The authors further stress that ―serious gaps in care guidelines and processes continue to have an adverse impact on the quality and safety of care, particularly in outpatient settings. Specifically, poor care coordination processes lead to failures in transmitting critical patient information, adverse drug interactions, conflicting treatment plans, and/or lapses in necessary treatment" (p. 24).

Moreover, Telehealth Quality Group (2017) has issued a number of international telehealth codes grouped under ―general considerations, ethical perspectives, governance and financial issues, personal information management, staff and staff management, contact with users and carers, interpretation of and responses to information, communications networks and hardware and technological considerations" (p. 8).

According to Krupinski and Bernard (2014), telehealth standards in the USA have received considerable attention and acceptance. These are also continuously used to either confirm or upgrade novel guidelines. Standards are crucial in the growth of telehealth services and are equally important to law makers and payer institutions. Besides, Cottrell et al. (2015) have examined the impact of hypertension protocols in England. Specifically, they have identified ―the extent to which predefined service outcomes, regarding ascertainment of a diagnosis or hypertension, and achievement of hypertension control, were met for the hypertension protocols” (p. 1). The authors have found weaknesses in the protocol as patients were poorly engaged and clinicians responded equally. Thus, more research is recommended to make it work. Similarly, Knight et al. (2016) have also voiced concerns in their research as regards the adoption of telehealth protocols, particularly in relation to the impact on patient coping strategies and changes in care processes. As the above care protocols eventuate and gain wider acceptance, GP practice normalisation (Knight et al. 2016) through proper workload management that is addressed next can be expected.

Workload

Workload is an unavoidable item that physicians need to consider in the way they approach their medical services. According to Rosenzweig and Baum (2013), telehealth is inevitably changing the work landscape, work design and work ratio division between face to face and online delivery. These authors have evaluated virtual health patient visits. Commonly, physicians are doubtful of this model as human health is at stake. Another possible consequence of this model is the reduction of physical patient visits and increase in online workload.

Moreover, workload has been described as a considerable barrier in the research by Brewster et al. (2014) as healthcare staff perceived increase in telehealth workload combined with decreased efficiency has a negative, discouraging connotation. These authors have evaluated staff acceptance and rejection factors of telehealth. Rejection factors “centred on the negative impact of service change, staff-patient interaction, credibility and autonomy, and technical issues” (p.21). Workload and other concerns need to be tailored to specific situations, however generally, technological ease, reliability, collaboration and “involvement in service design and training and support may improve staff experience of using telehealth” (p.22). Consequently, any telehealth platform needs to develop stable mechanisms that will ensure stable workload distribution (Blount and Gloet, 2017; Brewster et al. 2014). Additional factors are “flexible and responsive working practices, integration into routine practice, strong leadership and local champions, trust in technology and maintaining quality of staff-patient interactions” (p. 27).

Van Alstin (2016) on the other hand has reviewed a number of interviewed expert opinions on the predictions for telehealth in the near future. Workload to physicians remains a critical factor and benefits that outweigh disadvantages could turn things around. It has been claimed that doctors could generate considerable revenue from telehealth services without investing in additional resources. It may also enable doctors “to manage common care issues remotely to spend more time and focus on complex cases or patients with atypical symptoms” (p. 6). Once clinician telehealth use considerations are adequately addressed, the next essential element needing attention is Knowledge Sharing.

2.5 Knowledge Sharing (KS)

An anticipated contribution out of the proposed process is the development of innovative capacities through knowledge sharing that should be incorporated into a well-functioning or newly created telehealth innovation system. This second key construct, **knowledge sharing** contains three adapted sub-constructs that were previously tested however not in telehealth context & which may be explained by the Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003), the Communities of Practice theory (Lave and Wenger, 1991) and under a multi-grounded theoretical approach (Axelsson and Goldkuhl, 2004). The three sub-constructs are: a) Motivation to Share; b) Opportunity to Share; c) Ability to Share (Radaelli et al. 2014). The other two sub-constructs are Data Exposure Concerns and Telehealth Practice for which literature scales do not exist yet.

Measurement Dimensions	References
Motivation to Share	Radaelli et al. (2014, p. 414); Caine and Tierney (2015); Bahous & Shadmi (2016); Blumenthal and Squires (2014); Bock et al. (2005); Bullock (2014); Caffery, Farjian & Smith (2016); DesRoches et al. (2008); Hsu et al. (2007); Rho, Choi and Lee (2014).
Opportunity to Share	Radaelli et al. (2014, p. 414); Bahous & Shadmi (2016);Bock et al. (2005); Gillentine (2012); Hsu et al. (2007); Rheuban (2013); Schwamm (2014); Young and Badowski (2017).
Ability to Share	Radaelli et al. (2014, p. 414); Armitage and Conner (1999).
Data Exposure Concerns	Anderson (2010); Byrne (2010); Cocosila and Archer (2017); Featherman and Pavlou (2003); Featherman, Valacich and Wells (2006); Greenhalgh et al. (2010a); Greenhalgh et al. (2010b); Hsieh (2015); Lim (2003); Martins, Oliveira and Popovic (2014).
Telehealth Practice	Audet, Squires and Doty (2014); Bullock (2014); Raven, Butler and Bywood (2013); Jang-Jaccard, et al. (2014); Peterson and Bertelsen (2012); Wade and Hamlyn (2013).

Table 4: Knowledge Sharing Measurement Dimensions

Motivation to Share

According to Caine and Tierney (2015), patients and doctors trusted each other in the past and patient records have been confidential. Traditionally, doctors would share patient data with patients who would then use their results when visiting other practitioners in the process of care. With the advent of electronic health records, patient health information has become more widely available to providers and health care managers and has broadened its potential use beyond individual patient care. This development opens new avenues for sharing data to which one‘s motivation is the precursor. Caffery, Farjian and Smith (2016) have researched key factors that may have an impact on the time waited by patients to receive a telehealth intervention. The authors have focused on telehealth consultations and image-founded triage. While only about ten percent of all referrals were referred to telehealth consultations, a significant reducer of unnecessary telehealth appointments was the pre-screening of medical images by a triage practitioner. Consequently, improvements in coordination were likely which further enhance motivation to share.

Radaelli et al. (2014) have studied health teams and their knowledge sharing practices that enable them to innovate and enhance performance. They have presented the processes of direct knowledge translation which influence innovative practice, indirect impact on social circumstance and the impact of knowledge sharing antecedents on the promotion of innovation. Their findings are that those staff members who engage in knowledge sharing are also more creative and willing to promote and implement novel practices. In their field data survey, they have utilised measurement items developed by Bock et al. (2005) and Hsu et al. (2007).

Bock et al. (2005) have studied the process of transformation of knowledge of individuals working in organisations in order to comprehend the elements that may inhibit their intentions to share knowledge. While utilising the theory of reasoned action, they have argued that augmented outside motivating factors such as psycho-socials and organisational forces may influence more sharing of knowledge by individuals. They have confirmed that attitudes and subjective elements such as organisation approval play a key role in this endeavour.

Hsu et al. (2007) have on the other hand explored a similar issue however from a different angle. These authors have studied knowledge sharing elements in virtual space among professional communities. Their study has focused on both one‘s personal as well as environmental views and has utilised a social cognitive theory that evaluates one‘s efficacy, expectations of final outcome and trust in knowledge sharing.

Moreover, Bullock (2014) has explored issues with knowledge sharing among physicians and particularly in the way that technologies may support the interconnection between doctors and knowledge. Concerns with ―knowledge ownership, information overload, quality control and interpretations attached to the use of mobile devices in the workplace" (p. 28) justify a need for additional empirical investigations that may support access to data, learning and knowledge sharing motivation among physicians.

DesRoches et al. (2008) also evaluated doctors‘ uptake of electronic records system in the US together with the levels of quality and satisfaction derived from its use and expected uptake hurdles. They have found that physicians in primary settings are more motivated to share data if they are practicing within a larger network or group of practices. Key reported barriers to adoption were of a financial nature. Rho, Choi and Lee (2014) on the other hand have developed a conceptual framework that explains dimensions which could predict doctors‘ readiness to utilise telemedicine and telehealth technologies in their work. The authors have validated the impact of ―the perceived usefulness and the perceived ease of use" (p.559) as direct predictors on the actual intention by physicians. The two key predicting factors were directly impacted upon by ―the accessibility of medical records, self-efficacy and perceived incentives" (p. 559). According to these authors, physician adoption willingness is in direct interconnection with electronic data accessibility and motivation for electronic knowledge sharing.

On the other hand, Blumenthal and Squires (2014) have dealt with another crucial electronic data accessibility issue and it is the ownership of patient medical data. They have contrasted some physicians‘ perspectives arguing on the basis of a duty of care that this information should be completely accessible by them. The other physicians whose view that patient data should only be owned by patients has been supported by the authors, just as personal health preferences are owned by patients as long as they are mentally capable to make sound decisions. Once again, motivation to share this data by patients and physicians among themselves also represents the crucial backbone for the integration and functioning of the system used by doctors. The key problem however, is that in a multicontributor electronic data system, no single practitioner can be held accountable, which is a real cause of worry for patient safety and final health outcomes (Anderson, 2010; Byrne, 2010).

Furthermore, Bahous and Shadmi (2016) have assessed sources of patient data disparities upon paediatric unit‘s emergency admission process. Among these were the ―health information system, physician referral letters and information collected from patients/parents at admission to the ED (patient‘s medical history)" (p. 68). They have found that direct on the spot information collected from the patients was revealing the most in relation to centrally concerning areas, which was followed in significance by the electronic system and lastly referral letters held the least data. Consequently, patient motivation to share has proven a strong contributor to overcoming patient data gaps. While each source was found to be important, electronic systems could overcome substantial disparities whether it concerns an admission to a health facility or importantly a specialist consultation.

Opportunity to Share

Gillentine (2012) has reported on telehealth initiatives in the USA, Colorado where the state‗s biggest healthcare provider and an insurance corporation have joined forces to provide telehealth specialist services. This has provided them with enormous opportunities to share data while patients can be examined remotely through the use of electronic stethoscopes, by a range of specialists on offer including: ―ear, nose and throat doctors, as well as specialists in gastroenterology, cardiology, critical care, pulmonology, neurosurgery and pre and post-surgery consultations" (p.1).

Rheuban (2013) has reported on another telemedicine initiative by the University of Virginia and a specialist telemedicine company that provides round the clock non-stop remote consultations to over three hundred US hospitals. Accordingly, this opportunity to share data has found that ―Specialists On Call reduces the cost of on-call coverage, provides otherwise hard to find specialty coverage, improves patient care & hospital financial dynamics, and improves the workplace satisfaction of physicians and staff by reducing the call burden and providing specialty backup" (Rheuban, 2013, p. 4872).

Schwamm (2014) on the other hand has explored seven key telehealth strategies that may impact the health landscape. These are ―understanding patients‗ and providers‗ expectations, untethering telehealth from traditional revenue expectations, deconstructing the traditional health care encounter, being open to discovery, being mindful of the importance of space, redesigning care to improve value in health care and being bold and visionary" (p. 200). He has suggested the creation of ―accountable care organisations and patient-centred medical homes‗ where ‗a pool of specialists could be made available to provide information and consultation on demand for referring primary care providers who require more efficient methods of managing large populations of patients" (p. 205). A more inclusive proposition is made by this thesis with a one stop cross-disciplinary provision of telehealth services where opportunities to share are enhanced with small close knit teams of GPs‗, pathology, medical imaging and specialists working together.

Additionally, Young and Badowski (2017) have discussed the relevance of specialist services in serving prisoners due to unavoidable distance, cost and accessibility factors and have emphasised the significance of goal clarity, guided by business frameworks and medical protocols. This scenario opens opportunities to share data between remote care health practitioners and those that may occasionally visit such remote facilities. Naturally, specialist consultation may lead to a treatment plan, which also may include electronic prescribing that is likewise enhanced through remote opportunities to share data and deliver medications remotely.

Ability to share

Radaelli et al. (2014) have studied health teams and their knowledge sharing practices that enable them to innovate and enhance performance. They have presented the processes of direct knowledge translation which influences innovative practice, indirect impact on social circumstance and the impact of knowledge sharing antecedents on the promotion of innovation. Their findings are that those staff members who engage in knowledge sharing are also more creative and willing to promote and implement novel practices. Radaelli et al. (2014) have utilised Armitage and Connor (1999) items to measure one‘s ability to share.

Armitage and Connor (1999) have explored the theory of planned behaviour in an attempt to evaluate how predictive and valid it is in relation to choices made when selecting healthy foods. They have confirmed the significance of intention as being the primary determinant in the decision making process besides subjective elements such as one‘s identity and attitude. Social factors such as desirability produced only a weak link with the stated objectives. It is important to say that the measurement items utilised by these authors to test one‘s ability to share have also been utilised in this proposed model.

Data Exposure Concerns

Lim (2003) have examined concerns from consumers‘ perspective in online commerce and have found that perceived risk concerns are closely intertwined with trust. Consumers also view risk sources individually as regard the concerned technology, service provider or the final product. Similarly, Featherman and Pavlou (2003) have also evaluated online commerce and found that consumers‘ ―adoption is adversely affected primarily by performance-based risk perceptions, and perceived ease of use of the e-service reduced these risk concerns” (p.451). These outcomes were validated again in another study on online commerce by Featherman, Valacich and Wells (2006).

Another study by Martins, Oliveira and Popovic (2014) has evaluated concerns for consumers contemplating the use of online banking through a theoretical model. They have tested ―performance & effort expectancy, social influence, facilitating conditions, performance, financial, time, psychological, social, privacy and overall risk‘ besides ‗behavioural intention and usage behaviour” (p.11) and found behavioural aspects to be key drivers in uptake. The following articles discuss health settings. Greenhalgh et al. (2010a) have evaluated UK‘s health organisations along with patients and their carers‘ encounters with electronic health records and found that unless they are closely aligned ―with people‘s attitudes, self-management practices, identified information needs, and the wider care package (including organisational routines and incentive structures for clinicians), the risk that they will be abandoned or not adopted at all is substantial” (p. 1). On a similar note, Anderson (2010) has voiced strong concerns with summary care records as they are deemed unsafe for patients, disturbing functionality and autonomy of clinicians and in breach of human, moral and constitutional rights. The solution particularly in emergencies is a —properly engineered medic alert” platform (p. 1).

Greenhalgh et al. (2010b) have evaluated the adoption process of summary care records in England between 2007 and 2010. The uptake has been slow and lower than predicted benefits have been realised. Important reported benefits are medication compliance and improved care support while challenges are intensive labour processes, safety concerns, data incompleteness and inaccuracies, longer than anticipated consultations, –complex interdependencies, inherent tensions, and high implementation workload on a national scale” (p. 1). Hsieh (2015) on the other hand has tested physicians‘ determinants for the exchange of electronic health records. They have found five central determinants to be highly influential. These are —attitude, subjective norm, perceived behaviour control, institutional trust and perceived risk‘. They are ‗predictable by perceived usefulness, perceived ease of use, and compatibility, interpersonal and governmental influence, facilitating conditions and self-efficacy, situational normality and structural assurance, and institutional trust, respectively” (Hsieh, 2015, p. 1).

More recently, Cocosila and Archer (2017) have proposed a conceptual framework on physicians‘ electronic health record adoption perspectives in Canada. They have confirmed the importance of —positive performance and effort expectancies help while perceived psychological risk hinders adoption in the view of Canadian medical practitioners who are not yet using EMRs” (p. 827). In addition to this, there is very scarce specific literature on any healthcare professionals‘ concerns related to cross-disciplinary telehealth practice and associated consultations. This thesis hopes to make a significant contribution to novel telehealth practices.

Telehealth Practice

Petersen and Bertelsen (2012) have researched critical power and cultural influences of information technology professionals in hospitals due to the increasing reliance on digital data by healthcare practitioners. While they are influential in the running of hospitals, on the other hand, information technology professionals cannot only be viewed as an infrastructural asset. The authors suggest strategic restructuring as an option and healthcare practitioners‘ engagement in the running of IT units. Wade and Hamlyn (2013) have come up with similar conclusions on the relationship among IT professionals and clinicians. According to Wade and Hamlyn (2013, p. 401)

> –the most frequent difficulties reported were between telehealth services and the internal IT departments of health services, rather than with external vendors. The

difficulties included barriers to installing telehealth over IT networks, a lack of priority given to telehealth services, and IT departments insisting on standardised approach. Alternatively, when IT staff were assigned to supporting clinical staff and had a close working relationship with them, they were major enablers of telehealth services”.

Raven, Butler and Bywood (2013) have reviewed literature on telehealth consultations in Australian primary care settings. They have found that telehealth has been used in interactions between specialists, general practitioners and patients primarily for diagnosis and in home settings. While telehealth consultations have an important role, physical consultations cannot be excluded. Telehealth platform also provides enhanced experiences for nurses especially in supporting remote patients.

Jang-Jaccard et al. (2014) have evaluated barriers to telehealth deliveries in remote and rural Australian settings. They have uncovered key barriers to ―regulatory, financial, cultural, technological, and workforce‘ factors with ‗governments, technology developers and providers, health professionals, and patients” (p. 496) as key stakeholders. Authors have emphasised a need for coordinating efforts between all identified players in order to overcome uncovered barriers.

Bullock (2014) has explored issues with knowledge sharing among physicians and particularly in the way that technologies may support the interconnection between doctors and knowledge. Concerns with ―knowledge ownership, information overload, quality control and interpretations attached to the use of mobile devices in the workplace” (p. 28) justify a need for additional empirical investigations that may support access to data, learning and knowledge sharing among physicians.

Audet, Squires and Doty (2014) have assessed doctors‘ technological use through a number of variables such as ―participating in an integrated delivery system, sharing resources and support with other practices, and being eligible for financial incentives” (p. 347). They have found that ―practices that are part of an integrated delivery system or share resources with other practices have higher rates of electronic medical record (EMR) adoption, multifunctional HIT, electronic information exchange, and electronic access for patients” (p. 347). Incentives too are important uptake drivers. As a result, newly negotiated cross-disciplinary telehealth codes of practice that address all relevant and important aspects enforceable by law must stipulate how much access to electronic patient records individual practitioners are granted, which must be adhered to at all times. Furthermore, Wright et al. (2010 in Audet et al. 2014, p. 356) are of the strong belief that ―electronic exchange of clinical information will likely remain a significant challenge for some time—one that goes beyond technical and financing solutions and requires new relational approaches that address issues of trust, competition, autonomy, privacy, and security". The following section will deal with the third central element of this telehealth service value network, hereby named ‗relationship management' through communication, collaboration, trust and commitment of Australian GPs.

2.6 Relationship Management (RM)

Understanding interpersonal relationships through their interactional behaviours are the cornerstones to any successful relationship management activities or team-based objectives. Who influences whom and what contributes to that influence and subsequent actions is an ongoing phenomenon in human behavioural research that is particularly significant in the medical field, which is unique in many ways. Human interactions may be portrayed through various actions, expectations, perceptions and attitudes that work in a particular reciprocal manner (Darley and Fazio, 1980; Oliver et al. 2016). No article in the literature could be found that has measured electronic communication, collaboration, trust and commitment amongst doctors. One of the theories that could explain practitioner interpersonal relationships through its interactions is communities of practice theory. Thus, the third central element of the proposed telehealth service value network: **relationship management** will be closely evaluated through its sub-constructs namely; a) communication; b) collaboration; c) trust and d) commitment as potential evolving by-products and under a multi-grounded theoretical approach as depicted below. The abovementioned sub-constructs are often mentioned as central determinants for the transformation of intentions (Michie et al. 2008; Mearns, 2012). They are depicted below.

Measurement Dimensions	References
Communication	Brady et al. (2017); Georgiou, Westbrook and Braithwaite (2012); Knight et al. (2016); Rees and Williams (2009); Voruganti et al. (2017); Wu et al. (2012).
Collaboration	Johansen et al. (2017); Macfarlane, Schofield and Desombre (2004); O'Leary et al. (2017); O'Reilly et al. (2017); Yang L-Y, et al. (2017).
Trust	Byrne et al. (2014); Glazer et al. (2014); May et al. (2011); Morilla et al. (2017); Kayyali et al. (2017); Rothschild and Lapidos (2003); Van Velsen et al. (2016).
Commitment	Barrett and Hatfield (2014); Blount and Gloet (2015; 2017); Dewar, Bull and Malvey (2017); McKenzie and Williamson (2016); Morilla et al. (2017); Keijser et al. (2016); Saleh et al. (2016); Spencer et al. (2015);

	Uscher-Pines and Mehrotra (2017); Vassilev et al. (2015).

Table 5: Relationship Management Measurement Dimensions

Communication

Various communication tools and devices are currently being used in hospital settings such as white boards, emails, bleep devices and patient charts (Brady et al. 2017), alphanumeric pagers (Ighani et al. 2010), hands-free devices (Richardson and Ash, 2010), mobile phones (Ortega et al. 2009), smartphones (Wu et al. 2010), display-based paging systems (Abenstein et al. 2003) and task management systems (Locke et al. 2009). Wu et al. (2012) have appraised the impact on patient communication facilitated through information technology in hospitals. They have found that healthcare practitioners are not necessarily improving in their communication abilities alongside technological advances in communication applications and have suggested additional examination of these technologies with the purpose of enhancing both practitioners‘ efficiencies and patient-centred outcomes.

Moreover, Brady et al. (2017) have evaluated communication workflows among nurses and physicians in an after normal hours setting. Good interprofessional collaboration through effective communication was recognised by both professions as crucial for the sustainability of organisational workflows, safety of patients and work effectiveness. Georgiou, Westbrook and Braithwaite (2012) on the other hand, have examined a specific framework in pathology services in Sydney which ―was empirically developed as a tool to tackle organisational communication challenges in the implementation and evaluation of health information systems‘ between ‗pathology departments (laboratory information system) and an emergency department (computerised provider order entry)" (p.1). They have emphasised the crucial role of both pre-existing and transformative communication infrastructures as technological transformation goes hand in hand with organisational transformation or alternatively it may fail and affect safety and quality of care.

Rees and Williams (2009) on the other hand have stressed the importance of proper information provided by health practitioners to patients such as guides, treatment path plan checklists and educational resources for the purpose of enhancing self-management patient capabilities. This should be done as early as possible and at the very latest during diagnosis and afterwards as needed. Whereas this approach equips patients and involves them in their care process, it also influences self-managed care results and frees organisational resources down the track, while recognising and valuing patient experience and input. Furthermore, Voruganti et al. (2017) have conducted a scoping analysis of online based communication applications for use by practitioners and patients and evaluated their attributes and usability. While there was a variety of online tools, very few addressed team communication needs, which are essential in the provision of care to chronically ill due to the cross-disciplinary nature of care. Moreover, Knight et al. (2016) have discussed the advantages of consulting by using telehealth in Australia. The key players evaluated were distant patients and specialists through intermediary medical practices which hosted medical students and patients. A specific protocol was adhered to and positive benefits were identified by patients and medical students. These were educational support through real patient circumstances, work preparedness, care continuity, timely delivery and telehealth mainstreaming. While communication is the essence and foundation without which there cannot be collaboration, collaboration is its by-product.

Collaboration

Collaboration through teamwork is crucial in the process of medical care in order to ensure effective and safe delivery. According to O‘Leary et al. (2017), this is particularly important in the delivery of distant care such as telehealth medical services where practitioners may be as dispersed as the patients being cared for and where professional divisions prevail. O‘Leary et al. (2017) have evaluated interdisciplinary team performance and found inconsistencies that emphasise the need for leadership, whereas Macfarlane, Schofield and Desombre (2004) have reported very positive responses by GPs involved in a ―quality team development program" (p. 356) due to the feasibility, acceptability, and teamwork improvements when providing patient care while workload remained challenging.

O‘Reilly et al. (2017) have appraised inter-disciplinary team work dynamics and found that doctors hold a crucial position in the process of encouraging other practitioners and also in facilitating effective team role allocations. In circumstances of regular inter-disciplinary meetings, solid respect and effective communication, the experience alone was the stimulator to complete allocated team tasks successfully. Likewise, ―having an interest in a specific condition such as chronic kidney disease" (O‘Reilly et al. 2017, p. 10) is likely to enhance ties. Moreover, to enact ―interdisciplinary team work in practice, it was clear that financial resources are extremely significant" (p. 11). These authors however suggest future research focused on comprehension of all team members‘ experiential encounters as the research so far has always paid attention only to overall team outcomes.

Johansen et al. (2017) have evaluated medication related concerns in the aged sector through interdisciplinary collaborative efforts by primary and secondary health practitioners. Practitioners in this study have utilised the so called ―integrated medicines management model" (p.1) and found importance of a protocol targeting safety and communication in the process of administering medication, coordination and interventions as regards health and life quality. In contrast, Yang et al. (2017) research was a simulated educational project that targeted improvements in interdisciplinary collaborations in China. The participants included doctors, nurses and chemists. During the three month long study, interprofessional improvements were noticed in all disciplines however chemists and nurses reported higher learning outcomes than doctors. Moreover, after the promotion of a new program and new facilitators, doctors reported higher improvements in work skills transfer, attitudes and reflections. Additionally, it was found that individual mentoring could produce even higher interprofessional outcomes for each individual practitioner (Yang et al. 2017) that leads to stronger interprofessional trust.

Trust

The next crucial component is **trust** in cross-collaborative relationships and technology. Byrne et al. (2014) have described central findings of a community pilot program on ‗virtual lifetime health electronic record' that has looked into how medical data has been exchanged with private healthcare providers on a national level in the US. Patient trust along with perceptions of value have driven technology's acceptance. These have been underpinned by addressed policy and technical concerns as well as accuracy of data exchange thus further supporting interoperability protocols.

Glazer et al. (2014) have analysed the interrelationships between trust and telehealth technologies through ―blurred boundaries between domestic and medical, and between system smartness and individual responsibility" (p. 213). According to these authors, in 21st century, ―to gain trust the platform must acknowledge individuality; adapt to personal experience all the while constructing affordances towards familiarity, hope and reassurance" (p. 223).

Van Velsen et al. (2016) have explored the role that trust plays in the acceptance of telemedical portals for rehabilitation services. The authors have found disparities in factors which impact on trust among participants. ―For instance, trust in technology is made up, for patients, mostly by a perceived level of control and privacy, while for healthcare professionals, a larger and different set of issues play a role, including technical reliability and a transparent data storage policy" (p.1).

Kayyali et al. (2017) have looked into telehealth experiences by GPs, nurses and chemists in England. The project has uncovered that professionals in primary care settings lack relevant telehealth experiences. Its' identified ―barriers were cost and lack of funding and resources, whereas facilitators were raising awareness among staff and the public and investment in resources" (p. 203). Uncovered misunderstandings mainly related to the ―fear of losing face-to-face contact with patients and vital care information, patients' beliefs and confidence in using technology" (p. 203).

Morilla et al. (2017) similarly have evaluated physicians' determinants and opinions on the benefits, weakness and threats of e-health. The study found that doctors perceive e-health as useful. Particularly strong supporters and readier implementers were those who had previously experienced it. Training and funding have been highlighted as crucial dimensions. If well implemented, the above elements are likely to lead to **commitment.**

Commitment

Barrett and Hatfield (2014) have recognised the importance of **commitment** through the significance of engagement by intended users of telehealth. These authors have attempted to show current engagement levels by healthcare professionals in telehealth through coordinated European initiatives. They found that early involvement of clinicians since the inception of a particular program plays a significant factor in the sustaining of commitment and those clinicians and other stakeholders need to be given ownership in any process of change.

Blount and Gloet (2015) have evaluated key telehealth concerns within three Australian organisations that healthcare workers are facing when utilising information technology to deliver care remotely. These relate to technology itself, worker-client relationships, worker management and quality of service. Blount and Gloet (2017) have also written on organisational leadership challenges in managing remote workforce of today and tomorrow. Behavioural models and needed capabilities were explored.

Dewar, Bull and Malvey (2017) have created an index that measures user motivation for engaging with telehealth technologies. This particular study found ―that autonomy, competence, relatedness, goal attainment, and goal setting underpin motivation to use telehealth systems" (p.248). Spencer et al. (2015) have studied motivations that drive healthcare professionals' involvement in interdisciplinary learning and subsequent practice in rural areas of Tasmania. The authors have found ―formal and informal arrangements, the collaborative nature of small, close-knit healthcare teams and patient-centred models of care employed in rural practice settings, provide ideal contexts for interprofessional practice and learning" (p. 389). Rural practices are more naturally prone to interprofessional collaboration, as these ―organisations have structures and processes that facilitate interprofessional practice and can accommodate collegial supervision and promote interprofessional learning opportunities that transcend siloed boundaries” (p. 390). Facilitating structures are playing a crucial role.

Vassilev et al. (2015) have studied telehealth interventions for chronic conditions; namely diabetes, cardiac failure and chronic obstructive pulmonary disease in order to identify key motivational elements that make these interventions successful. The authors have found that telehealth only partially substitutes a health professional‘s role and thus the patient/provider relationship is crucial; secondly, ―successful telehealth interventions are those that can be well integrated into everyday life and health care routines, are easy to use, compatible with patients‘ existing environment, skills, and capacity, and that do not significantly disrupt patients‘ lives and routines” (p.1). Finally, the intervention that provides ―visibility or visualisation of symptoms‘ through ‗feedback has the capacity to improve knowledge, motivation, and a sense of empowerment; engage network members; and reinforce positive behaviour change, prompts for action and surveillance” (p.1). Next, we evaluate the Process Management construct through its sub-constructs that are adding to knowledge contribution in telehealth acceptance and utilisation of associated technologies by healthcare practitioners.

2.7 Process Management Construct (PM)

P**rocess management** construct could be explained through both TAM – Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003) and Communities of Practice theory (Lave and Wenger, 1991). It is the final and deciding essential operational element in this research model. No article could be found that has either, dealt with, nor developed telehealth adoption process management scale items. This model proposes a number of key essential steps that support the dependent variable which are derived from a) effective interoperability; b) speed of quality data at the point of care; c) productivity, d) routine practice and e) integrated care respectively and under a multi-grounded theoretical approach. It is believed that well targeted user needs supported by properly distributed and managed resources for targeted programs are likely to influence successful implementation of the proposed service delivery.

Measurement Dimensions	References
Effective Interoperability	Baig, Hosseini and Connolly (2015); Hay, Lim and Wartena (2012); Morrissey (2016); Jury & Kornberg (2016); Mosa, Yoo and Sheets (2012); Paterson et al. (2017); Schooley et al. (2016).
Speed of Quality Data at the Point of Care	Artis et al. (2017); Caliendo et al. (2008); Dubbey et al. (2015); Gold, McGrath and Mohan (2018); Morrissey (2016); Mosa, Yoo and Sheets (2012).

Productivity	Ahmed et al. (2014); Brewster et al. (2014); Carlisle (2013); Deldar, Bahaadinbeigy & Tara (2016); Jonnagaddala et al. (2018); Peirson et al. (2012); Raziuddin (2016); Schooley et al. (2016); Sikka and Barash (2012); Tang and Ricur, (2013).
Routine Practice	Bouamrane and Mair (2013); De Souza et al. (2017); Dunnebeil et al. (2012); Naseem, Rashid and Kureshi (2014); Zanaboni and Wootton (2012).
Integrated Care	Armstrong et al. (2012); Baker et al. (2011); Gellis, Kenaley and Have (2014); Grabowski & O'Malley (2014); Li et al. (2012); Kvedar, Coye and Everett (2014); Tang and Ricur (2013).

Table 6: Process Management Measurement Dimensions

Effective Interoperability

It consists of both one's computer self-effectiveness and interoperability of systems & applications. Baig, Hosseini and Connolly (2015) have evaluated the applicability of mobile technologies such as smart phones in health settings for tasks such as the checking of vital signs and blood sugar levels. They also investigated how time and energy efficient, reliable, cost effective and secure these technologies are in addition to the quality of information provided and found critical challenges in relation to data privacy and security as well as cost, reliability and acceptance issues. Importantly, interoperability of telehealth technologies inclusive of monitoring devices in addition to smartphone applications and online media has the potential to enhance clinical results.

Hay, Lim and Wartena (2012) have argued in favour of interoperability due to its patient reach, merging and patient data analysis purposes from a variety of applications and devices. They also strongly emphasised savings, clinical efficiencies and the need for interoperability standards in order for these technologies to fulfil their potential. Mosa, Yoo and Sheets (2012) on the other hand have evaluated eighty three functionalities of smartphone applications and devices. The vast majority targeted diagnosis and disease management, followed by medication references, calculations, education and general usage. Besides education, they have also emphasised their usability in patient monitoring.

Jury and Kornberg (2016) have conducted an empirical study into central disparities between physical face-to-face and telehealth consultations in Melbourne with the aim to integrating and mainstreaming telehealth. The authors found main disparities with administration, scheduling and technical issues. The implementation of an electronic patient health record, healthcare staff training and standard processes have closed some of the disparities. Schooley et al. (2016) have explored healthcare practitioners‘ perceptions relating to potential and actual productivity enhancements, provision of care, communication with patients and applicability of mobile technology linked to electronic data sources. The vast majority of practitioners reported positive impact on education and communication with patients, invested time on interactions, productivity, care delivery process and overall satisfaction. Around one quarter of participants reported negativities with submission orders and completion of notes, general workload, productivity and delivery process and experiential patient approval through final outcomes.

Paterson, McAuley and McKinstry (2017) have examined telemonitoring efforts that depend on data generated by patients. The absence of integration of this data with the electronic patient database has been identified as a significant inhibitor. The authors have designed a method in which anonymous data is ―downloaded from a third-party telehealth system to National Health Service systems and linked to the patient record using the patient identification through an interface accessed by healthcare professionals" (p. 317). This data is then drawn together in a report and distributed to GP practices, as a result of which more GPs have been utilising telemonitoring in the management of hypertension.

Morrissey (2016) has discussed key problems with the lack of interoperability due to the lack of integration of data. One such issue is product differentiation among IT vendors competing for a leading position, followed by a diversity of applied standards, their interpretations and applications. The solution is then in driving interoperability by the value it brings to clinical processes and patient outcomes and not through vendor driven technologists. Interoperability directly impacts speed of quality data at the point of care.

Speed of Quality Data at the Point of Care

Speed of quality data serves to ensure that the most appropriate, timely and available course of action is planned, coordinated and implemented at the point of care. Caliendo et al. (2008) have evaluated the impact of filters that prevent spam data on costs in organisations. The authors have found that productivity losses are minimised by about thirty five percent when spam data filters are installed and appropriately deployed. On the other hand, Dubey et al. (2015) have explored the so called ―Fog Data infrastructure, which is a low power embedded computer that carries out data mining and data analytics on raw data collected from various wearable sensors used for telehealth applications" (p.1). The authors have demonstrated how ―specific data mining techniques show order of magnitude data reduction and hence transmission power savings and improvement in system efficiency" (p.1).

Artis et al. (2017) have explored the issues of data accuracy which is crucial in clinical decisions. Their research focused on intensive care units and interdisciplinary interactions. The authors developed a methodology which measured communicated errors, classified them according to the type of communication failure and “assessed how commonly the rounding team detected data misrepresentation and whether data communication was impacted by environmental, human, and workflow factors” (p. 179). Electronic records were compared with directly observed spoken laboratory information. The authors found that “despite a structured interprofessional rounding script and a well-established electronic health record, clinician laboratory data retrieval and communication during ICU rounds was poor, prone to omissions and inaccuracies, yet largely unrecognised by the rounding team. This highlights an important patient safety issue” (p. 179).

Furthermore, Gold, McGrath and Mohan (2018) have evaluated the impact of data errors that were fed into electronic records during daily health staff ward rounds. They have also tested whether and to what extent these were recognised by health staff across various hospitals. The research has found that inaccuracies are always present, no matter what system is being used. All of the above findings have a direct impact on productivity outcomes.

Productivity

Schooley et al. (2016) have examined the use of tablet devices in relation to education, communication, perceptions by patients of their health providers, time invested on interactions, productivity, delivery of care process and satisfaction. Jonnagaddala et al. (2018) have evaluated cardiac risk dimensions with the aim to predict episodic or serious incidents. The authors have found that “electronic health record systems are a great resource of the required risk factor data however most of the valuable information is buried in the form of unstructured clinical notes” (p.1). A data extraction approach which “employs machine learning and rule-based clinical text mining techniques” (p.1) was demonstrated.

Ahmed et al. (2014) have evaluated the applicability of “an automated algorithm for identifying selected acute respiratory stress syndrome predisposing conditions at the time of hospital admission” (p.58). The authors have found that “an electronic rule-based search strategy was able to identify patients with risk factors for ARDS with more accuracy and higher sensitivity than manually collected data” (p.64).

Carlisle (2012) has explored positive and negative views by nurses in the UK in the way telenursing is perceived and approached. While some were enthusiastic and others not, remotely available notes, accessibility to the records held by GPs and enhanced computer literacy, distant patient support, satisfied patients and efficiencies gained were key productivity drivers in the uptake. Furthermore, Deldar, Bahaadinbeigy and Tara (2016) have reviewed publications on teleconsultations between physicians of which most occurred in Australia, the US and Italy in the general medical sector. The authors found that though teleconsultations had an impact on changes “in treatment plans, referral or evacuation rate, change in diagnosis, educational effects, rapid decision making and patient management ”(p. 286), other productivity disparities still needed to be addressed.

Sikka and Barash (2012) have discussed benefits and drawbacks of telemedicine and mobile health and its future. They also discussed how various devices have changed the health landscape, collegial collaboration, the way that care is delivered, the role of education in patient behavioural change, its impact on patient health outcomes, patient/practitioner interactions, and the role of data filters and control of care processes. Among drawbacks, data privacy and security are the biggest concerns in addition to who manages such enormous data and devices.

Similarly, Tang and Ricur (2013) have debated ophthalmic advantages and disadvantages of telehealth. Importantly, crossdisciplinary approaches that connect general practitioners and other allied health professionals through training in ocular initiatives aimed at the filling of undersupply of ocular specialists in order to meet increasing demands for retinal examinations, automated computer diagnosing capacities through recognition of images particularly in chronic diseases and online portal management and patient reminders and alerts were discussed. Unresolved reimbursement and insurance drawbacks in addition to the management of change for virtually designed models of care, accessibility and ongoing user support for both patients and crossdisciplinary professionals involved were among the key challenges discussed.

Raziuddin (2016) has written a thesis on the perceived lowering of errors especially by specialists in association with electronic health records. Years of experience and frequency of electronic record usage in addition to nanotechnology were elaborated. He found that experience and frequency of use of diverse functions does result in the lowering of errors, for instance elimination of dosage and medication type errors as well as incorrect location surgery. Telehealth technologies may in fact serve as support mechanisms in both routine practice and non-routine medical situations that assist with decision making (Bullock, 2014).

Routine Practice

The process of understanding anything unknown, in this case, telehealth technologies needs to start with education and training, which are bound to affect the medical profession itself. In this context, practitioner professional habits and associated routines play a substantial role.

Dunnebeil et al. (2012) have explored physicians‘ ―opinion, attitudes, and knowledge in ambulatory care to find drivers for technology acceptance in terms of information technology utilisation, process and security orientation, standardisation, communication, documentation and general working patterns”(p. 746). In terms of routine, the authors found that technological ease has a direct impact on integration suitability and subsequent routinisation which is supported by the structural environment and orientation processes where information technology assists the delivery of daily clinical activities.

Zanaboni and Wootton (2012) have explored telemedicine adoption processes amongst other available technologies and dimensions that influence its adoption. The authors found that its adoption ―is similar to that of other health technologies and follows an S-shaped growth curve” (p.1). Cost savings are important however, they alone are not adequate for adoption on a large scale, whereas ―personal incentives for the health professionals involved in service provision are needed before the widespread adoption of telemedicine will occur” (p.1) and become routine care delivery method.

Boumrane and Mair (2013) have studied GP‘s views on electronic patient records and associated management practices in Scotland. Most doctors recognised the role of electronic patient records in the provision of integrated care and decisions made, however, some reservations were also expressed in terms of usability, navigating tools and data visibility. The authors recommend additional training for GPs to increase their comprehension, knowledge and command of the available features and functions.

De Souza et al. (2017) have explored drawbacks and advantages of telemedicine intervention between remote health entities and technologically advanced hospitals in Brazil. The authors found

> ―lack of experience in the use of technology or the quality of the internet signal; the multiplicity of different telemedicine platforms; the quality of the image sent to the HT hospital; the misunderstanding that telemedicine is a time-consuming technology instead of a resource that may help save lives; not feeling comfortable exposing doubts to other HT colleagues; problems in the management of telemedicine use in the remote units; and political and legal issues” as key barriers (p.527).

The authors recommended that commonly accepted distant care protocols could influence more telemedicine usage as well as the creation of novel work routine practices. Consequently, these could provide capacity for and lead to more integrated care particularly in remote patient settings. *Integrated care* is the final sub-construct in the proposed process management element.

Integrated Care

Integrated care is a multidisciplinary, collaborative, holistic, evidence-driven and coordinated approach of care delivery that aims to prevent, heal and promote wellness (Leach et al 2018).

Armstrong et al. (2012) have evaluated the effect of integrated surgical teams‘ interventions on patients suffering from diabetes in their feet. The authors have found that ―interdisciplinary diabetic foot surgery teams may significantly impact surgery type, with greater focus on proactive and preventive, rather that reactive and ablative, procedures" (p. 514) and consequently reduce amputation rates.

Gellis, Kenaley and Have (2014) have examined the impact of ―an integrated telehealth intervention to improve chronic illness (congestive heart failure, chronic obstructive pulmonary disease) and comorbid depression in the home healthcare setting" (p. 889). The authors have found that ―integrated telehealth care for older adults with chronic illness and comorbid depression can reduce symptoms and post-discharge ED use in home health settings" (p.889).

Baker et al. (2011) have evaluated a telehealth demonstration program linking coordinating activities with Medicare for chronic patients needing intervention. The program was examined for cost-effectiveness and patient experience. Savings found were significant and similarly managed programs recommended.

Dvorak (2014) has also discussed financial concerns that prevent telehealth progress particularly in underserved areas. These were due to the poorly aligned reimbursement schemes with the provision of care. The authors found that telehealth enables integration and more effective coordination of home, hospital and specialty care, which avoids re-hospitalisation, however legal and reimbursement frameworks are behind to support it.

Grabowski and O‘Malley (2014) have discussed hospitalisation prevention measures for nursing facilities‘ residents through the utilisation of telemedicine physicians in the after-hours periods. The authors found that these facilities could achieve savings and lower hospitalisation rates with this approach as opposed to consulting costs during normal hours which often end up with an unnecessary emergency visit.

With the integration of various other stakeholders, even greater saving could be made. Kvedar, Coye and Everett (2014) on the other hand have reviewed the idea of connected or integrated telehealth and telemedicine with the aim to target integrated care. They have suggested stakeholder involvement at various levels in order to have the concept tested, funded and deployed.

Due to their crucial roles, doctors and nurses hold key to integrated care in practice as well as in influencing policy makers and platform providers. Next is evaluated the construct named ‗Value Creation' which acts as the central interconnecting mediator and predictor between the four essential operational elements and GPs' readiness to develop telehealth capabilities.

2.8 Value Creation in the Context of Telehealth Service Value Networks (VC)

As mentioned and presented, literature on service value networks strongly supports value creation as the central driving and sustaining force on which the concept is founded. Amongst all of the reviewed studies on telehealth acceptance, the most influential direct predictor of practitioner intentions to use telehealth technologies has been perceived usefulness that originally came from the Technology Acceptance Model but which has also been amended as performance expectancy by the Unified Theory of Acceptance and Use of Technology (Gagnon et al. 2014; Dunnebeil et al. 2012; Raymond et al. 2015).

This thesis has introduced a construct that enriches telehealth context from a management field's perspective, which provides enhanced value in comparison with perceived usefulness. This construct is ***‗value creation***' and in the context of this thesis, it revolves around benefits or incentives as perceived from GPs' angle and which might stimulate their adoption of telehealth.

Measurement Dimensions	References
Close experiential encounters	Blount and Gloet (2015); Moffatt and Eley (2010).
Paths to self-employment	Van Alstin (2016).
Improved access to specialists	Alkmim et al. (2012); Dharmar et al. (2013); Gillentine (2012); Patel et al. (2011); Rheuban (2013).
Reduced rehospitalisation	Andres et al. (2015); Venter et al. (2012).
Cost efficiencies	Abramson et al. (2016); Park et al. (2015); Zadeh and Tremblay (2016).

Table 7: Value Creation Measurement Dimensions

The following articles discuss some of those potential benefits. Moffatt and Eley (2010) have reviewed literature in relation to the uncovered benefits of telehealth among health professionals and remote Australian residents. The authors ―reported access and quality of clinical care available to rural Australians' whereas ‗professional development opportunities and support from specialists through the use of telehealth may improve rural medical workforce recruitment and retention" (p. 276). Thus, it is evident that GP community of practice has been impacted by the evolving telehealth developments. GPs are also likely to benefit from close experiential encounters with other healthcare practitioners (Blount and Gloet, 2015), particularly specialists from whom they may learn a lot more details about specific health conditions.

Moreover, Van Alstin (2016) has discussed several predictions for telehealth and its implications for practitioners. One of those interesting predictions is the rebounding of independent private practices and GP practitioners running them. Telehealth is in fact likely to open more opportunities for GPs as a result of better designed integration one of which is more paths to self-employment. Better integration is likely to lead to improved access to specialists and other healthcare practitioners whether in critical care and rural emergencies (Dharmar et al. 2013), improved accessibility to specialised care (Alkmim et al. 2012); faster access to specialist telehealth equipment and guidance in remote examinations (Gillentine, 2012) or around the clock availability of specialists for teleconsultations and other forms of assistance (Rheuban, 2013).

Furthermore, Patel et al. (2011) have conducted a study on US physicians connected to a network of health data institutions in order to evaluate their preferential options for exchanging health data and uncover influencing factors to utilise electronic exchange. The overwhelming majority were interested in electronic data exchanges with expectations of improved communications, efficiency and coordinating outcomes in the provision of continuous care. The reported drawbacks were ―start-up costs and resources to select and implement a system. Technical assistance and financial incentives to use or purchase health IT systems" (p.171) in addition to technological usefulness and electronic viewing preferences were significant adoption indicators.

Venter et al. (2012) have performed a one year long telemonitoring trial for patients suffering from COPD and congestive cardiac issues in New Zealand and found significant improvements in life quality among telehealth users compared to a group which did not utilise telemonitoring. The study also showed lowered hospitalisations and acceptance of telehealth technologies by patients.

Similarly, Andres et al. (2015) have studied the effect of telemonitoring on chronic cardiac failure patients through the use of sensors. The authors reported likely benefits to physicians, nurses and patients through the provision of automatically transmitted information which serves to uncover early heart malfunctioning signs, which enables doctors to act timely and potentially prevents rehospitalisation. Park et al. (2015) have evaluated the impact of telehealth on expenditure in Korea and found that patient cost saving is substantial particularly in cases of multiple episodes. Telehealth also enabled doctors to have faster access to previous patient tests, which also had a cost saving impact on diagnostic tests, which did not need to be repeated needlessly.

Abramson et al. (2016) examined intern physicians working in an ambulatory clinic that had been utilising the electronic health record system for two years under their community of practice arrangements. The key onus was placed on functionality of e-prescribing and other efficiencies. Central uncovered issues were ―efficiency and usability, effects on safety, ongoing training requirements, customisation, and competing priorities for EHR" (p.994). The authors also found the significance of short cut customised features aimed at maximising efficiency that physicians were not utilising. Furthermore, continuously evolving features which are not supporting workflow efficiency add extra problems due to the need for continuous physician education and support. ―Of greatest importance to physicians appears to be the ease with which key functions can be performed. Thus features of the e-prescribing application which are simple and improve efficiency are likely to be preferred and should be a consideration for vendors" (Abramson et al. 2016, p.1001) as these save time and associated cost.

Similar outcomes were reported by Zadeh and Tremblay (2016) who found benefits of telehealth besides cost efficiencies, to be enhanced care and quality service, enhanced efficiencies in medication dispensing and reduction in errors to be significant values to both clinicians and patients alike. In addition to ‗Value Creation' this model also employs telehealth enablers that act as moderating factors in the relationship between ‗Value Creation' and GPs' Readiness to Develop Telehealth Capabilities.

2.9 Telehealth individual and organisational enablers (TE)

Telehealth enablers represent personal and organisational GP practitioner's motivating factors that may support value creation elements in stimulating one's level of readiness to adopt telehealth technologies. No article in the literature could be found that has measured telehealth enablers for the purpose of assessing doctor readiness to develop technical and collaborative capabilities for telehealth medical services. Based on identified literature gaps, these should essentially target GP user needs, technical support, adequately skilled workforce, GP practice professional improvement advantages and government funding support as justified by the following literature review.

Measurement Dimensions	References
GP user needs through appropriate system design	Flores-Vaquero (2016); Gagnon et al. (2016); Holahan et al. (2004); Klein and Sorra (1996); Rodbard and

	Vigersky (2011); Mohktar et al. (2013); Zhang and Walji (2011).
Technical support	Brewster et al. (2014); Gagnon et al. (2014; 2016).
Skilled workforce	Darius (2015); Holahan et al. (2004); Klein and Sorra (1996); Shaw et al. (2013); Wilson (2017).
Professional improvement advantages	Rutledge et al. (2017); Sisi et al. (2017); Zhang and Walji (2011).
Government funding support	Gagnon et al. (2016); Rho, Choi and Lee (2014).

Table 8: Telehealth Enablers Measurement Dimensions

Any new innovation essentially needs to accommodate individual user‘s needs to be implemented successfully. Research by Klein and Sorra (1996) has demonstrated that implementation requires a supporting organisational climate and proper innovation/user fit. Thus, the importance of appropriate system design which addresses and accommodates intended user needs is an indispensable enabler and goes a long way towards successful implementation. Klein and Sorra‘s (1996) model has also been widely cited and used by other researchers. Among them, Holahan et al. (2004) have empirically tested and extended it in the context of IT implementation in science schools. The way telehealth system is designed likewise determines its functionality and directions. That is why system design also needs to support adequate clinical user needs and capabilities. Thus, long-term telehealth requirements that accommodate both clinicians‘ and patient‘s side need to be addressed. This has been researched by Flores-Vaquero et al. (2016) particularly in the context of long-term medical conditions. The onus of their case was on smartphone hypertension applications. Similarly, Rodband et al. (2011) have worked on the development of an IT support decision mechanism for patients suffering from diabetes type two. Their system was evaluated in practice and found useful in managing the above condition. In comparison, Mohktar et al. (2013) have designed a more general support mechanism for telehealth home users that assists with the management of staff workload and provision of open communication through the utilisation of open software platform.

Furthermore, Zhang and Walji (2011) have presented a novel framework on assessing electronic record usability, forecasting and measuring ***individual dissimilarities*** and designing usable protocols. Its key elements which decide whether the system is usable and thus acting as user enabler are ―task, user, representation, and function" (p.1056). While the framework assesses usability, it also evaluates its usefulness through performance expectancy and satisfaction from the users‘ perspective in the way tasks are approached and accomplished. These are importantly supported by the Unified Theory of Acceptance and Use of Technology as performance expectancy is its key element. The authors have demonstrated that usability can be improved by redesigning the system to accommodate user needs which can be measured methodically and accurately.

Furthermore, Gagnon et al. (2016) in their study on the evaluation of healthcare organisations‘ adoption of electronic medical records in Canada have utilised the following individual enabler elements, namely; “1) training for the EHR use; 2) time to learn and experiment with the EHR; 3) the presence of incentives/rewards for use; 4) access to technology, information resources and the internet; 5) access to technical assistance and 6) the administration‘s reactivity in removing barriers and to provide requested assistance” (p.268). They have found that, strategies targeting individual clinical users are likely to be more successful than strategies targeting entire organisations.

Moreover, Brewster et al. (2014) found that “nursing staff acceptance of telehealth is critical to effective service delivery, but barriers include concerns about autonomy and the impact on the staff” (p.22). Tailoring solutions that suit professionals dealing with real issues in addition to technological ease, quality equipment that is reliable, collaborative participation in the design of service, learning and technical support and assistance are true enablers. Similar views have been reported by Gagnon et al. (2014). These are all supported by both the Unified Theory of Acceptance and Use of Technology and Communities of Practice theory.

On the other hand, Shaw et al. (2013) have studied ***organisational factors*** that enable or disrupt adoption of telemedicine for hypertension monitoring. The study included doctors, nurses, technologists and administrators. It found stakeholder commitment besides hypertension improvements as central enablers. Sufficient staffing, comprehending evidence-founded interventions, technological infrastructure and adequate use of the current instruments and space and technical assistance were other enablers. However, “unclear long-term commitment of nursing, added workload, competition with existing programs, implementation length and limited available nurse staff time” (p.1), lack of improvement evidence, integration hardship with the current workflows and limited skilled personnel were key barriers.

Importantly, telehealth has been recognised as a cost-efficient platform to distant patients. Rutledge et al. (2017) have researched the case for essential workforce skills and relevant knowledge and attitudes in support of telehealth practice. They have “found that training using the multimodal approach allowed students to develop comfort, knowledge, and skills to embrace the utilisation of telehealth in health care” (p. 399). Similarly, Li et al. (2017) have explored health workforce IT capabilities in the European context through the inclusion of diverse health professions and experts. Their key findings suggest that workforce issues need to be addressed by the incorporation of IT skills into educational curriculum, awareness campaigns and ongoing training and through involvement of health practitioners in potential solutions.

Telehealth's potential advantages over conventional face to face physical attendance services according to Darius (2005) are drawing attention by investors and insurance companies looking to increase return on investment through user convenience, savings and perceptions of similar outcomes to those with physical doctor visits for less urgent conditions. This is seen as another important telehealth adoption enabler. On the other hand, urgent cases seem to be embracing telehealth too. According to Wilson (2017), ―urgent care providers are slowly adding telemedicine to their clinical portfolio, seeing them as an opportunity to expand their client base while meeting consumers' need for access to care when and how they want it" (p. 38).

Moreover, Zhang and Walji (2011) have also found that professional improvement advantages over current practices may crucially impact organisational readiness to implement telehealth methods. Moreover, Rho, Choi and Lee (2014) found ease of access to patients and their health records in addition to incentives and ongoing government funding support to also predict organisational acceptance. Both individual and organisational factors play important roles in the facilitation of telehealth medical services. As such, they cannot be ignored at all due to the fact that telehealth is a cross-disciplinary platform by default, which importantly depends on individual contributions of multiple stakeholders who need to be supported by facilitating factors. Literature on clinicians' telehealth readiness is reviewed next.

2.10 GPs' Readiness to Develop Telehealth Capabilities (RDTC)

Clinician readiness for telehealth remains a key challenge for the telehealth platform planners. It is also the key aspect under evaluation in this thesis. Various studies have been conducted in this field some of which are reported here. However, no article in the current literature has developed a scale that has measured either technical or additional collaborative telehealth capabilities by doctors. Below is presented literature review on readiness and its evolving measurement dimensions identified as current gaps.

Measurement Dimensions	References
Perceived technical preparedness	Edwards, 2017, pers. comm., 24 November; Jennet et al. (2003a); Jennet et al. (2003b); Legare et al. (2010a); Legare et al. (2010b).
Technical readiness	Jennet et al. (2003a); Jennet et al. (2003b); Legare et al. (2010a); Legare et al. (2010b); Philips et al.

	(2017).
Perceived impact due to physical distance barriers	Blount and Gloet (2015); Gagnon et al. (2012; 2014); Greenhalgh et al. (2015); Lapointe and Rivard (2005).
Perceived impact on clinical interactions	Lapointe and Rivard (2005); Gagnon et al. (2014).
Collaborative readiness	Henry et al. (2017); Parasuraman and Colby (2015); Morilla et al. (2017); Philips et al. (2017); Shaw et al. (2013); Yusif, Hafeez-Baid and Soar (2017).
Perceived impact on clinical autonomy	Audet, Squires and Doty (2014).

Table 9: Readiness to Develop Telehealth Capabilities Measurement Dimensions

Jennett et al. (2003a) have explored rural doctors' readiness for telehealth and found four readiness types: structural, engagement, core and non-readiness. Besides, key themes evaluated were benefits, risks, education and awareness, inner and outer group underlying forces. Legare et al. (2010a; 2010b) have reviewed literature on existing telehealth readiness surveys and developed a French language version based on Jennet et al. (2003b) which then underwent psychometric testing and validation with administrators and doctors. Results showed higher readiness among administrators than doctors.

Khoja et al. (2007) have presented evaluation tools for institutional readiness of e-Health in the developing world and tested it in Pakistan. Each tested tool consisted of four categories. In core readiness category, these are identified telehealth needs, status quo dissatisfaction, awareness, comfort, trust, planning, willingness and satisfaction and integration. In technological readiness category, these are internet quality and speed of data, support services, software and hardware, information and communications technology affordability and availability and training and access. Literature review has demonstrated a variety of aspects related to telehealth readiness however, no article in the literature could be found that deals with or has dealt with clinicians' readiness to develop technical and collaborative capabilities in a service value network with general practitioners in the centre and with one where chronic and/or acute conditions of aged care patients drive its adoption. This topic of inquiry is therefore pursued by this thesis.

Therefore, GP readiness to develop telehealth capabilities has been divided into technical and collaborative components. ***Technical readiness*** represents individual health practitioner's views of one's own technical skillset to effectively engage with other practitioners, providers and stakeholders via telehealth technologies for the purposes of receiving or providing clinical support to distant health practitioners and patients. Clinician resistance or unwillingness to adopt telehealth delivery of care is seen as both key technical and collaborative barrier to one's pursuance to develop essential technical capabilities required by the telehealth platform (Dunnebeil et al. 2012).

As telehealth is a completely new model of health care delivery, every clinician intending to utilise it needs to learn new skills, ways, rules, procedures and processes in order to deliver care effectively and efficiently. To achieve this, readiness to develop technical capabilities are foundational upon which other capabilities rest (Edwards, 2017, pers. comm., 24 November). However, clinician resistance remains a key barrier (Dunnebeil et al. 2012). In fact, clinicians resisting to develop technical capabilities are not likely to pursue additional collaborative capabilities (Gagnon et al. 2012). In that context, Lapointe and Rivard (2005) have studied the interrelationship between technology introduction and its resistance amongst healthcare professionals. They have explained several different types and levels of resistance and behavioural likelihoods among personnel depending on their positions, power levels and risk opportunity ratios. Furthermore, Gagnon et al. (2014) have used Lapointe and Rivard (2005) findings in their physician acceptance integrated framework by emphasising resistance towards technology as it is likely to affect one‘s accustomed daily clinical decision making processes.

Likewise, Greenhalgh et al. (2015) have evaluated telehealth effectiveness and support services for the elderly and have expressed mixed perspectives and results that either underpin or reject technological use. They have challenged the distant approach in being able to fully replace physical clinical service delivery. Similarly, Blount and Gloet (2015) have empirically explored key challenges with the telehealth approach in remote Australian communities and stressed the significance of balancing distant with physical presence in the delivery of adequate and quality care.

Collaborative readiness on the other hand represents individual GP‘s likelihood of developing additional collaborative skills to effectively engage with other health practitioners, providers and stakeholders via telehealth technologies for the purposes of receiving or providing clinical support to distant health practitioners and patients. These are in addition to technical capabilities omnipotent elements to make the telehealth platform workable. Henry et al. (2017) have identified health providers‘ behavioural attributes while delivering telehealth care to patients. According to these authors and irrespectively of the many benefits presented by telehealth, ―there is a gap in professional preparation for this mode of care delivery. The success or failure of telehealth may very well be more dependent on interpersonal attributes than on technological access as clinicians rely on positive relational behaviours to engage and obtain good clinical information" (p.883). Furthermore, according to Philips et al. (2017, p.120), ―a measure of readiness of interdisciplinary healthcare teams to use e-health technology has not been formed" yet. Morilla et al. (2017) have on the other hand found that physicians experienced in the use of telehealth are more accepting of it and may be ready to develop additional collaborative capabilities, though others have stated a long adapting curve due to the importance of understanding new relationships between practitioners, patients and technology.

Yusif, Hafeez-Baid and Soar (2017) have reviewed various databases and articles on readiness in e-health and found commonalities related to technological, motivational and core readiness as well as acceptance, organisational, information technology learning, engagement and societal aspects. Technological, core, engagement and information technology readiness were particularly identified as needing reliable measurement items in order to decrease failures in e-health implementation. Moreover, Philips et al. (2017) have proposed a theoretical readiness framework for e-health teams with 59 measurement items that is based on four key factors: technology, team, external and patient driven capabilities and which aims to enhance outcomes for patients, whereas Shaw et al. (2013) have evaluated theoretical themes regarding organisational change and readiness. Parasuraman and Colby (2015) on the other hand have developed an updated index on technological readiness and validated it empirically through both qualitative and quantitative methods. However, the above reviewed authors' scale are not very suitable for the purposes of this thesis, because this thesis is measuring readiness to technical and additional collaborative capabilities of doctors in telehealth medical services.

Audet, Squires and Doty (2014) have assessed doctors in primary settings through their use of health information and searched for dimensions that increase their collaborative information using & sharing capabilities. The authors analysed ―whether participating in an integrated delivery system, sharing resources and support with other practices, and being eligible for financial incentives were associated with greater HIT capacity" (p.347). Findings showed that those practitioners in integrated networks had higher sharing and health information capacities, electronic record uptakes and electronic patient accessibility than their counterparts in smaller practices involving one or a few physicians. Financial enticements also positively influenced adoption however negative impact on professional doctor autonomy was likely to reverse the adoption process. Furthermore, Gagnon et al. (2014) has emphasised that telehealth technologies could face resistance amongst doctors and thus not receive full doctor support due to their high likelihood to reduce clinical interactions which are essential to assess patients properly. No researcher thus far has either proposed nor empirically evaluated all of the elements as recommended in this thesis. Overall literature gaps are evaluated next.

2.11 Overall Literature Gaps

Interprofessional and/or interdisciplinary disparities are evident throughout the health system due to strong interprofessional and/or interdisciplinary divisions along opposing objectives, skills, values and professional loyalties (The Institute of Medicine, 2015; Meleis, 2016). These unresolved divisions are blocking reform and slowing acceptance of new innovations in health (Health Workforce Australia, 2011; 2012) such as telehealth technologies and technology-based medical services. Such disparities and the resulting lack of acceptance of technology-based services and telehealth technologies are the main concerns of this thesis project. According to Taylor (2013) and Wade, Eliott and Hiller (2014), telehealth sustainability is far more dependent on acceptance of technology-based services and telehealth technologies by clinicians than on advances in telehealth technologies alone, which is why the main onus in this project is on GPs and their interactions with specialists, pathology and medical imaging clinicians.

In support of sustainability through a gradual and logical telehealth acceptance building process not considered before, the present study considers enriched telehealthcare service value network elements. These are key elements of a service value network; technology, knowledge, relationship and process management (Walters and Rainbird, 2007, Agarwal, 2008; Agarwal and Selen, 2009; 2011; 2013; Scerri, 2015) herein renamed as telehealth technology use considerations, knowledge sharing, relationship and process management in addition to value creation, telehealth enablers, age, gender and experiential factors. According to extensive literature review and to the best of the author‘s knowledge, these elements have not been employed before as they are in the context proposed in this thesis.

As in every novel field, likewise ideas about telehealth can be seen from various angles and very different perspectives. While this is good for discussion and ongoing dialogue purposes, it also leaves plenty of room for the exploration of weaknesses. What has been explored during literature review phase as a weakness is in fact going to be addressed in this work. Namely, researchers thus far have failed to recognise and thus evaluate telehealth adoption through the prism of service value network analogy and its key elements. Universally though, literature recognises the benefits of telehealth on increasing health expenditure and the likely impact it could have on the treatment of the underserved and remote patients. Yet research specifically focusing on ongoing aged and chronic conditions and various types of disabilities as essential drivers of adoption in a service value network has not been attempted before. Telehealth could be a potential solution to these conditions, however to realise the benefits of telehealth, clinicians need to develop telehealth capabilities. Primary care clinicians and general practitioners in particular are centrally positioned clinicians at the interface between the patients and the rest of the health system. For that reason, they are very significant contributors to the success or failure of telehealth initiatives. Furthermore, the telehealth platform has not yet been examined through the role of GPs in a service value network where clinical and data-led initiative in conjunction with chronic and acute patient needs is also driven by GPs and their cross-disciplinary needs to interact with specialist, pathology, medical imaging and/or other practitioners.

While focus on technology has been widely published, a lack of focus on knowledge sharing by health practitioners using technological tools and telehealth advances remains an important challenge and literature gap needing research attention (Bullock, 2014; Choo et al. 2015). Furthermore, the interrelationships of health practitioner communities of practice and their impact on the novel field of telehealth through relationship management and process management innovations related to the progress of telehealth are very scarcely available in literature which would thus clearly benefit from solid research output. Also, what remain unknown phenomena to this date are the influences or significance of GPs' *telehealth technology use considerations, knowledge sharing concerns and data exchange flows for the successful functioning of a telehealth network and relationship and process building blocks* on their readiness to develop telehealth capabilities. These important gaps will be addressed by this research which are conceptualised in the following section. This research can further offset the found gaps in literature, as essential operational elements never previously examined are explored and evaluated in this study which is likely to predict and influence the disruptive business model of future clinical interactions between various stakeholders amongst whom GPs play a highly significant role.

Sudden interest in telehealth following COVID-19 has led to various projects being undertaken by the medical community. One such project is the development of a novel protocol in England that aims to monitor infected patients in self-isolation in order to curb the spread of the corona virus (de Lusignan et al. 2020). Another recent study by Fisk, Livingstone and Vinona (2020) has examined telehealth trends in the USA, UK and Australia post COVID-19 events. It has concluded that there are countless difficulties on the path to transforming virtual care by doctors. Many of those and other not mentioned by their study have been dealt with by this thesis. Even though telehealth has been embraced to a degree at least temporarily due to COVID-19 pandemic events, the model herein explored adds substantial novel benefits to the medical community and other key societal stakeholders such as policy makers, telehealth service providers and software developers, payment and insurance authorities, patients, carers and others through its novel approach and findings.

The model proposed in this thesis does not represent business as usual for medical practitioners and the proposed interconnections between the key elements and the way that they influence, that is interact with each other is a novel way of thinking not tested before. Namely, general consensus is that relationship management is the precondition for knowledge sharing. That is, one needs to have a good working relationship with another medical practitioner to willingly share one's knowledge or information. However, under the proposed model, telehealth technology use considerations are the precursors to knowledge sharing out of which relationship management is influenced. That is, the predicted outcome is that those willing to utilise telehealth technologies are sharing knowledge either willingly or unwillingly, that is whether they are being aware of it or being unaware. Knowledge sharing is simply put, a product of one's willingness to consider and utilise telehealth technologies, not one's good and trusting relationship with another practitioner. New processes related to relationship management and process management then evolve due to the above developments which will be explored and measured in this study.

2.12 Telehealth Service Value Network Conceptual Model

Technological advances and resulting novel innovations have been to this date and are likely to be for times to come drivers of change and disruption to various business and other operational models. As a result of telemedical and telehealth developments, different modes of patient-practitioner and practitioner-practitioner interactions have become available. Shown below is a conceptual diagram of such telehealth service interactions. These could for instance serve specific medical conditions focusing on a specialised area with a general practice as a referral, monitoring and treating or co-treating point.

However, the best possible technology when idle either becomes obsolete and subsequently replaced by a more novel idea or eventually dies out unused. The challenge then is not the technology itself as is the human workforce for whom it has been intended. Moreover, this is only a conceptual model at this stage, due to low levels of telehealth acceptance by clinicians and a consequent lack of readiness to exchange patient data which limit collaboration and block further integration that needs to be clinically owned and done responsibly (Anderson, 2010).

The proposed cross-disciplinary framework will hopefully contribute to overcoming some of the current adoption and implementation barriers. Consequently, the onus in this thesis will be on GP practices / medical centres that are predominant primary care practices Australia-wide and their telehealth interactions with specialist, pathology and medical imaging practitioners as illustrated below. The objective of the present study is to explore GP‘s readiness to accept the proposed SVN telehealth model.

According to this patient-centric model, general practices and individual GPs are utilised as telehealth primary care network reference points and the patient‘s electronic record is jointly fed by all of the stakeholders involved in patient care, though the system should include special privileges and/or access restrictions based on patient preferences and clinician role / function. While the practitioners under this model access patient data through the electronic patient record, the patient however may wish to receive a hard copy or alternatively register for an online record delivery application of his/her medical results upon being referred to and visiting either an imaging, pathology or specialist practitioner, which is indicated by the broken line. In this scenario, GP practitioner, pathology, medical imaging and specialist practitioners all have certain access and/or restriction availability to a patient‘s e-record.

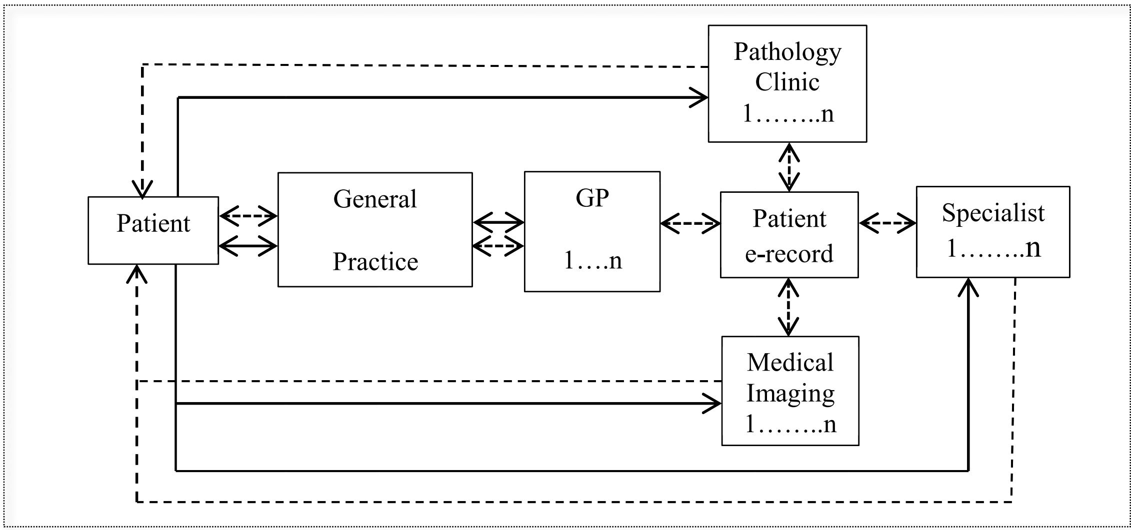


Figure 4: Proposed GP practice cross-collaborative typology

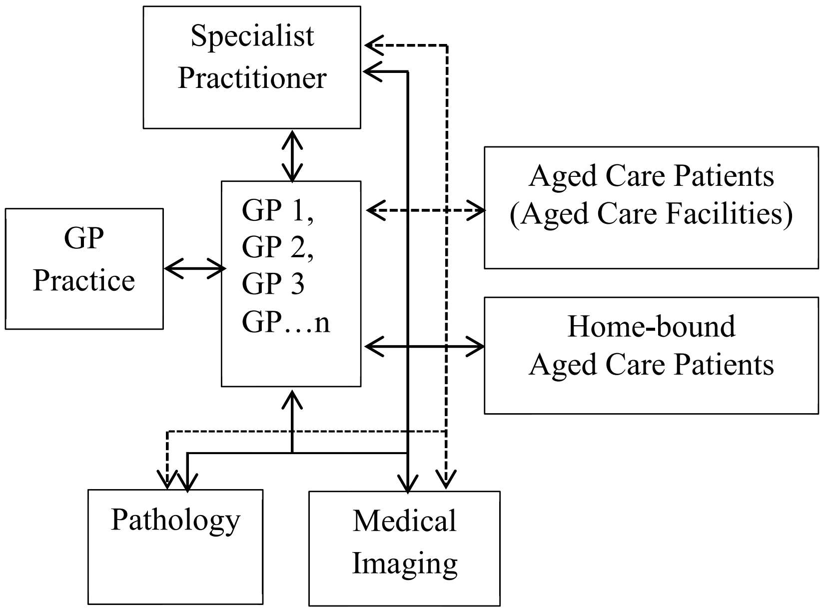
For instance, pathology and medical imaging practitioners do not need to have access to a full e-record as they are not directly involved in the actual patient treatment and care delivery act. Likewise, specialist data may not be relevant for GP roles. Thus, the model also proposes legally binding guarantees and protections of health practitioners‘ intellectual property and code of professional practice as fundamental constructs in the knowledge sharing process.

The model considers GP practice as one unit made up of different individual general and/or other associated healthcare practitioners, administrative staff and managers. Each GP is also considered individually through individual preferences and interactions with other external practitioners (pathology, medical imaging and specialist practitioners) as well as inter-organisational colleagues, so that enough room is left to test intra-organisational and inter network professional working relationships and their overall impact on telehealth acceptance.

Accordingly, the model allows for legally enforceable patient e-record ownership (ease of withdrawal at any time), data exchange consent, transparency of data input and practitioner-patient joint health care decision making and delivery. Below is the proposed scenario and novel phenomenon that is going to be initially explored through a qualitative pilot study which will then subsequently be incorporated into the main quantitative project on a larger scale. The key stakeholders presented in this conceptual scenario, namely; GPs are evaluated on the basis of their readiness to participate in cross-disciplinary clinical interactions with pathology, medical imaging and specialist practitioners in order to serve targeted chronic and acute or other aged care conditions.

GPs also directly interact with these practitioners through the mentioned telehealth control and intervention services such as teleconferencing, telemonitoring, tele-dermatology, tele-radiology, tele-ultrasound, e-consultation, e-referrals, e-prescribing, e-support in decision making and the like.

In order to realise the benefits of telehealth and its technologies, the initial step attempted by this thesis is to examine selected GPs telehealth technology use considerations, knowledge sharing, relationship and proposed process management factors, all of which are central to understanding GPs‘ levels of readiness to develop capabilities for the proposed telehealth medical service network. Shown below are very specific medical conditions that are currently dominating the healthcare landscape in the targeted settings. Critically, this thesis intends to evaluate GPs telehealth clinical perspectives on cross-disciplinary efforts with pathology, medical imaging and specialist practitioners in relation to chronic conditions (MENA Report, 2013) such as: cardiovascular conditions (heart failure); respiratory conditions (COPD - chronic obstructive pulmonary disease) (Franek, 2012); kidney failure (e.g. dialysis) (di Benedetto et al. 2010), diabetes (Bardsley, Steventon and Doll, 2013) and acute condition such as hypertension (Australian Institute of Health and Welfare, 2014).



Medical Conditions Used as Context:

- Chronic conditions (heart failure, COPD, kidney failure, diabetes)
- Acute condition (hypertension)

Proposed Control and Intervention Services:

- Teleconferencing / videoconferencing (consultation, diagnosis, tele-monitoring);
- Remote e-checks (symptoms, vital signs measurement: pulse (oxygen saturation), heart rate, blood pressure, glucose level, weight, height);
- Store and forward data analysis for diagnostic purposes;
- Tele-imaging (tele-dermatology; tele-radiology; tele-ultrasound)
- e-scheduling of appointment and reminders;
- e-referrals;
- GP-patient-specialist e-consultation;
- e-prescribing;
- e-support in decision making;

Figure 5: Proposed Cross-Disciplinary Telehealth Control and Intervention Services for Chronic & Acute Medical Conditions in Aged Care

It is known that GPs are often overwhelmed with multiple conditions that their patients present them with and these challenges cannot be addressed by a single practitioner alone. These could serve as driving forces for cross-disciplinary telehealth engagement as no one practitioner alone can deal with them more effectively than when forces are joined with the right clinically owned guidelines, procedures, processes and back-up systems. These phases imply involvement of a community of practice, best described by the community of practice theory but also technology as a facilitator which can be well explained by the Unified Theory of Acceptance and Use of Technology. It would not only be a cross-disciplinary novel service offering, but also one which would bring clinical efficiencies and expenditure savings through cross-disciplinary specialisations and expertise gained through such initiatives. After initial successes with a few key diseases that are concerning the current health landscape, the initiatives could then extend to other conditions too. This collaborative phase is the most critical, that is why the focus on very specific commonly concerning conditions that the targeted practitioners are either overwhelmed with due to the demand or willing to learn more about for other reasons. Therefore, the present onus here is primarily on GPs as the main reference point to patients in the above settings, but also on other stakeholders and practitioners with whom they will need to very closely interact to kick start these initiatives from the ground and move them into the clinical telehealth sphere via cross-disciplinary education, management, monitoring, control and prevention services. This is not only a gap but also a novel phenomenon and a new service offering because the above targeted practitioners are still and predominantly operating in silos.

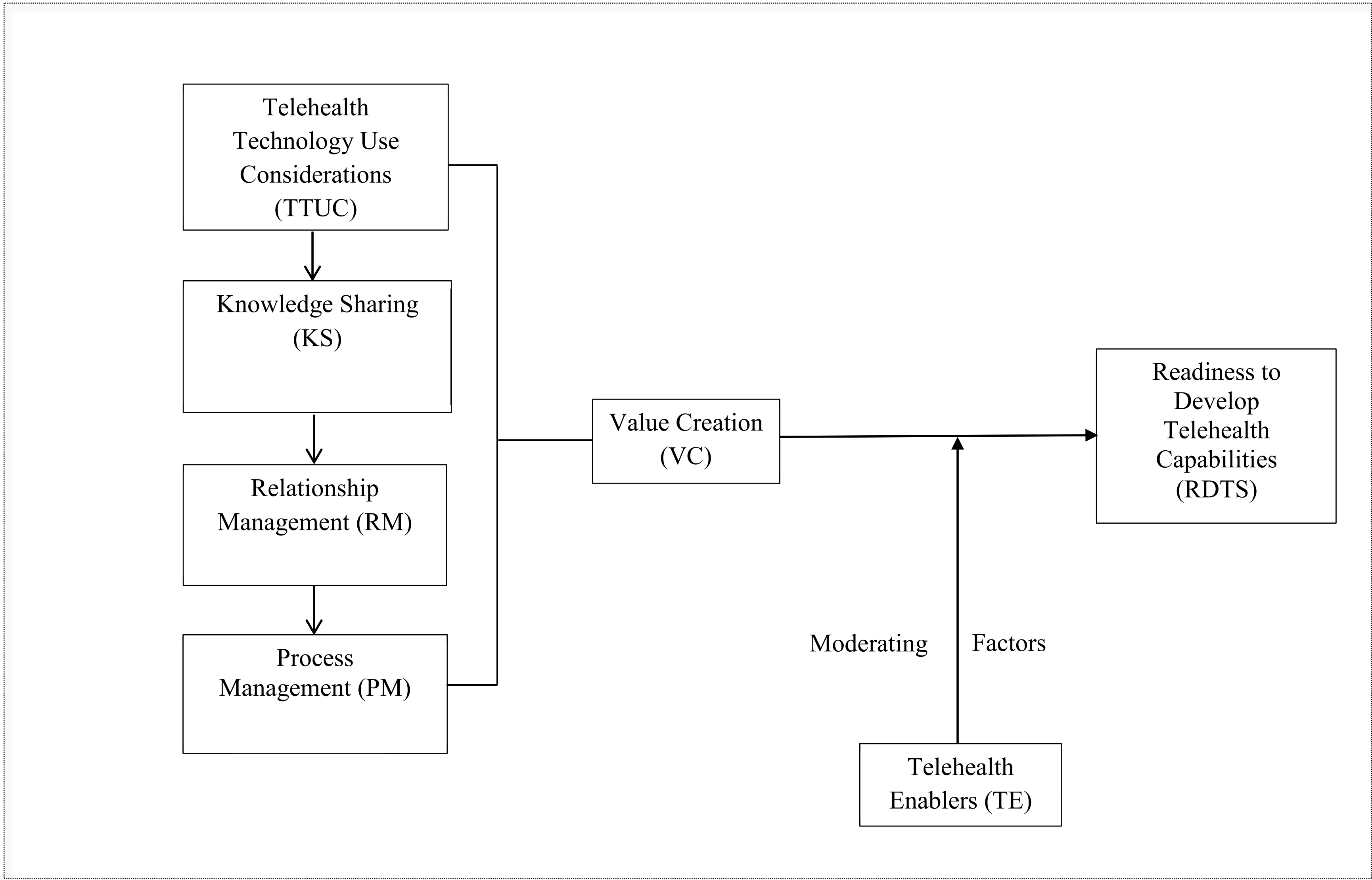


Figure 6: Conceptual Model on GPs' Readiness to Develop Telehealth Network Capabilities

2.13 Illustration of a Telehealth Service Value Network

Due to many recent innovations, and some of those in the health sector, health services have started extending to patients who are remotely located. Some of these patients are disabled, while others chronically and/or acutely ill. The main notion behind this model relates to the central role of locally well established and acquainted GPs, whom patients frequently approach as the first line of call in need. GPs, however, due to their particular expertise which is of a general nature in many cases cannot provide the full spectrum of necessary interventions (Wade and Stocks, 2017). This is particularly true for chronic and acute conditions which require more complex and long-term interventions that overburden the health system and families affected through cost, lost productivity and overall unhappy and unwell citizens. This concept proposes a cross-collaborative direction, whereby GPs are able to access specialist services together with their patients present either physically in the same location or via a video conferencing link provided by a broadband connection.

A number of services may be offered to patients such as telemonitoring (heart, kidney monitoring, vital signs checks, etc), tele-dermatology, tele-radiology, tele-ultrasound, e-consultation, e-prescriptions and ongoing condition management amongst other telehealth control and intervention services (McLean, Protti and Sheikh, 2011; Blinkhorn, 2012). The initial qualitative pilot study phase seeks only to confirm the existence of the proposed phenomenon through interviews with eligible GP practices. However, as aged care facilities are eligible recipients in both metropolitan as well as non-metropolitan areas, general practices could provide these services if ready and properly resourced in all areas (Taylor et al. 2013). This is a very feasible proposition in metropolitan areas where numerous GP practices exist, and which are not utilised for this purpose, partly because of the systemic or structural setup and partly because of the lack of cross-collaborative support and action. The current legal arrangement is that each aged care facility is staffed with at least one onsite registered nurse. There is rarely a doctor present onsite (Gaffney, 2017). In a large number of aged care facilities in Australia one registered nurse is often under enormous pressure in managing the entire facility‘s workforce (Gaffney, 2017). Gaffney (2017, p. 13) has ―found the aged care setting to be the one where a high level of skill is most keenly needed, yet it is not the preferred choice of many nurses". Besides the registered nurse, enrolled nurses and assistants in nursing are the other onsite personnel who care for patients, however under the current staffing arrangements, they are inadequately equipped and resourced (Bonner, 2017) to deal with increasing chronic and acute conditions of aged care residents. This situation often leads to poor outcomes in aged care residents‘ health states as they are neither trained nor able to treat these nor other medical conditions (Lamp, The, 2011; Stokoe et al. 2016; Welton, 2013).This is doctors‘ domain. As we are dealing with chronic and acute conditions of aged care patients some of whom are suffering from more than one condition simultaneously, a GP alone may not be sufficient to successfully treat these patient states either (Wade and Stocks, 2017; Stokoe et al. 2016). A holistic approach which treats the cause and not only the symptoms is essential to make it a true success (Clarke et al. 2017). GPs and other proposed professionals such as pathology, medical imaging and specialist practitioners would be enabled to utilise various communications applications that are either interoperable with their current system or standardised. Below is an illustration of some telehealth interactions between healthcare practitioners and patients that could become standard practice one day.

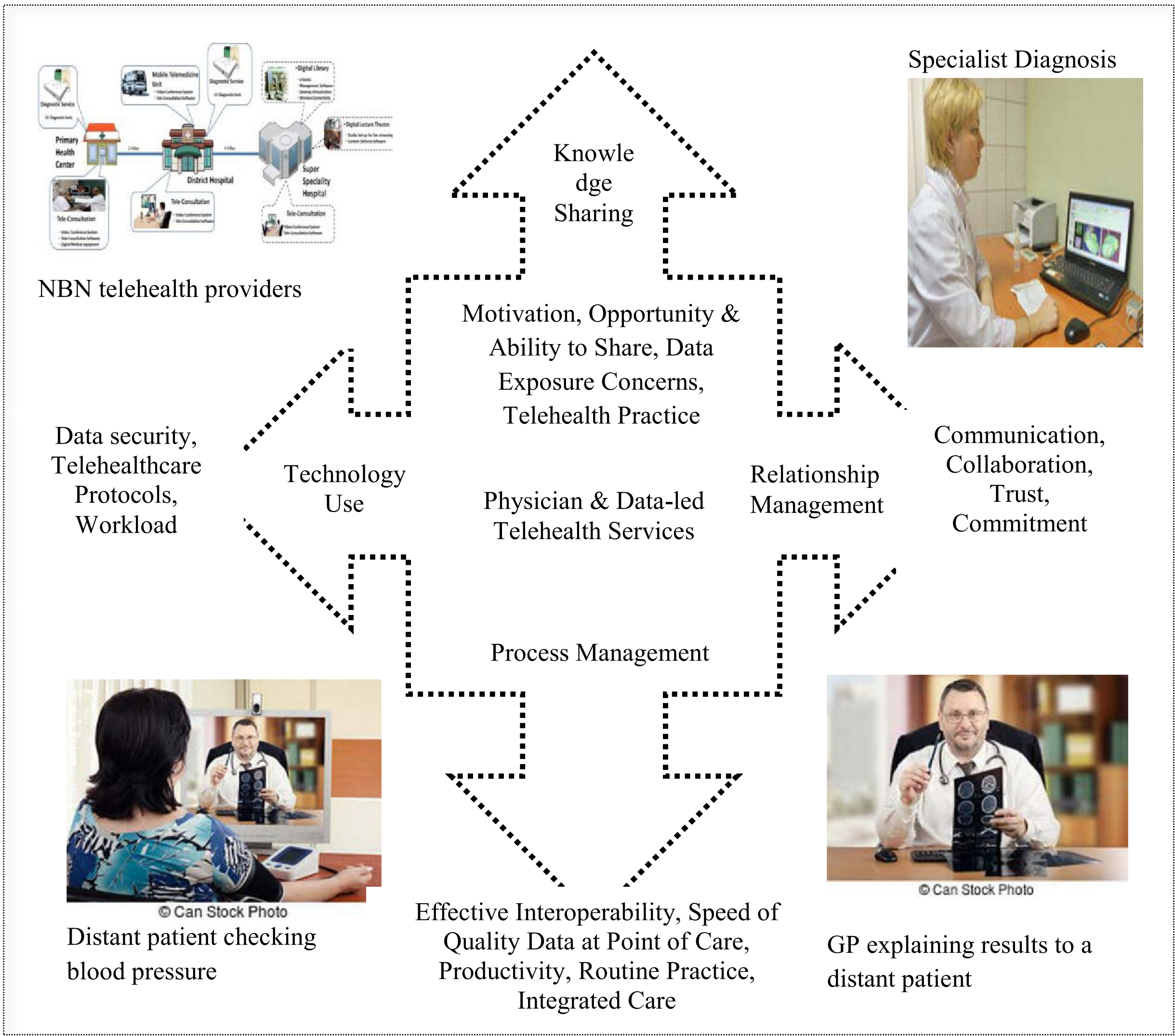


Figure 7: Illustration of a telehealth service value network delivery typology

The key prerequisites for cross-collaborative engagement as proposed in this project are adequate telehealth infrastructure, patient and practitioner data security, privacy and safety standards, cross-disciplinary access to electronic patient records and knowledge sharing, clarity, coherence and assurance in relation to practitioners‘ roles & accountabilities in telehealthcare, and this is one of the main concerns that practitioners have under the current arrangements (May et al. 2011). Amongst most common telehealth control and intervention services that GPs could access are teleconferencing, e-referrals, store and forward data analysis for diagnostic and test result purposes (Blinkhorn, 2012; McLean, Protti and Sheikh, 2011) and integrated telehealth services such as tele-dermatology, tele-radiology, tele-ultrasound together with or remotely of their patient depending on a condition and the patient concerned. It is in fact anticipated by the author of this thesis that chronic and acute conditions which are growing steadily in quantity due to various factors will in fact become the precursors for increased demand for telehealthcare services. One such sector of potentially great demand for these types of services is distant aged care.

Aged care patients whether in aged care facilities (nursing homes or residential villages) or home-bound patients increasingly require both prolonged health care and intervention services. As the health budget stretches to the maximum and the working population that pays taxes shrinks, alternative feasible and deliverable approaches to health care are imminent (MENA Report, 2013). General practices that are currently being evaluated in this project are only one segment of a multi-layered health system. The expectation is that other sectors will be impacted upon too. Thus, the contributions made here can likewise serve as a guide to other sectors.

2.14 Relationship between Key Service Value Network Elements and Value Creation

Strongly grounded service value network key elements have been widely cited in literature. These are technology, knowledge, relationship and process management constructs (Walters and Rainbird, 2007, Walters, 2009; 2012; Walters and Bhattacharjya, 2015; Agarwal, 2008; Agarwal et al. 2010; Agarwal and Selen, 2009; 2011; 2013; Scerri, 2015), which have been for the purpose of telehealth service value network renamed as telehealth technology use considerations, knowledge sharing, relationship and process management constructs. The aim of the thesis has brought into the equation ‗value creation' elements that directly link these SVN elements, with GP's readiness to develop telehealth capabilities. In previous telehealth technology acceptance studies, performance expectancy has been the most validated predicting construct (Dunnebeil et al. 2012; Gagnon et al. 2012; Raymond et al. 2015; Rho, Choi and Lee, 2014) and this is a key ingrained element of the Unified Theory of Acceptance and Use of Technology. This study has created a construct with additional improvements in the context of telehealthcare management and foreseen developments needed to advance telehealth service value networks. This direct predicting construct represents newly created ***value creation*** dimensions in chronic and/or acute telehealth settings (Kohnke, Cole and Bush, 2014) that are the main focus of this thesis. *Value Creation* is in fact the key reason why service value networks exist, that is to create value that otherwise could not be created by a single entity alone**.** Preconditions which are likely to drive effectiveness and efficiencies in the creation of telehealth value are in fact key operational elements of telehealth use considerations, knowledge sharing, relationship and process management. The first such precondition which is most frequently cited in literature is appropriate data security (Daker-White et al. 2015; Dunnebeil et al. 2012) and privacy and confidentiality (Hsu et al. 2013; Huang, Lee and Lee, 2012; Jin, 2011, Kumar et al. 2013). Furthermore, these are supported by telehealthcare protocols (Clarke et al. 2016; Cottrell et al. 2015; French et al. 2013; Knight et al. 2016; Krupinski & Bernard, 2014; Taylor, 2015; Taylor et al. 2015; van Gurp et al. 2016) and workload mechanisms (Brewster et al. 2014; Rosenzweig and Baum, 2013; Van Alstin, 2016).

Furthermore, GP clinicians' motivation, opportunity and ability to share information and knowledge (Bock et al. 2005; Hsu et al. 2007, Radaelli et al. 2014, Armitage and Connor, 1999) are likely to lead to additional value creation for those clinicians involved in these encounters. These encounters will likewise need to pass the test of secure and effective communication through secure channels (Brady et al. 2017; Knight et al. 2016) in order to ensure continuous feedback when needed and regular interdisciplinary collaboration (O'Reilly et al. 2017). The more successful collaborations take place, the more trust and commitment is likely to be gained and the more integrated remote clinician services are likely to become. Another by-product of these interactions is cost efficiency. Overall, the telehealth platform needs to ensure that it is stable and simple to use with minimal or no interruptions (Baig, Hosseini and Connolly, 2015) and high quality data speed (Hay, Lim and Wartena, 2012; Morrissey, 2016; Mosa, Yoo and Sheets, 2012; Rathore et al. 2018) and properly curated patient information (Artis et al. 2017; Gold et al. 2018). Values derived from these qualities are better integration of technologies which may lead to GP paths to self-employment from any location (Van Alstin, 2016), improved access to specialists (Dharmar et al.2014; Schwamm, 2014) and reduction in rehospitalisation (Andres et al. 2015; Bahous and Shadmi, 2016; Venter et al. 2012).

2.15 Relationship between Value Creation and GPs' Readiness

It is proposed and anticipated that value creation may serve as a very important prerequisite to GP telehealth interactions, that is GP practitioner readiness to commit to developing telehealth capabilities for the purpose of providing telehealthcare medical services to distant chronically and/or acutely ill patients. These interactions inevitably imply the involvement of a community of practice which may be best described by the community of practice theory. Similarly to any disruptive technologies, telehealth too provides both downsides as well as positive uptake reasons. For instance, telehealth‘s enablement of close experiential encounters between distant healthcare professionals from different disciplines is among key benefits or drivers of value particularly for those who are likely to benefit from a higher source of knowledge, practical experience and expertise (Blount and Gloet, 2015; Moffatt and Eley, 2010). This is the case with general practitioners who may receive expert advice or know how from specialists, which may act as an important dimension for the uptake of telehealth by GPs.

On the other hand, the likelihood that telehealth cannot fully replace physical clinical service delivery (Blount and Gloet, 2015 and Greenhalgh et al. 2015) and its probable negative impact on GP clinical autonomy (Audet, Squires and Doty, 2014; Wright et al. 2010) may be offset by the provision of better designed integration which may also support GP paths to self-employment (Van Alstin, 2016) and independent remote work from any location (Brewster et al. 2014; Varty, O‘Neill and Hambley, 2017). Finally, better integration of technologies will make clinicians more telehealth ready (Van Alstin, 2016) and benefits derived from these besides close encounters with specialists by GPs are also cost efficiencies (Park et al. 2015) and potentially reduced rehospitalisations (Andres et al. 2015; Bahous and Shadmi, 2016; Venter et al. 2012), all important uptake telehealth drivers for general practitioners.

2.16 Theoretical Reasoning

Research suggests that human relationships and their interplays represent a crucial and significant contribution to any current and novel technological innovation and its adoption or rejection (Agarwal, et al. 2010; Gagnon et al. 2003; 2010; 2012; 2014). After a lengthy reading of literature in the areas of management, medicine and telehealth acceptance by health practitioners and especially physicians, highly regarded and validated theories emerged. These are the **Unified Theory of Acceptance and Use of Technology and Communities of Practice Theory**. Many influential telehealth acceptance studies (Dunnebeil et al. 2012; Gagnon et al. 2014; Choi, Rho and Lee, 2014) have either focused on a very influential Technology Acceptance Model (Davis, 1989), the Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003) or the combination of both. Unified Theory of Acceptance and Use of Technology has been a very influential theory in the field of information and communications technologies.

As mentioned, the other theory which will be evaluated is *Communities of Practice Theory* (Lave and Wenger, 1991). *Communities of Practice Theory* could show the likely impact of current practices on present-day developments and possibly indicate implications for further occurrences amongst GPs‘ and other practitioners (clinicians) in telehealth initiatives in the treatment of distant aged care chronic and acute conditions. On the other hand, *the Unified Theory of Acceptance and Use of Technology* could explain or even demonstrate GPs‘ readiness to develop technical skills and associated process results. Moreover, it could explain individual GP clinician‘s and discipline group behaviour, and its impact on the adoption or acceptance of particular telehealth technologies and technology-based healthcare services. The theoretical model employed in this thesis covers the mentioned areas however in a different and modified arrangement order. For instance, in the case of direct predicting elements, namely; perceived usefulness and perceived of use (Davis, 1989) used in the TAM model, the model in this study employs value creation construct as a direct predictor instead that is enriched with direct and current sub-dimensions. On the other hand, the core purpose of the Communities of Practice Theory as pointed out by Lave and Wenger (1991) and Wenger (2015) is the engagement of members in a process of exchange of knowledge, experiences, norms and values, obtaining of skills and learning more from each other, for the purpose of resolving significant problems and through these interactions developing each other‘s practices and consequently transforming communities of practice.

Communities of practice theory has been widely utilised in medicine, education, policy making and other social segments and continues to be applied across various topics of interest and diverse disciplines. However, as fundamentally different developments start emerging, it is expected that the theory itself will need to adapt to the changing circumstances in which slowly but surely currently disparate disciplines expand their collaboration initiatives in order to survive as such or even merge and mould into newly created disciplines. Thus, a new and/or modified version of the communities of practice theory may emerge as a by-product and an essential requirement that explains ongoing evolving processes. To allow for new contributions, it may be necessary to explore the research phenomenon from completely different angles which may bring about multiple realities and deeper comprehensions of both causes and effects. Such an approach is possible when methods are mixed or when existing theories and emerging field data findings are combined. For that reason, the present study employs the multi-grounded theoretical approach (Axelsson and Goldkuhl, 2004), which is founded on the recognition of both knowledge from existing theories and new empirical data.

Novel developments may lead to the formation of *cross-disciplinary communities of practice theory* or even a *telehealthcare community of practice theory*. This shift in thinking will most likely go along with changes in health education design and its cross-disciplinary curriculums that are currently on the agenda of some institutional and government commissions and in its formation stages. However, as stated by Mann (2011, pp. 63-64) ―efining current teaching and learning approaches alone will not achieve the changes recommended. Theoretical perspectives which broaden and reframe the process of medical education are required". In that context, communities of practice theory together with educational and clinical practice transformational processes are expected to evolve into a new theoretical and practical framework. Consequently, telehealth (tCoP) or (telehealth CoP) communities of practice, or as some literature suggests electronic (eCoP) or virtual (vCoP) communities of practice (Ho et al. 2012; McCartney et al. 2012) may become cornerstones to the functioning of cross-disciplinary technology-based services via telehealth technologies. That is why the proposed thesis employs the multi-grounded theory, which is a more powerful methodology than the classic grounded theory, because it offers the researcher the flexibility of adapting suitable existing theories that serve research objectives (Goldkuhl and Cronholm, 2003; 2010) in addition to allowing theory to emerge from empirical data.

The following section 2.17 introduces and justifies the model‘s theoretical research paradigm and its building elements. The subsequent section connects the theoretical research paradigm elements. The central emphasis within this service value network study is placed on the elements of technology use, knowledge sharing, relationship and process management steps targeting a number of alleged building blocks which aim to evaluate GPs‘ readiness to develop telehealth capabilities necessary for effective utilisation and implementation of telehealth technologies with the purposes to treat and manage chronic and acute medical conditions as central initiating factors. This is particularly crucial in an environment where innovation, collaboration and exchange of data and knowledge are essential success components for cross-collaborative initiatives and long-term patient outcomes. Such is the novel and emerging case of telehealth technologies and associated medical services. The thesis however does not intend to evaluate aged care users‘ readiness at the current stage. This work is planned for the future.

2.17 Conceptual paradigm

Literature suggests that no single theory or theoretical concept can reliably and in its entirety neither describe nor evaluate (Urquhart, 2001) the evolution of service value networks, particularly not those in a telehealthcare context. The conceptualisation of a telehealth service value network in this project is founded on the four key elements that underpin the functioning of a service value network, namely; technology, knowledge, relationship and process management through their direct and specifically adjusted constructs to suit the telehealth discipline. What this thesis will attempt to contribute to is an increased understanding of the impact of the key elements of service value network on the process of GP‘s readiness to utilise telehealth technologies. Besides the fact that telehealth acceptance has received some attention by the research community, it is still not known which factors are likely to lead to physicians‘ readiness to utilise telehealth technologies on a network level through either individual or network dimensions. Indeed, very little is known as to what building blocks play a crucial role in this endeavour from a service value network perspective, which this thesis will attempt to explore and make contributions to. Healthcare service value networks and particularly telehealth network services face countless challenges. This is especially evident in attempted online collaborations amongst practitioners, which are made even more complex due to the long-preserved, ingrained occupational and other professional divisions.

There is a presumed ownership of patient medical records (Jones, 2016) as well as patient personal preferences to deal with a specific practitioner. Rivalry amongst physicians (Turner and Laine, 2001) in particular is evident even through the luring of patients into their own practice where opportunities present themselves, which I have personally experienced. Thus *health settings, where rivalry is insignificant, and where practitioner collaboration is driven by the needs for each other‟s expertise has a lot more room for success* (Turner and Laine, 2001).

Consequently, this thesis project alleges that chronic and acute conditions cannot be managed by GPs alone in addition to all of the other burdening conditions that they are trying to treat and manage, which are likely to influence their cross-collaborative intentions and efforts with pathology, medical imaging and specialist practitioners through the utilisation of telehealth technologies and thus have a direct impact on their readiness to develop technical and collaborative telehealth skills for associated services in a telehealth network. These are practitioner and data-led initiatives (Bentley et al. 2014; Dawson, 2011; Goodman, 2014; NewsRx, 2016) that require a formal platform to manage critical ―valuable data and information for decision making" (Scichilone, 2014, p. 59) driven by chronic and acute patient needs. Below shown figures 8 and 9 respectively are theoretical illustrations showing an expected conceptual overview and conceptual adjustment / standardisation based on the multi-grounded theoretical framework and supported by two additional existing theories, the Unified Theory of Acceptance and Use of Technology (UTAUT) and Communities of Practice Theory (COP). Theory building diagrams used in this thesis are presented next.

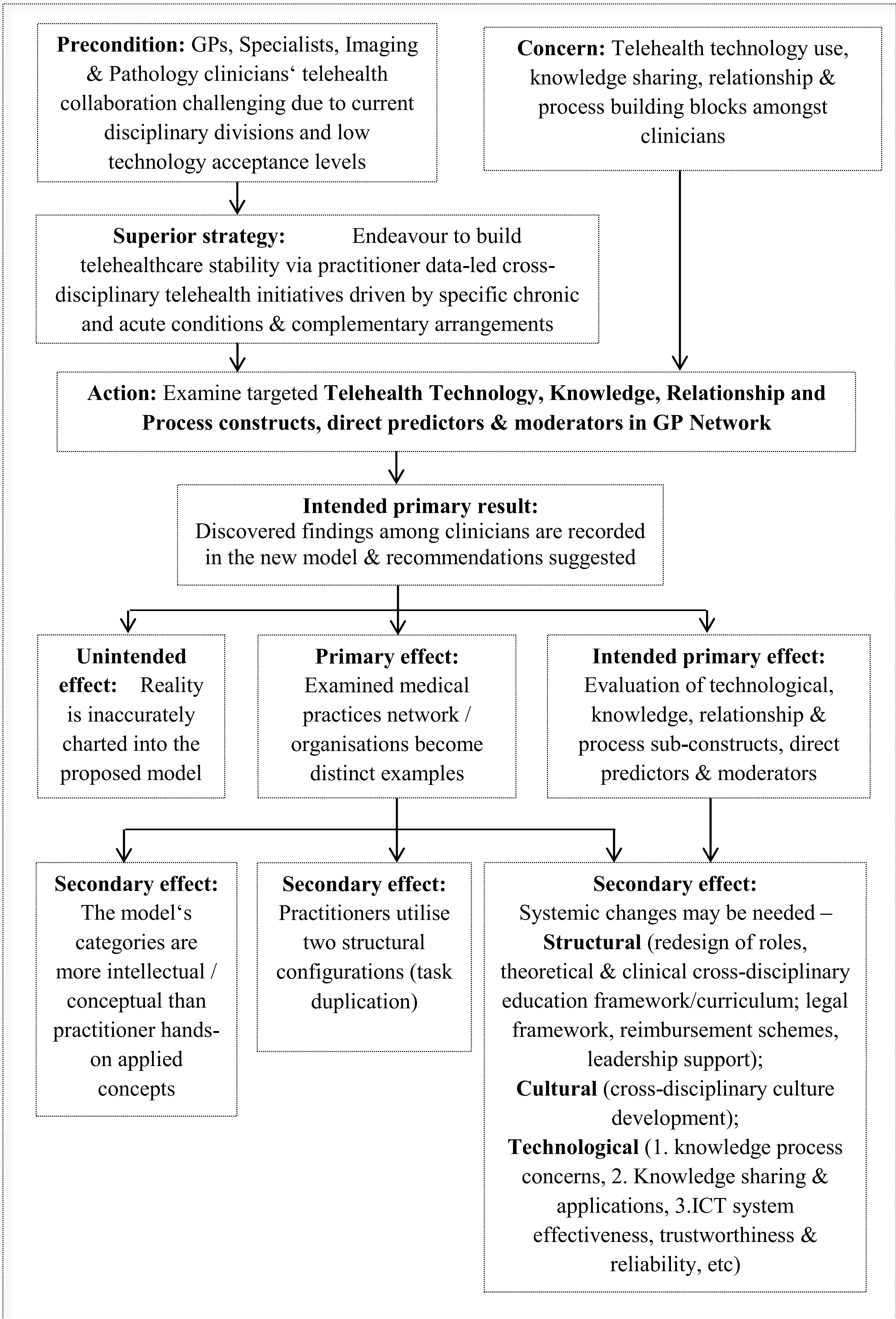


Figure 8: Theoretical illustration showing an expected conceptual overview - multi-grounded theory approach

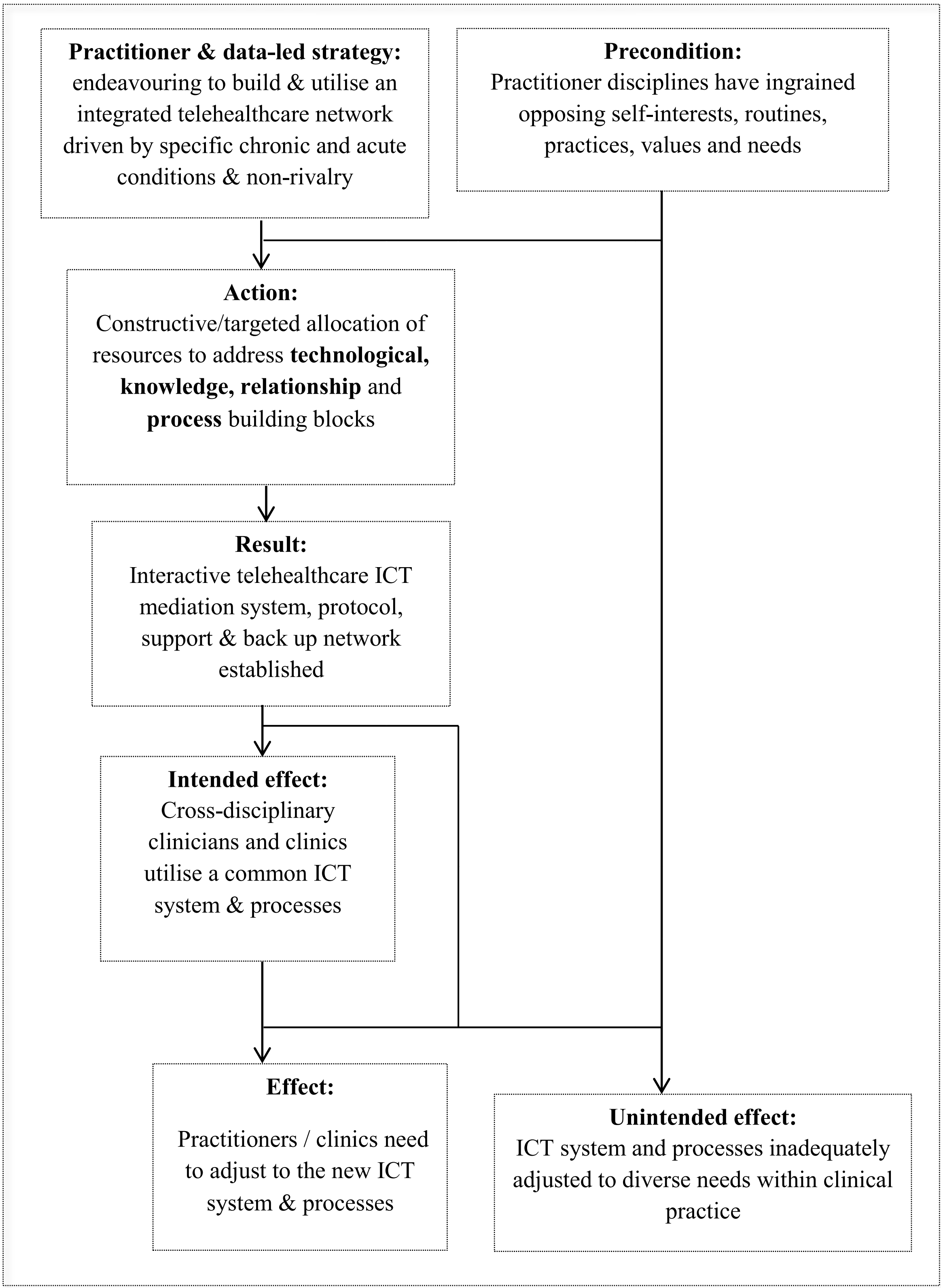


Figure 9: Theoretical illustration showing expected conceptual adjustment / standardisation

The starting points in figures 8 and 9 are portraying current difficulties facing the health sector created through long-standing differing unidisciplinary communities of practice (Meleis, 2016; The Institute of Medicine, 2015) as opposed to cross-disciplinary collaborative communities of practice which may cumulatively have an impact on innovative reforms in the Australian health system. The conceptual figure 8 is showing current conditions and hurdles, expected difficulties, sequential phase outcomes and their causal relationships with the proposed progressive process whereas figure 9 portrays expected adjustment phases following the proposed strategies. Thus, preconditions are likely to lead to the formation of a superior strategy which is linking both essential drivers (specific chronic and acute conditions and practitioner data-led cross-disciplinary telehealth initiatives) and end goal (telehealthcare stability). Necessary phases and actions with their forerunners are also outlined with the examination of targeted telehealth technology, knowledge, relationship and process elements, direct predictors and moderators in a GP network. It is at the centre of the entire process, from which expected intended primary results, unintended and intended primary and secondary effects are presented. These are also evaluated through communities of practice and the Unified Theory of Acceptance and Use of Technology theories underpinned by the multi-grounded theoretical approach.

The case in point, namely telehealth phenomenon and its associated progress stages require a fundamental shift in inter-professional, interdisciplinary, multidisciplinary and transdisciplinary (in one word; cross-disciplinary) thinking from the long outdated professional divisions and consequently, a different theoretical advancement that may be built on the existing communities of practice theory. For that reason, it is envisaged by the author of this thesis that a new or adequately modified communities of practice theory will emerge as a result of current and ongoing telehealthcare developments. Such developments may lead to the formation of *cross-disciplinary communities of practice theory* or even a *telehealthcare community of practice theory*. This shift in thinking will most likely go along with changes in health education design and its cross-disciplinary curriculums that are currently in its formation stages. However, as stated by Mann (2011, pp. 63-64) ―refining current teaching and learning approaches alone will not achieve the changes recommended. Theoretical perspectives which broaden and reframe the process of medical education are required". In that context, communities of practice theory together with educational and clinical practice transformational processes are expected to evolve into a new theoretical and practical framework.

Consequently, telehealth (tCoP) communities of practice, or as some literature suggests electronic (eCoP) or virtual (vCoP) communities of practice (Ho et al. 2012; McCartney et al. 2012) may become cornerstones to the functioning of cross-disciplinary technology-based services via telehealth technologies. According to McCartney et al. (2012, p.84) ―together, eliciting participation through goal setting and feedback, sustaining leadership through institutional support and organic development, and building for evolution by allowing participants to determine the direction and content of the CoP will lead to a sustainable eCoP".

In order to assess the full picture and produce credible and valid research output, *the Unified Theory of Acceptance and Use of Technology* will attempt to explain the reasons for technological acceptance or lack of it and *Communities of Practice Theory* will test healthcare stakeholders‘ practices and processes through a number of moderating and control factors. It may also be beneficial and appropriate to allow the evolving innovative phenomenon of telehealth and its development emerge in its own right. This is especially important because GPs‘ readiness towards technical and collaborative efforts in telehealth initiatives is unchartered territory and nobody knows what outcomes are likely or will evolve from these initiatives. For that reason, it should be allowed that theory be materialised from the field data in conjunction with the testing of existing most relevant and reliable theories.

Telehealth presents a potential for improvements in quality and elevated service offerings and can serve as a speedier and less costly medical delivery approach whose success in implementation is to the largest extent dependent on its acceptance and utilisation by healthcare practitioners - clinicians (Taylor, 2013, Wade, Eliott and Hiller, 2014). The theoretical emphasis in this thesis is placed on individual practitioners. The reason for this are most recent empirical findings by Gagnon et al. (2016) who have studied both individual and organisational factors in physician telehealth acceptance and have confirmed the insignificance of organisational-wide variables on physician acceptance of telehealth technologies, thus the importance of individual factors has been even more embedded in the literature and further research.

2.18 Grounding in Three Theories

A very extensive literature review has uncovered potential contributions by a number of theories. This model recognises the potential impact of a number of theories under a multi-grounded theoretical framework that is informed by existing theories and their contributions to knowledge as well as empirical findings from this project. Multi-grounded theory endorses flexibility and open-mindedness when it comes to research inquiries and their depth and stresses the importance of letting empirical and theoretical understandings to have an impact on research inquiry interest and research question development. It also recognises the cumulative effect of knowledge building based on what has been achieved prior and its usefulness in a given research situation is supported by the theoretical explanation that may further condense the concerned theory (Goldkuhl and Cronholm, 2010).To that effect, Multi-Grounded Theory has the objective to integrate and synthesise knowledge by comparing and contrasting research results with relevant existing theories (Goldkuhl and Cronholm, 2003). This study will therefore attempt to sideline weaknesses and instead combine and incorporate strengths from both deductive (theory focused) analysis and inductive (empirically focused) analysis.

Scholars of the Multi-Grounded Theory, Goldkuhl and Cronholm (2003) have formed empirical data based on an interpretive and qualitative modelling concept that is organised around the following categories: conditions → actions → outcomes and conceptual illustrations in the process of theory generation. Theory growth happens in four phases. Firstly, coding preferably happens in an inductive or unbiased way. Secondly, “critical reflection on empirical statements is conducted and ontological and linguistic determination done” through the so called theoretical refinement. Thirdly categorised configurations cumulatively lead to conceptual declarations before the final and fourth phase of theoretical compression (Axelsson and Goldkuhl, 2003). Grounding is the process of providing justification or reasoning for some act, development or finding (Merriam-Webster, 2010). Multi-grounded theory develops theory through the following three types of activities: “1) theory generation, 2) explicit grounding and 3) research interest reflection and revision” (Goldkuhl and Cronholm, 2010, p. 193). This theoretical modelling is led by descriptions of the theory being constructed, and supported by its diagrammatical illustrations (Axelsson and Goldkuhl, 2004). There are three types of grounding: “theoretical matching, explicit empirical validation and evaluation of theoretical cohesion” (Goldkuhl, 2004, p. 3).

Theory development process comprises “inductive coding, conceptual refinement, pattern coding and theory condensation” steps (Goldkuhl and Cronholm, 2010, p. 193). *Inductive or open process of coding* is borrowed directly from classic grounded theory by letting the fresh data communicate openly and with minimal or no preconceptions. It includes coding labels, data categories and its sub-components, notions, elements and measurements amongst other possible examples. *Conceptual or theoretical refinement* is novel to multi-grounded theory and includes a critical scrutiny of data or participant insights through reflection and challenging of data. Participant interpretations and statements need to be critically evaluated through the active clarification of the employed notions.

In the phase of “pattern coding” data “categories are combined into theoretical statements” and externally as well as internally conceptualised in action through their outcomes and consequences, which “means that action performed has social grounds and social purpose. It is based on social antecedent conditions and it is socially oriented, having intended effects for other humans” (Goldkuhl and Cronholm, 2010, p. 196) and can be presented theoretically, diagrammatically and graphically (Axelsson and Goldkuhl, 2004; 2010). The final phase is theory condensation, in which relevant external existing theories contribute additional knowledge and through empirical data are either confirmed, modified or become bases for the cumulative building of another emergent theory. Besides the multi-grounded theory itself, the Unified Theory of Acceptance and Use of Technology (UTAUT) and communities of practice theory (COP) could individually and combined contribute to explaining different stages of the suggested telehealth acceptance process under the proposed scenario. For instance, relationship management construct consists of communication, collaboration, trust and commitment elements which inevitably influence and build upon one another. These interactional developments evaluating practitioners‘ readiness to develop telehealth capabilities could be partly explained by the Communities of Practice theory, which needs to take into consideration the impact of present telehealth developments on current GP practices and indicate probable cross-disciplinary implications.

The dependent variable, Readiness to Develop Telehealth Capabilities is influenced directly by a novel construct, namely; Value Creation. This construct is new to management and telehealth literature and has been created to suit telehealth context. It is utilised in this conceptual model as the most direct predicting construct and is moderated by practitioners‘ individual and organisational enablers and demographic factors (experience, age and gender). Furthermore, Communities of Practice theory could add some value to foundational elements needed to inform medical practices‘ cross-disciplinary design in primary care settings. These are crucial beginnings in the development and building of a cross-disciplinary telehealthcare community of practice and its novel and evolving cross-disciplinary culture, which should invite participation and involve open dialogues among practitioners from various disciplines with a clear emphasis on value to all of the stakeholders (clinicians, managers, IT and support personnel, institutions, patients and others).

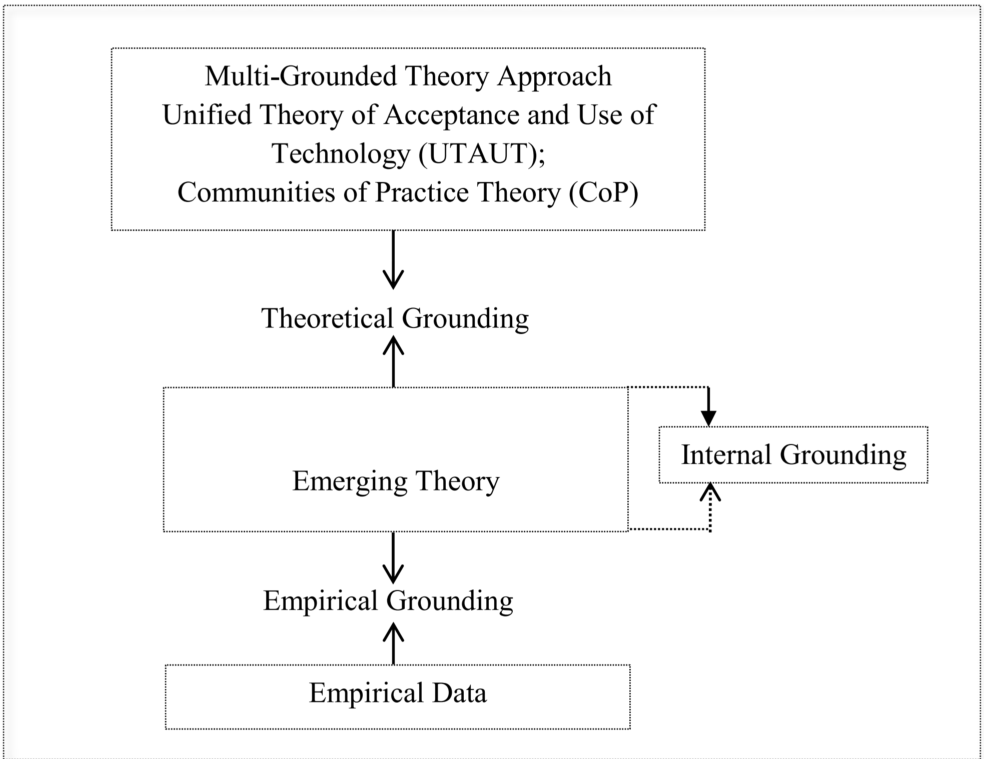


Figure 10: Three sources of grounding for an established multi-grounded theory (modification of Goldkuhl and Cronholm, 2003)

The fundamental aspect in the generation of a theory grounded in data is the continuous comparative investigation just as other statistical approaches and experiments make sense in their comparisons. What drives this comparative investigation is the process that ―allows obtained data and its analysis to take place almost at the same time, from which the process itself and its research outcome are formed” (Easterby-Smith, Thorpe and Lowe, 2002, p. 122). However, besides these empirical comparisons, multi-grounded theory additionally also makes theoretical and internal grounding contributions that are invaluable to knowledge (Axelsson and Goldkuhl, 2004).

2.19 Chapter Summary

This chapter has introduced all of the key concepts and their antecedents. It started with service value network elements on whose key factors this thesis has been founded. Key ingredients that power service value networks in a telehealth context were discussed. It was followed by a close overview of current telehealth efforts, its applications and benefits in the context of a number of key chronic and acute medical conditions. The conceptual model and research framework were demonstrated and proposed development phases outlined in detail. The subsequent chapter depicts the methodology proposed to examine the hypotheses, research design (selection of target participants, population sample and an outline of research strategy and process of collection and analysis of data.

Chapter 3 Methodology

3.1 Introduction

Chapter two has communicated the introductory research and conceptual model grounded in a comprehensive review of current and relevant literature. The methodology chapter intends to further explicate the proposed model and conceptually validate it. Literature review of previous telehealth studies has revealed the usage of both qualitative interpretivism (Bouamrane and Mair, 2013; Shulver, Killington and Crotty, 2016; Tang and Ricur, 2013) and quantitative or positivist methods (Dunnebeil et al. 2012; Gagnon et al. 2003; 2014; 2016). However, topics with an inquiry about which very little is known such as the one in this thesis tend to employ mixed methods (McLean et al. 2013; Salisbury et al. 2015) in order to allow for deeper comprehension that may be derived from them. Generally, this thesis holds a positivist philosophical standpoint by adopting a survey questionnaire approach in the biggest and main phase. However, the phenomenon under inquiry is being evaluated through qualitative semi-structured interviews which are based on interpretivism. Next, the chapter proceeds with ethical principles and telehealth ethics overview, justification of the research paradigm driven by the research question and sub-questions, design, unit of analysis, research methods, strategy, data collection and data analysis process.

3.2 Ethical Principles to Be Upheld

For the purposes of this healthcare research project, it is important to understand ethics regulatory bodies‘ guidelines and requirements in Australia. As universities are federally funded bodies, federal laws and guidelines on ethics must be upheld, particularly in research involving human subjects. The main federal body responsible for setting ethical guidelines, provision of research grants and national health advice to the medical profession and society is the (NHMRC) ‗The Australian National Health and Medical Research Council‘ through its ethics committee called (AHEC) ‗The Australian Health Ethics Committee‘. The Australian Research Council also provides some funding for medical and social science research projects.

In 2007, in collaboration with the Australian Research Council and Universities Australia that was previously known as ‗the Australian Vice-Chancellors‘ Committee‘ the NHMRC produced ‗The National Statement on Ethical Conduct in Human Research‘ (Cregan, 2012, p. 385). It is the main legal instrument that every healthcare researcher dealing with human subjects in government funded healthcare facilities must abide by. In the context of this thesis, its ethical application will need to be firstly evaluated and accepted by the home institution to which this project belongs through its ‗human research ethics committee. In addition to ethical requirements, researchers are also governed by and must comply with relevant government legislations that deal with research conduct, intentions and potential consequences which are outside the ‗National Statement‘s scope (Cregan, 2012).

According to Cregan (2012, p. 385), ―The National Statement‘s recommendations are based on

> four broad principles – research merit and integrity, justice, beneficence, and respect for human beings (section 1) and two main themes: minimising risk and ensuring adequate (informed) consent, including circumstances in which it may be waived (2.1-2.3). These principles and themes are then applied to the discussion of ethical considerations related to specific fields of human research".

Some or all of the following sections may be relevant to this project. These are section 3.1 which guides ethical concerns in qualitative methods, section 3.2, which is responsible for databanks, section 5.1 and 5.2 that detail the researcher‘s responsibilities, section 5.3 dealing with speedy ethical reviews, section 5.4 dealing with potential conflicts of interest, section 5.5 dealing with research monitoring, section 5.6 dealing with complaints and section 5.7 that details researchers‘ accountabilities (Cregan, 2012).

As part of the mandatory research training, the author of this thesis project has completed all of the relevant subjects and online research integrity modules in addition to attending an array of research workshops and seminars throughout the Master by Thesis and PhD candidature. The researcher has utilised the standardised approach as the methods of use were survey questionnaires and semi-structured interviews. This PhD project did not obtain patient data. In addition to obtaining ethics clearances from the responsible institutional bodies, the researcher also provided detailed information of the project to the participants/respondents and secured written consent from the participants. In order to increase participation rates and acceptance of the project, the author of this thesis has guaranteed full confidentiality and anonymity to all the participants/respondents and their affiliated institutions to ensure privacy and identity protection at all times throughout the research project and thereafter during its data archiving and repository process. As regards the storing, archiving of data and its accessibility, the researcher and the supervisory panel will observe and uphold all procedures set out by the home institution and the responsible healthcare regulatory bodies mentioned above.

3.3 Telehealth Ethics

Telehealth brings along with it an array of ethical and legal implications and other justified concerns for the intended recipients (Botrugno, 2017; Chaet, 2017; Eccles, 2015; Ellis et al. 2011; Greenhalgh, 2012; McCartney, 2012; Oliver, 2013; Steventon, 2012; Worth, 2015).

Amongst key ethical concerns are remote patient safety and welfare (Chaet, 2017). Furthermore, doctors‘ accountabilities and responsibilities are not reduced in any case, irrespectively of whether they deliver care in person or remotely as their service is based on a pledge to serve the well-being of the patients before any other interests, which is dependent on patient trust (Chaet, 2017). In doing so, all due care needs to be provided competently and patients need to be well informed while their confidentiality and privacy deserves utmost respect and protection (Chaet, 2017). The delivery of care thus rests on the premise that the abovementioned is upheld.

If telehealth is to enhance access to care, then it truly cannot afford to be either excessively priced or too complex to use which might cause more disenfranchising and isolation. In saying that, enhanced accessibility can also lead to inappropriate care particularly in cases where patient-doctor relationship was not pre-established (Worth, 2015). Many are also of the view that authorities are attempting to roll out the telehealth platform too quickly and without substantial evidence for its effectiveness and justification on a wider scale (Ellis, 2012; Greenhalgh, 2012; McCartney, 2012) particularly when it comes to thorough patient assessments (Ellis, 2012; Oliver, 2013; Steventon, 2012).

Another critical ethical concern is a predominant research onus on economic (cost-saving objectives) as opposed to experiential aspects in the view of care recipients (Eccles, 2015). Overly relying on telehealth can create loneliness and loneliness itself can lead to the exacerbation of health conditions and reduced patient welfare. The need for a better solution to such problems is certainly in how technology can assist rather than hamper one‘s recovery and well-being. This requires a human solution first such as care through shared living arrangements for instance which is supported by technology where a need arises (Eccles, 2015). Moreover, it is crucial to establish ethical telehealth frameworks that guide day to day practice by considering all possible scenarios and their ethical and legal implications. Furthermore, benefits and consequences should be seriously assessed with the aim to focusing on high standards of health delivery as opposed to serving profitability of information and technologies manufacturers and developers and other stakeholders (Botrugno, 2017).

In the design of these frameworks, it is critical to fully address patient and health practitioner data security, confidentiality of information, patient rights, privacy and safety safeguards, all of which are essential elements to ensuring ethical and safe telehealth practice. These have been addressed throughout this thesis project from a general practitioners‘ perspective.

3.4 Research Guidelines / Paradigm

Prior to attempting this empirical quest, one needs to establish proper theoretical and practical guidelines and effective instruments that will be capable of providing a strong final output. A plan of action is usually defined as methodology whereas research methods are the means, procedures or techniques by which one gathers and analyses quantitative or qualitative information in relation to a hypothesis or research question (Levy 2006). Two major methodologies have been widely known and used in the social sciences; quantitative and qualitative (Creswell 2003).

Quantitative methodology is founded on the paradigm called positivism, whereas qualitative methodology is grounded in realism or interpretivism. Methodology that is purely quantitative is ―essentially a nomothetic methodology drawn upon systematic protocols and techniques. In contrast, qualitative methodology is an ideographic methodology which stresses the importance of letting one‘s subject unfold its nature and characteristics during the process of investigation" (Burrell and Morgan, 1979, p. 6). Though this process ensures its better fluidity (Tsoukas, 1989), different authors seem to have dissimilar methodological preferences. Both methodologies have their identifiable disadvantages and advantages. Whereas existing theories are typically tested through quantitative methodology, they might lack research generalisability. On the other hand, qualitative methodology offers deeper insights into people‘s phenomenological comprehension however may suffer from one‘s own research bias and associated result interpretations. The table below demonstrates these differences.

Table 10: Differences between quantitative and qualitative methodologies

Methodologies	Strengths	Weaknesses
Quantitative	Testing already constructed theories about how phenomena occur; Allow generalisations when research has been replicated on different populations; Useful for obtaining data that allow quantitative predictions to be made; Eliminates the confounding influence of many variables allowing assessments of cause and effect relationships; Results are relatively independent of the researcher; Useful for studying large numbers of people;	The researchers‘ theories and categories that are used may not reflect local constituencies‘ understandings; The researcher may miss out on phenomena occurring; because of the focus on theory or hypothesis testing rather than on theory or hypothesis generation (i.e. confirmation bias); Knowledge produced may be too general and abstract for direct application to local contexts, settings, and individuals;
Qualitative	Provides description and understanding of people‘s personal experiences of phenomena; Can describe in detail phenomena that are situated in local contexts; Useful for understanding how participants interpret ‗constructs‘ Responsive to local situations, conditions,	It is more difficult to make quantitative predictions, and test theories and hypotheses; It takes more time to collect and analyse data compared to quantitative research; Results are more easily influenced by the researcher‘s personal biases and

	and stakeholders‘ views; Responsive to changes that occur during the conduct of a study Useful for studying a limited number of cases in depth.	idiosyncrasies; Knowledge produced may not generalise to other people or settings.

Source: Johnson and Onwuegbuzie (2004, p. 20)

While the ongoing debate in relation to which is a better methodology still exists (Johnson and Onwuegbuzie, 2004), these two could be mixed in order to overcome their individual weaknesses and thus provide a more holistic conceptualisation. As such, qualitative and quantitative ―data should not be seen as distinctly separate” (Bond et al. 2004, p. 22). The chosen methodology needs to be able to solve the research problem and answer research questions. Therefore, the problem comes first, then the choice of appropriate data and finally the method of data collection (Bond et al. 2004). In many projects where issues are complex, none of these two methodological approaches alone offers the complete picture and thus these two are often mixed, from which a new discipline of mixed methodology has evolved (Bamford & Deibler 2004; Guba and Lincoln 1994; Johnson and Onwuegbuzie 2004; Newman & Benz 1998).

As previously indicated, the goal of this chapter is to examine the hypotheses, research design (selection of target participants, population sample and an outline of research strategy and process of collection and analysis of data). Due to the phenomenon of telehealth and expected complexities addressed by the research question, this thesis has utilised the mixed methodological approach through a number of quantitative and qualitative inquiries via questionnaire survey instruments (mailed and online equivalent) and semi-structured interviews. However, as this is predominantly a quantitative study, it is overwhelmingly in line with the positivist paradigm. In order to adequately approach this proposed telehealth phenomenon, a pilot study was carried out first to determine how serious and pervasive these issues are in practice. This first phase of the project as an exploratory pilot study via semi-structured interviews has explored the existence, scope and extent of the phenomenon under inquiry. This phenomenon relates to GPs‘ utilisation of telehealth technologies to jointly serve specific medical conditions of distant patients proposed in this thesis where GPs serve as central reference and ongoing care providers through a cross-collaborative approach with specialists, pathology and medical imaging practitioners. The purpose of the qualitative pilot study was to support the main quantitative survey which will be carried out on a much larger scale soon after the pilot study. The pilot study has included a number of GP respondents in different Sydney metropolitan general practices who provided consent to participate in the project.

3.5 Research Methods

As this is a new phenomenon about which our understanding is very limited and scarce, it is thus assumed that the project would benefit by mixing both qualitative and quantitative methods of data collection as well as from the advantages that may be derived from dissimilar methodological perspectives that are likely to complement each other and out of which novel understanding and contribution to knowledge are expected to emerge.

3.5.1 Face and Content Validity Described

While face validity serves to ensure that the employed research methodology and its tools measure what they are supposed to measure, content validity on the other hand serves to ensure that those are measured adequately, in order to assure their validity (Middleton, 2020). This study has followed Klabunde et al. (2012) recommendations on the development of multiple (mixed) data collection strategies with doctors. This approach also ensures triangulation validity. Guiding rules recommended by Jarvis, MacKenzie and Podsakoff (2003) have been employed in the operationalisation of survey items. Key phases of data collection recommended by Klabunde et al. (2012) include considerations of initial points and modes of contact. Amongst common multiple modes of contact, introductory brochures or letters via mail, fax, email and telephone are precursors to later survey distributions via follow-up mail, telephone and internet mode as well as non-response follow-ups. Workshop type meetings and incentives are also important considerations aimed at increasing the response rate. Workshops or seminars were also utilised as a crucial point of contact in data collection.

Face validity of the qualitative phase was ensured by following all final survey version constructs grounded in literature and exploring them in order to validate them in the context of the thesis topic and through such an approach discovering any gaps/emerging themes or contributions to knowledge. Careful consideration of survey design through cognitive pre-testing for layout, wording and formatting was given essential importance in order to make it as user friendly and effort minimalistic as practically possible (Klabunde et al. 2012). First wave of data collection, namely fifteen semi-structured interviews were audio recorded, transcribed, uniquely coded and organised into thematic categories and sub-categories which represent different constructs with associated dimensions. Based on common and consistent meanings, all extracted measurements wherever possible were matched with relevant literature to make sure that these items have literature grounding. Consistently appearing common themes which had no literature grounding were used in the formation of new sub-construct and items. This approach ensured content validity of the proposed data collection instrument which was late evaluated and validated in a much larger quantitative study (Chowdhury and Quaddus, 2017).

3.5.2 Qualitative Empirical Study

The exploratory segment of the project has employed a qualitative field or empirical study which has been chosen with the purpose to evaluate the existence of the phenomenon under inquiry in order to pre-test the initial conceptual model. Constructs, sub-constructs and links between the variables grounded in literature were examined. The study was carried out through semi-structured interviews with responding GPs. Semi-structured interview method has been recognised a very effective tool in qualitative data collection (Hair, 2013; Whiting, 2008). Depending on the results of the empirical study, the initial conceptual model was to be adjusted if necessary. Semi-structured interviews were the chosen avenue prior to the start of major quantitative phase due to the fact that only a direct contact with the targeted respondents using an open-ended conversation approach could possibly and sufficiently explore the phenomenon under inquiry. This is a crucial step in the mixed method study that attempts to explore all potential avenues before arriving at the final or comprehensive testing model (Cresswell and Clarke, 2007; 2017). Its purpose is to first of all confirm its existence and only then the extent to which it has been impactful in relation to the objectives of the study. Another important contribution that is expected from a qualitative field study is the discovery of important novel dimensions or items that have not been previously explored or measured by literature. These items would then be added to the quantitative survey for pre-testing in conjunction with other constructs that are derived from literature (Chowdhury and Quaddus, 2017). Eventually, all surviving pre-tested constructs and their items would be explored in the major quantitative study. This would later on also serve as a back-up where quantitative data results or findings provide insufficient evidence to confirm or conclude the impact of the tested variables and their relationships through hypotheses.

3.5.3 Mixed Methods

The use of mixed methods in both social and health research have been gaining growing acceptance for a number of decades (Freshwater, 2006; Plano Clark, 2010). It became a popular methodology and widely accepted amongst researchers trying to uncover and comprehend complex phenomena where a single methodology was insufficient to comprehend it fully (Creswell and Plano Clark, 2007) and should continue to be rigorously used in healthcare context which is full of complexities and unknown phenomena (McManamny et al. 2015; Hesse-Biber, 2015). This approach ensures triangulation validity, which serves to make sure that the phenomenon under inquiry is explored from sufficient angles in order for it be better understood (Creswell and Plano Clark, 2017; Moon, 2019). Besides validity, it also enhances the study outcomes‘ reliability and legitimacy. One of the main reasons that mixed methods have been chosen in this study is due to the fact that the research problem under exploration requires critical input from health professionals‘ perspectives. Therefore, the constructs and their measurement items need contextualization from GP‘s perspective as GPs are the targeted clinician population. As a result, field study interviews fulfil a very important purpose in the exploration of context-specific constructs and their measures.

Whereas in the not so distant past, quantitative and qualitative research methodologies were opposing each other, they were missing crucial counterbalancing ingredients. Thus, integration of the methods proves wieldy and beneficial not only in methods of collection of data, but also in integrating two or more theories that try to explain the same phenomenon from their own perspectives, which potentially provide richness in clarification, unification and validity of results. This is important especially in healthcare contexts as healthcare knowledge needs to be integrated in order to make health teams‘ integration closer to reality (DeMarco, 2002).

According to Olatunbosun et al. (2012) the mixed method methodological technique allows for the combination of at least two different types of data collection being utilised. With this approach, limitations of one method can be overcome by its alternative. This project has utilised both qualitative and quantitative methods; namely semi-structured interviews at a pilot stage and a combination of hard copy and online soft copy questionnaire surveys. In this way multiple preferences are catered for with the aim to encourage a higher response rate among the targeted respondents. Research shows increased effectiveness when qualitative and quantitative methods are combined, and strongly suggests that in survey research doctors amongst other healthcare professionals tend to prefer hard copies or paper-based surveys, however online surveys may add extra value and increase in response rates (Flanigan, McFarlane and Cook, 2008; Van Geest, Johnson and Welch, 2007).

The electronic version can also be used as an alternative as well as a reminder to consider completing it due to their busy schedules (Olatunbosun et al. (2012). To accomplish the above research objectives and solve the devised research problem, a mixed methodological approach aimed at obtaining qualitative and quantitative data from general practitioners has been designed. Both qualitative semi-structured interviews and quantitative survey instrument, complemented by a mixed methodological analysis, synthesis and writing were employed in the completion of this thesis. The mixing of methods enables triangulation and cross-checking of data validity, thus increasing the acquisition of understanding of the phenomenon under inquiry (Bohme et al. 2014).

This methodology may capture point in time practices and processes where the researcher is attempting to generate a new theoretical framework for the establishment of a novel theory.

However, to be successful in the generation of a novel grounded theory, familiarity with the phenomenon under inquiry, as well as the research subjects inclusive of their cultures are essential (Eisenhardt, 1989; Pratt, 2005). Events that were investigated in this project were certainly beyond the control of the researcher. The focus is fundamental to the Australian healthcare system with a special emphasis on telehealth and its private networks performance and no similar or comparable research has been conducted in the context planned for this thesis and especially not to the extent and within the parameters proposed in this study. Mixed methods provide appropriate avenues for the analysis, individual depiction and comparison of researched phenomena.

3.5.3.1 Selection of a target sample

Similarly to other qualitative methods, a field empirical study needs to undergo the process of selecting target respondents. This is usually done through non-random or random sample approaches (Burger and McLaren, 2017; Zikmund et al. 2013). This project employs a non-probability sampling approach (Cramer, 1999; Emborg et al. 2016), which is also referred to as convenience sampling (Kothari, 2004; Malhotra, 2004). As this study evaluates GPs readiness to develop capabilities for telehealth medical services, only GP respondents were targeted.

Whereas some scholars suggest a limitless amount of cases, others on the other hand recommend a limited, purposefully, well targeted and restricted scope of inquiry. Well-known and established authorities in qualitative research, Eisenhardt (1989) and Perry (1998) recommend up to eight individual cases sufficient for a qualitative project. The emphasis in this thesis is placed on individual practitioners as opposed to organisational units within a chronic and acute aged care telehealth service value network with the key onus on the proposed pillars and steps that are expected to lead to concrete results.

The reason for this are most recent empirical findings by Gagnon et al. (2016) who have studied both individual and organisational factors in physician telehealth acceptance and have confirmed the insignificance of organisational-wide variables on physician acceptance of telehealth technologies, thus the importance of individual factors has been even more embedded in the literature and further research. Once data saturation levels are reached, sufficiency is reached too (Greg, Bunce, and Johnson, 2006). Due to the fact that this first phase of the study only intended to establish whether the phenomenon under inquiry exists, it has targeted a limited number of physicians in general practice representing the sample frame area.

Besides, UTS Human Research Committee (2017) recommends only a sufficient sample that answers the research inquiry to be used. Excessive samples would unnecessarily expose respondents to risks and increase discomfort. Due to data saturation levels being reached earlier than anticipated, fifteen GP respondents from different Sydney metropolitan areas (with that many individual interviews) were determined as more than a sufficient sample to pre-test the phenomenon under inquiry (Eisenhardt, 1989). Respondents for this phase were selected based on the following criteria:

a) Privately run GP medical practices;

b) Involvement in provision of medical services to aged care patients;

c) Individual GPs within practices willing to participate;

d) Location of their GP practice within the Sydney metropolitan area and potential representativeness of the wider Sydney metropolitan area given a limited number of selected respondents;

e) Availability of both male and female GPs working within the practice targeted;

f) Written consent.

Based on the above criteria, the selected GP practices were contacted through their gatekeepers (receptionists), invitation letters and participant information sheets. The field empirical study has targeted the following Sydney metropolitan areas: south-east, south-west, north, north-west and inner-west. The target sample for qualitative phase was 8-20 interviews and quantitative phase over 150 respondents. The final number of interviewed GPs was 15 due to a relatively fast reach of data saturation levels within a homogenous group of unidisciplinary health professionals and valid quantitative responses 187 as accessibility of GPs for data collection was extremely difficult and the data collection process took over 8 months.

3.5.3.2 Qualitative data acquiring process

After the targeted sample unit of respondents were chosen, they were approached through GP practices' gate keepers (receptionists) and/or practice managers with an initial invitation letter and participant information sheet. A follow-up letter was sent after one week to either confirm interest or disinterest to participate in the study. If interest to participate was confirmed, complete information was then forwarded to the appropriate authorities within the willing GP practices. This information explained the phenomenon under inquiry, expected interview length, permission to record and potential use of data in future publications amongst other matters.

Upon obtaining consent, an appointment was scheduled with each individual participating GP respondent at a time and place suitable to their own schedule. A letter confirming each appointment time was also sent to individual respondents and their GP practice. Respondents were reminded of the voluntary nature of their participation in the study and fully assured of their confidentiality and the preservation of anonymity at all times now and in the future due to the fact that this research does not need nor intends to ask for any of their personal details, nor their practice‘s details. Interviewees were sent a semi-structured list of questions on the topic of inquiry one week in advance. Interviews were recorded and notes were jotted down. Upon the completion of each interview, it was transcribed as soon as possible in order to capture the full essence and character of the entire conversation, its process and post-reflection.

3.5.3.3 Qualitative Data Analysis Tools or Techniques

Qualitative data from case studies may be presented in the form of charts and analysed through framework analysis technique with commonly established themes that can be read horizontally or vertically. This is considered to be a straightforward presentation of data themes that provide transparency and allow for ease of traceability of original information as well as easy tracking of themes from interviews and transcripts and enable discussions. The process can be easily picked up where it was left off. Furthermore, it shows how decisions were made and allows cross-collaborative contributions that may improve the project through peer audit and dependability (Ward et al. 2013).Qualitative interview data can also be effectively analysed by using the content analysis tool (Siltaoja, 2006).

Due to the fact that this project is exploratory, content analysis is also a useful tool in evaluating the obtained data (Lundman, 2004). Various model‘s elements, dimensions and variables with their links were explored in NVivo statistical application, which is commonly used in qualitative data analysis. Content analysis can be approached from various angles and this project has initially utilised inductive and then a deductive approach (Andersson et al. 2015). In the inductive segment, content was skimmed through first in order to establish any data commonalities upon transcribing the text, searching for, finding and exploring data patterns and their links with the model‘s elements, dimensions and variables. The transcribed text will be coded through common themes (Braun, 2006) via the utilisation of NVivo software has transformed this textual information into statistical or numerical values (McIntosh and Morse, 2015). These common themes and sub-elements can be presented as individual trees and their branches with each considering a specific construct or sub-construct grounded in literature. The purpose of this segment is to produce a complete empirical study model.

After the completion of the inductive segment, the deductive segment has first compared the conceptual model with the proposed empirical study model in order to evaluate the importance of the model‘s elements and its variables. Next, thematic commonalities were chosen based on the findings. Further, these empirical findings were compared with the previously conducted literature review. And the eventual result from the above segments was a final and complete research model. Main survey quantitative data were then entered into Smart PLS statistical package for detailed analysis. This detailed analysis has also involved the use of SPSS statistical package in order to test indirectly hypothesised mediated relationships and partial least square algorithm and bootstrapping technique to test directly hypothesised relationships through its statistical verification processes.

3.5.4 Quantitative Survey Study

Quantitative survey studies predominantly utilise questionnaires specifically designed to suit a particular topic of inquiry. The present model needed to undergo confirmation of the proposed dimensions, variables and connections between the dimensions through a quantitative evaluation. This phase included the development of the questionnaire and hypotheses, appraisal of the questionnaire, semi-structured interviews whose feedback has improved the questionnaire, determination of the technique for sampling, data collection and partial least squares (PLS) methodological analysis.

3.5.4.1 Questionnaire Instrument

Questionnaires or information gathering instruments are likewise called scales as they evaluate numerical results or scores. They are typically self-managed and usually contain a number of questions that target particular topics of concern needing scrutiny. Well-designed questionnaires can go a long way in obtaining particular quality information.

Many validated pre-existing questionnaire instruments may be used in various settings as they have been successfully applied in the past. However, if questionnaire that serves the specific purpose of a particular study does not exist, a new one needs to be created from scratch. The most important point to be considered in this process of creation is the research objective or aim which will influence the project‘s structure (the type of questions and their order), design (question wording, open/closed inquiries), variety of information required and how it is to be analysed. Frequently, questionnaires are utilised as quantitative scales, containing ordinal, nominal or continuous values. Ordinal values are numbers placed in order, out of which one is typically chosen as a response in each question. Nominal values on the other hand usually represent a single word answer or a choice of answers in a multi form. Continuous values are obtained by asking the ‗how much or how many‘ questions (Slattery, Voelker, Nussenbaum, Rich et al. 2011). As regards this project, surveys are critically important methods in collecting valuable information about healthcare developments, health discoveries and leading edge research. That is why, access to key practitioners is crucial to stay on the forefront of medicine in healthcare research. Four critical challenges that could improve the quality of research instruments targeting physicians and other healthcare practitioners have been addressed by Klabunde et al. (2012). These are sample frame selection, administration of surveys and contact with respondents, consideration of incentives and design of a questionnaire that is not burdensome. These authors have found that amongst US physicians, preferred way of response is surprisingly to some via postal mail. Incentives are also regarded positively (O'Donnell, Lutfey, Marceau and McKinlay, 2007). Similarly, surveys targeting topics that are of interest to the respondents, with well-defined goals, logical and clear non-ambiguous inquiries, succinct, short, assuring anonymity, are easy to respond to and easy to get in contact with the researcher have a higher likelihood of response than those not containing these elements. Additional ingredients are its reliability, validity and incentives (Slattery, Voelker, Nussenbaum, Rich et al. 2011).

Following the interview phase which involved 15 individual semi-structured interviews with GPs from all corners of metropolitan Sydney region, the survey instrument was distributed to the selected sample of remote GP practitioners Australia-wide both in hard copy through postal mail and with a provided pre-paid return envelope as well as in soft copy online. This was in addition to the targeting of all accessible GP practices NSW-wide either through local primary health networks, GP conferences and seminars and/or direct distribution of the instrument to GP practices. The downside in this project however, is GPs‘ scarcity of time due to a large volume of work and busy patient schedules, thus a response level may become an issue. For that reason, this project has taken advice from literature to make it short, succinct, straight to the point and quantitative throughout (Tan, 2002). Secondly, quantitative surveys can only provide a limited number of targeted responses and nothing more than that without an opportunity to ask additional questions or expand on an issue. Thirdly, the researcher cannot verify that the person to whom the survey was intended is the one who actually responded. This however can be overcome through a conference room survey where the researcher can have some control over what person fills in the survey by previously establishing a brief contact and in this way even qualitative responses can be obtained through a brief contact, question clarification as well as respondent observation technique (Veal, 2005). While the respondents would be initially briefed about the project, this also provides an interactive opportunity for the researcher to ask pre-planned questions relevant to the topic, which are not addressed by the questionnaire. The respondents would then as time allows them during conference breaks fill in the survey and ask any additional questions that they may be interested in as this directly relates to their present and future, while the researcher could also come across unexpected data and supplement the process with participant observation technique too (Veal, 2005).

The phenomenon under inquiry in this project is a very novel idea by the author which sees a number of chronic and acute conditions as key drivers in GPs‘ readiness to develop technical and collaborative skills and actively engage in cross-collaborative telehealth network relationships. The initial pilot semi-structured interviews have explored the level of existence and magnitude of the proposed phenomenon and the model‘s potential application in telehealthcare before a large scale study commenced. These initial interviews have targeted metropolitan GPs to find out whether they are using or contemplating the use of telehealth technologies to treat distant aged care chronic and acute conditions. The responses and any implications were then fed into the design of the main questionnaire which followed soon after.

The purpose of the interview phase was to establish whether GPs are serving or contemplating to serve chronic and acute medical conditions through a cross-collaborative telehealth approach, and in such a way assist the research direction by making it more focused on the collection of significant data that can be successfully analysed (Ling, 1998). The phenomenon initially explored in the study was addressed through the following question: *are GPs ready to develop telehealth capabilities for novel cross-disciplinary clinical activities through their telehealth interactions and joint collaborative efforts with pathology, medical imaging and specialist practitioners in the proposed telehealth phenomenon where GPs act as the primary healthcare reference point and healthcare service providers to assist their distant / aged care patients in the management of chronic and acute medical conditions such as for instance commonly known: (1) heart conditions, (2) COPD (chronic obstructive pulmonary disease), (3) kidney diseases, (4) diabetes and (5) hypertension.*

The key by-product of this research is expected understanding of how these particular medical conditions through service value network pillars can influence physicians‘ readiness to develop technical and collaborative skills for the purpose of managing the above medical conditions, thus contributing to the sustainability of the Australian healthcare system. This is the first telehealth acceptance study that was carried out from a service value network angle in this form and shape.

A questionnaire grounded in literature has been designed, to address all of the four pillars in targeting the respondent group, namely, GPs dealing with the above phenomenon. Each questionnaire has also included a consent form and an introductory letter describing the area of research and the purpose and benefits of the survey. Instructions were provided to simplify the filling in of the questionnaire and clarify any potential bias. In case of a conference room survey that has supplemented the main survey, the researcher was on hand to immediately discuss any issues arising from the research, thus gaining a much better overview and understanding of the respondents‘ way of thinking and understanding of the issues being analysed (Zeithaml, 1988).

The straightforwardness of the process that could be observed in fact may unveil a particular trend in the raising of issues of significance and intriguing concern that individual respondents may raise with the researcher. It could further assist the uncovering of experiential differences in the targeted healthcare roles and advance the understanding of their modes of thinking and behaviours when making telehealth related decisions of concern to them. Even though, the researcher cannot be completely sure "how honest or accurate people are in responding to questions, the alternative is to observe their behaviour" (Veal, 2005, p. 30).

3.5.4.2 Questionnaire and Hypotheses Development

Following a thorough literature review, an initial conceptual model has been developed. The questionnaire covers all constructs and their sub-elements with relevant measurement items grounded in literature. The model has been accompanied by the development of applicable hypotheses aimed to test various links between the model‘s constructs, direct predictors and moderating factors. Reviews of research studies that have employed structural equation modelling approach demonstrate the use of the Likert scale as the most predominant measurement tool.

While many studies utilise either a 5-point or 7-point Likert scale, this project has utilised a 5-point Likert scale (Blumberg, Cooper and Schindler, 2008). The 5-point Likert scale has asked respondents to tick the level of agreement or disagreement from 1 being the strongest disagreement to 5 being the strongest agreement.

Research also supports the use of the 5-point Likert scale as being simple to answer by respondents and easy to prepare by researchers who also find it simple to interpret (Chowdhury, 2014; Zikmund et al. 2013). To increase response rate, this project has utilised both a hard copy (mailed questionnaire) as well as an identical online survey. The same questionnaire survey has been used throughout the entire quantitative phase as only one respondent group has been targeted, namely GPs.

3.6 Research Design

Research design section covers the planned setting and venues where this project was intended to be carried out together with the selected population sample of research subjects, research strategy, data collection and data analysis process respectively.

3.6.1 Research Setting

The proposed project was planned to be carried in NSW healthcare settings. Namely, in general practices or medical and health care centres which serve as reference points to the wider population and which utilise or plan to utilise telehealth technologies in their practices. The setting for these dialogues was arranged individually with each practitioner to suit each and every respondent‘s preference, convenience and availability (Namageyo-Funa et al. 2014). These authors have published their doctoral projects‘ recruitment challenges in the public health sector and have categorised them into the following three groups. The first challenge relates to consensual acceptance to participate, the second challenge relates to the maintenance of a working relationship with organisational gatekeepers and the third challenge relates to direct access of the respondents who have agreed to participate. The following strategies have been recommended to overcome and successfully manage the above recruitment challenges.

These recommendations include: collaboration with trusted gatekeepers (Spratling, 2012; Renert et al., 2013); direct recruitment contact method (Spratling, 2012); using word of mouth suggestions and trust building with respondents (Namageyo-Funa et al. 2014). It is also crucial to sufficiently comprehend the targeted healthcare sample population (Renert et al. 2013), as well as utilise supplementary recruitment incentives (e.g. monetary) as well as maintain persistent contact through for instance emails and follow up messages, calls and if possible direct contact in person (Namageyo-Funa et al. 2014).

The second quantitative phase did not involve direct participation of the researcher as questionnaire instruments were sent either electronically or via mail directly to the prospective respondents with whom prior contact had been made through their organisational gatekeepers following the ethics clearance process. As a matter of convenience to the respondents, a UTS survey webpage with exactly the same questionnaire content was made available to every respondent who wished to contribute their responses online. The only exception to the researcher‘s partial face to face interactions was going to take place if insufficient response was generated from mailed and online surveys. In such a case, GP conferences and seminars were to be targeted as the alternative source of access to empirical data. With this approach, the researcher‘s only involvement was to meet the potential respondents for the first time in a conference room setting and explain all of the research requirements and ethical considerations in addition to the provision of all of the necessary documents for the respondents to agree with before proceeding with filling in the hard copy surveys.

3.6.2 Unit of Analysis and Population Sample Frame

Namely, Sydney metropolitan GPs who may be immediately involved in the provision of direct and/or indirect short and/or extended care outside the hospital system in community aged care system and similar recovery arrangements were prospective targets for the initial qualitative pilot study and the main quantitative project. The study has targeted privately run, bulk billing (Medicare eligible) Sydney metropolitan GPs in order to evaluate their readiness to develop telehealth network capabilities with the aim to treat common chronic and acute conditions of aged care patients. The reason for this choice was the fact that most Sydney GP practices are privately run and are eligible for general Medicare and telehealth rebates in relation to aged care residents, irrespectively of their location when providing collaborative consultations with specialists.

The inclusion criteria stipulates that all GP practices that are currently providing medical services to aged care facilities and are willing to provide consent to participate in the study will be considered. All others were excluded. The initial pilot study phase has targeted between 8 – 20 consenting GPs. These were upon consent visited and interviewed in person. Selected GP practices and their GPs for the pilot study were located in different parts of the metropolitan Sydney region in order to be as representative as possible of the entire metropolitan region.

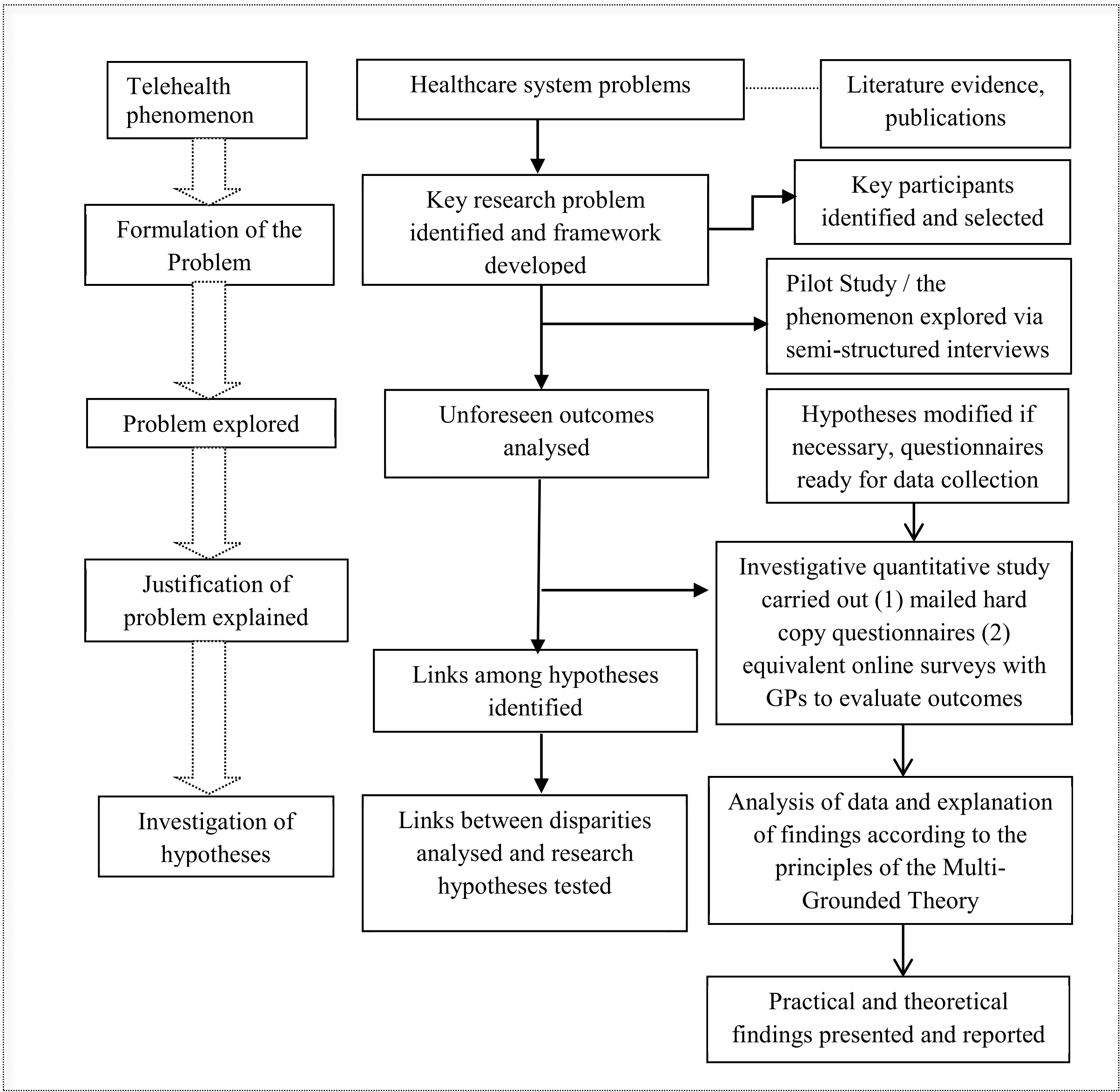
The key aim of the pilot study was to confirm the existence of the alleged telehealth phenomena. Targeted healthcare professionals were GPs who currently interact or plan to interact through telehealth technologies with pathology, medical imaging practitioners and specialists to treat and manage chronic and acute conditions through telehealth technologies with the patient present and/or with assistance of tele-nurses or other support personnel. To ensure access to a larger population of GPs, GPs were also targeted through conferences and primary health network events that were attended by GPs and other types of physicians as well as other healthcare practitioners. The population sample frame determined during supervisory panel discussions was at least one hundred and fifty or more respondents in order to test the model adequately. Ideally, more than a hundred fifty respondents were expected.

3.7 Research Strategy, Data Collection and Data Analysis Process

Appropriate strategy that functionally serves research circumstances needed to be chosen. The key issue of concern, being studied in this project is subsequently defined as ‗challenge to influence and predict physician behavioural intention to adopt and use telehealth technologies' through the four service value network pillars. These are due to disparities in perceptions and attitudes towards telehealth technologies by healthcare practitioners and challenges in cross-disciplinary collaboration, integration and alignment initiatives that cumulatively impact on healthcare system's sustainability and telehealth which it is by default a cross-collaborative medical service delivery approach.

Consequently, it mirrors the research inquiry that asks: *Are GPs ready to develop telehealth capabilities for telehealth medical services that can be effectively utilised to jointly treat and manage some of the most common chronic and acute medical conditions of distant aged care patients in Australia?* The figure below illustrates the planned research process.

Figure 11: Research path / process



Research phase one: Extensive Literature Review

Following an extensive and ongoing literature review stage, this project was pursued in additional four chronological research phases. Outcomes derived from each research phase have guided the arrangement for the subsequent phase.

Research phase two: An exploratory qualitative pilot study through semi-structured interviews

This phase aimed to find out how persistent this research problem is. In fact the inquiry has tried to find out how the assumed novel cross-disciplinary work of general practitioners and their telehealth interactions and joint collaborative efforts with pathology, medical imaging and specialist practitioners in the proposed telehealth phenomenon where general practitioners act as the primary healthcare reference point and healthcare service providers may assist their distant aged care patients in the management of chronic and acute conditions. The following conditions were used as context due to their nationwide and commonalities (heart failure, chronic obstructive pulmonary disease (COPD), kidney failure, diabetes and hypertension). After analysis of qualitative data and comparison with literature review, qualitative data was transcribed into text and coded through common themes via the utilisation of NVivo software which transform this textual information into statistical or numerical values (McIntosh and Morse, 2015).

Research phase three: adjustment of hypotheses and proposed survey instruments

After the evaluation of recommendations from the second phase, appropriate amendments to the hypotheses and questionnaire design were completed at this time of phase three.

Research phase four: An investigative predominantly quantitative study

In the third phase, an investigative study was carried out through the carefully designed questionnaire instrument in mailed and online form. Consequently, this phase has aimed to present and analyse the links amongst the hypotheses and statistically examine them through collected sample data. Following this process, complete data from the entire project was evaluated. Links between participating practitioners' disparities were analysed and research hypotheses tested through data and findings according to the principles of the Multi-Grounded Theory, that is continuous comparison of emergent data out of which novel telehealth theory grounded in empirical evidence is may emerge. Content analysis has also supplemented the grounded theory principles described throughout this thesis.

Research phase five: investigation, analysis, comparison and presentation of results

Investigation, analysis and comparison of strategies and results with the participating healthcare organisations were thoroughly conducted first. Identification of discrepancies and their causes from the model and detailed investigation whether, those differences were due to or caused by (e.g. different perceptions towards creation of value, technology use considerations, data accessibility and knowledge sharing), or ineffective patterns of interaction and relationship and process management practices or other uncovered factors were investigated thereafter. Quantitative data in numerical values was then entered into both Smart PLS and SPSS statistical package for detailed analysis of direct and indirect relationships. This detailed analysis has involved hypotheses tests through partial least square based structural equation modelling (Barclay, Higgins and Thompson, 1995; Ringle, Sarstedt and Straub, 2012) statistical verification processes and regression founded moderation and mediation Hayes macro process analysis (Hayes, 2013; Hayes, 2017; Hayes and Rockwood, 2017).

3.7.1 Qualitative Study Phase

The final form of the survey questionnaire was used as the basis for the development of a qualitative study phase, whose purpose was to find out whether the phenomenon under inquiry exists, to identify potential issues and examine the questionnaire‘s appropriateness through qualitative responses. 20 GPs from different geographical Sydney metropolitan areas meeting the selection criteria were key targeted respondents. Respondent GP practices and individual participants were selected based on the criteria shown in the subheading on selection of a target sample (section 4.3.2.2) and non-random convenience sampling approach. Respondent GP practices were at first approached face to face through their gatekeepers. Invitation letter and participant information sheet were provided at this time. Within seven days, a follow-up visit was made to find out if there is sufficient interest in the project. Those practices and/or individual practitioners who agreed to be part of the project were sent full information and times for interviews were arranged. Written confirmation of the arranged interview times were sent to their practice one week in advance. All interviews were recorded and transcribed as soon as possible in order to fully reflect on the responses provided. Following the above process, the model‘s elements with their sub-constructs were refined and new found items were added to the quantitative survey.

3.7.2 Questionnaire pre-test

The introductory survey questionnaire instrument was pre-examined by the supervisory panel and skilled industry practitioners. Six individuals have provided recommendable input. Besides the three supervisory panel members, three GP practitioners were consulted to provide pre-test feedback. The aim of the pre-testing was to obtain a consensus regarding the comprehension and practicality of the chosen measurements. The evaluators were asked to provide valid recommendations and where necessary adjustments were made. The final questionnaire was then created.

3.7.3 Target population and sampling tools or techniques

The target population in this project were privately run GP medical practices within the wider Sydney metropolitan area. The main objective of the project was to evaluate GPs' readiness to develop technical and collaborative capabilities for telehealth medical services to distant aged care patients and in due process produce an appropriate model that reflects the current reality.

Though, the pilot study has considered general practices with an average number between five and ten employed GPs, the main survey has considered general practices with at least two or more practicing GPs. Sufficiently representative purposive sampling was utilised in both phases as addresses and individual practices were screened and selected based on their location, that is, the targeted area within Sydney metropolitan region and Australia wide, sizes, ownership type, involvement in aged care and the other stated criteria above.

Fifteen GP practices with one consenting GP from each practice were evaluated in the qualitative pilot study phase and over one hundred fifty GP responses in the main quantitative phase. The final amount of required responses has exceeded one hundred and fifty respondents, which was sufficient for a partial least squares structural equation modelling analysis. The following table summarises the sampling process relevant for this project.

Table 11: Sampling process in this thesis

Sampling process	Sampling plan in the project	Observations
Targeted respondents	GP medical practices	Only privately run practices are targeted due to their wide availability and community reach / exposure.
Sample frame	Sydney metropolitan region and Australia	Sydney metropolitan GP practices and GP practices Australia wide, national GP conferences & primary health networks represent potential target respondents.

Sample unit	Qualitative study targeted only fifteen qualified GP practitioners based on set criteria, whereas main survey targeted entire Sydney Metropolitan Region and every PHN within Australia.	Within these sample units there are sample elements that were targeted.
Sample elements	General practitioners (GPs)	Some practices may have dual GP / practice manager roles.
Sample plan	Purposive / convenience sampling	GP practice size, location, ownership type, involvement in aged care & other criteria.
Size of sample	8-20 consenting GPs in the pilot study and at least 150 expected GP respondents overall. Minimal total required size is 150 respondents.	Final number of valid responses individually evaluated.

3.7.4 Determination of a sample size

Statistical evaluations require a desired amount of observations in order to acquire sufficiently validating and clarifying power of a particular model being tested (Chowdhury, 2014). This thesis utilises a PLS (partial least squares) based SEM (structural equation modelling) method with the purpose to measuring and evaluating proposed dimensions and associated hypotheses of the model. A careful consideration should be given to the size of the sample. According to Gefen, Straub and Boudreau (2000), the minimum prerequisite for a size of a sample is that it contains at least ten times more respondents than the quantity of items contained in the most difficult element of the proposed model Chowdhury (2014). Based on this principle, the minimum required number of responses is 50 (10x5) given 5 items within the following elements; Workload and Telehealth Practice. Even though the above principle states a considerably smaller response, the targeted overall minimum response rate is 150 responses in the quantitative phase. Achieved valid responses between 150 and 200 have surpassed the required minimum size of respondents.

3.7.5 Analysis of quantitative data with Structural Equation Modelling

As previously revealed this project is utilising partial least squares based structural equation modelling for the analysis of the quantitative information. According to Chowdhury (2014), this technique belongs to a 2nd generation and is capable of handling a lot of variables that this project requires. Besides, it may enable the running of a few regression calculations simultaneously. First generation analytical tools are limiting in terms of depth and creativity (Barclay, Higgins and Thompson, 1995).

3.7.5.1 Justification of SEM (Structural Equation Modelling) Data Analysis Approach

In addition to the abovementioned capabilities, SEM analysis approach has been chosen due to the fact that it provides certain other benefits to the researcher. For instance, a) it is flexible in the assessment of measurement components of a particular theoretically entrenched element or construct; b) SEM categorically sorts out measurement errors; c) it also allows cluster evaluations, multiple regression and other types of analyses (Ullman and Bentler, 2012). The researcher is also enabled to provide answers to multiple connected inquiries systematically and thoroughly through an individual analysis (Chowdhury, 2014; Gefen, Straub and Boudreau, 2000). This model contains a great amount of variables and elements, that first generation tools cannot handle. Thus, a 2nd generation technique which is enabled to simultaneously assess a great number of measurement items is better equipped in this case. This type of data analysis is also widely and effectively utilised in other similar projects.

3.7.5.2 Justification of Partial Least Squares based Structural Equation Modelling

Many researchers have used and continue to utilise structural equation modelling applications which are covariance-based or based on partial least squares (Chowdhury, 2016; Chowdhury and Quaddus, 2017). The approach chosen for this thesis works well in predictive project modelling which also aims to develop theory. Furthermore, it is appropriate in investigative projects, compared to covariance-based applications that are used to confirm analysis (Rai, Patnayakuni and Seth, 2006; Ringle, Sarstedt and Straub, 2012). As this project is very novel and is attempting to empirically uncover the phenomenon about which very little is known it is investigative or exploratory. There has in fact never been a study that has dealt with a similar content and on a similar scale as this project. Its aim is to evaluate the links between GPs and their readiness to develop technical and collaborative capabilities for telehealth medical services to aged care patients. The study evaluates the links and associations between technology use considerations, access to data and knowledge sharing, relationship and process dimensions in addition to direct and moderating factors that may determine GPs readiness towards technical and collaborative telehealth capabilities. As far as the researcher knows and literature gaps confirm it, there is no prior research that has dealt to this very date with a similar issue either theoretically or empirically.

Besides the recognition of two existing theories evaluated in this thesis, this project also intends to contribute to the development of a novel theory that may emerge from field data. Furthermore, this project contains formative and reflective dimensions. For that reason, it is reasonable to utilise the partial least squares based structural equation modelling approach (Ringle, Sarstedt and Straub, 2012) which is able to handle formative and reflective dimensions compared to AMOS or LISREL which cannot (Rai, Patnayakuni and Seth, 2006; Ringle, Sarstedt and Straub, 2012). An additional strength of this analytical technique is the fact in is enabled to manage a great amount of elements within a multifaceted model such as the one in this project (Chowdhury, 2014).

3.7.6 PLS (partial least square) procedures

The following procedures are typically carried out in partial least square based structural equation modelling analysis. These include the examination of the measurement and the structural or operational model (Chowdhury, 2014, Hair et al. 2012). Important requirement or precondition in the assessment of the measurements employed is the fundamental association between evident variables and other existing however less noticeable variables (Chowdhury, 2014; Jarvis, MacKenzie and Podsakoff, 2003). Founded on this fundamental relationship, two different measurement tools are offered. One is reflective and the other formative (Jarvis, MacKenzie and Podsakoff, 2003). This study contains both measurement types. Thus, the measurement model will be utilised through the evaluation of the following indicators: reliability, weight, inner consistency, extracted variance averages, discriminant validity and multi-collinearity (Chowdhury, 2014; Hair, Ringle and Sarstedt, 2011). On the other hand, the structural or operational model will be assessed by analysing endogenous elements and their clarifying power besides the examination of the t-value correspondent to every path coefficient and the related hypotheses. The following table describing analysis procedures in structural equation modelling has been adopted from Chowdhury (2014, p. 70).
Table 12 Systematic procedures for SEM analysis.

Table 12: Analysis procedures in structural equation modelling

Stage	Type of Item	Type of Measurement	Decision Parameter
Stage 1 Assessment of Measurement Model	Reflective	Convergent validity	
		Item reliability	≥0.5, and *t*-value > 1.65
		Internal consistency	≥0.7
		Average variance extracted (AVE)	≥0.5
		Discriminant validity	
		AVE analysis	Square root of the AVE of a construct is larger than its correlation with other construct
		Cross-loading matrix	Loading of an item within a construct is greater that its

			loading in any other construct
Stage 2 Assessment of Structural Model	Reflective	Coefficient of determination	$R2 \geq 0.25$
		Test of hypotheses	Significant *t*-value = 1.65

Source: Based on Chowdhury (2014, p. 70)

3.7.6.1 Determination of formative or reflective measurement

This study contains reflective measurement elements. Due to a potentially falsely specified model, it is firstly important to determine whether the proposed model and elements within it are either formative or reflective (Chowdhury, 2014; Henseler, Ringle and Sinkovics, 2009). Next, we discuss matters in relation to the classification of model‘s elements as either formative or reflective. Conceptually, reflective dimensions are caused by the less noticeable or latent (less established) variables (Chowdhury, 2014). As a result of the causal interrelationship between every measurement item and the latent variable, modifications of the model‘s construct or element would lead to alterations in the measuring items. Furthermore, according to the reflective model, measures used define a particular construct as they also commonly relate to the same theme or subject under inquiry (Chowdhury, 2014; Polites, Roberts and Thatcher, 2011). Consequently, a high level of correlations among measuring items is likely to exist (Jarvis, MacKenzie and Podsakoff, 2003). Formative dimensions, on the contrary portray the causal interrelationship between the measuring items and the latent variable in the opposite way (Chowdhury, 2014; Diamantopoulos and Siguaw, 2006) by causing the latent variable. The measuring items are believed not to have correlations between each other, thus measuring dissimilar components within the latent variable (Chowdhury, 2014). Any deletion of measuring items might also change the construct‘s meaning (Jarvis, MacKenzie and Podsakoff, 2003).

Due to the differences in the model‘s conceptual elements and their interrelationships, the study employs together reflective and formative measuring items. The choice between a reflective or formative model is dependent on conceptual underpinnings. In particular scenarios, the causal interrelationship between the model‘s elements and their indicators makes this choice simpler and clearer (Coltman et al. 2008; Finn and Wang, 2014) than in other more complex cases (Diamantopoulos and Siguaw, 2006). For that reason, a theoretical criteria, that differentiates the two types of measurement choices has been created by Jarvis, MacKenzie and Podsakoff (2003). The following table shows the basis on which corresponding decisions are made.

Table 13: Guiding rules on deciding whether a construct is reflective or formative

	Formative model	**Reflective model**
1.Direction of causality from construct to measure implied by the conceptual definition	Direction of causality is from items to construct	Direction of causality is from construct to items
Are the indicators (items) a) defining characteristics of b) manifestations of the construct	Indicators (items) are defining characteristics of the construct	Indicators (items) are manifestations of the construct
Would changes in the indicators (items) cause changes in the construct or not	Changes in the indicators (items) should cause changes in the construct	Changes in the indicators (items) should not cause changes in the construct
Would changes in the construct cause changes in the indicators (items)	Changes in the construct do not cause changes in the indicators (items)	Changes in the construct do cause changes in the indicators (items)
2.Interchangeability of the measurement (items)	Indicators (items) need not be interchangeable	Indicators (items) should be interchangeable
Shall the indicators (items) have the same or similar content?	Indicators (items) need not have the same or similar content	Indicators (items) should have the same or similar content
Do the indicators (items) share a common theme?	Indicators (items) need not share a common theme	Indicators (items) should share a common theme
Would dropping one of the indicators (items) alter the conceptual domain of the construct?	Dropping an indicator (item) may alter the conceptual domain of the construct	Dropping an indicator (item) should not alter the conceptual domain of the construct
3.Co-variation among the indicators (items)	Not necessary for indicators (items) to co-vary with each other	Indicators (items) are expected to co-vary with each other
Should a change in one of the indicators be associated with changes in the other indicators?	Not necessarily	Yes
4.Nomological net of the construct indicators	Nomological net for the indicators may differ	Nomological net for the indicators should not differ
Are the indicators (items) expected to have the same antecedents and consequences?	Indicators (items) are not required to have the same antecedents and consequences	Indicators (items) are required to have the same antecedents and consequences

Source: Jarvis, MacKenzie and Podsakoff (2003, p.203)

On the basis of the guiding principles of Chang, Frank and Lee (2016); Coltman et al. (2008); Ellwart and Konradt (2011); Finn and Wang (2014); Jarvis, MacKenzie and Podsakoff (2003); and Pekkola, Hilden and Ramo (2015), individual elements within this thesis‘ model have been evaluated as either formative or reflective or a mix of both being guided by the rules on deciding whether each element/construct fits a particular category. Upon the full evaluation referring to literature and prior studies, dependent variables‘ constructs (readiness to develop technical and collaborative telehealth capabilities) and direct predicting constructs (value creation and simplicity) have been considered as reflective together with all of the other elements

3.7.6.2 Evaluation of the reflective model

Evident indicators (items) of the proposed model needed to undergo an evaluation process that would determine their validity and the thus the validity of the corresponding construct (Chang, Frank and Lee, 2016; Pekkola, Hilden and Ramo, 2015). Discriminant and convergent validity are together assessed in the reflective model (Henseler, Ringle and Sinkovics, 2009). Discriminant validity is confirmed through the evaluation of indicators‘ cross loadings of the concerned construct and comparisons of correlations within constructs against the square root of average variance extracted, whereas convergent validity is evaluated by computing the reliability of items, average variance extracted and internal consistency (Chowdhury and Quaddus, 2017; Hair, Ringle and Sarstedt, 2011). On the other hand, the formative model is evaluated on the basis of the importance of the construct‘s indicators (items), their weights and loadings (Pirskanen, Laukkanen and Pietila, 2007). Additionally, it may be evaluated by determining redundancy through the formative items‘ multi-collinearity (Hair, Ringle and Sarstedt, 2011). Table 4.3 describes the relevant stages and steps involved.

Reliability of items

Reliability of items evaluates every individual indicator‘s (item‘s) loading in terms of how well it fits within a particular element/construct. Its purpose is to measure the level of variance within a construct and show the strength of the indicator‘s measuring capability (Chowdhury, 2014). Based on Nunnaly (1978) and psychometric theory, the lower the loading, the lower the correlation of indicators and vice versa, the higher the loading, the higher the correlation of indicators within the concerned construct (Nunnaly, 1978).

In the reflective model, the partial least squares technique evaluates indicator (item) reliability by assessing the significance of individual indicator‘s loading results, whereas in the formative model, individual indicator‘s levels of importance with their weights are considered (Chowdhury, 2014; Ringle, Sarstedt and Straub, 2012). Literature suggests slight variations in the appropriate value of acceptable item loading. While for instance, Hulland (1999) and Chin (1998) suggest acceptable value threshold as low as 0.5, Barclay, Higgins and Thompson (1995) recommend acceptable item loading value to be as high as 0.707. On the other hand, Hair, Ringle and Sarstedt (2011) and Chowdhury (2014) are of the view that the value needs to be at least 0.7 in order for the proposed model‘s convergent strength to be validated and maximised.

Internal consistency

The reliability of the model's constructs needs to be established by measuring internal consistency. Firstly, unidimensional correlations between the construct's items need to be assured through convergent strength or validity (Kimbrel et al. 2015; Hair, Ringle & Sarstedt, 2011). Cronbach's alpha was a typical measure of reliability in the past however a newer measure of reliability created by Fornell and Larcker (1981) has shown to be stronger. Similarly to item reliability, the acknowledged, widely agreed internal consistency threshold is set at 0.7 (Barclay, Higgins and Thompson, 1995; Chowdhury, 2014; Fornell and Larcker, 1981; Hair, Ringle and Sarstedt, 2011) even though some scholars argue for a smaller threshold. The formula for measuring internal consistency has been adopted from Chowdhury (2014, p. 75).

$$\text{Internal consistency} = \frac{(\Sigma\lambda i)^2}{(\Sigma\lambda i)^2+\Sigma \text{Var}(\varepsilon i)}$$

in which λi = is the factor loading representing simple relationship among the measurement item and the construct it belongs to, and Var (εi) = $1 - \lambda i^2$, the distinctive/error adjustment. The next statistical measure is called average adjustment or variance extracted.

Average adjustment or variance extracted

In order to evaluate the validity of a construct, this statistical measurement is suitable (Hair, Ringle and Sarstedt, 2011). This measurement tool calculates the discrepancy between individual indicators or items and the construct they are positioned in. According to Hair et al. (2012), an average adjustment or variance extracted value which exceeds 0.5 is acceptable. This result represents an adequate convergent strength as the hidden variable can explain on average over fifty percent of the variation in the items (Campbell, Parks and Wells, 2015; Hair et al. 2012). The average adjustment or variance extracted formula has been adopted from Chowdhury (2014, p. 75).

$$\text{Average variance extracted (AVE)} = \frac{\Sigma\lambda i^2}{\Sigma\lambda i^2+\Sigma \text{Var}(\varepsilon i)}$$

in which, λi is factor loading meaning a simple relationship among the measurement item and the construct it belongs to (item/indicator loading), and Var (εi) = $1 - \lambda i^2$ (the adjustment or variance). The following evaluation requiring attention is discriminant strength or validity.

Discriminant strength or validity

Testing of discriminant strength or validity is very prevalent in research involving surveys and it calculates the level of mutual differentiation between constructs (Voorhees et al. 2016). It in fact evaluates the statistical levels of adjustment or variance which is shared between the indicators or items and constructs (Campbell, Parks and Wells, 2015). As the current model is multidimensional, discriminant validity is completed at the item and construct levels. According to Voorhees et al. (2016), there are several methods to calculate discriminant validity however, both the HTMT and AVE-SV methods when used in conjunction with each other provide the most rigorous evaluation and associated results. According to Hair, Ringle and Sarstedt (2011) and Henseler, Ringle and Sinkovics (2009), two diagnostic practices need to be performed to evaluate it. The first one is to compare the average adjustment or variance‘s square root of each model‘s element/construct and their interrelationships and the second one is to evaluate a cross-loading medium or matrix at indicator or item level. In order to satisfy discriminant validity latent or hidden variables‘ correlations should at least equal the average adjustment of variance‘ square root in the applicable/relevant columns and rows (Chowdhury, 2014). Thus, individual indicator‘s loading inside a construct should be higher than when the same indicator/item is evaluated with other elements / constructs (Chowdhury, 2014; Hair, Ringle and Sarstedt, 2011).

3.7.6.3 Formative model’s measurement evaluation

According to literature, the validity of constructs and item reliability are not essential notions (Chowdhury, 2014; Jarvis, MacKenzie and Podsakoff, 2003; Hair, Ringle and Sarstedt, 2011). Formative model‘s items are validated according to a theoretical reasoning. In order to evaluate individual items‘ formative values, it is essential to appraise whether they are contributing according to their planned or projected meaning (Chowdhury, 2014; Hair, Ringle and Sarstedt, 2011). Each formative construct as well as each item can also be analysed statistically. What significance is looked for in values is item weighing and construct‘s loading (Henseler, Ringle and Sinkovics, 2009). Whereas some authors back only the inclusion of significant, high loading and weight values, others are of the view that all values inclusive of low ones or even negative values need to be included in order to prevent the omission of items and thus entire constructs (Bollen and Lennox, 1991; Santosa, Wei and Chan, 2005). Next, a scholar undertaking a research project needs to find out how redundant formative items are (Chowdhury, 2014; Henseler, Ringle and Sarstedt, 2011). The most commonly required test evaluates the variance or adjustment influence factor, which examines how multi-collinear formative items are (Chang, Franke and Lee, 2016; Finn and Wang, 2014). Values lower than five are deemed satisfactory. On the other hand, higher values indicate very high (over eighty percent) item variance caused by the outstanding items within the same element (Hair, Ringle and Sarstedt, 2011).

3.7.6.4 Evaluation of multi-dimensional or hierarchical elements

Multi-dimensional or hierarchical elements are contained within this project‘s model. Consequently, comparison or contrast of categorised constructs is essential. According to Ellwart and Konradt, 2011 and Wetzels, Odekerken-Schroder and van Oppen, 2009), a multi-dimensional or hierarchical element is one which contains multiple dimensions. In fact, a construct is multidimensional in scenarios where a number of items within a particular construct are interconnected or interrelated. In order to operationalise these elements, they need to go through a process of theoretical validation or grounding. This process shows how each sub-dimension or sub-construct relates to others within and in relation to the concerned higher order element/construct (Palmer and Devitt, 2014; Polites, Roberts and Thatcher, 2011). Moreover, it is very important to correctly define a multi-dimensional element as the model‘s fitness and effectiveness depends on it (Polites, Roberts and Thatcher, 2011). After the principal construct or constructs have been specified, it is then essential to specify each sub-construct carefully (Palmer and Devitt, 2014).

Different levels among multi-dimensional or hierarchical elements

Multi-dimensional or hierarchical levels are categorised according to a) internal model levels such as first, second or third order level and b) the associations among the model‘s elements/construct such as reflective or formative (Chang, Franke and Lee, 2016; Finn and Wang, 2014). Those elements at a higher level are reflective when they contain a few unobserved dimensions (see figure 4.2 for type III and type I). On the other hand, a higher level element is in a formative state if it contains a few specific suppressed (latent) dimensions (Wetzels, Odekerken-Schroeder and van Oppen, 2009). While higher level elements could exist at 1st, 2nd, 3rd or even 4th order level, a commonly observed hierarchical exemplar level for these in literature is the 1st order ranked level. This latent variable model type can be categorised according to four classifications which are founded on the association between a) 1st order latent (suppressed) variable and their evident variables; b) 2nd and 1st order latent (suppressed) variables (Ellwart and Konradt, 2011; Ringle, Sarstedt and Straub, 2012) as demonstrated in figure 15 adapted from Chowdhury (2014, p. 79).

Higher-order reflective elements in this project's model

At 1st order level, telehealth technology use considerations element is measured by data security (Dunnebeil et al. 2012), telehealthcare standards (May et al. 2011) and workload (van Alstin, 2016) reflectively. As evident and grounded in literature, a high level of interdependence between this and other high level 1st order level multi-dimensional elements exists. Consequently, technology use considerations elements are closely related to knowledge sharing multi-dimensional construct (Bullock, 2014; Raven, Butler and Bywood, 2013) and relationship and process management elements. According to these facts and decision measurement rules (Jarvis, MacKenzie and Podsakoff, 2003), these 1st order level elements are defined as reflective.

Higher-order formative elements in this project's model

Based on literature and decision measurement rules abovementioned, all of the constructs are in fact of a reflective character. Thus even the direct predicting elements of value creation as well as the dependent variable; GPs‘ readiness to develop telehealth capabilities is reflective in the proposed model. As a result of the rule measurement decisions (Jarvis, MacKenzie and Podsakoff, 2003), this model is fully reflective in its character.

3.7.6.5 Evaluation of the structural model

Once the measurement model proves its validity and reliability, then, the structural model needs to be evaluated (Chowdhury, 2014; Hair, Ringle and Sarstedt, 2011). This evaluation tests the significance of the proposed hypotheses and the links among the model‘s elements through path coefficients and path loading between latent elements (Hair, Ringle and Sarstedt, 2011; Santosa, Wei and Chan, 2005). In the case of this project, partial least square based structural equation modelling provides an advantage through effective prognosis or appraisal of the coefficient of determination (represented as R2) and utilised to describe the model‘s capability to forecast the suppressed endogenous variables (Chowdhury, 2014; Hair, Ringle and Sarstedt, 2011). Consequently, what is needed is to evaluate the proposed model‘s clarifying power for each model‘s element. It is tested by the value of the coefficient of determination (R2). Values which are acceptable do differ among scholars. For instance, Hair, Ringle and Sarstedt (2011) support R2 between 0.25 and 0.75 with 0.75 being considerable, 0.50 being a moderate value and 0.25 weak. Others such as Santosa, Wei and Chan (2005) consider and accept smaller values than 0.25. Besides, the coefficient of determination, t-values and path coefficients need to be calculated to evaluate the proposed hypotheses and links between the model‘s elements/constructs. Literature suggests 2 approaches which are non-parametric, the so called bootstrap and jackknife techniques (Chowdhury, 2014; Santosa, Wei and Chan, 2005). Due to the fact that each approach has its strengths over the other, the preference in this project is given to the bootstrapping technique (Chowdhury, 2014).

Nomological strength or validity

This measure is performed in order to evaluate the principal construct‘s items and the links between them and other model‘s elements as grounded in the theoretical framework (MacKenzie, Podsakoff and Podsakoff, 2011). Path coefficients‘ statistical importance in both exogenous and endogenous elements is the central evaluation tool for nomological validity of the items in the principal construct (Akter, D‘Ambra and Ray, 2013). The statistical significance of path coefficients demonstrates the relationship between the elements of the nomological chain and the principal construct, which rises the level of confidence and thus validity of the measuring items / indicators (Akter, D‘Ambra and Ray, 2013; Chowdhury, 2014). Furthermore, nomological strength or validity can be performed to evaluate the appropriateness of multi-dimensional constructs and structure of the principal construct (Edwards, Ward and Bytheway, 1995). In scenarios where a multi-dimensional endogenous principal construct that is reflective in character is tested, nomological strength or validity can be performed through the evaluation of the straight effects between the antecedent (precursor) construct on the sub-items in the principal model‘s element and the secondary effect which the precursor construct has on the indicators or sub-items caused by the principal construct (Chowdhury, 2014; Edwards, 2001). In cases where secondary effects of the antecedent (precursor) construct on the sub-items in the principal model‘s element are greater than primary (straight) effects, the decision can be made that the measured multi-dimensional construct‘s indicators hold validity (Chowdhury, 2014; MacKenzie, Podsakoff and Podsakoff, 2011). The next performed measure is predictive validity.

Predictive strength of validity

This statistical value evaluates whether the measurement method‘s results project correct forecast in relation to the element represented (Chowdhury, 2014; Newsome, 2006). Predictive strength or validity can be ensured by a technique called ‗predictive sample reuse‘ represented by Q2. Founded on the method known as blindfolding, this value examines the prognostic significance in big, complex models through the utilisation of the partial least square. The prognostic significance of a specific model‘s construct may be examined by the formula below:

$$\text{Predictive relevance } (Q^2) = 1 - \frac{\sum_D E_D}{\sum_D O_D}$$

Source: Chowdhury (2014, p, 83)

in which E represents the prediction error's square sum, 0 represents the square root sum through the use of the average or mean value and D represents the error distance. Predictive strength or validity (Q2) can also be approximated through the utilisation of two dissimilar prognosis approaches. The first is called cross-validation communality and the second one cross-validation idleness or redundancy. Bigger and more complex models should utilise the second approach, which is adopted by this study too (Chowdhury, 2014; Chin, 2010). This project evaluates the significance of prognosis of the value creation direct predicting construct as well as other endogenous model's elements. Predictive validity is typically measured by utilising the error distance between five and ten in current partial least square software applications. A value higher than 0.5 is considered as an acceptable indicator that cross-validated redundancy is a valid predictor (Chowdhury, 2014; Akter, D'Ambra and Ray, 2013). The next statistical measure is effect size.

Effect size

In addition to the evaluation of significance of R2 (prognosis or appraisal of the coefficient of determination) for every endogenous element in the model, f^2 effect size can be measured too. This calculation measures particular exogenous suppressed (latent) element's ability to predict endogenous elements of the model. The following formula to calculate f^2 is that 0.35, 0.15 and 0.02 values be used for large, medium and small sizes (Chowdhury, 2014; Cohen, 1988).

$$f^2 = \frac{R^2_{\text{included}} - R^2_{\text{excluded}}}{1 - R^2_{\text{included}}}$$

Source: Chowdhury (2014, p. 83)

in which $\boldsymbol{f^2}$ represents effect size, R2 excluded represents R2 value which does not include control variables and R2 included represents the value of R2 with the inclusion of control variables. The next statistical measure used is goodness of fit.

Goodness of Fit

This measure is utilised in order to assess the accuracy of the overall prognostic capability in addition to the evaluation of the general performance of structural and measurement factors. Reflective items in this model can be evaluated through the general fitness index (Akter, D'Ambra and Ray, 2011; Chowdhury, 2014). Goodness of fit or (GoF) guide or index is utilised to evaluate universal strength or validity of models based on partial least square (Moralles, Neto and Rebelatto, 2014; Tenenhaus et al. (2005). This value is measured by calculating the geometric average value or mean of the average/ordinary communality and average/ordinary R2 results in endogenous elements (Chowdhury, 2014; Moralles, Neto and Rebelatto, 2014; Wetzels, Odekerken-Schroder and van Oppen, 2009). Importantly, partial least square algorithms calculate communality outputs with the same result as average expected discrepancy or variance. Goodness of fit is calculated with the following formula adopted from Chowdhury (2014, p. 84).

$$\mathrm{GoF} = \sqrt{}\mathrm{AVE} \times R^2$$

Acceptable value should be between 0 and 1 or more precisely 0.36 being considered large, 0.25, medium and 0.1, a small value (Moralles, Neto and Rebelatto, 2014; Wetzels, Odekerken-Schroder and van Oppen, 2009). The final proposed measure in this PLS-based study is power analysis.

Power analysis

This measure indicates the likelihood of achieving statistically valid and accurate hypothetical outcomes whether positive or negative predictions were made (Chowdhury, 2014; Cohen, 1988). Sample sizes inferences are likewise importantly developed before partial least square based path modelling can be validated (Akter, D'Ambra and Ray, 2011). This measure is dependent on a) the level of significance, b) size of the sample, and c) the effect size (Chowdhury, 2014; Cohen, 1988). It is recommended that values above 0.80 should indicate statistical confidence of the portrayed hypothesised relationships (Zhang and Gou, 2016).

Construct measurement

In terms of the number of constructs and number of items per construct, this study has considered many frequently cited top-tier articles in telehealth adoption literature. After extensive review of the existing literature, the initial model was derived from the comparison of general literature with telehealth literature. During this phase, twenty constructs were initially considered as part of the conceptual model. Following ongoing suggestions by the supervisory panel to condense it into a meaningful and feasible framework, only those construct dimensions or items that were commonly accepted among authors as critical or essential were modified or adopted. Importantly, the selection was driven by most essential telehealth adoption elements from a service value network perspective. This has meant most relevant and most essential telehealth dimensions that are reflective of a particular construct in addition to items which emerged from the qualitative field study phase and most relevant items were selected. Furthermore, essential literature gaps that were identified were addressed through the sub-constructs and associated items which were empirically validated through both qualitative and quantitative phase.

Detailed tables with all individual items and their references utilised in this empirically tested model can be seen in the survey instrument section one to eight in chapter five. These contain items from both the comprehensive framework and those added following the qualitative phase. In the context of this specific telehealth project, telehealth technology use considerations essential operational pillar has been measured with data security, telehealthcare protocols and workload sub-constructs; knowledge sharing essential operational pillar with motivation to share, opportunity to share, ability to share, data exposure concerns and telehealth practice sub-constructs; relationship management essential operational pillar with communication, collaboration, trust and commitment sub-elements and process management essential operational pillar with six key telehealth service delivery process elements.

Furthermore, value creation has been measured by six most relevantly found and established dimensions whereas telehealth enablers at both individual and organisational level have been measured by six combined dimensions. Finally, GPs‘ readiness to develop telehealth capabilities has also been measured with six individual dimensions.

3.8 Chapter Summary

This chapter has clarified the research paradigm, research methods, its design, units of analysis, strategy, data collection and data analysis process, sampling, justification for both qualitative semi-structured interviews and quantitative survey questionnaires and ways to overcome low responses. It has also justified partial least squares based structural equation modelling approach as the most appropriate method for analysing hypotheses and multiple links between constructs and variables. The next segment in this thesis deals with empirical, first qualitative and then quantitative data by applying the methodology covered herein.

Chapter 4 Empirical Field Study Analysis

4.1 Introduction

This segment of the thesis serves to evaluate empirical field study data. Empirical study was performed through semi-structured qualitative interviews with general practitioners practicing in different parts of metropolitan Sydney. The number of conducted interviews is fifteen and all interviewees are GPs practicing in privately owned medical practices. The aim of this qualitative phase was to cross-examine and test the validity of the initial study model which is portrayed in figure 6.

While the initial model is built on the components of a service value network and is assisted by the Unified Theory of Acceptance and Use of Technology, community of practice theory under the multi-grounded theoretical approach, it has been adjusted to fit the proposed telehealth context. All of the elements in the initial phase were used from and grounded in latest relevant literature. Even though, the model itself is grounded in relevant literature, it nonetheless needed to undergo a reality test as no study of a similar context has been carried out on general practitioners and particularly not in the context proposed in this thesis. General practices and GPs herein have been proposed as central players in a telehealth care service value network in collaboration with specialists. Chronic and acute conditions of aged care patients have also been utilised as important elements in the proposed cross-collaborative arrangement.

The present chapter begins with the study background which is then accompanied with the analysis of the content and results of the empirical study covering deductive and inductive phases. Based on empirical study results, the final model was refined.

4.2 Qualitative Field Study

This research project utilises both qualitative and quantitative methods. The first phase was accomplished through qualitative semi-structured interviews (Eisenhardt, 1989) with fifteen general practitioners practicing in metropolitan Sydney region. Literature review and central service value network elements supported by direct predictors, moderating and control factors have provided the context for the creation of interview topic queries. Interview queries have been further refined through literature, supervisory panel meetings and suggestions in order to fit the scenario under scrutiny. Upon selection of data collection methodology, data sample was chosen, through a non-random, convenience sampling method. The aim of the empirical study was to evaluate the initial study model and produce the final refined model. Out of the final refined model, a quantitative survey instrument has been developed and major quantitative study phase undertaken on GPs and their readiness to develop capabilities for telehealth medical services. When a quantitative phase follows a qualitative phase, it is recognised as mixed methodology investigation (Johnson and Onwuegbuzie, 2004). The ensuing process is presented next.

4.2.1 Development of semi-structured interview questionnaire

Key elements of the proposed model were represented in the design of the semi-structured interview questionnaire. The first interview question has aimed to obtain a straightforward response in relation to general practitioners' utilisation of telehealth technologies. For that reason, the first inquiry required either a one-word negative response or a positive response with clarifying details.

Inquiry two aimed to explore the first pillar of the proposed telehealth service value network; telehealth technology use considerations. That is why, the respondents were asked to express their ideas and thoughts in terms of how they view telehealth technologies and what they consider important for their utilisation. Question two has been utilised for this purpose. The third inquiry addresses the second key pillar, namely knowledge sharing, which aims to explore the respondents' perspectives on their motivation, opportunity and ability to share knowledge with colleagues electronically. The third and fourth interview questions have addressed this topic area.

The fourth inquiry addresses the next key pillar; relationship management through open commentaries on any issues deemed important to the respondents in relation to telehealth communication and collaboration with specialists. Question five addressed these issues. The fifth inquiry aimed to address the final key pillar by summing up key elements of the proposed telehealth service delivery process and asking the respondents their opinions and perspectives on these key elements from their angles. Question six and seven have addressed these issues.

The fifth inquiry addresses direct predictor of the proposed model, namely; perceived / expected value to general practitioners from their perspective. Question eight reflects these aspects. The sixth inquiry relates to GPs' personal and organisational factors that might influence them to enhance technical and collaborative telehealth capabilities and the final question is an opinion of their readiness to develop the same capabilities for telehealth medical services to aged care patients. These inquiries have been addressed through questions nine and ten.

Table 14: Empirical study topics and linked questions

Theme	Question	Question explanation
To find out whether GPs utilise telehealth technologies in aged care	1	This is a straightforward question about current provision of telehealth services to aged care patients
To explore telehealth technology use considerations	2	Individual GP perspective on any issues of importance to them in terms of telehealth technology use, current, prior or future considerations
To explore current knowledge sharing practices	3	With whom GPs share patient data
	4	Comprehension of individual GP's knowledge sharing practices
To explore proposed relationship management elements	5	Free commentary on any issues of interest to individual GPs in relation to telehealth communication and collaboration with specialists
To explore proposed process management elements	6	An individual GP's opinion on simple interoperable system, uninterrupted broadband speed, curated health data, personalised remote patient support, remote care protocols and integrated treatment phases
	7	An individual GPs' suggestion on any other important service process element from personal angle
To explore value creation elements	8	Individual GP's expected benefits from telehealth use and collaborative arrangements through telehealth technologies
To explore GPs' individual and organisational telehealth enablers	9	GP's individual and organisational factors that might influence them to enhance telehealth capabilities
To explore GPs' readiness to develop telehealth capabilities	10	Individual GP's opinion on their levels of readiness to develop technical and collaborative capabilities for telehealth medical services in aged care

Following interviewee feedback and question responses, more in-depth comprehension of the key elements of the proposed telehealth service value network model with GPs at the centre of care delivery provision was gained. Additionally, links between the different elements were better understood. A full list of qualitative interview questions in this empirical study can be seen in Appendix 1. All questions went through the approval process first by the supervisory academic panel and then the UTS Human Research Ethics Committee.

Likewise, the proposed qualitative instrument had undergone a pilot study phase with the aim to test its comprehension and relevance of the inquiries. It was valuable for the exploration of other emerging issues and adjustment considerations as regards interviewees' available time while addressing the proposed model. As a result, the interview protocol had been designed and approved before the empirical field study was pursued. The total of six academics and general practitioners were involved in this process. All participants were consulted in a face to face conversation. The initial proposed interview consisted of 17 questions. The pilot phase has proven to be very useful in helping refine and reduce the number of questions to 11 while at the same time addressing the full model and achieving the stated and planned objectives. After question finalisation, individual interviews with fifteen general practitioners were carried out face to face in one to one sessions. The interviewed general practitioners practice medicine in different parts/areas of metropolitan Sydney.

4.2.2 Selection of the sample

The number of chosen interviewees in this qualitative phase was twenty. This was decided upon researching literature on qualitative interviews (Eisenhardt, 1989; Eisenhardt and Graebner, 2007; Perry, 1998). Interview time duration was pre-tested and accordingly a protocol was created for the purpose of ensuring that the aimed conversation outcomes were achieved while respecting and effectively accommodating time constraints imposed on general practitioners' work schedules. Targeted GP respondents were initially supplied with high level interview questions to help them understand the process and prepare their answers should they wish to answer the inquiries. Their participation was completely voluntary. Finally, due to the reach of saturation in this homogenous group, the final number of completed interviews was fifteen.

4.2.3 Description of respondents

This field study has utilised participation of fifteen general practitioners. All the respondent interviewees are GPs practicing within metropolitan Sydney region and who serve their respective geographical areas. Different corners of Sydney metropolitan region have been represented by the respondent GPs in order to draw a representative sample of the wider Sydney GP population. Among the participating GPs, three were female doctors and twelve male doctors. They represent GPs in their early thirties, forties, fifties and sixties. Their years in GP practice likewise stretch from five years minimum to over thirty years in GP practice.

4.2.4 Collection of data

Upon selection of the sample, GP respondents were invited through gatekeepers (practice managers and receptionists) at first. Whereas early interest in the project was slow, with continued contacting, more face to face encounters have led to all the interviews. Individual interviews lasted around 20 minutes, though some were shorter and others longer. The initial response was weak as out of contacted 10 GPs within 1 medical practice, only 1 GP accepted the invitation to be interviewed. However, with increased contacts, GP response rate improved as well, and all the interviews were completed within four weeks. Of those interviewed, 3 were female GP interviewees and 12 male GP interviewees. GP interviewees were asked whether interviews could be voice recorded and all except one GP have approved their acceptance of this interview approach. Notes were also taken down in order to recap on any important or emerging points emphasised throughout the process. All the interviews were verbatim transcribed and during this time, the researcher involved had reflected again upon the content and the essence of the themes explored.

4.2.5 Analysis of data

Interview data was analysed by utilising the content analysis method, since the purpose of this phase was to explore the topic of inquiry (Berg, 2008), the phenomenon of telehealth and current GP involvement in it. In the content analysis process, different links among the constructs were evaluated. NVivo 12 statistical tool for analysing qualitative data had been utilised.

It assisted in the facilitation of analysis of data through the search, exploration and linkage of common themes, notions and data patterns (Ozkan, 2004; Richards, 1999). To achieve its exploratory objectives, this project has utilised both deductive and inductive processes in data analysis (Berg, 2008).

Its purpose was to closely examine and approve the commonly appearing themes and their sub-categories from raw interview information. Commonly appearing themes and their sub-categories together with other elements and sub-elements were found and recognised in the inductive stage. NVivo software tool has fist uncovered free nodes out of which a tree hierarchy based on similar notions emerged.

Individual tree hierarchies were recognised as potential higher order constructs. These were then compared with similar elements in each individual interview, which due to their significance have led to the final service value network model. These segments finalise the inductive data analysis stage.

The final stage of data analysis was deductive. Its purpose was to compare the conceptual model with the field model in order to review and evaluate the importance of the model‘s constructs and sub-elements and to validate the findings from the interviews in literature as well. This has led to the final and complete model for the project at hand. The following steps were followed in this qualitative data analysis process.

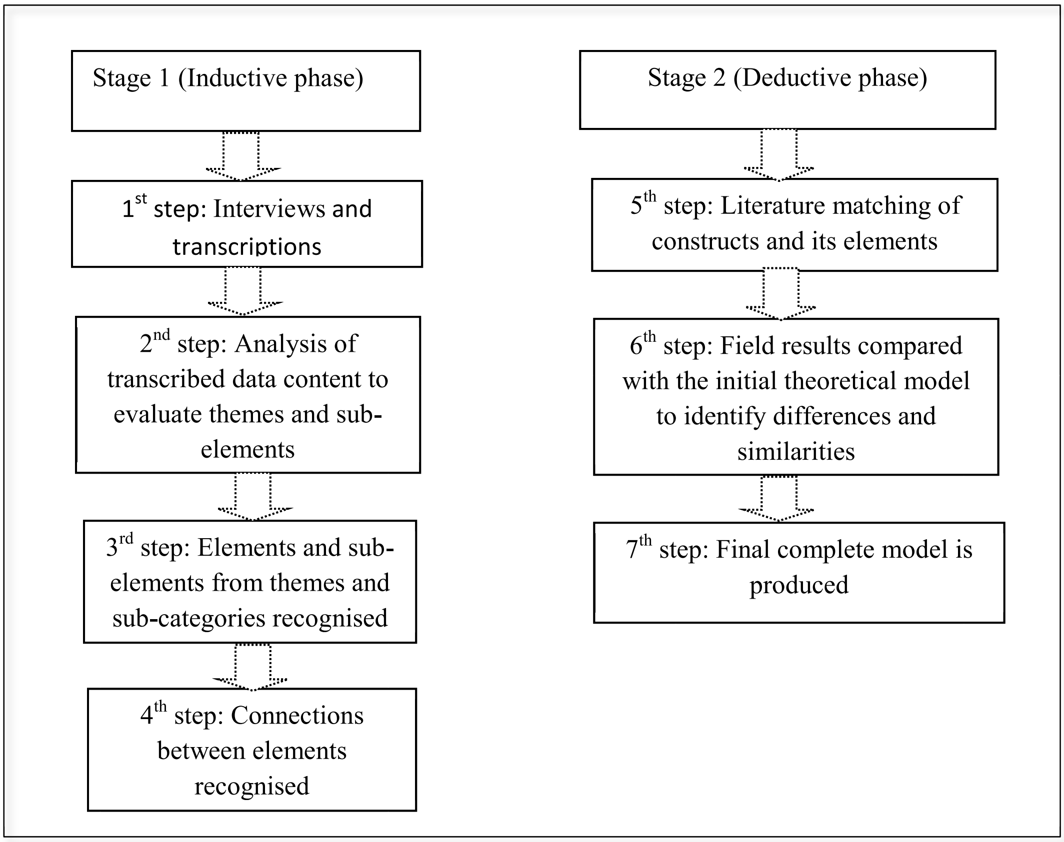


Figure 12: Process of analysing qualitative field data

4.3 Field study exploration (inductive stage)

In this segment of the project, field study results are presented through the content analysis approach. Exploration relates to all the key constructs, direct predictors and moderating / enabling factors. Following interview question 1, presented are findings on telehealth technology use considerations, followed by findings on knowledge sharing, relationship and process management elements. Next, results on direct predictors and moderators / enablers are presented in line with the dependent variables - estimated GP readiness levels to develop both technical and collaborative telehealth capabilities. And finally, connections between model‘s key elements and sub-elements are identified and recognised in the final and complete research model.

Finding out whether GPs utilise telehealth technologies in aged care

The first question posed to the interviewees was whether they currently provide any telehealth services. None of the participants except R11 have had any prior telehealth exposure or related experience in the use of telehealth services in general practice. R11 provided the following response: –*as good practicing, we were doing remote medicine in the Northern Territory, and we had video conferencing, the teleconferencing and telemedicine was used there. Now, the technology has changed, but yeah, so we are going to be doing this and that. Back then, there was no item number as such for it, but we had a, we still had a very good system, which was running in place and we were remotely managing patients from one location in the outer communities there and in the rural communities. There will be a health care provider and a nurse, a community nurse. She will liaise and we had a set pack and our questionnaires, which I was writing on a piece of paper, and I was following a systematic protocol of taking information and transferring the answers on that. So, we knew exactly what we did, and what was the information given to us. On that basis, we give the information and we proceed from that. This is an extension of that kind of a concept. This is the future, this is the way that is going to happen, the way the eye is coming in all of the things. We were doing telephone conferencing and video conferencing at that time, and especially we were doing with the Childrens"Hospital, Adelaide Hospital and we used to do with paediatric cases, especially with the Sydney Childrens" Hospital in Randwick here from Taren Creek. Taren Creek, we would do once a week video conferencing, we"d take our cases and this was taken live with inpatients around and as hours come. It was a done thing and beside that, we were doing everyday telephone consultations in the remote community".* Next follow findings on the key proposed telehealth service elements.

4.3.1 Exploration of telehealth technology use considerations

Telehealth technologies could potentially transform the healthcare industry in various ways. These have especially been helpful in reaching out to underserved communities and chronically/acutely ill patients. As telehealth technologies are still in their infancy phases for wider community use, their potential utilisation has not been adequately researched by the research community, particularly in the aged/chronic/acute care sector which is possibly its biggest growth driver. As telehealth technology is multifaceted, its considerations are multidimensional too. Although, telehealth technologies' common elements are economic, technological, organisational and human (Pan American Health Organisation, 2016; Roig and Saigi, 2011), the results of this interview phase have particularly stressed the following aspects of the most common elements mentioned above, namely; the importance of data security, telehealthcare protocols and workload as significant considerations that may affect the utilisation of telehealth technologies by general practitioners. These considerations have not been adequately researched in telehealth context. Of the three sub-elements, only data security has gained high exposure by researchers, whereas there is a paucity of research on telehealthcare protocols and no research on telehealth workload in literature in the context of telehealth as they are in this thesis, at the time of writing this chapter.

Data security

Interview data has uncovered the significance of data security amongst most of the interviewees. Particularly, total data security and confidentiality of all patient and general practitioner data (n=15) and patient identity/privacy (n=11) have been overwhelmingly supported concerns. Consequently, all respondents have agreed that data security / protection is a must (n=15), upon which other security measures rest (see table 15 for particulars). R2 for example stated the following “*I have concerns about it, because there are security and privacy concerns that have not been fully explained to me. I think for instance, I have a concern that, say if I talk about my health record, but just say a patient, an individual's health record gets accessed by a health facility and then gets unlocked within that health facility. It can then be repeatedly unlocked within that facility without the patient being notified. And I think that, that is probably inadequate security for a health record".* Similarly, R3 stated “*you have to have safety nets in place so that the likelihood of patient harm occurring, or misdiagnosis occurring, or mismanagement occurring, be minimised*". In addition, R11 reaffirmed “*if you want to use it, we need better technological support, stable technological support, information privacy, data privacy, both patient and doctors' confidentiality".* These are all highly relevant concerns by healthcare practitioners and if not addressed properly can affect the entire telehealth ecosystem which could cause its failure and discontinuation of use among health practitioners.

Telehealthcare protocols

Following total patient and GP data security and privacy, the next key element in considering the use of the telehealth platform amongst general practitioners is a set of protocols suited for remote healthcare. Telehealth protocols have been emphasised as essential guides in terms of individual roles (n=15). Besides, remote care protocols also need to be fully approved and recommended by professional medical bodies. R3 has confirmed it through the following statement: “*I'd be also guided by the RACGP recommendations; you'd want to make sure it's all approved fully by the RACGP. Then I'd also be interested to see what the Australian Medical Association's stance is. I'd be guided by the relevant professional bodies to make sure that everything is supported by the RACGP and the AMA. Ultimately the aim is to provide assistance to the patients*". Similarly R11 had reiterated: “*definitely, because you need to have a system or a protocol. So the protocol should be designed in the best interest of the care for the patient. Not keeping the best wallet of the GP. It may be important, time, remuneration, reward, but how will I be able to provide the best quality care to the person remotely, and what all, actually it's a* *good question. What all is required, yes, RACGP should come up with some good guidelines for you know, telecommunications, and it is actually an extension of normal communication we do but we are not seeing anybody's physical, maybe video if it is and some time it may not be video, and in some areas, where people may not be able to come on the video, you may not be able to see".*

Protocols' function is especially crucial in specifying and clarifying practitioner accountabilities (n=12). R2 has outlined ―*I think it's almost about having clear outcomes, clear roles and responsibilities, for what happens after it's finished.... it's more like clear accountabilities* ". Clear roles and accountabilities throughout all the phases of the telehealth service delivery process have been emphasised as important and supported by the respondents due to the fact that telehealth is by default a cross-disciplinary method of healthcare delivery which adds additional complexities through the involvement of multiple healthcare providers (see table 15 for particulars). R14 has further stressed ―*I think it needs to be a structured delivery, otherwise you can't really assess if it's really working or not*". Whereas healthcare protocols have been in existence for a long time, it might be a matter of modifying or updating them to suit telehealth purposes. R9 has summed it up in the following statement: ―*I think it's more an adjunctive support for ongoing regular care to patients. So, if patients have got a good rapport and relationship with their GP, this is an extension of providing that service through inability for distance and availability to come to a surgery*".

Over one half of all the participants also supported the view that cross-disciplinary care should be doctor-led as opposed to a health professional with less training or with lower expertise (n=8). R3 has affirmed with ―*that sounds good*", R4 was supportive however stressed the importance of a multidisciplinary team approach by stating ―*I think GPs should be involved as one of the medical professionals but of course sometimes you need advice from the specialist or allied health*". R7, R8 and R13 were brief with a confirmation ―*I think*" and ―*yeah*", ―*yeah*" respectively, whereas R9 was more upfront by saying ―*I must be biased if I say – it sounds biased for me to say, yes it does, because the alternative would be less well-trained practitioners, taking a lead role in that*".

The above respondent statements point to a number of complexities in remote care and the need for protocols to address these and many other unexplored, and potentially conflicting issues when remote care is concerned. R12 has pointed to some of these: ―*sometimes, we are depending on other persons interviewing the patient. If sometime, a doctor was deciding, if he personally talked to the patient by looking at it, the diagnosis can be different, so it can, it can, it may affect the diagnosis. If you are only telling them, let's focus, if the camera is there, you would tell the patient, but still, your ears are listening to the chest. My ears are listening to the heart, my diagnosis may change. When I am depending on somebody, I am diagnosing by* *somebody"s ear, looking at somebody"s ear, not my ear. It still would be helpful, but will it give you a hundred percent diagnosis? I have a bit of suspicion".*

Empirical findings from this phase indicate that telehealthcare protocols face substantial challenges while a lot of important questions remain unanswered at this stage. However, some commonalities can be identified which should assist in the preparation and building of necessary steps for unforeseen situations that may require more attention due to the distance between the patients and the practitioners. Besides data security and telehealthcare protocols, workload is another inevitable element that requires serious thoughts and consideration when designing the platform.

Workload

Workload imposes itself as a critical consideration in any work context, whether individual or team based and particularly so in healthcare delivery. In a telehealthcare context, workload is defined as the amount of work assigned or accumulated in the course of provision of planned and/or unplanned clinical as well as non-clinical activities for the purposes of carrying out telehealth and other ongoing medical services. Due to the fact that telehealth will highly likely impact on the design of work practices by moving from conventional to online delivery, it is also likely to have an impact on increases in online workload and consequent reduction in conventional delivery (Van Alstin, 2016). R7 has stated it in the following statement: ―*I think telehealth will probably increase the workload a lot*". R2 has also stated: ―"*at the moment I wanted it to be a work saving tool, not creating extra work".*

R9 on the other hand has been more optimistic in his statement: ―*I think the workload can be - you give someone an incentive and make it easy to use the technology, people will start adopting and trying it out. They will work out their workload. Yes, it will be another - added to your workload, but I think it's reflected by the overall service delivery of what you're trying to do. Yeah, so would it be more workload? Possibly. Would it be [new equilibrium on] how you manage it? Yes, it will, but it means that you can deliver care from a distance*". R11 has reaffirmed in the positive by stating: ―*the workload, for majority of the people, I tell you for aged care as you"ve come up, good idea, it will be a win-win situation. And it will not, it may affect a percentage of GPs" workload, those GPs who are totally focused on aged care, and if he is not using telemedicine, telehealth technologies and resources, then he is missing the boat*".

Additionally, telehealth is likely to enable GP practitioners to work from any location as stated by R3: ―*It means that you can deliver care from a distance*". Similarly R5 stated: ―*that is easy access to patients*". However to make it effective, the platform needs to ensure stable workload distribution. It is clearly affirmed by R11 as follows: ―*as for quality care it looks promising as* *long as the technology is stable. As long as the technology is stable, and that people who are involved in providing technology and regulators have done their homework before they came to GPs to go ahead and fire*".

Importantly, telehealth services that are time efficient are likely to help GPs improve workload management. R3 has emphasised: *"this could potentially increase the efficiency of certain medical services, so that would be helpful. It could perhaps make certain consults more - it'll save time. So if there are some simple problems you could potentially deal with them this way. It'll save you time travelling to the healthcare facility".* R14 has stated the following: *"I think it would probably improve workload because we will be actually able to assess someone without travelling to see them*".

R11 is of the view that time efficiency will reduce the burden on GPs. The following was stated: *"but I can tell, aged care burden will be reduced on GPs. Because, constant data is coming and the time consumed in my office to see an aged care patient is very high. I had a 90-year old man yesterday, who had some chest pain, he came, it took me 20 minutes for him to get up and go to my ECG room and do an ECG. And that was normal, it came out to be a muscular pain, Panadol was given. It was a half an hour consultation, it was not very well rewarded to me. But if the same consultation was live (online), he would have called me and I would have triggered my buttons, I would have known to take Panadol, let me know tomorrow or in five minutes, it is not hard to take, you stay there. I was making the same money or similar and I would promptly act, and they would not delay because they do not take, they would take the prompt service. It is a win-win situation, I think".*

R15 however, who specialises in aged care has emphasised some real issues that the current working arrangement imposes on his time in terms of record writing, keeping and uploading it. In addition to a nursing home record, he has to write his own notes and then yet write and upload a separate record in the My Health Record - the central patient data repository utilised by telehealth practitioners. He explains it: *"My Health Record is a problem because we still have to generate a report to contribute to a database. So, for example, I finish my database, I have to generate my health report to be sent to My Health Record and that is another 5-10 minutes. How do you do it? So, I've got one record in the nursing home in their database, when I go home, I've got my record, and another record, 3 records, triplication*". This triplicated workload concerns need to be addressed by the telehealth platform. Table 15 below shows a consolidated view of the above analysis.

Table 15: Telehealth technology use considerations elements

Elements	Variables	Respondents															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	%
DS	Data security protection	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	100
	Patient privacy/identity	√	√	√	√	√	√	√	√		√	√	√				73.3
PR	Protocols' clarity	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	100
	Practitioner accountabilities	√	√	√	√		√	√	√		√	√		√	√	√	80
	Cross-disciplinary care			√	√				√		√	√					33.3
W	Conventional care delivery		√					√		√		√	√				33.3
	Work from any location					√	√			√		√	√		√		40
	Workload distribution		√	√	√		√	√		√		√	√	√			60
	Time efficiency	√	√	√	√	√	√	√		√	√	√	√		√	√	86.7

DS=Data Security, PR=Telehealthcare Protocols, W=Workload

The above table evidently confirms the significance of the telehealth technology use considerations elements or its sub-constructs by the interviewed general practitioners who are practicing in different areas of Sydney metropolitan region. Due to the importance of the above key factors, the telehealth platform needs to seriously address these as they are essential for its solid foundation. The other key telehealth service value network segments crucial for its model of delivery could then be reliably built upon these solidly established elements. As telehealth is a cross-disciplinary service delivery platform by default, the respondents inevitably also discussed the importance of knowledge sharing, relationship and process management, the other remaining essential operational elements.

4.3.2 Exploration of current knowledge sharing practices

Knowledge sharing is defined as practitioner willingness and readiness to exchange useful medical information and/or share treatment techniques that may be usefully engaged or utilised in the process of treating patient conditions. It contains dimensions of one's motivation to share, opportunity and ability to share knowledge as well as electronic data exposure concerns and electronic work practices.

Motivation to share

Field data has shown that a minority of the interviewed respondents are intending to share their knowledge or working experiences electronically with colleagues (n=4). R1 indicated that: *"it will be a good option for the patient and I think especially in a quick management plan. For me, personally, I've got a few of the specialists we deal with, I know one of the cardiologists, if there is you know some funny ECGs, I am not sure, I usually send him to What's app, so he could look* *at it and give me a response. Yeah, that sort of thing, but that is not a very large amount. But, in the my health share, it*‗*s a very important thing, what we*‗*ve been doing lately*". R12 emphasised the importance in knowledge sharing with specialists through the following statement: *"that is very important, knowledge sharing can be a great endeavour, so yes, telehealth is very important for that."* R11 also reiterated: ―*we have eHealth on board now. My Health Record, yeah. We are doing that, we are registering patients. Patient has to sign consent if they want to take their files, we are doing notes on their approval unless we have consulted, and we have vetted an agreement and I am referring them*".

Few interviewees have also mentioned that they will try to give their knowledge in the most efficient way (n=6). R3 has highlighted the importance of efficiency as stated: ―*Yeah. efficient start and finish time so that if you are going to obtain an opinion from a specialist that you can book them in for a certain time that's mutually convenient. So you could block out that period in your day*".

R11 did say: ―*we share information for quality care, we exchange thoughts, that needs to be there, knowledge has to come from a better source and delivered to the person. It should be a streamlined process. GP has been the prime care provider and he creates that with his own wisdom, with his own experience, if he*‗*s got a patient he is serving, he thinks that he needs to take A,B,C,D wing of the service, he involves them on his button".* R12 replied in the GP-specialist exchange context with: ―*with some sick patients, with them, a specialist would look at my opinion, the specialist might tell me can you ask these various questions of the patient, so that would help the specialist. So it might become not easier, but a GP will take it into a process to tell the specialist on the phone or the tele-conference*".

Opportunity to share

In terms of opportunities for knowledge sharing, only a couple of participants indicated that they may devote enough time to sharing their knowledge electronically (n=3). In terms of electronic sharing through My Health Record, respondent 1 has pointed out: ―*sometimes it is a lot easier to update the health record, rather than just pick up the phone and call*". R3 on the other hand has added: ―*I'd like to look into the way it works and time involved*".

The climate in one‗s organisation that allows for easy sharing of knowledge electronically has likewise been mentioned by a couple of participants (n=6). R3 has signalled: ―*I receive correspondence from various specialists electronically which is good. I also receive electronic correspondence, for example discharge summaries, from various hospitals, usually the local hospitals in my area. So if patients that present to a hospital or have a procedure, if they say their GP is myself I then receive an electronic discharge summary for example".* R12 on the other hand has reiterated: “*I use the My Health Record if I send my patient a letter”*. R14 has also highlighted the following: “*yeah, we upload patient summary and also the electronic referral pathway. Someone from primary health network has shown us how to, hmm, I can't remember what the system is called but to send the referral directly to the specialist rather than giving it to the patient. Because we receive a lot of the letters back electronically*”. R15 likewise has indicated: “*each facility has its own database. So, the facility keeps all the data there. All the staff would be able to use it in the facility. If the specialists make a request, we can generate a report and give it to them. If the specialist is onsite, they can use it. Yeah, yeah, one of the facilities goes to the use club base and I can access it from home or from office. That is where specialists write in the notes, then, I would be able to see it. It is a cloud system*".

Another comment provided in relation to organisational approval to share knowledge electronically is stated by R11. The respondent indicated it indirectly through the following statement: “*that has to be, that is a good question. You know what happened is, you suppose my practice where I am working here is not willing to adopt as a group. This technology, I may be enthusiastic and then it's a very good thing. If I have to get up and go to work, and sit down and do something else, I want to make sure my kids are not hungry, because that will depend on remuneration*”.

The climate in one‘s organisation which facilitates informal meetings for knowledge sharing purposes has also been mentioned as an important element in the knowledge sharing process (n=5). R12 supported the informal knowledge sharing process through his own experiential journey by stating: “*I quite certainly consult with my specialist doctors and I tell them I have a patient like this, I know a lot of specialists so I do consult if I have a problem… I have a cup of tea with them, I have lunch with them, dinner with them, so, because I am quite friendly with specialists here, so I have no problem*”. R15 has also simply stated:”*a specialist and I look after the same patients, any problems I can just ring him or text him on the spot regarding the medication and we just talk, so it is very efficient*”. Besides motivation and opportunity to share, one‘s sharing ability is also essential in order to make it happen. However yet again, only two respondents have pointed out this dimension.

Ability to share

An important aspect in being able to share data mentioned by the participants is one‘s full capability to share knowledge with others electronically at any time (n=3). R3 has confirmed his capability to share knowledge electronically with others at any time through the following statements. “*yes, so I fill out the My Health Record for patients after they have consented. I receive correspondence from various specialists electronically which is good. I also receive* *electronic correspondence, for example discharge summaries, from various hospitals, usually the local hospitals in my area*". Similarly, R14 has added: *"yeah, we upload patient summary, the electronic referral pathway and discharge summaries".* R11 has also stated: *"My Health Record, yeah. We are doing that, we are registering patients; we are doing notes on their approval, unless we have consulted, and we have vetted an agreement and I am referring them. We just look at the data, what relevant information. My job is seeing when I write a referral letter and using the technology now, so I am keeping the right record at the right place, computers are doing it for me. Actually, this is good health; I do not have to look into it*".

The last comment mentioned in sharing ability is one's full capability to articulate knowledge in written or spoken form (n=1). R11 yet again has provided the following answer: *"GPs have the skills of communication and serving, providing and delivering the message, but they will be able to do it".* Following ability to share, some important data exposure concerns have inevitably received due attention.

Data exposure concerns

Data exposure concerns in electronic ecosystems for the purpose of this thesis may be defined as concerns related to patient safety, potential legal and performance expectation issues. These are closely interrelated with perceptions of risks emanating from a potential and real use of electronic health records. Issues that have been mentioned by the participants relate to potential serious threats to patient safety.

A crucial health data exposure concern is it poses a real risk that can turn into a real danger for patient safety. When it is accessed for evil intentions, the concern discussed was that misuse of electronic health records may threaten patient safety (n=13). R3 clarifies this point very well: *"you have to have safeguards, and you have to have an organised plan. You have to have safety nets in place so that the likelihood of patient harm occurring, or misdiagnosis occurring or mismanagement occurring, be minimised".*

This was furthermore discussed by R11 when asked whether he has these concerns and who elaborated and clarified as follows: *"we have, we have, because, this is electronic data. These are serious concerns. Now, what happened is: look at the way data has been managed by you know outside sources, and it's all the data, not only health data, all of the data is the same. Yeah, outsourced, and there are so many people who are non-medical people, non-technical people, they are involved and all sorts of brains are looking into this electronic data. Before, when I had a paper file, it was lying in my room, I could burn it or only staff could physically access it and would have to go through the papers.* R14 also added: *"I don't think it should be used for acutely unwell because of safety concerns*".

Another concern discussed was that electronic data might not meet expectations in terms of patient outcomes (n=5). R11 has reiterated again: ~~so~~ *this is a different thing, plus the other concern I have if you look back into the technology in the last quarter of a century, there are so many languages have been returned, we are listening that IBM Watson is coming with a new language, which zero one, zero one (0101) is going to go and a new language they are going to start, and it will change again the concept. All, the computer software writing, software is going to write, NOT 0100101088, as right now, COBOLT, or PASCAL long gone, DOS is long gone, WINDOWS came. Look, even if you have the data, you can't read your own electronic notes if you have data 10 years ago. So, what is it (the concern)? This is stability here. I am writing here today, will that be lined for 1000 years? Now, who will be able to read this language that I am writing? It looks like English to me here, this software, but if this software company goes and nobody updates, what happens to this medical director's data? Oh now, what measures policy makers are going to take? And, for how long they think that their measure is full-proof? For how many generations they want to keep this record and data? This is another problem and this data, I don't know, they cannot see, they cannot read, I cannot read my old software myself, which was 20 years ago (20 years old). If I wrote a letter to you 20 years ago, and I had that floppy disk, you know, what do you do with that? Whatever you have, you cannot read, you cannot see those things. This is a bigger problem too, every second month, they toss over a new software, a new software, a new way of looking at, faster and exhausting and all of the things. It would need to be stabilised. Before we had a pen and paper and writing, I wrote and it was kept for as long as the paper was alive. Paper had a longer life. We have books a thousand years old. You can read it, you know*".

R14 has brought some other valid performance expectations concerns in terms of patient outcomes as follows: *"yeah, from our point of view you could potentially use it for a lot of people but I don't think it should be used for acutely unwell because of safety concerns, you just can't assess them properly...I think if it was a patient you already knew and it was a simple issue, then most of the time, you would get enough information in telehealth, like you would not worry about not getting enough, but if it's a patient you'd never met before or a complex problem, not being able to examine them fully, I think would be a problem there, and the other thing I guess is in aged care hearing impairment and without your capacity to communicate non-verbally is reduced so whether you have a third party there, like a nurse or somebody but then you are still losing communication".*

The third data exposure concern which emerged relates to potential legal issues resulting from the use of telehealth and associated with telehealth (n=4). R11 has added: *"doctors should be easily available for the data, who wants to own that data, then the law has to change, doctors* *have to change, there are a lot of other legal changes. Right now, I own this file, I am responsible for all the data for you but when this data has gone in the cloud, I say, whole new rules need to be written for it. It is a scam now, so we cannot compare with old rules now. This data and data ownership is a big giant fight, you know who will compete. Microsoft will say: I want to hold this data, I am going to give Australian health data, I am going to keep it, I want to give the government 30 billion or what not, then I own it, my respondent, some other giant will come and buy the data. Now, that is what is going to happen, that is what the government is going to do. And they do not need, but they still should protect it".*

The following conversation between the interviewer and R14 adds to this concern as follows: *"R14: I think it still needs to be well documented, and the only thing I have is the idea of the whole consult being recorded. Interviewer: Ok, that is something that you see as putting you off. R14: Yeah, a bit like a video procedure and maybe legally. Interviewer: There might be legal issues so the government will have to look into it of course. R14: Yeah".* All of the above discussed sub-elements are the prerequisites for the establishment of telehealth practice in general medical practice, which is the final sub-element of the knowledge sharing construct.

Telehealth practice

Two key areas of telehealth practice were discussed by the participants. The first one addresses the need for interdisciplinary competition negotiations (n=6). While discussing negotiations on competition taking place between GPs and specialists, R2 stated: *"hmm, look I think it's collaboration, so I think they must both agree to what the outcomes of this would be which you would assume if I am engaging a specialist, I am probably asking their advice, but it would be a collaboration between the two as to what we think the best approach might be".*

R6 likewise mentioned some relevant issues: *"sometime I have a duplication of care; sometime we have a conflict, maybe a different way of managing a patient. Only a specialist can order free MRI. If I order one, the patient pays for it. Sometime - most of the time, I can manage myself [without seeing] a specialist*". R11 has reiterated the following: *"negotiations should take place because a lot of problems you see, if you look into the current model of practice and approach, a lot of the people when the primary physician, like the GP provides care to a person in their community, wherever they are living, or they are coming to me or I am going to meet them, my technology, my services are going to them, whatever the model we have, we share information for quality care, we exchange thoughts, that needs to be there, knowledge has to come from a better source and delivered to the person. We need to have a negotiation for that, otherwise quality care will be jeopardised. The connection needs to be there. So, GP will hit the* *button and information will go to specialists and he will take their response or either administer or the specialist will record, I am taking care of it".*

The second issue addresses the need for negotiations regarding clinical autonomy (n=5) under the proposed telehealth model of care delivery. R9 has voiced no particular concern over clinical autonomy by stating: *"clinical autonomy, I think all doctors have got clinical autonomy, so I don't think there's - that's a new language or currency that's not happening already. Well it's an extension of what you're doing. I had to give up some of my nursing home things because of barriers to being present, going there and support from the other. Look, most of the geriatricians that I use - we're talking about here, about aged care, so specifically, is that most of the geriatricians I communicate with, I have excellent communications with. I think being so much into that at the moment as I have been, I don't see - yeah I don't - put it this way; if you had more geriatricians doing more aged care, I think GP's would be happy".*

On the other hand, R11 had the following to say: *"negotiations should take place because a lot of problems you see, if you look into the current model of practice and approach, a lot of the people when the primary physician, like the GP provides care to a person in their community, wherever they are living, or they are coming to me or I am going to meet them, my technology, my services are going to them, whatever the model we have, we share information for quality care, we exchange thoughts, that needs to be there, knowledge has to come from a better source and delivered to the person. We need to have a negotiation for that, otherwise quality care will be jeopardised. The connection needs to be there. It should be a streamlined process. GP has been the prime care provider and he creates that with his own wisdom, with his own experience, if he's got a patient he is serving, he thinks that he needs to take A,B,C,D wing of the service, he involves them on his button. So, he will hit the button and information will go to specialists and he will take their response or either administer or the specialist will record, I am taking care of it. There will be a shift, it is the same thing, the patient we refer. It will be all electronic".*

From the data analysis above, an amalgamated picture is presented in table 16.

Table 16: Knowledge sharing elements

Elements	Variables	Respondents															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	%
MOT	Share knowledge/working experiences	√					√					√	√				26.7
	Sharing efficiency						√			√	√	√	√			√	40
OPP	Time sufficiency	√		√								√					20
	Organisational approval			√			√	√					√		√	√	40

ABIL	Sharing capability			√								√			√		20
DEC	Misuse of records	√	√	√	√		√		√	√	√	√	√	√	√	√	86.7
	Patient outcomes	√		√								√	√		√		33.3
	Legal issues			√								√	√		√		26.7
TP	Competition with specialists		√				√	√		√		√		√			40
	Clinical autonomy						√	√		√		√		√			33.3

MOT=Motivation to share, OPP=Opportunity to share, ABIL=Ability to share, DEC=Data exposure concerns, TP=Telehealth practice

Table 16 clearly shows that telehealth practices are not yet well established amongst the studied GP population though most of the respondent GPs did indicate that they either receive or share some of their patient data electronically. This mode of healthcare delivery thus presumably faces some challenges. Reasons for those and strategies to overcome them were not explored by this field study and are opportunities for future research. The next key element of the proposed telehealth model with GPs at the centre is relationship management.

4.3.3 Exploration of proposed relationship management elements

Relationship management is a complex human endeavour which attempts to manage human views, attitudes, expectations, actions and behaviours with the purpose of achieving team-based objectives. It tends to portray very dynamic characteristics and essentially includes communication, collaboration, trust and commitment components (Darley and Fazio, 1980; Oliver et al. 2016). These are also the fundamental elements of this proposed model.

Communication

The first communication dimension discussed by the participants relates to communication channels between clinicians (n=7). While some participants discussed conventional phone, fax and letter correspondence, few have also mentioned the use of the My Health Record whereas most agreed on some sort of secure channels. R7 stated: ―*I think it is good for patients and for us, delay is the problem*". R15 who specialises in aged care has first described conventional communication channels with specialists by stating of the channel: *"it's alright, they are very responsive, once I ring up, so if they delay, I would just ring up again*". The same respondent went on to further describe the communication system used by him (GP), other nursing home staff and specialists: ―*each facility has its own database. The facility keeps all the data there. All the staff would be able to use it in the facility. If the specialists make a request, we can generate a report and give it to them. If the specialist is onsite, they can use it".* R6 has also stated: ―*sometimes we'll fax but most time we use the same system*".

However, real time communication barriers with specialists have been recognised as it may not be practicable or achievable due to busy, conflicting schedules and other issues. R9 has explained it in the following way: *"I think some of the barriers are being available at the same time to collaborate. It doesn't have to be real-time collaboration, but it needs to be committed by the specialist and the GP [unclear] Again, the patient's a common denominator, but if the specialist and the GP aren't on the same page in terms of time allocation, being together at the same time, or even those things that work, just the commitment to communicate. Whether it be verbal communication, whether it be - predominantly verbal or - audio-visual is great, but there's some significant barriers there for that collaboration to work smoothly".*

Therefore, to ensure practicable communication between GPs and specialists, an essential channel preferred by clinicians needs to be chosen. Secure messaging channel has emerged as a possible preferred solution to real time communication challenge that provides continuous feedback between clinicians and also between clinicians and patients. It is supported by the field study. R2 has confirmed it in the following statement: *"I do secure messaging so that is my preferred communication with specialists*". This clinician preferred communication channel is also strongly grounded in literature (Cronin et al. 2015; Hoonakker, Carayon and Cartmill, 2017; Raghu et al. 2015; Scheck, 2017; Shenson et al. 2016; Shimada et al. 2017; Sieck et al. 2017).

The second dimension discussed refers to communication channels between clinicians ensuring continuous feedback (n=7). In relation to that R2 has emphasised: *"I think, the communication is probably one of the biggest problems between a GP and a specialist is that a lot times, there is a delay in the communication, so potentially this will provide sort of real time access to information which would be really helpful*". R14 has added: *"that would be far preferable than sending a letter and getting a letter back".* R11 on the other hand has further explained: *"process has improved significantly since we started using technology, because faxes have become electronic, e-faxes now, so as soon as the letter gets typed, so that aspect has improved significantly, even with hospital discharge electronic letters*". Moreover, R15 has explained: *"one of the facilities goes to the use club base and I can access it from home or from office. That is where specialists write in the notes, then, I would be able to see it, so it is a cloud system*". To ensure continuous feedback loop, literature strongly suggests secure messaging channels as preferred clinician communication channels (Brady et al. 2017; Cronin et al. 2015; Hoonakker, Carayon and Cartmill, 2017; Raghu et al. 2015; Scheck, 2017; Shenson et al. 2016; Shimada et al. 2017; Sieck et al. 2017).

The third communication dimension discussed was that patients must be clearly informed in decision making during their ongoing care (n=3). R11 outlined the following electronic hospital discharge letter experience with one of his patients: *"you know, a patient was discharged yesterday, even before the patient walked into my room, she had no idea I opened the letter that came from the hospital, I know everything what is written inside and it was so nice to consult with that patient. She felt so good, the doctor is so informed. I said, I know that you were discharged from a hospital yesterday and she felt so comfortable, and I noticed she had confidence in our service*".

Besides, R12 stated: *"I use the My Health Record if I send my patient a letter".* R14 on the other hand has pointed to another problem in clear communication with aged care patients through telehealth technologies by stating: *–understanding the patient is very important, it‟s crucial and them also to understand you because often you are yelling or speaking very loudly and the other thing I guess is in aged care hearing impairment and without your capacity to communicate non-verbally is reduced so whether you have a third party there, like a nurse or somebody but then you are still losing communication*".

The above statements show the importance of the communication dimensions discussed particularly in telehealth context and aged care. Therefore, there need to be ongoing efforts to improve communication practices in healthcare as there should be no room for error if it is to become more efficient and sustainable in the long run. To achieve this, cross-disciplinary collaboration is essential.

Collaboration

One of the most commonly discussed aspects that is likely to improve collaboration in telehealth is that of regular inter-disciplinary meetings or other point of contacts (n=11). As seen, the overwhelming majority of respondents agree with its significance. R1 has been very positive regarding interdisciplinary exchange by stating: *"yeah, yeah, it is going well, excellent. It makes your life easy. Trust me it makes your life a lot easier".* R2 further added*:"I think it is a great idea. I think collaborating with the specialists is a really good idea".*

R11 has outlined his experience in terms of regular inter-disciplinary collaboration with specialists as follows: *"the response has improved. It has improved now with the technology I am using, I am getting faster letters than I did before, it was a lot of manual handling before, and there was a delay for no reason not because the doctor did not do the job or send the letter, but the process itself was taking time. Process has improved significantly since we started using technology, because faxes have become electronic, e-faxes now, so as soon as the letter gets typed, so that aspect has improved significantly. Even the hospital discharge electronic letters".* R14 on the other hand has added: *"sometimes it can be really quick and easy and sometimes* *prolonged and there may be a delay, but I guess it's never instant like it would be if you're talking on telehealth".*

The second issue discussed was that GPs‘ interest in a specific chronic condition will enhance cross-collaborative ties (n=6). R1 stated: *"if it is something that the GP can't treat, of course it would need to be done with the physician, but sometimes it could be just a physician appointment once a year or even six monthly".* Moreover R11 has added: *"GP has been the prime care provider and he creates that with his own wisdom, with his own experience, if he's got a patient he is serving, he thinks that he needs to take A,B,C,D wing* 3 *of the service, he involves them on his button. So, he will hit the button and information will go to specialists and he will take their response or either administer or the specialist will record, I am taking care of it".*

Finally, R15 has spoken from an aged care experiential angle: ―*we've got doctors who are geriatricians who are visiting. And we look after the same patients, any problems, I can just ring him or text him on the spot regarding the medication, and we just talk so it is very efficient*".

The third item discussed by the participants relates to interdisciplinary teams‘ need to be well resourced to effectively collaborate (n=6). R1 has stated: *"I think the practice needs to be more skilled and more like interested to do that and to be involved. So if there is no continuation of care, I don't think that telehealth will survive. Yeah, more support, more training, and I think once you have the training, I need to become confident in what I am doing, Otherwise, that is the biggest dilemma with all the doctors. If I am not 100% sure, I am not going to take any chance to make a diagnosis or chance to do the treatment. So, you need to be 100%.".* R3 mentioned the importance of funding: ―*if you are doing teleconferencing you would want to know what the funding is for your time*".

R9 added another crucial resource aspect: ―*if you had more geriatricians doing more aged care, I think GP's would be happy. We are already strained in terms of workforce*". Furthermore, R13 stated his collaborative resource motivation to engage with telehealth by stating: ―*part of motivation is that we have easy access to specialists, yes if they can fill the topic, if they can expand and have answers for us*". Finally, R15 reaffirmed the importance of time and time slots with specialist as a prerequisite for effective collaboration by saying: ―*both of us would need to set more time, fixed time slots, time is crucial*". Following communication and collaboration, trust is the next essential component of effective relationship management.

Trust

The most immediate concerns that almost all respondent GP practitioners have expressed in terms of trust are their inability to make an immediate relevant physical assessment through telehealth as they are not physically with the patient (n=13). R2 started by saying: “*so, I suppose the challenge with anything that is remote is that you can't actually physically examine the patient*”. R3 likewise has stated his concerns to assessments from a distance: *“that needs to be looked at. The teleconference may not be sufficient. So you may still need to go and see the patient. Definitely if there's a patient that's acutely unwell you can't rely on teleconferencing, you need to be there. If you had some concerns you could do a teleconference with the aged care facility, for example, but you could not substitute that for a clinical assessment on-site, definitely not”.* R6 added: “*well an issue is because you're not there, of course, you always have some problem without seeing the patient*”. R7 voiced her opinion by saying: “*I think telehealth is only very basic, it wouldn't be able to do the relevant physical assessment*”. R9 further reaffirmed the above by saying: *“you can't do every single thing through the internet. Nothing replaces the direct assessment with being physically available”.* R13 likewise reaffirmed the above views by saying: “*through telehealth, we can just observe the patient, we can't heal it, we need to be physically there*”.

The second important trust concern that emerged from the interviews, can be summed up as that of telehealth's potential to cause deterioration of patient trust relating to remote assessment information (n=11). R5 has voiced his concerns regarding physical assessment from a distance by stating: “*physical assessment! Yes, you need to be - that's the only thing. If the person has come in with a cough; doctor I've got a cough, can't breathe. Then you can't - if you miss it - if they've got pneumonia then medically - ethically you're getting it all wrong. If you're sick, okay I'm coming to see you*”. R7 stated another deterioration of trust concern: “*I think in terms of technology, some find it a bit scary. They're not sure they may - somewhere else some people, they can see…*”.

R12 raised another important assessment point: “*we can't see much because we depend on talking all the time. With experience I've noticed when a patient is sitting in front of you the patient will tell you more things. Because they also want to, demeanour, you know the patient demeanour, doctor demeanour is different. I have a feeling, patient is more comfortable when patient is in front of a doctor*”. Finally, R14 reaffirmed once again by saying: “*I think if it was a patient you already knew and it was a simple issue, then most of the time, you would get enough information in telehealth, like you would not worry about not getting enough, but if it's a patient* *you'd never met before or a complex problem, not being able to examine them fully, I think would be a problem there*".

The third telehealth trust concern discussed by the participants was its introduction of new negotiated approaches to trust between medical and IT professionals (n=4). R3 has explained his approach: *"I think you'd need - before it was implemented I think you definitely need some expert panels. You need some expert panels, so medical and maybe IT and the medical software companies. You need some thinking groups where they could discuss the various possibilities and all the various issues that are involved. I think that's important. So that way you can make sure you cover everything"*. R12 has gone a step further with his statement by saying: *–that will come, training I think will also happen, people will get trained in that, technology changes, we will have more computer programmers, computer analysing things, so medical people will also probably become computer engineers or computer analysts, a lot of doctors will also like to become analysts, so that will become easier for them, so they do not have to depend on somebody. More independence and also cheaper, if more doctors are together, if one doctor is a computer analyst, computer programmer, and a doctor, I think it would become cheaper, wouldn't it?*". Following communication, collaboration and trust, commitment is the final essential element of the relationship management construct.

Commitment

Only a few respondents have addressed the commitment phase in this field study. Two key issues were raised. The first one was collegial support (n=3). R1 began by saying: *"yeah, yeah, it would be a nice thing if some patient, let's say, if someone had an AF or something and we had a good record of the heart rate, and we know like it has been under control or not, and if the nursing home someone who is doing the obs (observations), can send us a kind of a weekly or monthly summary of things, of course it is going to be helpful*".

Again, R1 has further added: *"I think, lately, the hospital is doing a very good job. Every single patient in the emergency, they are uploading all the discharge letters. So even though, you have not seen the patient as a regular, usually, once you've got a discharge letter, they usually have a good summary of patient medication, past background, illness and stuff like that. So, I think if all of us start doing bits and pieces as an everyday practice, and in the end it will be a complete health record for all of us, yeah"*.

The other raised topic was active telehealth engagement by colleagues (n=3). R1 has contributed by explaining: *–so, sometimes, even the system is there, if all of us don't use, it just does not make any sense. So if you put something, as a new GP, I can't put that medication on* *there. So it will be more helpful, I think if we all participate, so all of the information is there, not only bits and pieces. Yeah*". Another important point has also been raised by R1 who stated: *"I think that we all have to agree that this is good, otherwise in the long run, I don't think it is going to work, because I end up seeing my other colleagues" patients. So if there is no continuation of care, I don't think that telehealth will survive"*.

R9 has additionally stressed: *"it doesn't have to be real-time collaboration, but it needs to be committed by the specialist and the GP. Again, the patient's a common denominator, but if the specialist and the GP aren't on the same page in terms of time allocation, being together at the same time, or even those things that work, just the commitment to communicate. Whether it be verbal communication, whether it be - predominantly verbal or - audio-visual is great, but there's some significant barriers there for that collaboration to work smoothly"*.

Table 17**:** Relationship management elements

Elements	Variables	Respondents															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	%
COM	Secure messaging	√	√					√		√		√		√		√	46.6
	Decision making											√	√		√		20
COL	Inter-disciplinary meetings	√	√		√		√	√		√	√	√		√	√	√	73.3
	Chronic conditions	√					√	√			√	√				√	40
	Inter-disciplinary resources	√		√						√	√			√		√	40
T	Physical assessment	√	√	√		√	√	√	√	√	√	√	√	√	√		86.6
	Patient trust		√	√		√	√	√	√		√	√	√	√	√		73.3
	Medical & IT professionals			√				√			√		√				26.6
CT	Collegial support	√						√		√							20
	Collegial engagement	√								√		√					20

COM=Communication, COL=Collaboration, T=Trust, CT=Commitment

Relationship management is a crucial element of the proposed telehealth delivery model. It is in fact the bridge between technology use considerations, knowledge sharing and process management (the other key elements). Table 17 above shows a depiction of the importance of the discussed dimensions and their significance from a GP perspective. The lack of trust in the telehealth platform by the respondents and the possibility to overcome it with regular inter-disciplinary meetings can be noticed. Its connection should be further investigated through additional research work, some of which is expected to come from the next quantitative phase in this project. The results of that phase will show in a lot more detail how strong that connection is as data from a substantially larger national GP population will be analysed. The next key element under inquiry is process management and all of its explored key telehealth service delivery steps.

4.3.4 Exploration of proposed process management elements

Process management is the final essential operational element of the proposed telehealthcare service value network model. This construct contains a mix of elements which have a potential to succeed through properly targeted patient and practitioner needs supported by well distributed and managed resources. The first key aspect that was discussed by the participants is the need to use a simple and stable interoperable system with minimal interruptions (n=14). R1 began by stating: “*it should be something standard, like most of the doctors use, so that they would not have any problem with accessing the data, so whatever they want. So I think it would need to be something that we are all using: medical director, best practice, those sorts of things, yeah*". R2 also stated: *“so I think a reliable connection, simple and interoperable, available health data, standard protocols, and I think it's almost about having clear outcomes, clear roles and responsibilities, for what happens after it's finished”*.

R3 has likewise confirmed: *“so simple, interoperable system. That sounds good*". R4: *“uninterrupted is better always, yeah”.* R5: *“simple interoperable system, that's good”.* R6: *“simple, yeah, yeah, definitely*”. R7: *“of course we prefer simple interoperable one*". R7 also voiced her issues with telehealth technologies: “*I think if the technology is better, the internet connections are better. I think even now we have lots of interruptions with the internet from time to time. Yeah. Whether - how reliable the speed, whether clear or not… accuracy. I think that probably the telehealth won't be able to give very accurate data*”. R9: “*yeah, look I think the simple interoperable system makes sense. Easy to operate, that's what I've seen between systems…*” R11 has further reaffirmed: *“see, if technology you want to be the key player between a patient and a doctor relationship, if that is the bridge technology, the bridge needs to be sound. The bridge needs to be sound, long lasting and stable bridge*".

The second key service delivery process element discussed was a need to maintain secure/uninterrupted high quality broadband data speed (n=14) which was approved by almost all of the respondents. To the question on whether secure and uninterrupted high quality broadband speed is important, R1 has replied: “*yes, absolutely*”. R2 said: “*look, I think that is kind of a given, a reliable connection*”. R4: “*uninterrupted is always better, yeah*”. R5: “*uninterrupted broadband stream, yes*”. R6: “*I think that is very important, yeah*”. R7: “*very important, yeah*”. R9: “*I think the internet speed isn't ideal, but it doesn't - that's one other thing. I suppose one thing is, if you know your patient, the picture and audio just supports that* *relationship. I have patients that I see that I don't even see, but on the phone, they talk to me, I know exactly what's going on*". R11: "*if that is the bridge technology, the bridge needs to be sound. The bridge needs to be sound, long lasting and stable bridge*". R13 only confirmed it with: "*yeah*", whereas R14 has raised another issue besides the fact that broadband speed may be good: "*but also you are not getting your non-verbal as much, and them also to understand you because often you are yelling or speaking very loudly, but hearing impairment is possibly a problem*".

The third item that was discussed was the need for patient health data to be curated properly to prevent falsely present information (n=14). Again, the overwhelming majority has supported this view. R1 has clarified her experience thus far with the My Health Record and patient health data as follows: "*look, with My Health Record, so far, I don't have any problem. And, I think, lately, the hospital is doing a very good job. Every single patient in the emergency, they are uploading all the discharge letters. So even though, you have not seen the patient as a regular, usually, once you've got a discharge letter, they usually have a good summary of patient medication, past background, illness and stuff like that. So, I think if all of us start doing bits and pieces as an everyday practice, and in the end it will be a complete health record for all of us, yeah*".

R3 stated: "*properly curated health data. That sounds good*". R4 likewise affirmed the importance of curated patient data: "*yeah, yeah, for a thorough check, yeah*". R5: "*I think they are all important*". R6 only affirmed it with: "*yeah, of course*". R7 voiced her concerns regarding data accuracy: "*Precise one. I think that probably telehealth won't be able to give very clear data*". R8 too has only affirmed the importance of curated data with: "*yeah*". R9 has however been a bit more open: "*yeah, I think curating data, rubbish in, rubbish out, and someone's always going to be doing it, but who's got the role of doing it, and it takes time. Time that probably is irrelevant to a presenting issue in front of me that may not require fully curated data*". R11 extended the conversation by saying: "*electronic technology has to identify the person correctly at first. Otherwise this data has no meaning to me. So, nurse has to identify Mr Brett and the nurse is liable for that, if she has put somebody else's data as Mr Brett's data. Doctor is not going to take liability for that*". R14 concluded by saying: "*I think the great point check like you do in a hospital is very reasonable so every time you see a patient checking their name and date of birth, I guess not address if it's an aged care facility, like something else, their data file*".

Following the above three steps, the fourth discussed process step was that personalised remote patient support in the measurement of vital signs needs to be provided (n=12). Yet again, the majority of the respondents have agreed on this process step. R1 started the conversation by stating: *"yes, it is a very important step, yeah. Yeah, yeah, it would be a nice thing if some patient, let's say, if someone had an AF or something and we had a good record of the heart rate, and we know like it has been under control or not, and if the nursing home someone who is doing the obs (observations), can send us a kind of a weekly or monthly summary of things, of course it is going to be helpful*". R3 stated: "*personalised remote patient support and measurement of vital signs. That sounds good*". R4 also affirmed: "*it would be good but I think at nursing homes there's a nurse who can check vitals or… oh yeah, of course, yeah, very handy*". R5 affirmed all the process steps including personalised remote patient support by stating: "*I think they're all important*".

R6 likewise affirmed: "*yeah, yeah, yeah*". R7 also added: *"of course, yeah, yeah, I think. Yeah. If they are in a nursing home they have the nurse on site, or the care person, they can do the vital signs, which is of course very helpful".* R9 clarified it in a bit more detail by stating: *"yeah, I think it's handy to have vital signs on - as a start of a consultation. Do I always think that - now, do I always need those vital signs? Not really. So you have all these digital devices now to check for blood pressure and your pulse rate and rhythm. A nurse can do a measurement. They're handy. It depends on the scope of what you want to do over the internet. Yeah. I think particularly in nursing homes, they have nurses who are there who can make a clinical judgement".* R12 explained his view: "*I think it will really help us to diagnose quicker, like a person is getting a bit of funny temp at night, I tell the nurse, ok, check their sugar level, but they still do, somebody is in a bad mood, we need urine sample, like we do, it is still happening, we are already doing it. Because machines are so advanced now, we do ECG, machine tells you what the diagnosis is, the only thing that nurses need to do properly is where she is going to put it. You need to use a proper tool in a proper place, machine diagnoses it nowadays".* R13 only affirmed it: "*yeah, yeah, they can give it*". R14 also affirmed by saying: *"yeah, absolutely".* And finally, R15 who is a practicing aged care GP reaffirmed: "*yeah, I am there*".

The fifth process step that the respondents have discussed is that development of standard remote care protocols may create new work routines (n=11). R1 began with her response by justifying why these protocols are needed by saying: "*because the vital signs could be a major thing if it is an acute thing we are expecting. Chronic / acute revert state. Yeah, yeah*". R2 continued: "*I think it's almost about having clear outcomes, clear roles and responsibilities, for what happens after it's finished. I think that is crucial, and the other thing is patient consent… So, it means and that is why you need these sorts of protocols so that almost at the end of that telephone conference, I sit down and write down a plan or the specialist agrees to, you know,* *email me a plan so that we both are clear about what we've agreed to do. It's guaranteeing that what happens after the call is finished to make sure that it actually benefits the patient*".

R3 on the other hand simply affirmed: "*development of standard remote care protocols. That sounds good".* R4 also affirmed: "*yeah, that would be a good thing to have, remote care protocols, yeah*". R5 likewise reaffirmed: "*development of standard remote care protocols. I think they're all important*". R9 stated the following: "*they're already in our current interactions with consultations, there are already standards there already, so whether you modify or extend them to remote health*".

R11 on the other hand explained the importance of remote care protocols and how these are likely to influence remote work routines: *"definitely, because you need to have a system or a protocol. So the protocol should be designed in the best interest of the care for the patient, especially for correct identification of the person on whom we are collecting data remotely. The person needs to be identified. I don't know how visual recognition, or eye, face need to be shown before, the data will click in and then pick up that person. So that is what it is, the face recognition of whatever, whoever, it is not just that the nurse goes there, puts the machine on the elbow and says: I've got all the data when I do not know whose elbow was this, so that needs to be put first so that we know, yes, this was Mr Joe Blog, and this is Mr Joe Blog's data. Not keeping the best wallet of the GP. It may be important, time, remuneration, reward, but how will I be able to provide the best quality care to the person remotely, and what all, actually it's a good question. What all is required, yes, RACGP should come up with some good guidelines for you know telecommunications, and it is actually an extension of normal communication we do but we are not seeing anybody's physical, maybe video if it is and some time it may not be video, and in some areas, where people may not be able to come on the video, you may not be able to see. That is the future, and the kind of technology heading and aps coming in your head, it is very much possible to do it now. Look at the respiratory success in diagnosing in children, look at the sleep apnoea diagnosis come from the last week in the app, mobile app, ECGs coming on mobile app, you know spiral app".* R12 further added: "*because machines are so advanced now, we do ECG, machine tells you what the diagnosis is, the only thing that nurses need to do properly is where she is going to put it. You need to use a proper tool in a proper place, machine diagnoses it nowadays".*

R14 has also affirmed the importance of the development of remote care protocols by stating: "*yes, I think they are because they help you if someone is not considered reasonable, I guess, the only example I can think of is black remote termination of pregnancy protocols, doing that through telehealth. That is because it's a single pathway, but I think in aged care most people* *would not be that complex*". Finally R15 affirmed too: ―*yes, of course they need to have protocols*".

The final process element discussed was a need for integrated collaborative treatment phases to be managed by physicians (n=15). All of the respondents have agreed with this process element. R1 started with: ―*of course it would need to be done with the physician, but sometimes it could be just a physician appointment once a year or even six monthly, and but I am pretty sure any capable GP will be able to look after it*". R2 has added: ―*I think it's almost about having clear outcomes, clear roles and responsibilities, for what happens after it's finished. So I am not quite sure whether that is what you mean by the collaborative treatment phase but it's more like clear accountabilities*―.

R3 on the other hand only affirmed the statement by saying: *"integrated collaborative treatment phase management, managed by doctors. That sounds good".* R4 stated his viewpoint: *"as a GP I think GPs should be involved as one of the medical professionals but of course sometimes you need some advice from the specialist or Allied Health, but it's collaboratively. You've got to collaborate all doctors and all the health…whole team, yeah, teamwork".*

R5 likewise has reaffirmed: *"integrated collaborative treatment phase management for the doctors. I think they're all important".* Moreover, R6 stated: ―*yeah, yeah of course. You have to be in charge, because you are the one in the end, you're the one".* Both R7 and R8 have only affirmed with: ―*I think and yeah*" respectively. R9 has been upfront: ―*I must be biased if I say - it sounds biased for me to say, yes it does, because the alternative would be…less well-trained practitioners, taking a lead role in that*". R13 likewise did affirm the need for integrated collaborative phases to be managed by doctors' by saying ―*yeah*" and spoke particularly on his stance in the context of aged care by saying: ―*in aged care, sometimes we need to have a patient's family there, family support for the patient, family, specialist, everybody. When I can explain to the family and if the specialist can support me that will be good*". R14 has expressed her views by stating: ―*ok, I don't have a problem with other people being involved*". Finally, R15 put it in the context of collaborative treatment phase management in nursing homes: ―*we've got doctors who are geriatricians who are visiting, and we look after the same patients, any problems I can just ring him or text him on the spot regarding the medication, and we just talk*".

A few GP respondents also provided commentary or suggestions on any other important service process element from personal angle (n=4). R1 mentioned the importance of education: ―*I think we all need to be a bit more educated about these things. That is why, I find there is a big hole or lack. I think we all need to have a bit more understanding, a bit more background education,* *in that how we can help, how we can involve all and how things work, something like that, yeah*”.

R3 added additional significant commentaries on patient safety by saying: “*I think it's important that the safety of the patient is ensured so that if there are any concerns you can't substitute Telehealth for a physical assessment on site. I think that it's important that you need to have some kind of red flags built into it. So for example, if there are some danger signs you can't rely on this. I think you'd have to have some kind of threshold where you would need to be examining the patient in their residential care facility. I think it's very important. Safety is essential because that's ultimately you're trying to treat the patients. You need to make sure there's a safety mechanism built in that we all have to follow so it's standardised so that it can be easily followed. If there are some, for example, some kind of red flags, whatever it might be. It might be abdominal pain or something or chest pain, you can't do teleconferencing, you need to be there. Or you need to call an ambulance, for example. You can't substitute this for the treatment and management of an acutely unwell patient*”.

R4 also added other important considerations of “*safety and security and cost efficiency*”. R14 expanded her concerns that are putting her off in terms of legal issues that the government will have to look into through the following statement: “*I think it still needs to be well documented, and the only thing I have is the idea of the whole consult being recorded. Yeah, a bit like a video procedure and maybe legally*”.

Table 18: Process management elements

Elements	Variables	Respondents															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	%
PM1	A simple/stable interoperable system with minimal interruption should be used	√	√	√	√	√	√	√	√	√		√	√	√	√	√	93.3
PM2	Secure/uninterrupted high quality broadband data speed needs to be maintained	√	√	√	√	√	√	√	√	√	√	√	√	√	√		93.3
PM3	Patient health data must be curated properly to prevent falsely presented information	√	√	√	√	√	√	√	√	√	√	√	√	√	√		93.3
PM4	Personalised remote patient support in the measurement of vital signs needs to be provided	√		√	√	√	√	√		√		√	√	√	√	√	80
PM5	Development of standard remote care protocols may create new work routines	√	√	√	√	√	√			√		√	√		√	√	73.3
PM6	Integrated collaborative treatment phases need to be managed by physicians	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	100

AC	Commentary or suggestions on any other important service process element from personal angle	√		√	√										√		26.6

PM1=Process management element 1; PM2=Process management element 2; PM3=Process management element 3; PM4=Process management element 4; PM5=Process management element 5; PM6=Process management element 6; AC=Additional comments on process elements from one‘s personal angle.

The above discussion, commentary and empirical data are overwhelmingly validating key telehealth service delivery process elements which are also depicted in table 18 above. The table clearly portrays the importance of the proposed telehealth service delivery elements and associated steps. It also adds additional knowledge through commentary on other issues of significance, particularly in terms of a need for additional telehealth education for GPs, patient safety threshold mechanisms that are to be standardised in order to be easily followed, data security and the indispensable relevance of danger / warning signals / red flags that must be adhered to and that require physical onsite attendance by a healthcare practitioner in acutely unwell cases or emergencies. The next discussed topic by the respondents was perceived values to GPs from one‘s personal angle.

4.3.5 Exploration of value creation elements

This thesis defines value creation as potential and realisable tangible and intangible benefits that are likely to be derived from the utilisation of a particular skillset or newly introduced technological innovations for the purposes of enhancing and/or enabling one‘s occupational or cross-disciplinary capabilities, communication, knowledge building, work effectiveness, efficiencies and credibility in one‘s operational environment or other settings. Value creation has been marked as the most important direct predictor for the uptake of telehealth by GPs.

The first expected value that GPs openly discussed was the view that telehealth should adequately remunerate GP efforts (n=12). This essentially means provision of clearly delineated Medicare items. This view and expectation has been supported by the vast majority of the GP participants. This field study also proves a lack of awareness of Telehealth Medicare Benefits Schedule items amongst GPs. R1 opened the conversation by stating: ―*no, I am vaguely aware of them, but no to be honest*". R2 added: ―*and what values I also think increased remuneration for me by for providing those services, so that is something that I would expect*". R3 also simply affirmed the lack of awareness of the existence of items by saying: ―*oh, okay, okay, fair enough*". A similar surprise response was provided by R4: ―*okay*" and ―*yeah*" and ―*so are we talking to the nurse?"* and *"with the patient and the specialist, yeah"*.

R5 also reaffirmed the above predominant case by responding with: “*okay, is this…because I didn't know about that. Okay. Yeah. So 15 minute consultation, 30 minutes consultation?*”. R6 similarly replied: “*oh of course, right*”. R10 likewise was quick in pointing the expected value in “*the availability of MBS (Medicare Benefits Scheme) item*s”. R11 however has been similarly upfront with a lot more detail by saying: “*remuneration is important for a doctor. The doctor needs to be remunerated for the services accordingly, not because of the other people, this is going to be an added cause. When you add more to the computer, you add more bill to the service. So, this is going to be an expensive exercise, this is not a cheap exercise. The long term benefit of this depends on how stable this technology is and how long we can maintain it and retrieve this information”*. R13 was quick in recognising value to him by responding with: “*funding, yeah*”. R14 also showed lack of awareness through: *“ok, yeah, I guess it's not something I've ever really”.* And finally, even R15 who works in aged care facilities and looks after many patients has demonstrated the lack of awareness of the availability of telehealth items to GPs by saying: “*that is telehealth, exactly, it's more for the specialists because the patients then get to the specialist and very few specialists do house calls”.*

The second value discussed was that telehealth will provide close experiential encounters with other healthcare practitioners (n=13). R1 began with: “*it makes your life easy. Trust me, it makes your life a lot easier. I think I would be more confident from my side, and also from the patient side, they would be more confident, they will have that sense that they have been properly looked after and there is a communication, a continuation, yeah, I think that is good for both sides”.* R3 has explained his perceived value on this topic: “*well, look, it's an aging population this could potentially increase the efficiency of certain medical services, so that would be helpful. It could perhaps make certain consults more - it'll save time. So if there are some simple problems you could potentially deal with them this way. It'll save you time travelling to the healthcare facility*".

R4 likewise has emphasised some expected benefits by saying: “*so beneficial for the GP to get the more expert opinion. You know what I mean. Sometimes you need to check with your specialist so… That it's a timely, effective and helps advise the patients. The technology has always helped*”. R5 has also affirmed that extra experience will be possible because of close encounters with specialists by stating: “*yes, yes*”. R6 has also mentioned important encounter values derived from: “*training, opinion and advice, because sometimes our knowledge is limited and if we're not specialised in a certain area, they can give you a timely available advice. Because timely relevant is very important”.* R7 too has confirmed the above value with: “*that is right*”. R9 added his comment: *“well, it's giving you some feedback, giving you some* *information*”. In addition to the discussed values, R10 has confirmed: “*time saving, availability of specialists, easy access to specialists, MBS items, close encounters with specialists*”.

R12 as well has been quick to confirm the value from close experiential encounters with specialists by saying: “*that is it*! *And, you have remote area, you can do the same thing*”. R13 also confirmed by stating: “*yeah*”. Similarly, R14 reaffirmed: “*yeah, educational value*”. And finally, R15 has voiced his opinion on potential telehealth encounters with specialists from an aged care angle: “*so maybe some of the post-trauma, post-fracture views might be helpful, but they are odd cases. They are 1 or 2 in a few months maybe, so show the fractures where they could not, the specialist does not want to come by the way, so if they are in a wheelchair, they do not come, put them in a clinic, a GP follow up if there is a problem, they go to hospital, that is what they say. So if they are in a wheelchair, they do not want to get involved. And the hospital does not have orthopaedic clinic now, most hospitals, so, but those are odd cases".*

The third perceived GP value discussed was a possibility that telehealth technologies designed for better integration will lead to GP paths to self-employment (n=5). In response to a potential for GP independence, R5 has stated: “*yeah, that is the – that's easy access to patients*”. When posed the same question, R6 also affirmed: “*yeah, yeah, definitely*”. R7 also approved its potential by stating: “*it is*”. R9 has been a bit more critical by saying: “*I'd like to take a trip to Alaska or Antarctica, and I'd do remote medicine, and they can pay me. I'll be happy. I'd sit in my little cruise. I'm just thinking, it's – yeah, it's remote...It's too ideal, yeah. No, no, yeah, but I'm really interested in terms of how to enhance the patient interaction with the practitioner, or health practitioner. As I said, I think the technology for Telehealth is an extension of that. You put aged care, it could be Telehealth medical service. In the wider community, it could be people at home. It could be Gen Y, Gen X, Gen Z, [that each says], I don't want to see a doctor [and wait in a waiting room], I want to go sit in my office. All those things".* Finally R12 also affirmed that better designed integration is likely to lead to: “*more independence and also cheaper, if more doctors are together, if one doctor is a computer analyst, computer programmer, and a doctor, I think it would become cheaper, wouldn't it?*”

The fourth discussed perceived value item was that telehealth will provide improved access to specialists (n=10). R1 began by stating: “I *will be a good option for the patient and I think especially in a quick management plan, yeah, you don't really need to work for the specialist for six weeks sorry. Even, it could be more than that yeah*”. R2 added: “*I think it is a great idea. I think it's better than bad care now. But if you have well-coordinated care with specialists, I am interested to see how much better it is. I think it is improved care for patients, so improved access to specialist services, like improved care by them getting better care from the* *specialists*”. R3 likewise emphasised his value viewpoint: “*yeah. Ready access to specialists and efficient start and finish time so that if you are going to obtain an opinion from a specialist that you can book them in for a certain time that's mutual convenient. So you could block out that period in your day.* W*ell, look, it's an aging population this could potentially increase the efficiency of certain medical services, so that would be helpful*”. R4 on the other hand has voiced his value priorities by stating: “*that it's timely, effective and helps advise the patients. The technology has always helped”*. R6 highlighted the importance of access to specialists by stating: “*because sometimes our knowledge is limited and if we‟re not specialised in a certain area, they can give you a timely available advice. Because timely and relevant is very important. Sometimes if they have a heart attack, we can't see them next week, it's too late*”. R10 likewise expressed her value expectations: “*easy access to specialists, MBS items, close encounters with specialists*”. Similarly, R12 responded when close encounters with specialists and good access to specialists was mentioned as a potential value: “*that is it! Quick diagnosis and quick treatment*”. R13 added further: “*part of motivation is that we have easy access to specialists. Yes, if they can fill the topic, if they can expand and have answers for us. when I can explain to the family and if the specialist can support me, that will be good*”. R14 explained another very important value item and described a desired scenario in encounters with specialists: “*Hmm, I would hope it would reduce unnecessary investigations, yeah, and things which necessarily don‟t need to be done in general. I think often we do things because I will do this, this, this and then we will get an opinion. Yeah, rather than getting an opinion: oh no you don‟t need that, you need this for that chronic disease, so early involvement would be beneficial, so I think we‟ve probably already spent a lot of money on that consult*”. And finally, R15 has affirmed his perception that telehealth might improve access to specialists if fixed time slots were available by saying: “*yeah*”.

The fifth value point that emerged from the discussions was that telehealth may potentially reduce rehospitalisation (n=7). R1 started the conversation by saying: “*sometimes, we need the patient to come face to face, but of course it could be a transport issue, it could be something that we can still use as a telehealth*”. R2 has also been quick in responding: “*I think it is improved care for patients, so improved access to specialist services, I think less unnecessary transfers it that makes sense, like improved care by them getting better care from the specialists, but also less transport, that kind of thing, so less unnecessary*”…Interviewer added: “emergencies or prevention of rehospitalisation” and R2 affirmed with: “*yeah, exactly, so it‟s better quality care but also reduction in unnecessary transfers*”.

R3 likewise affirmed: “*so if there are some simple problems you could potentially deal with them this way. It'll save you time travelling to the healthcare facility*”. R4 also recognised the need for less travel transfers by nursing home patients by saying: “*they cannot travel, yeah*”. In reply to the following question by the interviewer: “*what about anything else you can think of in terms of value to you? Maybe reduced patient transport, thus less rehospitalisation for the patients if you use telehealth to prevent some people to go the emergency too often, too frequently. Maybe you can assess them on the spot and say: you don't need to go to the emergency, maybe give them panadol or paracetamol or check their blood pressure et cetera, you know through a device that is readily available. Because devices nowadays can check their glucose level, they can check blood pressure?”,* R13 replied with: “*yeah, they can do, hm, if they have a hard question because how many patients you can go to see as a doctor, like I see a lot of patients, so if every patient I have to go, I have to make fixed time slots*”. R14 also recognised this value and responded similarly to a question on potential unnecessary transfers of patients by stating: “*yeah, and things which necessarily don't need to done in general. I think, often we do things because I will do this, this, this and then we will get an opinion, rather than getting an opinion: oh no you don't need that, you need this for that chronic disease so early involvement would be beneficial, so I think we've probably already spent a lot of money on that consult*”. And finally, R15 has reaffirmed the value of reduced unnecessary transport between aged care facilities and hospitals, including rehospitalisation from an aged care perspective by stating: “*yeah, definitely*”.

The final value item discussed was that telehealth will provide cost efficient services (n=7). R3 highlighted efficiency by stating: “*oh, the efficiency of the service that would be important, the time taken to set up and the time taken during the consultations”.* R4 likewise emphasised: “*that it's a timely, effective and helps advise the patients. The technology has always helped*”. R11 was more than brief in this statement: “*the technology after my consulting time should automatically go to the doctor who is going to serve and not hang on to me, and... automatically, when the patients' data, telehealth is collecting, they already have the demographics, they already have the medical problem, they will be able to calculate, dadadada, health director will be there, community funding will be there, it's all coming through that*”. R12 also acknowledged: “*quick response, treatment is quicker, better treatment and cheaper*”. R13 answered with: “*yeah, I see*”. On the comment that it would save money, R14 also affirmed: “*yeah, hmm, I would hope it would reduce unnecessary investigations*”. R15 also acknowledged the importance of telehealth efficiencies for some diseases such as skin conditions: “*I think for some diseases, it is very good. That is right, any skin condition. That is right, so specialists check and give a diagnosis and then we can on the spot do a biopsy. That is very helpful. But* *not for other cases, I don't know*". Table 19 below depicts the full picture of all of the above discussed value elements.

Table 19: Value creation elements

Elements	Variable Description	Respondents															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	%
VC1	Telehealth Medicare items	√	√	√	√	√	√			√	√	√		√	√	√	80
VC2	Close experiential encounters	√		√	√	√	√	√	√	√	√		√	√	√	√	86.6
VC3	Self-employment					√	√	√		√			√				33.3
VC4	Improved access to specialists	√	√	√	√		√				√		√	√	√	√	66.6
VC5	Reduced transfers/rehospitalisation	√	√	√	√									√	√	√	46.6
VC6	Cost efficiency			√	√							√	√	√	√	√	46.6

VC1=Value creation element 1; VC2=Value creation element 2; VC3=Value creation element 3; VC4=Value creation element 4; VC5=Value creation element 5; VC6=Value creation element 6;

Value creation is an ongoing process and since the results of this study are based mainly on GPs' perceived values, as they have not started utilising any telehealth platform yet, thus a lot of room for improvement is left for future evaluations. What can be clearly said though is that GPs do expect clearly delineated billable items for their services and close professional encounters with other health care practitioners particularly with specialists through fixed time slots where possible or alternatively under other arrangements. Access to specialists has also come out as a strong driver of GPs' intention to use the telehealth platform due to the perceived benefits, both professionally and patient-wise. Reduction in unnecessary patient transfers and cost efficient service potential have also been validated by about half of the respondents, whereas design for better integration leading to GP paths to self-employment was endorsed by one third of the participants. The connection between these variables will be further examined and analysed in more detail in the quantitative segment of this study. The next construct which directly influences value creation is represented by technology enablers. Following direct predictor; value creation, this model also considers the support of moderators. In this project key moderators are telehealth individual and organisational enablers.

4.3.7 Exploration of GPs' individual and organisational telehealth enablers

Individual enablers for the purpose of this thesis refer to healthcare practitioners' telehealth learning resources and/or technical support along with the accommodation of user needs through appropriate system design in addition to local patient conditions or needs. Organisational enablers on the other hand refer to the availability of skilled workforce, professional improvement advantages over current GP practice along with government funding support.

The first discussed dimension relating to telehealth needing to accommodate GPs‘ user needs through appropriate system design has received overwhelming support (n=14). R1 initiated with: “*it should be something standard, like most of the doctors use, so that they would not have any problem with accessing the data, so whatever they want. So I think it would need to be something that we are all using: medical director, best practice, those sorts of things, yeah*”. R3 has suggested: “*you need some thinking groups where they could discuss the various possibilities and all the various issues that are involved*”. R4, R6, R9 and R15 have only affirmed the above need by: “*yeah, yeah, yeah*”. R5 has maintained: “*yes, the system should be developed in such a way, because this is aged care”.* He further added in the context of aged care: “*if it's palliative care there are teams involved. All the teams are involved. Then tele - this is a better way. Because I'm having problems now - because palliative care goes to visit them. I've got no idea”.* R11 has provided his outlook on system design by saying: “*telehealth should provide me a system and automatically switch that system for me. So, Dr Jhingran, this system is working for you from 8 o'clock to 9 o'clock. After that in the evening, the 9 o'clock because you are not working, this system has shifted to Dr Joe Blog*”. R13 has been quick to recognise GP needs by stating: “*and also we need training, also it is not easy*”. R14 provided her user need request: “*that the system does not take too long to set up. That does not drop in and out and having a billable item*”. She additionally provided specific GP user needs‘ examples by saying: “*being able to have two like if you can have the image of the patient plus like a sharing system if it was you and the patient and a specialist, then you could just: ok, here is the bloods, and then make it easy to put up their bloods and yeah, rather than clicking back and forward… And gets you distracted, and I think that is a good thing with medical software that is designed to reduce distraction*”.

The second discussed item relates to telehealth technical support as being essential to GP users, which also received unanimous support from the respondents (n=15). R1 yet again was very vocal by affirming: “*yeah, more support, more training, and I think once you have the training, I need to become confident in what I am doing, otherwise, that is the biggest dilemma with all the doctors. If I am not 100% sure, I am not going to take any chances to make a diagnosis or chances to do the treatment. So, you need to be 100%.* R2 has clarified his view:” *probably, I think, the support is more about what the outputs would be, more, after I've done the conference, sort of clear, as I said, clear accountabilities and what the expected output of this is*”. R 3 also answered in the affirmative: “*I think so. Yeah, you'd need support. You'd need to* *want to make sure that the technology is fairly easy to use. But these days a lot of technologies are pretty user friendly*".

R4 likewise affirmed by stating: "*of course, technical support*". R5 affirmed similarly with: "*of course, yeah*". R13 and R14: "*yeah*" and R6 too by saying: "*yeah, yeah, definitely*". R7: "*. telehealth, you get a technical support, and…I think you have to have a dedicated team and time*". R11 reaffirmed as well: "*if you want to use it, we need a better technological support, stable technological support, information, privacy, data privacy, patient and doctors' both confidentiality. Definitely, of course, that is a bridge, it has to be strong*". R12 stated: "*yes to start with*". And finally R15 replied with: "*It would have to be with a phone, on the phone, it has to be an app… not with a laptop, with a phone, because every GP has a phone, every specialist has a phone, and it is wireless, you don't have to be in an office sitting at your desk to be connected. On the spot diagnosis would be easy*".

Another emerged dimension from the discussions was the potential of telehealth to serve locally pressing patient conditions which was supported by one third of all the respondents (n=5). R3 outlined the potential process in which this would occur by saying: "*I think you'd need - before it was implemented I think you definitely need some expert panels. You need some expert panels, so medical and maybe IT and the medical software companies. You need some thinking groups where they could discuss the various possibilities and all the various issues that are involved. I think that's important*". R4 was quick in recognising such a need by confirming: "*both chronic and acute, yeah… yeah, helpful, yeah*". R6 also quickly affirmed: "*yeah, yeah*". R14 affirmed and also added as follows: "*yeah, so like being a self-chart?...I think what we have is probably sufficient, I think it's already done by the nurse, nursing staff there and it would all be documented in their system*". And finally R15 explained his experiential journey in both general practice and aged care setting: "*mainly, on the spot diagnosis would be easy. Yeah, they can already do that now with a smart watch. Yeah. We are actually using some of the telehealth, so for example, if there is a concern with cellulitis, I will get a nurse to send me photos and then with the photos I can diagnose…They email me the chart, the chart of medication, they order from the chemist. So we are already doing that. Yeah, so without a fax machine, without a laptop, we can do that over the phone. We do whatever is, so for example the smart watch thing, when it is mature enough, we are going to use it in nursing homes. So, they do not have to go out for health monitors, they do not have to go out to hospitals for cardiac monitor, which is just put a watch on and it monitors their rhythm*". Next, we analyse organisational enabler elements.

The first organisational enabler item that the participants were asked about is whether telehealth platform should ensure sufficient availability of skilled workforce. The overwhelming majority responded in the affirmative (n=13). R1 began with: ―*yeah, yeah, so someone to give me feedback that whatever the diagnosis that I have made up or it‟s been followed up. Yeah, yeah… so, I think the practice needs to be more skilled and more like interested to do that and to be involved*." R3 also confirmed: ―*yeah, it's definitely skilled workforce*". R4 similarly replied: ―*yeah, yes, a skilled person so they can advise me*". R5 was brief in affirming too: ―*yeah, yeah, I‟d think so*", whereas R6 stated: ―*yeah, I think that the workforce, the workforce is always the problem*". R7 likewise emphasised: ―*I think you have to have a dedicated team…and of course time*". R9, R11 and R15 confirmed with ―*yeah, it is*", ―*everything. It will be directed that way*" and ―*sure*" respectively, whereas R14 stated: ―*yeah, to have an initial assessment done by an experienced nurse*". Moreover, R12 has clarified his viewpoint by saying: ―*that will come, training I think will also happen, people will get trained in that, technology changes, we will have more computer programmers, computer analysing things, so medical people will also probably become computer engineers or computer analysts, a lot of doctors will also like to become analysts, so that will become easier for them, so they do not have to depend on somebody*".

The second organisational enabler discussed was that telehealth needs to provide professional improvement advantages over GPs‘ current practice. This view was also considerably supported by eight respondents (n=8). R2 started with a clarification on this issue by stating: ―*yeah, exactly, so I suppose, I‟d want this care to be at least as safe, so it‟s not just the assessment, it‟s also the follow up as what I am currently doing. So I probably would not, no, it does not have to be better, but just not worse. You know what I mean, so the safety, I would need to make sure that safety is still OK*". R3 also reaffirmed: ―*yeah, I think so. I mean it's one of the factors, yeah. Yeah, but you want to make sure that there are safeguards in place. You have to have safeguards, and you have to have an organised plan. You have to have safety nets in place so that the likelihood of patient harm occurring or misdiagnosis occurring or mismanagement occurring, be minimised*".

R4, R5, R6 and R14 likewise only briefly affirmed with: ―*yeah, why not? Yeah*", ―*yeah, yeah, I‟d think so. Of course, of course*", ―*yeah, yeah*" and ―*yeah*" respectively. R11 however has clarified and elaborated this issue in some important detail by stating: ―*That has to be, that is a good question. You know what happened is you suppose my practice where I am working here is not willing to adopt as a group. This technology, I may be enthusiastic and then it‟s a very good thing if I have to get up and go to work, and sit down and do something else, I want to make sure my kids are not hungry. Because that will depend on remuneration. Absolutely, because* *otherwise it's not going to happen. You know if I am going to be worse off in my living why would I do anything? You know, as long as we get the right bridge and a strong bridge and come to ourselves because we have a system which is running, people are not worse off, we only improve their care, and we want to reduce the cost and burden on the families, and the quality of life of a human will improve, because now 3 people come, to bring one patient here to my office and 3 persons" work time, if you look at the trillions of dollars are lost for all those people taking days off, to come here, so we talk it's about the worldwide 270 trillion dollars are lost, because of just providing care and all of it is going to increase cost. If the government sees it is minimal what they are talking about here to bridge, quality will improve, they need to transfer to the care giver also. So it's money. It will reduce a lot of social security funding and a lot of people are being paid for no reason*".

The final organisational enabler discussed by GP respondents was that telehealth platform needs to provide ongoing government funding support which was unanimously supported (n=15). R1 started by saying: "*of course, if there is*". R2 was upfront: "*and adequate financing, I mean that is the other thing, adequate remuneration, increased remuneration for me by for providing those services, so that is something that I would expect*". R3 likewise stated: "*yeah, funding, that's right. If you're doing teleconferencing you would want to know what the funding is for your time*". Similarly, R4 replied with: "*yeah, yeah, incentive, incentive from the government, yeah*". R5 and R6: "*of course, of course*", "*funding, of course*". Likewise, R7: "*yeah, that's right*", R8: "*yeah, it could be, yeah*", R10: "*MBS items*", R11: "*absolutely, because otherwise it's not going to happen*", R12: "*yes, government will fund it I think*" and R13, R14 and R15: "*funding yeah*", "*yeah*" and "*yeah*" respectively. Table 20 below depicts individual and organisational enabler dimensions and portrays the number of GP responses to these elements.

Table 20**:** Telehealth Individual and organisational enabler elements

Elements	Variable Description	Respondents															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	%
TE1	System design	√	√	√	√	√	√	√		√	√	√	√	√	√	√	93.3
TE2	Technical support	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	100
TE3	Local patient conditions			√	√		√								√	√	33.3
TE4	Availability of skilled workforce	√		√	√	√	√	√		√	√	√	√	√	√	√	86.6
TE5	Professional improvement advantages		√	√	√	√	√					√	√		√		53.3
TE6	Funding support	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	100

IE1=Individual enabler element 1; IE2=Individual enabler element 2; IE3=Individual enabler element 3; OE=Organisational enabler element 1; OE2=Organisational enabler element 2; OE3=Organisational enabler element 3.

The final construct explored in this phase was the dependent variable, namely: readiness to develop telehealth capabilities. This is presented next.

4.3.8 Exploration of GPs' readiness to develop telehealth capabilities

Readiness to develop telehealth capabilities represents an individual GP‗s likelihood of developing the technical and additional collaborative skills to effectively engage with other providers via telehealth technologies. In that respect, the interviewees were asked about their readiness at this stage. The first discussed probability was that an individual GP‗s practice is technically unprepared for telehealth as one knows little about its use. A number of respondents have voiced their concerns in terms of technical unpreparedness (n=6). R1 began by: ―*I think we all need to be a bit more educated about these things. That is why I find there is a big hole of lack. I think we all need to have a bit more understanding, a bit more background education, in that how we can help, how we can involve all and how things work, something like that, yeah…more support, more training, and I think once I have the training, I need to become confident in what I am doing, otherwise, that is the biggest dilemma with all the doctors. If I am not 100% sure, I am not going to take any chances to make a diagnosis or chances to do the treatment. So, you need to be 100%*". R3 and R4 also stated: ―*yeah, you‟d need support*" and ―*of course, technical support… yeah, yes, a skilled person so they can advise me. Especially like me, so I don't know much about telehealth"* respectively. R7 likewise clarified: ―*telehealth, you get a technical support, and …I think you have to have a dedicated team and time*". And R11 has reiterated: ―*if you want to use it, we need a better technological support, stable technological support, information, privacy, data privacy, patient and doctors" both confidentiality. Definitely, of course, that is a bridge, it has to be strong*". Finally, R13 was quick in stating: ―*we need training, also it is not easy*".

The most important inquiry that was directed in this phase was whether individual respondents are ready to develop technical and collaborative capabilities to treat patients with chronic and acute conditions using telehealth technologies. As this was interview with limited time for questioning, only one question was asked regarding both technical and collaborative capabilities, though in the quantitative phase, it was separated in two sections. The majority of the respondents answered in the affirmative (n=10).

R1 stated: ―*I think that I am ready, but I am not sure how to further it.*" R2 elaborated a bit more by saying: ―*I think we are very capable of, I think we have the capabilities, the technical capabilities and the collaborative capabilities but we don‟t have the aged care patients and we don‟t have the specialists who are seeing the aged care patients who‟ve agreed to provide the* *standard of care that we want. So, I would say, the practice has, we would be happy to do it, and I think it's a good model of care, but we just don't have the patients or the specialists to sort of link it up*".

R3 expressed readiness after some preliminary checks: "*I look, I'd look into it. I'd like to look into the way it works and time involved and then I'd make an informed decision. But I'd be open to the idea*". R4 replied with: "*yeah. I think, it's probably the way to go in the future*".

R5 likewise affirmed: "*I'm ready to develop, but it's okay. If there's a good support. Good support, and everything is in place, yes, I don't mind*". R6 also stated: "*yeah, we're also ready, we're ready*". R11 elaborated: "*you know, as long as we get the right bridge and a strong bridge and come to ourselves because we have a system which is running, people are not worse off, we only improve their care, and we want to reduce the cost and burden on the families, and the quality of life of a human will improve*". R12: "*I am ready now, I have no problem*". R14 likewise elaborated: "*I think it's really interesting, it's not something I feel really passionate about or that I would push, but I think if it was you know I don't have a major barrier to it, I would develop it probably, like I think, yeah ok, if it was easy and there are a few benefits in terms of like communication and access, that would be great, but I don't, I probably would not be first in*". And finally R15 explained: "*yeah. We are actually using some of the telehealth, so for example, if there is a concern with cellulitis, I will get a nurse to send me photos and then with the photos I can diagnose. We do whatever is, so for example the smart watch thing, when it is mature enough, we are going to use it in nursing homes. So, they do not have to go out for health monitors, they do not have to go out to hospitals for cardiac monitor which is, just put a watch on and it monitors their rhythm*".

In addition to the direct readiness responses above, most of the respondents have also affirmed their concerns with telehealth technologies' inability to fully replace physical clinical service delivery which is the cause of reluctance to fully embrace it (n=13). R2 stated: "*so, I suppose the challenge with anything that is remote is that you can't actually physically examine the patient*".

Similar concerns in relation to remote assessments were voiced by R3: "*the teleconference may not be sufficient. So you may still need to go and see the patient. Definitely, if there is a patient that is acutely unwell you can't rely on teleconferencing; you need to be there… you could not substitute that for a clinical assessment on-site, definitely not*". R6 also stated: "*you always have a problem without seeing the patient*" and R7 added: "*I think telehealth is only very basic, it would not be able to do the relevant physical assessment*". Furthermore, R9 reaffirmed:

“*nothing replaces the direct assessment with being physically available*” and R13 likewise: “*through telehealth, we can just observe the patient, we can't heal it, we need to be physically there*”.

In conclusion, one third of all GP respondents have expressed their views on the impact of the proposed telehealth interactions on their clinical autonomy (n=5). R2 stated: “*look I think it's collaboration, so I think we must both agree to what the outcomes of this would be which you would assume if I am engaging a specialist, I am probably asking their advice, but it would be a collaboration between the two as to what we think the best approach might be*”.

R9 has stated: “*Yeah, well in an integrated model it is - you could argue that that's just an aged care thing, and we don't need a doctor, GP. We'll just have a geriatrician run by a whole bunch of nurses with nurse - clinical nurses and CNCs. We'll arrange that ecosystem”.* On the other hand, R11 had elaborated: *it's going to be a shift, definitely, it is bound to happen….negotiations should take place because a lot of problems you see, if you look into the current model of practice and approach, a lot of the people when the primary physician, like the GP provides care to a person in their community, wherever they are living, or they are coming to me or I am going to meet them, my technology, my services are going to them, whatever the model we have, we share information for quality care, we exchange thoughts, that needs to be there, knowledge has to come from a better source and delivered to the person. We need to have a negotiation for that, otherwise quality care will be jeopardised.* When asked whether his clinical autonomy would change if he was to use telehealth, R13 immediately reaffirmed: “*yeah, definitely*”. Table 21 below depicts readiness to develop telehealth capabilities dimensions and portrays the number of GP responses to these elements.

Table 21**:** Readiness to develop telehealth capabilities elements

Elements	Variable Description	Respondents															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	&
RDTC1	Perceived technical unpreparedness	√		√	√			√				√		√			40
RDTC2	Technical readiness	√	√	√	√	√	√					√	√		√	√	66.6
RDTC3	Perceived impact due to physical distance barriers	√	√	√		√	√	√	√	√	√	√	√	√	√		86.6
RDTC5	Collaborative readiness	√	√	√	√	√	√					√	√		√	√	66.6
RDTC6	Perceived impact on clinical autonomy		√					√		√		√		√			33.3

RDTC1=Readiness to Develop Telehealth Capabilities element 1; RDTC2=Readiness to Develop Telehealth Capabilities element 2; RDTC3=Readiness to Develop Telehealth Capabilities element 3; RDTC5=Readiness to Develop Telehealth Capabilities element 5; RDTC6=Readiness to Develop Telehealth Capabilities element 6.

Table 21 shows that 10 out of 15 (66.6%) respondents have expressed their readiness to develop capabilities for telehealth medical services with 5 respondents (33.3%) expressing that they are not ready. Those respondents who have expressed readiness to develop technical capabilities have also expressed readiness to develop collaborative capabilities. It also shows an overwhelming concern that telehealth cannot fully replace physical clinical service delivery, which is a strong cause of GPs' reluctance to fully embrace telehealth (86.6%) at the present stage.

4.4 Relationships between the model's constructs

Table 22 portrays the links between the elements and precisely illustrates how the links between them were pulled out from the analysis of the qualitative field study. While supported by and grounded in literature and empirical data, the links between the model's constructs also lay the path for the development of the hypotheses.

Table 22: Relationships between the elements

Relationships between elements	GP Respondents														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TTUC ⟶ VC	√	√	√	√	√	√					√	√		√	√
TTUC ⟶ KS	√	√	√	√	√	√			√		√	√		√	√
KS ⟶ VC	√	√	√	√	√	√	√		√	√	√	√	√	√	√
KS ⟶ RM	√	√	√	√	√	√	√		√	√	√	√	√	√	√
RM ⟶ VC	√	√	√	√	√	√	√		√	√	√	√	√	√	√
RM ⟶ PM	√	√	√	√	√	√				√	√	√		√	
PM ⟶ VC	√	√	√	√	√	√	√				√	√	√	√	√
VC ⟶ RDTC	√	√	√	√	√	√					√	√		√	
TE ⟶ VC	√	√	√	√	√	√		√		√	√	√		√	√

Table 22originated from empirical field study results and is presented herein. It has established the links among the proposed model's constructs that were drawn from empirical data findings. For instance, (TTUC ⟶ VC) represents the link between telehealth technology use consideration construct (TTUC) and value creation (VC) which is a direct predictor in the proposed model.

The majority of the GP respondents directly or in some cases indirectly, pointed to the importance of this relationship. R1 for instance, emphasised this importance in the following statement: *“I think it is quite good… maybe as an after-hours even in a metropolitan or city based area. It will be a good option for the patient and I think especially in a quick management plan, yeah, you don't really need to work for the specialist for six weeks sorry. Even, it could be more than that yeah.*”

Besides its significance as a link between TTUC and VC, this statement also highlights the inevitable impact of TTUC on knowledge sharing (KS), which is in line with the second link (TTUC $\longrightarrow$ KS).

R1 once again stressed the importance of this link as follows: *“I usually share my data with the specialists, with the allied health, yeah, as needed, yeah.”* Similarly, R3 stated: *“I receive correspondence from various specialists electronically which is good. I also receive electronic correspondence, for example discharge summaries, from various hospitals, usually, the local hospitals, in my area. So if patients that present to a hospital or have a procedure, if they say their GP is myself I then receive an electronic discharge summary for example.*”

These statements also indicate the link between knowledge sharing (KS) and value creation (VC) as justified by the above interview data. R1 also indicated the importance of knowledge sharing (KS) in the creation of value (VC) by saying: *For me, personally, I've got a few of the specialists we deal with, I know one of the cardiologists, if there is you know some funny ECGs, I am not sure, I usually send him to What's up, so he could look at it and give me a response.* Similarly, R12 stressed: *knowledge sharing can be a great endeavour, so yes, telehealth is very important for that”.*

R11 also clarified: *“we share information for quality care, we exchange thoughts; that needs to be there, knowledge has to come from a better source and delivered to the person. It should be a streamlined process”,* which points out to the importance of the relationship between knowledge sharing (KS) and value creation (VC) as well as the link between knowledge sharing (KS) and relationship management (RM).

The following statement by R11 uncovers this link further: *“you know, a patient was discharged yesterday, even before the patient walked into my room, she had no idea I opened the letter that came from the hospital, I know everything what is written inside and it was so nice to consult with that patient. She felt so good, the doctor is so informed. I said, I know that you were discharged from a hospital yesterday and she felt so comfortable, and I noticed she had confidence in our service*”.

Moreover, the connection between relationship management (RM) and value creation (VC) can be seen from the statement by R2: *“communication is probably one of the biggest problems between a GP and a specialist is that a lot times, there is a delay in the communication, so potentially this will provide sort of real time access to information which would be really helpful”.* R14 also added: *“that would be far preferable than sending a letter and getting a letter back”.*

The link between knowledge sharing (KS) and relationship management (RM) has been highlighted by R1: *“if it is something that the GP can't treat, of course it would need to be done with the physician, but sometimes it could be just a physician appointment once a year or even six monthly”.* The same respondent also stressed it further: *“yeah, yeah, it would be a nice thing if some patient, let's say, if someone had an AF or something and we had a good record of the heart rate, and we know like it has been under control or not, and if the nursing home someone who is doing the obs (observations), can send us a kind of a weekly or monthly summary of things, of course it is going to be helpful*”.

R11 on the other hand has revealed the link between KS and RM as follows: *“the response has improved. It has improved now with the technology I am using, I am getting faster letters than I did before, it was a lot of manual handling before, and there was a delay for no reason not because the doctor did not do the job or send the letter, but the process itself was taking time. Process has improved significantly since we started using technology, because faxes have become electronic, e-faxes now, so as soon as the letter gets typed, so that aspect has improved significantly, even with hospital discharge electronic letters*”.

Furthermore, the link between relationship management (RM) and process management (PM) has been reinforced by the following statement by R2 who stated: *“so I think a reliable connection, simple and interoperable, available health data, standard protocols, and I think it's almost about having clear outcomes, clear roles and responsibilities, for what happens after it's finished”.*

The following statement by R1 demonstrates this link between PM and VC: *“I think, lately, the hospital is doing a very good job. Every single patient in the emergency, they are uploading all the discharge letters. So even though, you have not seen the patient as a regular, usually, once you've got a discharge letter, they usually have a good summary of patient medication, past background, illness and stuff like that. So, I think if all of us start doing bits and pieces as an everyday practice, and in the end it will be a complete health record for all of us, yeah*”.

In relation to the link between value creation (VC) from a GP perspective and the dependent variable: readiness to develop telehealth capabilities (RDTC), R2 has stated: *“and what values I* *also think increased remuneration for me by for providing those services, so that is something that I would expect*". Also in regards to another VC dimension, that is close encounters between clinicians that directly influence their readiness, R1 has clarified: "*I think I would be more confident from my side, and also from the patient side, they would be more confident, they will have that sense that they have been properly looked after and there is a communication, a continuation, yeah, I think that is good for both sides".*

Integrated technologies could also potentially lead to more GP independence and cost efficiencies, other 2 VC dimensions which R12 also affirmed by saying: "*more independence and also cheaper, if more doctors are together, if one doctor is a computer analyst, computer programmer, and a doctor, I think it would become cheaper, wouldn't it?*". Access to specialist as an important value denominator was introduced by R13 who added: "*part of motivation is that we have easy access to specialists. Yes, if they can fill the topic, if they can expand and have answers for us when I can explain to the family and if the specialist can support me; that will be good*".

R2 has also similarly affirmed and added another value dimension, namely reduced transfers and less transport: "*I think it is improved care for patients, so improved access to specialist services, I think less unnecessary transfers it that makes sense… less transport, that kind of thing".* Finally, a link which indicates cost efficiency as a driving value to GPs has been provided by R14: "*yeah, and things which necessarily don't need to done in general. I think, often we do things because I will do this, this, this and then we will get an opinion, rather than getting an opinion: oh no you don't need that, you need this for that chronic disease so early involvement would be beneficial, so I think we've probably already spent a lot of money on that consult…yeah, hmm, I would hope it would reduce unnecessary investigations".*

Telehealth enablers (TE) are also important drivers in this endeavour. The following field findings support the relationship between telehealth enablers (TE) and value creation (VC). In relation to individual GP enablers, R11 has provided his outlook on system design by saying: "*telehealth should provide me a system and automatically switch that system for me. So, Dr Jhingran, this system is working for you from 8 o'clock to 9 o'clock. After that in the evening, the 9 o'clock because you are not working, this system has shifted to Dr Joe Blog*".

R14 provided her user need request by saying: "*being able to have two like if you can have the image of the patient plus like a sharing system if it was you and the patient and a specialist, then you could just: ok, here is the bloods, and then make it easy to put up their bloods and yeah, rather than clicking back and forward… And gets you distracted, and I think that is a good thing with medical software that is designed to reduce distraction*".

Another enabler, namely; technical training and support was stressed by R1: “*yeah, more support, more training, and I think once you have the training, I need to become confident in what I am doing, otherwise, that is the biggest dilemma with all the doctors. If I am not 100% sure, I am not going to take any chances to make a diagnosis or chances to do the treatment. So, you need to be 100%*.

R11 reaffirmed as well: “*if you want to use it, we need a better technological support, stable technological support, information, privacy, data privacy, patient and doctors" both confidentiality. Definitely, of course, that is a bridge, it has to be strong*”. And finally R15 explained his view on pressing patient conditions in both general practice and an aged care setting by saying: “*mainly, on the spot diagnosis would be easy. Yeah, they can already do that now with a smart watch. Yeah. We are actually using some of the telehealth, so for example, if there is a concern with cellulitis, I will get a nurse to send me photos and then with the photos I can diagnose…They email me the chart, the chart of medication, they order from the chemist. So we are already doing that. Yeah, so without a fax machine, without a laptop, we can do that over the phone. We do whatever is, so for example the smart watch thing, when it is mature enough, we are going to use it in nursing homes. So, they do not have to go out for health monitors, they do not have to go out to hospitals for cardiac monitor, which is just put a watch on and it monitors their rhythm*”.

In terms of organisational GP telehealth enablers: R7 emphasised: “*I think you have to have a dedicated team…and of course time*” pointing to a need for adequate workforce resources. Similarly in relation to professional improvement advantages over GPs‘ current practice, R2 stated: “*so I suppose, I"d want this care to be at least as safe, so it"s not just the assessment, it"s also the follow up as what I am currently doing. So I probably would not, no, it does not have to be better, but just not worse. You know what I mean, so the safety, I would need to make sure that safety is still OK*”.

And importantly funding has been mentioned by R3 who said: “*if you're doing teleconferencing you would want to know what the funding is for your time*”. R4 also replied with: “*yeah, yeah, incentive, incentive from the government, yeah*”.

4.5 Field study model

Following the analysis of qualitative empirical data content, key elements or constructs, their sub-constructs and the relationships between the elements were identified upon which a field framework was developed.

The framework shows that key service value pillars of telehealth technology use consideration, knowledge sharing, relationship and process management hold key foundational positions, while value creation represents key predicting construct and is supported by ease of technology as its antecedent and telehealth enablers which are also moderating variables between value creation and the dependent variable: readiness to develop telehealth capabilities by GPs.

The framework is also further supported by empirical validation and has brought a couple of reflective items that are new contributions to the initial conceptual model. The results of the qualitative empirical study likewise conclude the inductive phase. The following stage of empirical qualitative data analysis is deductive. Presented below is the field framework model.

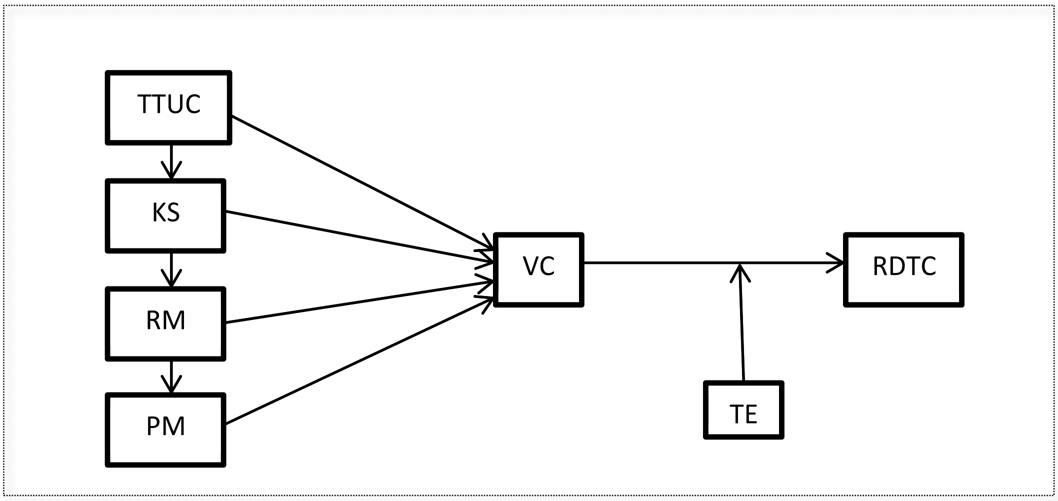


Figure 13: Field framework model

TTUC=telehealth technology use considerations; KS=knowledge sharing; RM=relationship management; PM=process management; TE=telehealth enablers; VC=value creation; RDTC=readiness to develop telehealth capabilities.

4.6 Field study findings and the conceptual model compared (deductive phase)

The purpose of the deductive phase is to find any difference between the initial theoretical framework and the empirical field framework. This phase consists of three parts. The first part was responsible for comparing the two frameworks, initial theoretical and field framework.
Through this comparison, every single proposed pillar and construct from the conceptual model was confirmed and verified. Besides that, the links between the model‘s elements/constructs were likewise reviewed. By and large, this step of comparing the models proved the relevance of the theoretical model in the context of this research project. Additional analysis was carried out in the subsequent part.

The second part was responsible for evaluating all of the model's elements and its variables, inclusive of the links among the elements in relation to how generalizable and common they are. This was done through literature and empirical field framework's review. Very importantly, all of the model's constructs that are grounded and supported in literature have also been validated by the GP respondents in the field study discussions. This is shown through the results of the empirical qualitative study. For that reason, all of the proposed theoretical elements have been kept. However, a few important items did emerge from the qualitative interview phase which became integrated into the comprehensive framework. These items became integrated into telehealth protocols sub-construct (PR), data exposure (DEC) and telehealth practice sub-construct (TP), communication (COM), trust (T) and commitment (CT) sub-construct, value creation (VC) and telehealth enablers (TE) constructs. The third part was responsible for the process of justifying all of the elements and their variables by validating them through grounding in the current literature. Table 22 below portrays all of the validated constructs and their dimensions through current literature. Following these steps, the final and comprehensive framework was produced that has incorporated relevant empirical findings and initial theoretical elements. This model is presented in figure 12.

4.7 Validation of the results in current literature

Based on literature support, this segment validates evaluated empirical framework's elements and its dimensions. Importantly, it needs to be mentioned that these elements and dimensions in the empirical framework were drawn on the basis of their consistency and cohesion. Therefore, their literature grounding and validation proves that the proposed constructs and their variables are competent and sufficient to evaluate the proposed model. Tables 23 to 29 show these elements and their dimensions that have finally been chosen due to the support by literature or field study findings.

Table 23**:** Telehealth technology use considerations elements

Elements	Dimensions	References
DS1	Data security protection	Wilkowska and Ziefle (2012, p. 194); Aleman et al. (2013); Caldicott (2013); Dunnebeil et al. (2012); Daker-White et al. (2015); Entzeridou, Markopoulou & Mollaki (2018); Hsu, Lee and Su (2013); Naeme (2014); Field study.
DS2	Patient privacy / identity	Wilkowska and Ziefle (2012, p. 194); Aleman et al. (2013); Caldicott (20130; Huang, Lee & Lee (2011); Hsu, Lee and Su (2013); Jin (2011); Raven, Butler and Bywood (2013); Field study.

PR1	Protocols‘ clarity	New item derived from field study.
PR2	Practitioner accountabilities	New item derived from field study.
PR3	Cross-disciplinary care	Clarke et al. (2017); Keijser et al. (2016); Page (2003); Rufo (2012); Field study.
W1	Conventional care delivery	Rosenzweig and Baum (2013); Van Alstin (2016); Field study.
W2	Work location	Blount and Gloet (2015; 2017); Brewster et al. (2014); Van Alstin (2016); Varty, O‘Neill and Hambley (2017); Field study.
W3	Workload distribution	Blount and Gloet (2015); Field study.
W4	Time efficiency	Kruse et al. (2017); Raven, Butler and Bywood (2013); Field study.

DS=Data security; PR=Telehealthcare protocols; W=Workload

Table 24**:** Knowledge sharing elements

Elements	Dimensions	References
MOT1	Share knowledge / working experiences	Radaelli et al. (2014, p. 414); Caine and Tierney (2015); Blumenthal and Squires (2014); Bock et al. (2005); Bullock (2014); Hsu et al. (2007); Rho, Choi and Lee (2014); Field study.
MOT2	Share with those who Ask	Radaelli et al. (2014, p. 414); Bock et al. (2005); Hsu et al. (2007); Field study.
MOT3	Sharing efficiency	Radaelli et al. (2014, p. 414); Bahous & Shadmi (2016); Bock et al. (2005); Caffery, Farjian & Smith (2016); DesRoches et al. (2008); Hsu et al. (2007); Field study.
OPP1	Time sufficiency	Radaelli et al. (2014, p.414); Alkmim et al. (2012); Bock et al. (2005); Gillentine et al. (2012); Hsu et al. (2007); Rheuban (2013); Schwamm (2014); Young and Badowski (2017); Field study.
OPP2	Organisational approval	Radaelli et al. (2014, p. 414); Bock et al. (2005); Hsu et al. (2007);Gillentine et al. (2012); Rheuban (2013); Schwamm (2014); Young and Badowski (2017); Field study.
ABIL1	Sharing capability	Radaelli et al. (2014, p. 414); Armitage and Conner (1999); Field study.
DEC1	Misuse of records	Anderson (2010); Byrne (2010); Greenhalgh et al. (2010); Field study.
DEC2	Patient outcomes	Cocosila and Archer (2017); Featherman and Pavlou (2003); Featherman, Valacich and Wells (2006); Greenhalgh et al. (2010a); Greenhalgh et al. (2010b); Hsieh (2015); Lim (2003); Field study.
DEC3	Legal issues	New item derived from field study.
TP1	Competition with Specialists	New item derived from field study.

TP2	Clinical autonomy	Audet, Squires and Doty (2014); Field study.

MOT=Motivation to share; OPP=Opportunity to share; ABIL=Ability to share; DEC=Data exposure concerns; TP=Telehealth practice

Table 25: Relationship management elements

Elements	Dimensions	References
COM1	Secure messaging between clinicians	New item derived from field study.
COM2	Secure messaging channels/ongoing feedback loop	Cronin et al. 2015; Brady et al. (2017); Hoonakker, Carayon & Cartmill (2017); Raghu et al. (2015); Shenson et al. (2016); Shimada et al. (2017); Sieck et al. (2017); Field study.
COM3	Decision making	Rees and Williams (2009); Field study.
COL1	Inter-disciplinary meetings	O'Leary et al. (2017); O'Reilly et al. (2017); Field study.
COL2	Chronic conditions	O'Leary et al. (2017); O'Reilly et al. (2017); Field study.
COL3	Inter-disciplinary resources	O'Leary et al. (2017); O'Reilly et al. (2017); Field study.
T1	Physical assessment	New item derived from field study.
T2	Patient trust	New item derived from field study.
T3	Medical and IT Professionals	May et al. (2011); Field study.
CT2	Collegial support	Keijser et al. (2016); McKenzie and Williamson (2016); Morilla et al. (2017); Saleh et al. (2016); Uscher-Pines and Mehrotra (2017); Field study.
CT3	Collegial engagement	New item derived from field study.

COM=Communication; COL=Collaboration; T=Trust; CT=Commitment

Table 26: Process management elements

Elements	Dimensions	References
PM1	Interoperability	Baig, Hosseini and Connolly (2015); Field study.
PM2	Uninterrupted data speed	Hay, Lim and Wartena (2012); Morrissey (2016); Mosa, Yoo and Sheets (2012); Rathore et al. (2018); Field study.
PM3	Curated data	Artis et al. (2017); Gold et al. (2018); Field study.
PM4	Productivity	Carlisle (2012); Tang and Ricur (2014); Boehm, Muehlberg and Stube (2015); Field study.

PM5	Routinisation	De Souza et al. (2017); Zanaboni and Wootton (2012); Field study.
PM6	Integrated care	Bentley et al. (2014); Kvedar, Coye and Everett (2014); Kivekas et al. (2016); Field study.

PM1=Process management step 1; PM2=Process management step 2; PM3=Process management step 3; PM4= Process management step 4; PM5=Process management step 5 & PM6=Process management step 6

Table 27: Value creation elements

Elements	Dimensions	References
VC1	Medicare items	New item derived from field study.
VC2	Close encounters with specialists	Alkmim et al. (2012); Blount and Gloet (2015); Dharmar et al. (2013); Gillentine (2012); Moffatt and Eley (2010); Rheuban (2013); Field study.
VC3	Self-employment paths	Van Alstin (2016); Field study.
VC4	Access to specialists	Alkmim et al. (2012); Dharmar et al. (2013); Gillentine (2012); Rheuban (2013); Schwamm (2014); Field study.
VC5	Reduction of unnecessary transfers /rehospitalisation	New item derived from field study.
VC6	Cost saving / efficiencies	Park et al. (2015); Field study.

VC=Value creation element 1; VC2=Value creation element 2; VC=Value creation element 3; VC=Value creation element 4; VC=Value creation element 5; VC=Value creation element 6

Table 28**:** Telehealth enabler elements

Elements	Dimensions	References
TE1	System design	Zhang and Walji (2011); Flores-Vaquero (2016); Gagnon et al. (2016); Holahan et al. (2004); Klein and Sorra (1996); Rodbard and Vigersky (2011); Mohktar et al. (2013); Field study.
TE2	Technical support	Brewster et al. (2014); Gagnon et al. (2014; 2016); Field study.
TE3	Locally pressing patient Conditions	New item derived from field study.
TE4	Skilled workforce	Darius (2015); Holahan et al. (2004); Klein and Sorra (1996); Shaw et al. (2013); Wilson (2017); Field study.
TE5	Improvement Advantages	Rutledge et al. (2017); Sisi et al. (2017); Zhang and Walji (2011); Field study.
TE6	Funding support	Rho, Choi and Lee (2014); Gagnon et al. (2016); Field study.

TE=Telehealth enabler1; TE2=Telehealth enabler 2; TE3=Telehealth enabler 3; TE4=Telehealth enabler 4; TE5=Telehealth enabler 5; TE6=Telehealth enabler 6

Table 29: Readiness to develop telehealth capabilities elements

Elements	Dimensions	References
RDTC1	Technical unpreparedness	Edwards (2017, *pers. comm., 24 November*); Jennet et al. (2003a); Jennet et al. (2003b); Legare et al. (2010a); Legare et al. (2010b); Field study.
RDTC2	Technical readiness	Jennet et al. (2003a); Jennet et al. (2003b); Legare et al. (2010a); Legare et al. (2010b); Philips et al. (2017); Field study.
RDTC3	Perceived impact due to physical distance barriers	Jennet et al. (2003a); Jennet et al. (2003b); Legare et al. (2010a); Legare et al. (2010b); Philips et al. (2017); Field study.
RDTC5	Collaborative readiness	Parasuraman and Colby (2015); Philips et al. (2017); Shaw et al. (2013); Yusif et al. (2017); Field study.
RDTC6	Perceived impact on clinical autonomy	Audet, Squires and Doty (2014); Field study.

RDTC1=Readiness element 1; RDTC2=Readiness element 2; RDTC3=Readiness element 3; RDTC5=Readiness element 5; RDTC6=Readiness element 6.

4.8 The comprehensive framework

In the final stage of qualitative data analysis, as previously described, both initial conceptual model and the outcomes from the empirical study were compared for the purpose of justifying the proposed elements and their dimensions. For that reason, this part positions ahead the comprehensive framework employed by this research which is presented by figure 12 on page 160. This frameworks suggests that GPs' readiness to develop telehealth capabilities (both technical and collaborative elements) needs to be supported by a stable service value network targeting value creation from GP perspectives and one which employs key technological, knowledge sharing, relationship and process pillars that are further supported by individual and organisational enablers.

The framework thus consists of four key service value network pillars, namely; a) telehealth technology use considerations; b) knowledge sharing; c) relationship management and d) process management. Telehealth technology use considerations pillar is measured by data security, telehealthcare protocols and workload sub-constructs. Knowledge sharing pillar is measured by motivation to share, opportunity to share, ability to share, data exposure concerns and telehealth practice sub-elements. Relationship management pillar is measured by communication, collaboration, trust and commitment whereas process management pillar is measured by six key elements derived from effective interoperability, quality data speed at the point of care, productivity, routinisation and integrated care. All of the above pillars with their elements/sub-constructs were introduced, described and discussed in literature review and theory building chapters.

The key direct predicting construct which connects central pillars of the model with the dependent variable: readiness to develop telehealth capabilities is value creation. Value creation is the fundamental and principal interconnecting driver between the model's elements. Its importance is crucial as value that is being created in the eyes of the practitioners make it both a possible and feasible enhanced service proposition. The proposed model has measured value creation with the following six elements the first of which is a new dimension derived from the study: a) clearly delineated Medicare items; b) close experiential encounters with other healthcare practitioners; c) better designed integration leading to paths to self-employment; d) improved access to specialists; e) reduction in unnecessary patient transfers and rehospitalisation and f) cost efficiencies.

These value propositions therefore need to target both better patient health outcomes then what the current model of practice is achieving and better value for practitioners' input into the new model of delivery of care from a distance. Needless to say that this is not a small feat and that in addition to the already mentioned elements, other elements likewise may need to be explored and further evaluated in theory and practice. In support of value creation, this model also engages telehealth enablers, which are seen by GPs almost as equally crucial dimensions that moderate the relationship between value creation and GPs' readiness to develop telehealth capabilities. These both represent practitioner individual and organisational driving factors. Individual enablers were measured by three dimensions: a) accommodation of GP user needs through appropriate system design, b) essential technical support and a new dimension derived from the study: c) targeting of GPs' most pressing local patient chronic/acute conditions/needs. Organisational enablers were measured by a) availability of sufficient skilled workforce, b) professional improvement advantages over current GP practice and c) ongoing government funding support.

Finally, the dependent or outcome variable: GPs' readiness to develop telehealth capabilities was measured by both technical and collaborative elements. Technical element was measured by: a) technical preparedness; b) technical readiness to develop telehealth capabilities to treat patients with chronic and acute conditions using telehealth technologies - a novel dimension grounded in the field study and c) reluctance to embrace telehealth due to its inability to fully replace physical service delivery. Collaborative element was measured by: a) reduced GP support due to reduced clinical interactions; b) readiness to develop additional collaborative capabilities to treat patients with chronic and acute conditions using telehealth technologies –

also a novel self-developed dimension grounded in the field study and c) reluctance to adopt it due to a negative impact on GPs‘ clinical autonomy.

Measurement items added as a result of the qualitative phase

Eleven new measurement items/dimensions that have originated out of the qualitative data collection phase are shown in the table below.

Table 30: New items following qualitative interviews

1.	Telehealth protocols must provide clarity in relation to GPs‘ roles
2.	Protocols must clearly specify practitioner accountabilities before, during and after service delivery
3.	Legal issues resulting from the use of telehealth may be serious
4.	New approaches addressing competition between GPs and specialists must be negotiated
5.	Secure messaging channels between clinicians are essential
6.	Telehealth will affect my ability to make an immediate relevant physical assessment
7.	Telehealth may cause deterioration of patient trust relating to physical assessment information
8.	Active telehealth engagement by colleagues will positively influence my commitment levels
9.	Telehealth will provide GPs with clearly delineated Medicare items
10.	Telehealth will reduce unnecessary patient transfers including reduced rehospitalisation
11.	Telehealth needs to target GPs‘ most pressing local chronic/acute conditions/needs

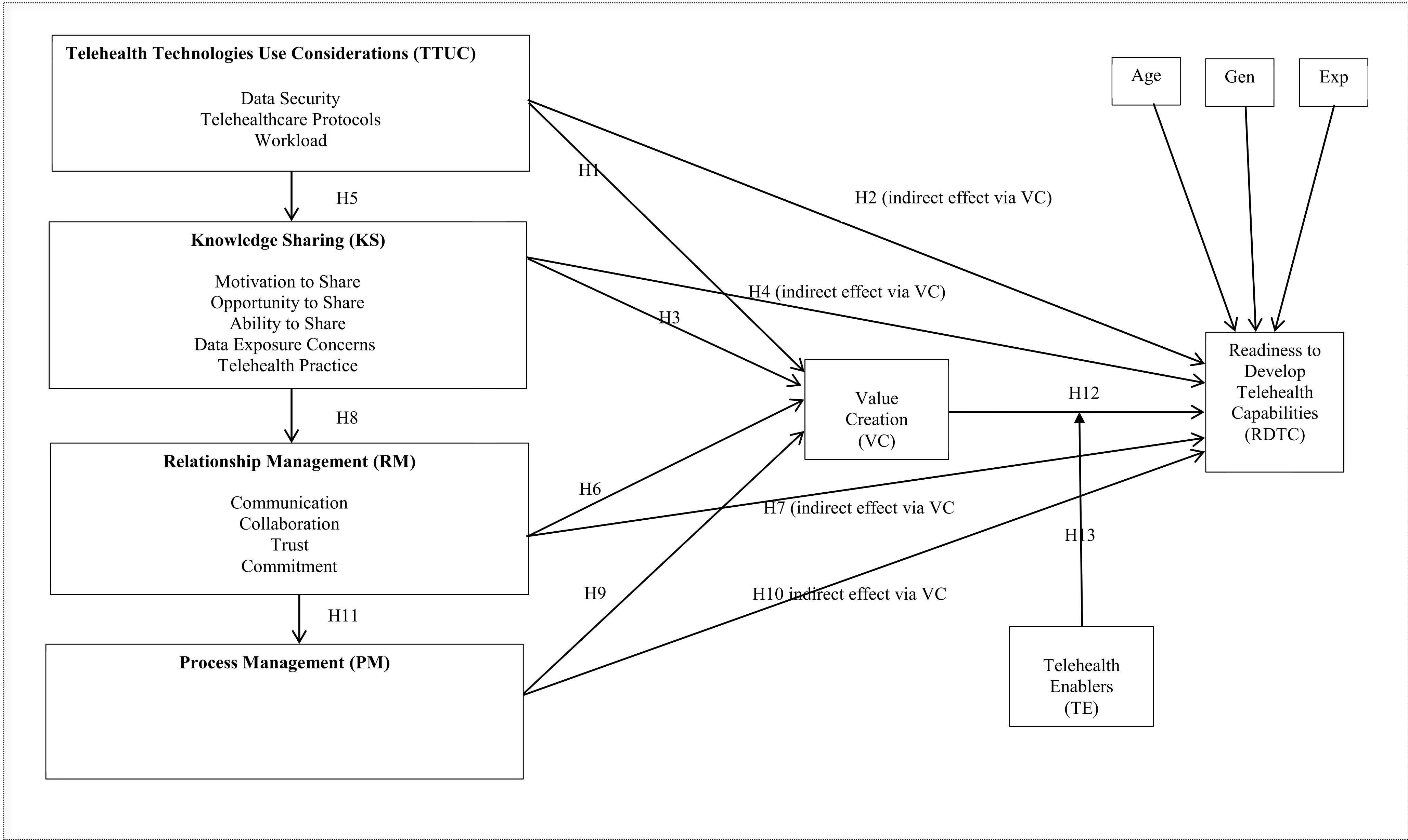
Items 1 and 2 have been incorporated into the telehealthcare protocol sub-construct of the first telehealth technology use consideration pillar stating ‗*telehealth protocols must provide clarity in relation to GPs" roles*‘ and ‚*protocols must clearly specify practitioner accountabilities before, during and after service delivery*‘; and item 3 into data exposure sub-construct of the knowledge sharing element stating ‗*legal issues resulting from the use of telehealth may be serious*‘. Item 4 has been incorporated into the telehealth practice sub-construct stating ‗*new approaches addressing competition between GPs and specialists must be negotiated*‘; item 5 into communication sub-construct of the relationship management element stating ‗*secure messaging channels between clinicians are essential*; and items 6 and 7 into trust sub-construct stating ‗*telehealth will affect my ability to make an immediate relevant physical assessment*‘ and ‗*telehealth may cause deterioration of patient trust relating to physical assessment information*‘.

Furthermore item 8 has been added to the commitment sub-construct of the relationship management operational element stating ‗*active telehealth engagement by colleagues will positively influence my commitment levels*'. Moreover, items 9 and 10 have been incorporated into value creation construct stating ‗*telehealth will provide GPs" with clearly delineated Medicare items*' and ‗*telehealth will reduce unnecessary patient transfers including reduced rehospitalisation*' respectively; and finally item 11 into telehealth enabler moderating construct as an individual enabler element stating ‗*telehealth needs to target GPs" most pressing local patient chronic/acute conditions/needs*'. In line with the reviewed literature and findings from the empirical study, the comprehensive framework is presented in figure 12 below.

4.9 Chapter summary

This segment of the thesis has served to evaluate empirical field study data. Empirical study was performed through semi-structured qualitative interviews with general practitioners practicing in different parts of metropolitan Sydney. It described the qualitative paradigm, process of development of semi-structured interview questionnaire, sample selection and respondent information, collection and analysis of data and field study detailed analysis and findings through both inductive and deductive phases. It also presented links between the proposed model's constructs which also set the path for the developed hypotheses. Finally, it validated results in literature and concluded with the comprehensive framework. The next chapter presents the process of developing the hypotheses and survey instrument elements used in the final quantitative phase.

Figure 14: GPs' Readiness to Develop Telehealth Capabilities Comprehensive Framework



Chapter 5 Hypotheses and Instrument Development

5.1 Introduction

This chapter considers the model's elements which reinforce the theoretical model in this project. It is continued by the evolving hypotheses following qualitative phase results. The map of chapter 5 is shown below.

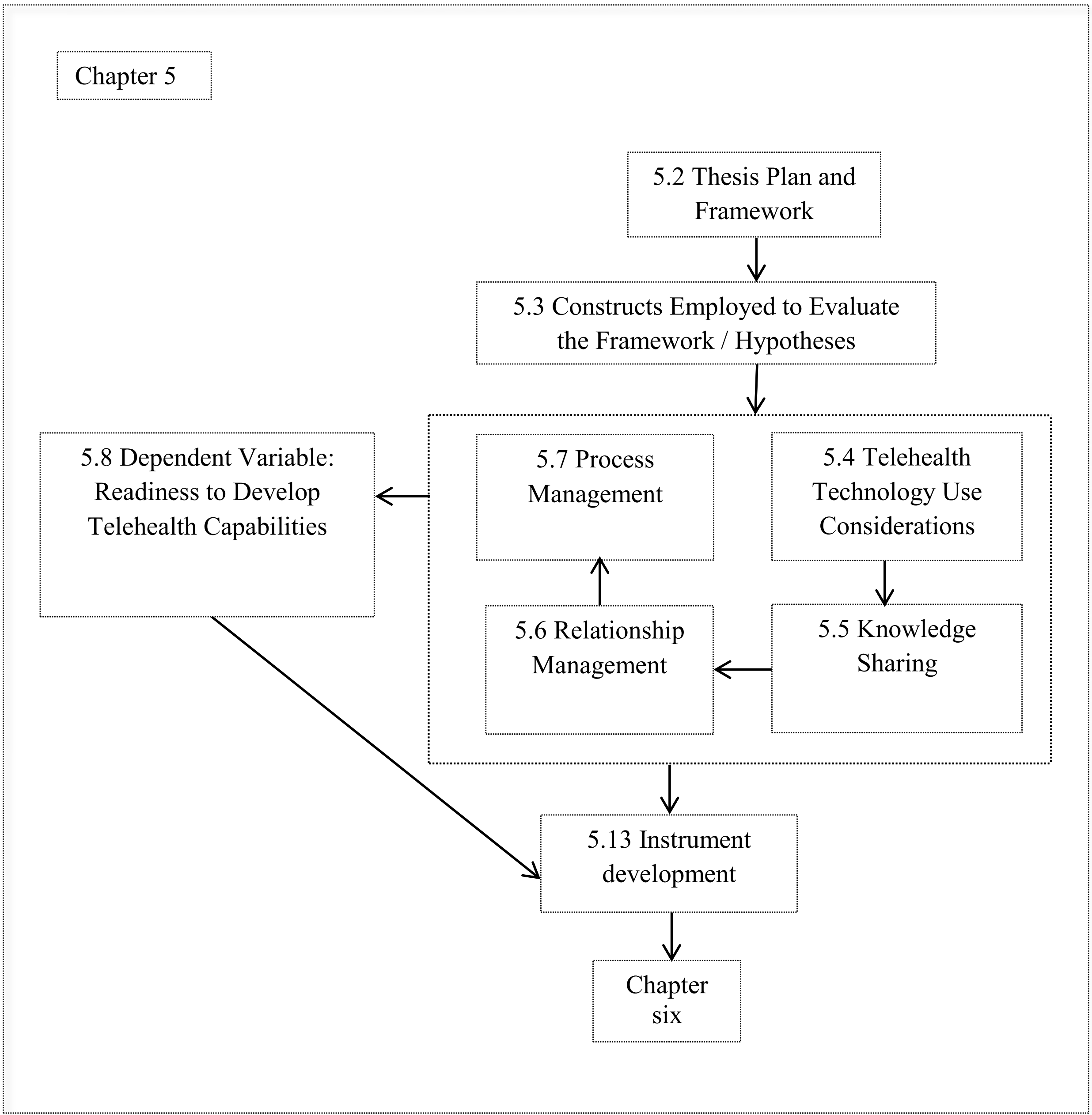


Figure 15: Plan of Chapter 5

The key prerequisites for cross-collaborative engagement as proposed in this project are adequate telehealth infrastructure, patient and practitioner data security, patient safety, privacy and cross-disciplinary access to electronic patient records and knowledge sharing, clarity, coherence and assurance in relation to practitioners‘ roles & accountabilities in telehealthcare, and this is one of the main concerns that practitioners have under the current arrangements (May et al. 2011). Amongst most common telehealth control and intervention services that GPs could access are teleconferencing, e-referrals, store and forward data analysis for diagnosis and test results (Blinkhorn, 2012; McLean , Protti and Sheikh, 2011) and integrated telehealth services such as tele-dermatology, tele-radiology, tele-ultrasound together with or remotely of their patient depending on a condition and the patient concerned.

It is in fact anticipated by the author of this thesis that chronic and acute conditions which are growing steadily in quantity due to various factors will in fact become the precursors for increased demand for telehealthcare services. One such sector of potentially great demand for these types of services is distant aged care. Aged care patients whether in aged care facilities (nursing homes or residential villages) or home-bound patients increasingly require both prolonged health care and intervention services.

As the health budget stretches to the maximum and the working population that pays taxes shrinks, alternative feasible and deliverable approaches to health care are imminent (MENA Report, 2013). General practices that are currently being evaluated in this project are only one segment of a multi-layered health system. The expectation is that other sectors will be impacted upon too. Thus, the contributions made here can likewise serve as a guide to other sectors.

The connection between essential service value network operational elements, namely; technology, knowledge, relationship and process management has been well established by literature (Agarwal, 2008; Agarwal and Selen, 2009; 2011; 2013; Walters and Rainbird, 2007, Walters, 2009; 2012).

These essential operational elements are in fact serving constructs which have been specifically adapted for the proposed telehealth chronic and acute network model and renamed accordingly to suit their intending purpose: telehealth technology use considerations, knowledge sharing, relationship and process management respectively in that order. A positive relationship between key constructs themselves and key predictor and key predictor and the dependent variable is expected.

5.2 Thesis Plan and Framework

As mentioned, the aim of the study is to target GP clinicians and their practices and utilise them as central reference points in the coordination and delivery of telehealthcare services with other healthcare providers within a telehealthcare network (pathology, medical imaging and specialist practitioners) in the wider Sydney region.

These are seen as the potential solution to chronic and acute conditions burdening the nation and the health budget. Consequently, the thesis will employ key service value operational elements, being technology, knowledge, relationship and process management constructs, and adapt them as they relate to telehealth. Central structural elements are proposed next.

5.3 Proposed Constructs Employed to Evaluate the Research Framework

This segment portrays very specific constructs that will be utilised to examine the key questions in this research project. These are in detail presented next. It starts with the description of the dependent variable in the framework, GPs' Readiness to Develop Telehealth Capabilities (RDTC).

A number of studies have attempted to build an understanding of a telehealth acceptance phenomenon, however with limited and insufficient success so far. This study is the first to attempt to make contributions to knowledge from a service value network perspective and its primary onus is on GP's and their interactions with other health practitioners in the proposed telehealth network setting.

Various constructs and dimensions in different combinations have been used in previous studies, however because of the survey length that would be required to cover all of them in this context and the fact that many of those constructs were not as significant, this study is predominantly concerned with the most significant elements and found gaps grounded in the literature and field study.

Consequently, constructs and sub-constructs have been introduced by the author. Telehealth service value networks exist for the purpose of providing value to its stakeholders which cannot function effectively without effective and active collaborations of its members. The subsequent segment positions all constructs and sub-constructs of the model employed.

Framework key elements	Constructs and sub-constructs
5.8 Dependent Variable	Readiness to Develop Telehealth Capabilities
5.9 Direct Predictor	Value Creation
5.10 Moderating Factors 5.11 Control Factors	Telehealth Enablers (Individual and Organisational) Demographics (Experience, Age, Gender)
5.4 Telehealth Technology Use Considerations	- Data Security - Telehealthcare Protocols - Workload
5.5 Knowledge Sharing	- Motivation to Share - Opportunity to Share - Ability to Share - Data Exposure Concerns - Telehealth Practice
5.6 Relationship Management	- Communication - Collaboration - Trust - Commitment
5.7 Process Management	- Effective Interoperability - Speed of Quality Data at the Point of Care - Productivity - Routine Practice - Integrated Care

Table 31**:** Constructs and sub-constructs

These integrate technology, data, knowledge, tangible and intangible resources and processes that are managed through internal and external relationship links based on common values, concerns, operational platforms, systems, interests and other elements (Agarwal and Selen, 2013). These are essential elements that can in fact be both explained by as well as extend communities of practice and the Unified Theory of Acceptance and Use of Technology tested in this study under the multi-grounded theoretical approach.

Correspondingly, key constructs have been made up of very similar sub-elements, which are reflected in the proposed model. Thus, for instance, technology use considerations construct is made up of data security, telehealthcare protocols and workload respectively. Likewise, some of the very core elements mentioned above have been missing in mainstream health service network literature. This is because the health field has been traditionally divided along professional unidisciplinary, occupational boundaries and tasks. These explain the lack of common values, common language, narratives, common curriculum, operational platforms, systems and consequent interests and thus the lack of foundational elements that are accepted by the wider health practitioner population of a telehealth service network to begin with (Health Workforce Australia, 2012). As healthcare practitioners are the most important assets to any healthcare network or organisation, it is their choices, intentions and subsequent decisions that can decide the outcomes of an initiative such as whether to accept telehealth technologies and associated service delivery provisions which focus on information and knowledge sharing and patient data exchange through common platforms or not. The interactions and human interplays between primary care practitioners (GPs, medical imaging, pathology and specialist practitioners) at both intra-organisational and inter-network levels can affect the performance of a telehealth service value network in addition to the other concerned stakeholders. Therefore, comprehending their common concerns and motivational factors that may stimulate their current unidisciplinary and evolving cross-disciplinary readiness to develop telehealth capabilities can be useful not only for telehealth technologies, their intention to use and adopt technology, but also for other types of collaborative technologies and initiatives.

These may aim to transform the field of health and telehealth in general through the creation of joint cross-disciplinary curriculums and clinical initiatives and consequently cross-disciplinary communities of practice. Previous studies on clinician acceptance of telehealth technologies have looked at various factors that may impede or enhance healthcare practitioners‘ acceptance of telehealth. A number of recommendations and identified gaps / limitations from those studies have been incorporated into this project, which is the first dealing with these issues amongst a number of interprofessional occupations previously never addressed in one study together from a service value network perspective.

5.4 Introduction to Hypotheses Development

The previous sections considered different theories which reinforce the theoretical model in this project and have also presented the process of constructing the model based on grounding in literature. Following field study analysis, this process has subsequently led to the comprehensive research framework (figure 12 in previous chapter). This current chapter places the main emphasis on the development of hypothetical links from the model and proposes the hypotheses accordingly.

The model suggests a link between the key elements of the proposed service value network, namely; telehealth technology use considerations (TTUC) and value creation (VC); TTUC and readiness to develop telehealth capabilities (RDTC) mediated by VC; knowledge sharing (KS) and VC; KS and RDTC mediated by VC; relationship management (RM) and VC; RM and RDTC via VC; process management (PM) and VC; PM and RDTC via VC; VC and RDTC and telehealth enablers (TE) and RDTC via VC. In addition to the development of the hypothesised links, this chapter also presents the process of development of the survey questionnaire that will be utilised for data collection and as a measurement tool of the proposed model that will evaluate all of the model‘s elements (constructs).

5.4.1 Hypothesis concerning TTUC to VC

Technology is one of the central communication mediums besides direct, physical face to face and paper data retrieval system in the distribution, analysis, utilisation, and reuse of information and data in today‘s healthcare environment. As speed of access, accessibility, availability, flexibility, consumer demand, personalisation and convenience amongst other factors continue to drive technology adoption (Brewster et al. 2014) on the other hand; a lack of understanding of essential telehealth technology use considerations regarding patient and clinicians‘ data security (Yarmand, Sartipi and Down, 2012), telehealth care protocols and workload may negatively affect perceived and expected value. TTUC has not been defined by literature. Telehealth technology use considerations can be defined as some of the most essential factors or antecedents that need to be addressed prior to clinicians‘ readiness to develop capabilities to utilise telehealth technologies in remote care.

Data security is of vital significance (Kumar, Durai & Vinotha, 2013) in the process of prevention or misuse which bears mistrust and may cause threats to the system‘s automatic malfunctioning. Due to ethical and legal implications and other justified concerns for the intended recipients (Botrugno, 2017; Eccles, 2015; Ellis et al. 2011; Greenhalgh, 2012; McCartney, 2012; Oliver, 2013; Steventon, 2012; Worth, 2015) patients must have rights to withhold their personal and sensitive data (Wilkowska and Ziefle, 2012; Jin, 2011; Raven, Butler and Bywood, 2013) which must be non-linkable to personal identity and only be accessed through secured authorised personal data authentication codes (Wilkowska and Ziefle, 2012; Caldicott, 2013; Huang, Lee & Lee, 2012).

Thus, the absence of legally enforceable legislated total security (Wilkowska and Ziefle, 2012; Aleman et al. 2013; Dunnebeil et al. 2012) and trust among practitioners, patients and the public makes coordination and protection of data security very challenging (Kumar, Durai & Vinotha, 2013). According to Adams (2012) in Whitman and Mattord (2012, p.435) data or ―information security is the foundation for the protection of the confidentiality, integrity, and availability of the organization‘s information". ***Data security*** for the purpose of this thesis may be defined as all protections, legal & other measures that can be utilised to ensure appropriate security and access of data, withholding, authorisations and authentication. Legislation for the total protection of patient and provider data is thus essential (Aleman et al. 2013; Caldicott, 2013; Dunnebeil et al. 2012; Daker-White et al. 2015; Entzeridou, Markopoulou & Mollaki, 2018; Naeme, 2014) as well as strict enforceable guidelines for the handling of computer files (Daker-White et al. 2015; Simon, 2015). Besides data security, telehealthcare delivery essentially requires protocols that provide clarity in relation to GPs‘ roles in the use of technology, patient care and coordination in cross-disciplinary settings (May et al. 2011; Taylor et al. 2013), with accountability protocols (French et al. 2013; Gollnick et al. 2013; Van Wormer et al. 2012), that are physician-led (Clarke et al. 2017; Keijser et al. 2016; Snell et al. 2014), support collaborative approach (Wade and Hamlyn, 2013) and are supported by standards on patient self-care management through effective user coping strategies, online and offline support (Knight et al. 2016; May et al. 2011). To date, there is no consensus on a single definition of a specific telehealth protocol. For the purpose of this thesis, ***telehealthcare protocols*** may be defined as cross-disciplinary clinically owned doctor-led medical service delivery guidelines that are supported by clearly defined practitioner roles, accountabilities and patient self-care management pathways. Furthermore, increasing demand for telehealth medical services by patients is highly likely to lead to increased online workload (Van Alstin, 2016). On the other hand, literature suggests that practitioners expect more work-life balance by being able to work from any location (Blount and Gloet, 2015; 2017; Brewster et al. 2014; Van Alstin, 2016; Varty, O'Neill and Hambley, 2017), through opportunities to be in regular telehealth communication support exchanges with colleagues and managers (Blount and Gloet, 2015). In addition to the above user considerations, reduced physical patient visits may negatively affect the conventional delivery of care (Rosenzweig and Baum, 2013; Van Alstin, 2016) thus require stable workload distribution mechanism through reorganisation or redesigning of work conditions and service delivery that are more time efficient in managing workload (Blount and Gloet, 2015).

Similarly, there is no consensus in literature around a common definition of workload, not to mention in telehealth context. For instance, Morris et al. (2007, p.464) define it as ―the amount of performance required to carry out activities in a specified time period". ***Workload*** in the context of this thesis may be defined as the amount of work assigned or accumulated in the course of provision of planned and/or unplanned clinical as well as non-clinical activities for the purposes of carrying out telehealth and other ongoing medical services.

In contrast to the above issues, security assurances for patient and clinicians' data, privacy and confidentiality, secured, authorised and authenticated access (Wilkowska and Ziefle, 2012), establishment of standardised widely accepted telehealth care protocols and stable workload distribution mechanisms would be perceived as important drivers of value. These expectations as demonstrated by field study participants the telehealth platform has not delivered yet. All of the above research elements have either a direct or indirect relationship with the *value* they create some of which are importantly GPs' adequate remuneration with clearly delineated service items, access to and close experiential encounters with specialists and other perceived professional benefits. Accordingly, based on literature and field study outcomes, it is hypothesised that:

H1: There is a positive relationship between Telehealth Technology Use Considerations (TTUC) and Value Creation (VC).

5.4.2 Hypothesis concerning KS to VC

Knowledge is a key pillar of a service value network concept and a crucial ingredient in any human endeavour. Cumulative knowledge residing in healthcare personnel is both a source of innovation and a competitive advantage. Consequently, each healthcare organisation and particularly its practitioners are concerned with protection of intellectual property which they have spent years building and accumulating through study, hard work and experiences. Therefore, without solid legal enforcement mechanisms through legally binding guarantees and safeguarded protection of healthcare practitioners‵ intellectual property and bound codes of practices of all stakeholders in the delivery of telehealth, collaborative knowledge sharing is less likely to be exploited to its full potential (Bullock, 2014; Petersen and Bertelsen, 2012; Raven, Butler and Bywood, 2013; Jang-Jaccard et al. 2014; Wade, Whittaker and Hamlyn, 2015). Knowledge sharing can be defined as a ―fundamental mechanism for making collaborative flows effective, allowing innovators to acquire new information and stimuli for exploring external ideas and exploiting internal knowledge" (Radaelli et al. 2014, p. 400).

The proposed cross-disciplinary telehealth framework adds an additional layer of complexity as regards knowledge sharing. This is however an essential segment without which there cannot be successful telehealthcare delivery as it depends on knowledge sharing and knowledge transformation to provide value to its stakeholders. An expected outcome due to this transformative service value process is the development of new innovative knowledge capacities and capabilities that should be incorporated into a well-functioning or newly created telehealth innovation system. Clinician‵s motivation and ability to share knowledge electronically given an opportunity and adequate channels represent key ingredients for the realisation of telehealth objectives and its long-term value (Radaelli et al. 2014; Bock et al. 2005; Hsu et al. 2007). On the contrary, ignored clinicians‵ data exposure concerns and absence of properly negotiated telehealth practice codes and associated rules particularly in terms of competition and clinical autonomy (Audet, Squires and Doty, 2014) are likely to work against the perceived value that cross-disciplinary knowledge sharing can bring.

Telehealth data exposure concerns have not been defined by literature. These can be defined as concerns related to patient safety, potential legal and performance expectation issues. However, perceptions of risks emanating from a potential and real use of electronic health records (EHR) have been discussed. ***Perceived risk*** has been defined as a probability of danger through negative outcomes on ―physical, economic, personal, time, social, performance and privacy risk" (Wang and Li, 2010, p. 2956) and expected loss ―if consequences of an act were not favourable, and the individual subjective feeling of certainty that the consequences will be unfavourable" (Cunningham, 1967, p.37). Various authors believe that electronic health records (EHRs) might cause a waste of financial resources and may not meet performance expectations (Cocosila and Archer, 2017; Featherman and Pavlou, 2003; Featherman, Valacich and Wells, 2006; Greenhalgh et al, 2010a; Greenhalgh et al. 2010b; Hsieh, 2015; Lim, 2003). Besides, legal and privacy issues resulting from its use are feared serious concerns as well as time that may be wasted (Cocosila and Archer, 2017; Featherman and Pavlou, 2003; Lim, 2003; Martins, Oliveira and Popovic, 2014). Professor of Security Engineering from University of Cambridge, Ross Anderson (2010, p. 1) believes that ―summary care record must be abandoned – for reasons of safety, functionality, clinical autonomy, patient privacy and human rights". In a ―multicontributor record no individual clinician is responsible" (Anderson, 2010, p.1) and they are also illegal. Similar views are voiced by Byrne (2010). According to Anderson (2010, p.1) ―the properly engineered solution is MedicAlert". Relevant patient data is stored in a secured disk worn by patients and is connected with a secured electronic record. These concerns are all crucial prerequisites for ***telehealth practice*** which to this date has not been defined by literature. Thus, ***telehealth practice*** for the purpose of this thesis can be defined as the conduct of telehealth activities within the parameters of all legal measures and protections that can be utilised to ensure the preservation and enforcement of health practitioners' intellectual property rights, upholding of negotiated telehealth practice codes including competition and clinical autonomy and legislated practitioner choices regarding the type of care delivery for each patient.

Besides competition among health practitioners, a particular concern voiced by researchers relates to IT professionals who currently enjoy a great deal of autonomy and power and are not perceived as bound by strict codes of telehealth practice. Namely, due to their level of influence in the management of health information systems, health IT professionals must be specifically bound by strict regulatory telehealth codes of practice enforceable by legislation (Bullock, 2014; Raven, Butler and Bywood, 2013; Jang-Jaccard et al. 2014; Petersen and Bertelsen, 2012; Wade and Hamlyn, 2013). Furthermore, new cross-disciplinary approaches which address practitioner autonomy, competition or rivalry among practitioners in the process of creation and shaping of clinical and non-clinical knowledge (Audet, Squires and Doty, 2014) are needed. Importantly, practitioners who doubt that their or their patient data has been misused should be able to choose without penalties whether to stop using the telehealth platform and continue conventional delivery of care (Audet, Squires and Doty, 2014). The foundational phase above will ensure access to patient records, which is a necessary prerequisite in the process of distant care delivery (Caine and Tierney, 2015).

Consequently, increasing cross-disciplinary healthcare interdependencies and associated interactions need to be supported by appropriate organisational climate to positively influence knowledge sharing practices as these make such interactions possible (Anderson and West, 1998; Bock et al. 2005). Moreover, well managed knowledge sharing processes may allow for the transfer of tacit or intangible knowledge into more explicit forms (Hansen, 1999; Martin, Currie and Finn, 2009) through close experiential encounters between clinicians (Blount and Gloet, 2015; Moffatt and Eley, 2010). Besides, clinicians are likely to receive adequate remuneration for their efforts through MBS items, and cost-savings through faster accessibility to patients, resources and other clinicians (Park et al. 2015). All of the proposed sub-elements and their dimensions have either a direct or indirect relationship with *value creation*, which is likewise supported by field study results. Thus, the following hypothesis is derived and made as follows:

H3: There is a positive relationship between Knowledge Sharing (KS) and Value Creation (VC).

5.4.3 Hypothesis concerning TTUC to KS

Adequately satisfied data security concerns in addition to widely accepted telehealthcare protocols and stable workload distribution mechanism are positive factors that may influence individual GP‘s remote care practice. These are further facilitated by motivation and opportunity to share (Bock et al. 2005; Hsu et al. 2007; Radaelli et al. 2014) and ability to share information (Armitage and Connor, 1999) with other practitioners which is likely to have a positive impact on the relationship between telehealth technology use considerations and actual knowledge sharing thorough the establishment of properly negotiated remote medicine practices (Smith et al. 2008). Due to the very close interconnectedness of technology and its electronic information use considerations addressed in the previous construct (Zeng, 2016) for the purpose of knowledge sharing in telehealth initiatives, these two service value network essential operational constructs (TTUC and KS) are unlikely to function in separation. This finding has also been strongly supported by field study results. Thus, it is hypothesised that:

H5: There is a relationship between Telehealth Technology Use Considerations (TTUC) and Knowledge Sharing (KS).

5.4.4 Hypothesis concerning RM to VC

Relationship management is one of the most complex segments in human behavioural research and is critical in comprehending as team-based activities and dynamics are highly influenced by it. Human interactions are likely to cause reciprocal responses in various forms such as views, perspectives, expectations and actions (Darley and Fazio, 1980; Oliver et al. 2016). Human resource management through relationship management, particularly in the context of healthcare where practitioners have enjoyed a substantial degree of autonomous functioning for a long time is the first critical step on the path of utilising health workforce knowledge through the concerned technologies (Stone, 1998) and turning it into value for its stakeholders. Relationship management contains essential dimensions of communication, collaboration, trust and commitment to make it effective. These dimensions are often mentioned as central determinants for the transformation of intentions (Michie et al. 2008; Mearns, 2012).

Though **cross-disciplinary communication** & collaboration show a great promise, as in all novel endeavours, difficulties and hurdles can be expected. Communication is the essence of life as it underpins every human and non-human interaction and activity. While it can be both spoken and written, verbal and non-verbal, cable and wireless, visible and invisible, it truly is a never-ending phenomenon. For the purpose of this thesis, communication is viewed through the lenses of GPs‘ and the clinicians that they formally interact with either verbally or in a written form in an alleged telehealth value network. According to Page (1984, p. 50) ―proper ***communication***‘ is a process ‗of achieving a fully reciprocal understanding between two (or more) people” In this process, ―one person (the sender) has to turn his thoughts or intentions into words (written or oral) which he intends to communicate to the other” (p.50). It consists of the following stages: ―gaining attention, achieving understanding, getting acceptance and checking results” (Page, 1984, p. 51).

According to Knight et al. (2016), novel cross-disciplinary medical delivery models require essential protocols that facilitate protected, effective communication channels. This is particularly of concern in the alleged telehealth value network between GPs, specialists, pathology and medical imaging practitioners. Likewise, Brady et al. (2017) are of the view that protected communication channels will ensure ―continuous feedback loop” (p. 930) between clinicians. Besides effective clinician communication, patients too need to be kept well informed of their diagnosis and involved in their ongoing care and decision making process from the very beginning (Rees and Williams, 2009). For instance, ―asynchronous text-based patient-provider communication is increasingly being used to support patient self-management functions for conditions such as diabetes, which, when properly controlled, are amenable to routine online check-ins” (Voruganti et al., 2017, p.387).

Collaboration on the other hand has greater chances of success where both vision and goals are shared through ongoing and respectful interprofessional gatherings (O‘Reilly et al. 2017) and where participants perceive positive, feasible teamwork benefits (Macfarlane et al. 2004). Comprehensive medical care is almost impossible without cross-disciplinary teamwork and collaboration (O‘Reilly et al. 2017). According to O‘Reilly et al. (2017, p. 14), “regular respectful interdisciplinary meetings will improve collaboration through the team‘s shared goals and vision”. Furthermore, physician “interest in a specific condition such as chronic kidney disease” (O‘Reilly et al. 2017, p. 10) will enhance one‘s cross-collaborative efforts. Essentially inter-disciplinary teams need to be well resourced and remunerated to effectively collaborate (O‘Reilly et al. 2017). ***Interdisciplinary collaboration*** has been defined as “an interpersonal process characterized by healthcare professionals

> from multiple disciplines with shared objectives, decision-making, responsibility, and power working together to solve patient care problems; the process is best attained through an interprofessional education that promotes an atmosphere of mutual trust and respect, effective and open communication, and awareness and acceptance of the roles, skills, and responsibilities of the participating disciplines” (Petri, 2010, p.79).

Besides understanding of mutual roles and accountabilities, **trust** plays a key role in the successful realisation of telehealth initiatives among cross-disciplinary practitioners. Trust is multidimensional however this thesis has adopted the following widely cited definition. Trust is “a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviour of another” (Rousseau et al. 1998, p. 395). According to field study results, there are existing concerns that telehealth will downgrade essential face to face patient contacts causing a loss of crucial on the spot relevant physical assessment information, which will negatively impact on patient trust and confidence in telehealth technologies (Kayyali et al. 2017).

Thus, telehealth technologies that provide safeguarded “technical reliability backed by transparent data storage policy” have a higher likelihood of trust amongst physicians (Van Velsen et al. 2016, p.1). Research further suggests that patients and practitioners should be provided with control over which organisations and actors store and view their medical information (Van Velsen et al. 2016; Krontiris, Langheinrich and Shilton, 2014). Nevertheless, new delivery method requires new approaches to cross-disciplinary trust, which must be negotiated (May et al. 2011) as clinician understanding and trust between themselves and towards telehealth technologies are the cornerstones to their **commitment** (Herian, Shank & Abdel-Monem, 2012). Interdisciplinary commitment has not been defined by literature, however organisational commitment which can be normative, affective and continuance based

(Meyer et al. 2012) has been defined. This thesis adopts the following definition by Mowday, Steers and Porter (1979, p.226) which states that ―organisational commitment is a relative strength of an individual‘s identification with and involvement in a particular organisation. It can be characterised by at least three related factors: (1) a strong belief in and acceptance of the organisation‘s goals and values; (2) a willingness to exert considerable effort on behalf of the organisation; and (3) a strong desire to maintain membership in the organisation". On the other hand, mistrust (Hall & McGraw, 2014; Hsieh, 2015) and the build-up of uncertainty are the greatest barriers to telehealth acceptance (McDonald, Jayasuriya & Harris, 2012).

Furthermore, research by Spencer et al. (2015) has found that ―small, close-knit patient centred" cross-disciplinary teams are likely to be more committed (p.389). Based on the principles of communities of practice theory (Lave and Wenger, 1991) and according to field study results which is also supported by literature, regular telehealth communication exchanges and collegial support (Keijser et al. 2016; McKenzie and Williamson, 2016; Morilla et al. 2017; Saleh et al. 2016; Uscher-Pines and Mehrotra, 2017) and active collegial engagement are likely to positively influence remote clinicians‘ commitment levels in the provision of remote care.

Consequently, the following hypothesis is made:

H6: There is a positive relationship between Relationship Management (RM) and Value Creation (VC).

5.4.5 Hypothesis concerning KS to RM

Health providers have for some time been providing patients with communications which support their own management of various conditions that are likely to lead to new remote routine tasks of vital sign check-ups such as diabetes or hypertension (Voruganti et al., 2017). Likewise, ongoing and respectful interprofessional gatherings (O‘Reilly et al. 2017), perceived positive, feasible teamwork benefits (Macfarlane et al. 2004) in addition to regular exchanges and managerial support (Blount and Gloet, 2015), commitment by the organisation (Mowday, Steers and Porter, 1979) protected communication channels for ongoing conversations (Brady et al. 2017) and informing and involving patients in decision making during their ongoing treatment (Rees and Williams, 2009) are further likely to strengthen knowledge sharing and relationships among practitioners. Due to the very close interconnectedness and inseparable dependence of knowledge sharing and relationship management (Bullock, 2014; Lee et al. 2012) for the purpose of knowledge sharing in telehealth initiatives, these two service value network key operational elements cannot function in separation. Thus, it is hypothesised:

H8: There is a relationship between Knowledge Sharing (KS) and Relationship Management (RM).

5.4.6 Hypothesis concerning PM to VC

Process management is the fourth and final essential element of the proposed telehealthcare service value network model. This construct contains a mix of elements which have a potential to succeed through properly targeted patient and practitioner needs supported by well distributed and managed resources. This concluding pillar could bring all of the constructs together and be explicated through both the Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003) and Communities of Practice Theory (Lave and Wenger, 1991) **via a set of key building components that are ingrained in**: a) effective interoperability; b) speed of quality data at the point of care; c) productivity; d) routine practice & e) integrated care respectively and under a multi-grounded theoretical approach (Goldkuhl and Cronholm, 2003).

Effective Interoperability consists of one‘s computer self-effectiveness and digital interoperability. There is no yet a definition of effective interoperability in the literature. For the purpose of this thesis, ***Effective Interoperability*** is defined as a capability of devices to be utilised in a number of systems and across a number of different platforms in the exchange and utilisation of data necessary for the delivery of healthcare services from a distance with no extraordinary user efforts.

Computer self-effectiveness in the context of this study can be defined as demonstrable results and/or proof to oneself of one‘s ability to accomplish wanted or necessary telehealth tasks by utilising computers and/or other electronic devices at a satisfactory level (Rho, Choi and Lee, 2014). Literature also shows that flexible technical support in primary healthcare enables higher proficiencies, better adaptation and expertise (Audet, Squires and Doty, 2014; Gagnon et al. 2014).

According to Duna et al. (2014, p.6) ―some of the aspects that need to be addressed to achieve effective interoperability are the correct and unambiguous identification of patients, improved cooperation among stakeholders to ensure the consistent application of standards across different domains, the use of data interchange standards to ensure syntactic interoperability, the application of semantic interoperability with the use of standard terminologies, and the use of quality measures to assure that data is accurate and relevant".

Furthermore, Baig, Hosseini and Connolly (2015) suggest the use of *simple interoperable systems with minimal interruption among patients in various settings, including those in aged care*. *Interoperability* of telehealth technologies has been spearheaded by various government and institutional partnerships and certification programs and incentives (DeSalvo and Mertz, 2014). According to Gagnon et al (2014), platform which provides necessary learning resources, standardised documentation & interoperable devices/software (Baig, Hosseini and Connolly, 2015; Hay, Lim and Wartena, 2012; Morrissey, 2016; Mosa, Yoo and Sheets, 2012; Schooley et al. 2016; Sikka and Barash, 2012) are more likely to be utilised.

Next, ***Speed of Quality Data at the Point of Care*** is particularly significant at the point of care where speedy, relevant, filtered, crucial, text, audio and video data can make an important contribution to patient health outcomes (Georgiou, Westbrook and Braithwaite, 2012).*This infrastructure needs to maintain protected and uninterrupted high quality broadband speed and data bandwidth* (Hay, Lim and Wartena, 2012; Morrissey, 2016; Mosa, Yoo and Sheets, 2012; Rathore et al. 2018) and prevent the loss of important, relevant patient information (Bahous and Shadmi, 2016).

Additionally, *it needs to provide information filters* (Caliendo et al. 2008; Dubbey et al. 2015) *which enable accurate cross-checking of patient data and test results in order to prevent falsely presented test results from further consideration* (Artis et al. 2017; Gold, McGrath and Mohan, 2018). Therefore, interoperable platforms need to be designed to follow the patient journey and as such have much better adoption chances by paying attention to the conditions they may serve (Hay, Lim and Wartena, 2012) and at what speed, quality data is utilised. Speed of quality data at the point of care has not been defined by literature.

Speed of Quality Data at the Point of Care may be defined as a value adding process to clinical coordination and integration of care through accurate, crucial patient data and information distribution to the right clinician/s or treating practitioner and/or patient healthcare treating team at the right speed, right time and amount of data & at the right point of care. In addition to the required speed, which may increase efficiencies, health data also needs to be checked for its quality, reliability, currency, validity and useability, which are all important for an effective and *productive* outcome.

Productivity is a multidimensional concept. Typically, researchers divide it into labour (input-output ratio) or multi-factorial types such as utilisation, efficiency and quality (Al-Darrab, 2000). Baily and Garber (1997, p. 146) define productivity ―as the physical inputs used (labour, capital, and supplies) to achieve a given level of health outcomes in treating a specific disease".

Healthcare productivity may also be defined as output outcomes or benefits gained through the effective engagement process of available resources and stakeholder efforts in the delivery of medical care to patients. Its by-product ***telehealth decision making*** is a process which considers and utilises available records, evidence, tools and resources in a particular patient's case or circumstances for the purpose of providing medical care from a distance. Schooley et al. (2016) have uncovered that practitioners' use of mobile communications devices improves their clinical communications, care process and associated tasks as well as overall *productivity* and *efficiencies* through the integration of records and other sources as well as cross-collaborative instant collegial feedback (Sikka and Barash, 2012). Besides, telehealth technologies could rapidly identify crucial information in medical records (Sikka and Barash, 2012) and enable the treating healthcare team to timely utilise crucial information (Schooley et al. 2016) and reduce risks in decision making as erroneous diagnoses and faults due to higher transparency are decreased or ruled out early (Raziuddin, 2016; Deldar, Bahaadinbeigy & Tara, 2016). *These technologies can also enable health education and personalised remote patient support in the measurement of vital signs* (Carlisle, 2012; Tang and Ricur, 2013; Boehm, Muehlberg and Stube, 2015).

In addition to productivity and decision making improvements due to the mentioned reasons and readily available data and human resources, increasing use of telehealth technological applications and devices is likely to lead to ***routine practice*** with the available resources (Bouamrane and Mair, 2013). According to the Medical Dictionary (2018), ***routine practice*** is defined as ―a regularly performed behavioural sequence, a standard method of completing a procedure, based on rules or habit, a fixed pattern of procedures used in any phase of treatment, a series of steps, to be followed in a carefully planned sequence, that provide a means of dealing with commonly encountered situations".

Routine practice may also be defined as a clinical methodology underpinned by ingrained characteristics of healthcare practitioners that they have willingly adopted and are readily utilising in their everyday practice for the purpose of medical service delivery to their patients. For instance, *development of standard remote care protocols could increase the use of telemedicine and create new work routines* (De Souza et al. 2017; Zanaboni and Wootton, 2012). According to Bouamrane and Mair (2013) frequent use of appropriate / fit for purpose telehealth devices is likely to lead to their routinisation. As a consequence of increased use, technology costs too are likely to come down and become more affordable (Park et al. 2015). *However, some practitioners" daily work may be "too heterogeneous to routinise important processes"* (Dunnebeil et al. 2012, p. 754).The combined impact of all of the above elements, have a high potential to lead to *integrated care*.

According to Leach et al 2018 (p.55) “***integrated health care*** is a client-centred model of care provided by a team of biomedical, allied and complementary health professionals, who work collaboratively, and respectfully to deliver accessible, holistic, evidence-based, personalised, coordinated care that emphasises disease prevention and health, healing and wellness promotion”. *Telehealth technologies enable enhanced cross-collaboration, blended education and learning prospects and technical capabilities* (Blount and Gloet, 2015), data flow and service quality outcomes (Baker et al. 2011), *through integrated clinician-led cross-collaborative team response* (Kvedar, Coye and Everett, 2014; Kivekas et al. 2016) and enhancement of alignment in care provision (Baker et al. 2011; Grabowski and O‘Malley, 2014; Li et al. 2012). Integrated care also bonds all of the other acceptance sub-elements (Brady and Force, 2013) thus providing enhanced value. Consequently, the following hypothesis is drawn:

H9: There is a positive relationship between Process Management (PM) and Value Creation (VC).

5.4.7 Hypothesis concerning RM to PM

Process management sums up key telehealth delivery elements which directly and indirectly affect healthcare practitioner relationship management. As this is a cross-disciplinary platform by default, it needs the support of cross-disciplinary colleagues to make it functional. Thus, besides interoperability of systems (Baig, Hosseini and Connolly, 2015), secure/uninterrupted high quality broadband speed (Hay, Lim and Wartena, 2012; Morrissey, 2016; Mosa, Yoo and Sheets, 2012; Rathore et al. 2015), properly curated patient health data (Artis et al. 2017; Gold et al. 2018) personalised remote patient support in the measurement of vital signs (Carlisle, 2012; Tang and Ricur, 2014; Boehm, Muehlberg and Stube, 2015), newly learned integrated collaborative protocols may create new remote treatment healthcare routines (De Souza, 2017; Zanaboni and Wootton, 2012) which are led by doctors (Bentley et al. 2014; Kvedar, Coye and Everett, 2014; Kivekas et al. 2016). Furthermore, due to the very close interconnectedness and inseparable dependence of relationship management and process management (Greenhalgh, Wherton and Shaw, 2017; Hughes et al. 2017) for the purpose of realising telehealth initiatives, these two service value network essential operational elements are not likely to be effective in separation. Thus, it is further hypothesised that:

H11: There is a relationship between Relationship Management (RM) and Process Management (PM).

5.4.8 Hypothesis concerning VC to RDTC

Physician readiness to develop telehealth capabilities is crucial if telehealth is to get off the ground and succeed as a platform and medical delivery method. No article in the literature has developed a scale to measure either readiness to develop technical or additional collaborative capabilities by doctors. Consequently, ***readiness to develop telehealth capabilities*** (RDTC) has not been defined by literature. It has been defined for the purpose of this thesis as likelihood by a healthcare practitioner of developing both technical and additional collaborative skills to effectively engage with other health providers via telehealth technologies.

Yusif, Hafeez-Baid and Soar (2017) are of the strong view that electronic readiness needs to be reliably assessed in order to avoid systemic failures such as those that relate to technical preparedness of clinicians. For the purposes of this thesis technical readiness is defined as likelihood that GPs will develop necessary technical skills in order to be capable to engage with telehealth technologies as they become available in their practices particularly for patients suffering from chronic and acute conditions. Thus, any enhancements including technical ones that may overcome these concerns are welcome support mechanisms. There are however concerns that GPs‘ lack telehealth technical knowledge (Edwards, 2017, pers. comm., 24 November). Besides that, some practitioners may unwelcome them due to the impact on their accustomed daily clinical decision making processes (Gagnon et al. 2014; Lapointe and Rivard, 2005). Moreover, others may be reluctant to develop technical skills due to their convictions that telehealth cannot fully substitute physical clinical service delivery (Blount and Gloet, 2015; Greenhalgh et al. 2015). According to field study results, others yet may be prepared to develop these capabilities to treat patients with chronic and acute conditions through telehealth technologies.

On the other hand, collaborative capabilities are particularly important in distant provision of care where room for mistakes is minimal. Readiness to develop collaborative capabilities has been defined as a likelihood that GPs‘ will develop both necessary unidisciplinary and cross-disciplinary collaborative skills that will enable them to become capable to engage with key cross-disciplinary telehealth providers in order to enhance health outcomes of chronically and acutely ill distant patients. There are some concerns that remote care will lead to reduced clinical interactions and have a negative impact on one‘s professional autonomy (Audet, Squires and Doty, 2014; Wright et al. 2010) which is likely to be viewed negatively by clinicians (Gagnon et al. 2014; Lapointe and Rivard, 2005). However, the expected likelihood is that once these concerns are fully addressed, GPs and other practitioners will be a lot more inclined to pursue cross-disciplinary telehealth collaborations.

Amongst all of the reviewed studies on telehealth acceptance, the most influential direct construct or predictor on clinician intentions to use telehealth technologies has been performance expectancy (Gagnon et al. 2014; Dunnebeil et al. 2012; Raymond et al. 2015) that originally came from the Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003) and which has also been adapted under different names. However, no study has targeted GPs' readiness to develop capabilities for distant telehealth medical services.

This thesis has introduced a novel direct predicting construct to suit telehealth from a management field's perspective. This is **Value Creation (VC)**, which theoretically reflects to a degree perceived usefulness from the Unified Theory of Acceptance and Use of Technology (UTAUT), however is unique in its telehealth context. According to Lepak, Smith and Taylor (2007, p.182) ―new value creation is a target user's subjective evaluation of the novelty and appropriateness of the new task, product, or service under consideration.

The greater the perceived novelty and appropriateness of the task, product, or service under consideration, the greater the potential use value and exchange value to the user" and GP community of practice. In support of GPs' readiness to develop telehealth capabilities, ***Value Creation*** is defined as potential and realisable tangible and intangible benefits that are likely to be derived from the utilisation of a particular skillset or newly introduced technological innovations for the purposes of enhancing and/or enabling one's occupational or cross-disciplinary capabilities, knowledge building, work effectiveness, efficiencies and credibility in one's operational environment or other settings. It can be evaluated through the Unified Theory of Acceptance and Use of Technology and community of practice theory. It may also in due course add value to novel knowledge applications and infrastructure capacities by making tacit knowledge more explicit (Hansen, 1999).

To move it off the ground successfully, according to field study results, the telehealth platform needs to provide GPs with adequate remuneration with clearly delineated service items and ongoing training and development opportunities (Raven, Butler and Bywood, 2013). Due to the close experiential encounters of practitioners from various disciplines, it is likely to provide direct and indirect learning opportunities (Blount and Gloet, 2015; Moffatt and Eley, 2010). It is also perceived that patient care could be planned more efficiently than conventionally due to integrated cross-disciplinary communication and collaboration (Gagnon et al. 2014; Rho, Choi and Lee, 2014).

Other advantages are faster patient diagnosis, monitoring and early intervention which may reduce re-hospitalisation (Andres et al. 2015; Bahous and Shadmi, 2016; Venter et al. 2012), prevention of unnecessary test duplications (Gagnon et al. 2014) and decrease of faults due to combined cross-disciplinary efforts and higher transparency (Dharmar et al. 2013). Besides, telehealth technologies designed for better coordination and integration have a potential to lead to GPs' paths to self-employment (Van Alstin, 2016) and cost efficient service provisions (Park et al. 2015). In essence, TAM states that the more positive the perceptions of usefulness (value creation) are, the more accepting a person is of that form of technology, and the more likely that they will comply with using it (Davis, 1989; Goodman, 2014). Therefore, the proposed hypothesis is:

H12: Value Creation (VC) has a positive relationship with GPs" Readiness to Develop Telehealth Capabilities (RDTC).

As mentioned above, this thesis also engages a mediating and a moderating factor.

5.5 Hypotheses concerning mediation relationships

The role of the direct predictor and mediator ‗Value Creation' (VC) has not been made explicit by literature yet. It is the only mediator in this proposed model. Similarly, the mediating role of VC between TTUC and RDTC; VC between KS and RDTC; VC between RM and RDTC; and VC between PM and RDTC cannot be explicitly found in the literature. Nevertheless, based on rational and independent literature assumptions (Barron and Kenny, 1986; Bollen and Stine, 1990; Hayes, 2009, 2013, 2017; Hayes and Rockwood, 2017, Holbert and Stephenson, 2003, Rucker et al. 2011; Stone and Sobel, 1990 and others) and field study support, this thesis creates hypotheses concerning mediating relationships between the above mentioned constructs. Consequently, hypotheses H2, H4, H7 and H10 are presented herein.

The mediating role of VC between TTUC and RDTC

Essential telehealth use considerations concerns that the telehealth platform needs to address are assurance of patient and clinician data security (Aleman et al. 2013; Dunnebeil et al. 2012), provision of widely accepted telehealth care protocols (Clarke et al. 2017; Keiser et al. 2016) and stable workload distribution mechanism (Blount and Gloet, 2015). These are seen as both opportunities not to be missed and strong facilitators of value for the successful running of the entire platform. According to field study results, once the above concerns are adequately addressed, other perceived benefits are likely to work in telehealth's favour. These are derived from clearly delineated Medicare items that GP clinicians can claim, improved access to and close GP encounters with specialists (Blount and Gloet, 2015; Moffatt and Eley, 2010); improved technological design and integration potentially leading to GP paths to self-employment (Van Alstin, 2016); reduction in unnecessary transfers including reduced rehospitalisation (Andres et al. 2015; Venter et al. 2012) and service cost efficiencies (Park et al.

2015). These are also likely to have a positively mediating impact between telehealth technology use considerations and GPs' readiness to develop necessary capabilities for telehealth medical services. Therefore, the following hypothesis is drawn.

H2: There is a positive relationship between telehealth technology use considerations (TTUC) and GPs" readiness to develop telehealth capabilities (RDTC) which is mediated by value creation (VC).

The mediating role of VC between KS and RDTC

Systems which focus on knowledge sharing are likely to be more innovative and enhanced performers (Zhou and Li, 2012). According to field study results, this alone represents enormous value to the concerned stakeholders particularly in telehealth care as long as the process and associated stakeholders' concerns are managed well, that is, the contributing clinicians and their patients are not worse off, legal and safety assurances are in place (Audet, Squires and Doty, 2014), and the ultimate aim is to safely deliver patient care and improve the quality of human life. According to field study results, under these circumstances, clinicians are prone to be motivated to share their knowledge given the appropriate opportunities and benefits that will compensate them for their knowledge and efforts. Their motivations are further facilitated by supporting organisational climate and opportunities to share knowledge and one's ability (Radaelli et al. 2014). Clinicians' motivation to participate in telehealth is also driven by improved access to specialists (Gillentine, 2012, Rheuban, 2013), close encounters from which they can benefit professionally in terms of enhanced experiences and knowledge building (Blount and Gloet, 2015), time and cost saving potential and ability to work remotely from almost any location through better designed and integrated services (Van Alstin, 2016). As a result of the above considerations, the following hypothesis is drawn:

H4: There is a positive relationship between knowledge sharing (KS) and GPs" readiness to develop telehealth capabilities (RDTC) which is mediated by value creation (VC).

The mediating role of VC between RM and RDTC

Relationships management represents the backbone of the proposed telehealth platform. According to field study results and literature (Brady et al. 2017; O'Reilly et al. 2017), each participating clinician's individual communication, collaboration, trust and commitment count when it comes to this cross-collaborative delivery of care. These are essential ingredients that clinicians depend on to deliver effective medical services from a distance. Therefore, communication needs to be uninterrupted and thus delivered through protected channels in order to ensure continuity of care (Brady et al. 2017).

According to field study results, collaboration and value produced from it are likely to be strengthened through regular inter-disciplinary meetings where respective disciplinary perspectives are openly discussed in the best interest of the patient and where clinicians share common interest in specific conditions (Macfarlane et al. 2004) which are likely to return positive experiential benefits and enhance teamwork outcomes. Trust in telehealth technologies, on the other hand can be enhanced through the provision of secured, reliable and transparent policy regarding the storing of data (Van Velsen, 2016) and close working relationships between doctors and IT professionals. Finally, clinicians supported by colleagues who are also actively engaged with the telehealth platform and those within larger practice networks (DesRoches et al. 2008) or those working in ―small, close-knit patient-centred" remote teams (Spencer et al. 2015, p. 389) are more likely to be committed to utilising telehealth. The above steps would also be accompanied by adequate remuneration, close experiential encounters and ready accessibility to appropriate services in addition to benefits of integration, improved patient outcomes and cost efficiencies. Thus, the following hypothesis follows:

H7: There is a positive relationship between relationship management (RM) and GPs" readiness to develop telehealth capabilities (RDTC) which is mediated by value creation (VC).

The mediating role of VC between PM and RDTC

Process management is the final essential operational element of the proposed telehealth service value network. It sums up key service delivery elements that were validated by the field study and which are also supported by relevant literature. Each respective element represents important value in itself that is essential for the successful delivery of remote care. These elements are simple and stable interoperable system with minimal interruption (Baig, Hosseini and Connolly, 2015); maintained secure and uninterrupted high quality broadband data speed (Hay, Lim and Wartena, 2012; Morrissey, 2016); properly curated patient health data (Artis et al. 2017; Gold et al. 2018); personalised remote patient support in the measurement of vital signs (Carlisle, 2012; Tang and Ricur, 2014); development of standard remote care protocols that may create new work routines (De Souza et al. 2017; Zanaboni and Wootton, 2012) and integrated collaborative treatment phases managed by doctors (Bentley et al. 2014; Kvedar, Coye and Everett, 2014). The above process elements can be utilised in remote care or as an extension to the current model in primary GP care. Furthermore, according to field study results, if clinicians are remunerated by adequate clearly delineated items and if the telehealth platform delivers close access to specialists, improved communication and other claimed benefits, clinicians are likely to change the status quo and develop the necessary capabilities to start utilising telehealth. Therefore, the final mediation hypothesis is drawn which states as follows:

H10: There is a positive relationship between process management (PM) and GPs"readiness to develop telehealth capabilities (RDTC) which is mediated by value creation (VC).

5.6 Hypothesis concerning moderating relationship

The role of moderating factors ‗Telehealth Enablers' (TE) has not been made explicit by literature yet. It is the only moderator in this proposed model. Likewise, the moderating role of TE between VC and RDTC cannot be explicitly found in the literature. Nevertheless, based on rational and independent literature assumptions (Baron and Kenny, 1986; Hayes, 2009; Hayes, 2013) and field study support, this thesis creates hypothesis concerning a moderating relationship between the above mentioned constructs. Consequently, hypothesis H13 is presented herein.

The moderating role of TE between VC and RDTC

Telehealth Enablers for the purpose of this thesis are represented through **individual** and **organisational** components. Any system including the proposed telehealth platform is only as valuable as it is useful, usable and satisfying (Zhang and Walji, 2011). Zhang and Walji (2011) have introduced the so called TURF model which explores the usability of electronic health record frameworks in a unified approach. These authors state that ―asystem is useful if it supports the work domain where the users accomplish the goals for their work, independent of how the system is implemented", it is ―usable if it is easy to learn, easy to use, and error-tolerant" and ―satisfying to use if the users have good subjective impression of how useful, usable, and likable the system is" (Zhang and Walji, 2011, p. 1057).

All of the above mentioned elements could be measured by how well the system accommodates GPs' user needs through appropriate system design. When it comes to technology, each individual GP practitioner has individual user needs which need to be addressed through appropriate system design (Zhang and Walji, 2011). Brewster et al. (2014) in fact have recognised ―the negative impact of service change, staff-patient interaction, credibility and autonomy, and technical issues" (p.21). Consequently, essential learning resources and technical support are seen as being crucial enablers (Gagnon et al. 2014; Brewster et al. 2014). It may be also worthwhile to purposefully target local patient chronic/acute conditions/needs that practitioners are facing increasing problems with as locally pressing chronic/acute conditions that GPs face with their patients are commonly shared concerns among GP community of practice and may act as both increasing drivers for the development of cross-disciplinary telehealth collaborative capacities as well as the uptake of associated support technologies (Klein, 2010; O'Sullivan, Stoddard and Kalishman, 2010).

In terms of organisational components, Rho, Choi and Lee (2014) have found that perceived value positively impacts doctors' intentions to utilise telehealth technologies, for which reasons it is also expected that these perceived values in the form of professional improvement advantages over GPs' current practice will also positively influence their readiness to develop telehealth capabilities.

Shaw et al. (2013) in a study on telemedicine adoption aimed at improvement in hypertension control have found ―other similar programs that support buy-in, adequate staff, and alignment with the existing site environment, improved patient outcomes, evidence-based understanding of the intervention, IT infrastructure and support and utilisation of existing equipment and space" to be positive enablers (Shaw et al. 2013, p.1). Consequently, sufficient availability of skilled and support health workforce (Shaw et al. 2013), provision of professional improvement advantages over current medical practice (Zhang and Walji, 2011) and provision of ongoing government legislative and funding support (Rho, Choi and Lee, 2014) are seen as strong organisational enablers to influence GPs' readiness to develop telehealth capabilities. Based on the above arguments, the final hypothesis states that:

H13: Telehealth Enablers (TE) moderate the relationship between Value Creation (VC) and GPs"Readiness to Develop Telehealth Capabilities (RDTC).

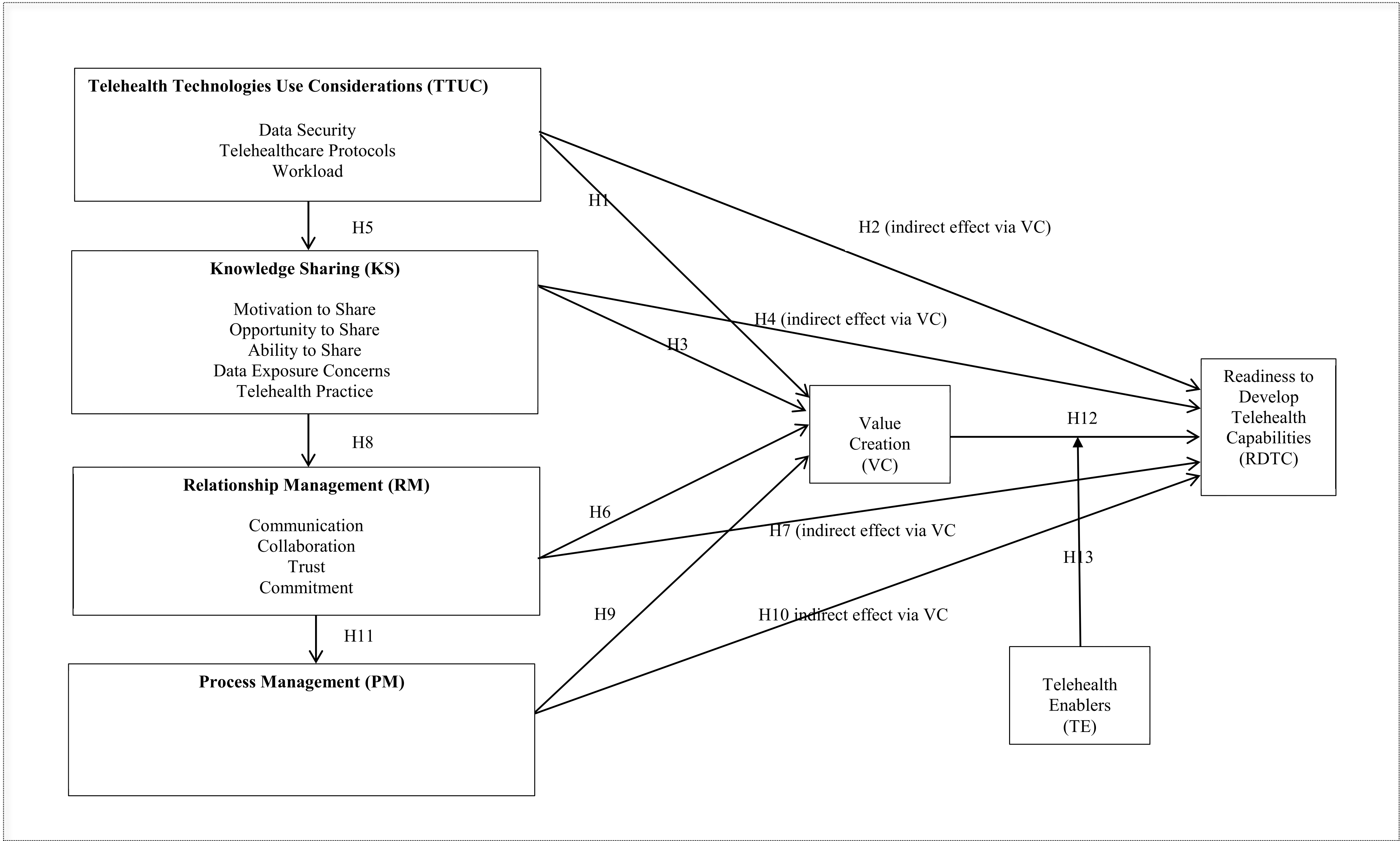
5.7 Summary of the hypotheses

In line with the above argumentation and literature grounding, 13 hypotheses have been developed which portray 13 links between the constructs, of which 8 direct links, 4 indirect mediating links and 1 moderating relationship. The following table shows all of the proposed hypotheses employed by this thesis whose proposed links are also visually depicted in the subsequent hypothesised model.

Table 32**:** Summary of the employed hypotheses

Hypothesis Number	Relationships	Hypothetical statement
H1	TTUC→VC	There is a positive relationship between telehealth technology use consideration and value creation.
H2	TTUC→ RDTC via VC	There is a positive relationship between telehealth technology use consideration and GPs‘ readiness to develop telehealth capabilities mediated by value creation.
H3	KS→VC	There is a positive relationship between knowledge sharing and value creation.
H4	KS→RDTC via VC	There is a positive relationship between knowledge sharing and GPs‘ readiness to develop telehealth capabilities mediated by value creation.
H5	TTUC→KS	There is a relationship between telehealth technology use consideration and knowledge sharing.
H6	RM→VC	There is a positive relationship between relationship management and value creation.
H7	RM→RDTC via VC	There is a positive relationship between relationship management and GPs‘ readiness to develop telehealth capabilities mediated by value creation.
H8	KS→RM	There is a relationship between knowledge sharing and relationship management.
H9	PM→VC	There is a positive relationship between process management and value creation.
H10	PM→RDTC via VC	There is a positive relationship between process management and GPs‘ readiness to develop telehealth capabilities mediated by value creation.
H11	RM→PM	There is a relationship between relationship management and process management.
H12	VC→RDTC	Value creation has a positive relationship with GPs‘ readiness to develop telehealth capabilities.
H13	VC→RDTC Moderated by TE	Telehealth enablers moderate the relationship between value creation and GPs‘ readiness to develop telehealth capabilities.

Figure 16: GPs' Readiness to Develop Telehealth Capabilities Hypothesised Model



This model came into being by considering key crucial issues that a service value network attempting to manage distant chronic and acute aged care conditions might face when considering GP practices and their cross-disciplinary interactions with other healthcare providers and stakeholders. Among these are importantly pathology, medical imaging and specialist practitioners who are interested in and enabled to serve distant chronic and acute conditions through telehealth technologies. The model rests on four key elements, namely; telehealth technology use considerations, knowledge sharing, relationship management and process management, which contain important dimensions. Telehealth technology use considerations element reflects some of the most concerning dimensions that concern physicians such as GPs as evident in literature. Knowledge Sharing is an important construct in telehealth adoption studies and represents key concerns and outcomes as regards a potential GP centred service value network in collaboration with other disciplines. Relationship management portrays most crucial elements of any interpersonal and/or interdisciplinary interactions or team-based activities, particularly in distant aged care settings where room for mistakes is minimal. Finally, process management represents the sum up of important elements that could lead to effective and integrated provision of care via telehealth technologies. Once the key concerns through interrelationships between the essential operational elements have been addressed it is believed that the cumulative effect is likely to positively influence ‗value creation', being one of the central drivers for technological uptake as a direct predictor. These are also likely to be directly influenced, that is mediated by value creation leading to the dependent variable or readiness to develop telehealth capabilities for distant medical services.

Communities of Practice Theory could show the likely impact of current practices on present-day developments and possibly indicate implications for further occurrences amongst GPs' and other practitioners (clinicians) in telehealth initiatives in the treatment of locally pressing distant aged care chronic and acute conditions. On the other hand, *the* Unified Theory of Acceptance and Use of Technology (UTAUT) could explain or even demonstrate GPs' readiness to develop telehealth capabilities and associated process results. Moreover, it could explain individual GP clinician's and discipline group behaviour, and its impact on the adoption or acceptance of particular telehealth technologies and technology-based healthcare services. In the case of the direct predicting element, namely; perceived usefulness used in the TAM model, the model in this study employs value creation as a direct predicting construct instead that is enriched with relevant items. On the other hand, the core purpose of the Communities of Practice Theory as pointed out by Lave and Wenger (1991) and Wenger (2015) is the engagement of members in a process of exchange of knowledge, experiences, norms and values, obtaining of skills and learning more from each other for the purpose of resolving significant problems and through these interactions developing each other's practices and consequently transforming communities of practice. Communities of practice theory has been widely utilised in medicine, education, policy making and other social segments and continues to be applied across various topics of interest and diverse disciplines. However, as fundamentally different developments start emerging, it is expected that the theory itself will need to adapt to the changing circumstances in which slowly but surely currently disparate disciplines expand their collaboration initiatives in order to survive as such or even merge and mould into newly created disciplines. Thus, a new and/or modified version of the communities of practice theory may emerge as a by-product and an essential requirement that explains ongoing evolving processes. To allow for new contributions, it may be necessary to explore the research phenomenon from completely different angles which may bring about multiple realities and deeper comprehensions of both causes and effects. Such an approach is possible when existing theories and emerging field data findings are combined. For that reason, the present study employs the multi-grounded theoretical approach (Axelsson and Goldkuhl, 2004), which is founded on the recognition of both knowledge from existing theories and empirical data. Novel developments may thus lead to the formation of *cross-disciplinary communities of practice theory* or even a *telehealthcare community of practice theory*.

While key theory utilised in this thesis is the Unified Theory of Acceptance and Use of Technology (UTAUT), this model is unique as it presents essential constructs in a service value network context particularly with GPs at the centre. This thesis has also utilised control dimensions of which three (gender, age and experience) are borrowed from the Unified Theory of Acceptance and Use of Technology Theory (Venkatesh et al. 2003).

While TAM uses only perceived usefulness and ease of use besides external variables construct, this model is enriched with telehealth technology use considerations, knowledge sharing, relationship and process management, direct predictor value creation in conjunction with telehealth enablers containing both individual and organisational components and control factors. Community of Practice theory (COP) on the other is directly involved throughout as GPs are one community of practice, however with interactions with other health practitioners a novel community of practice is likely such as a telehealth COP. This potential generation of a novel theory is enabled through the Multi-Grounded theoretical framework employed by the thesis. All four key elements in fact relate to change and learning processes occurring within a community whether one is at the centre or on a periphery of that community, which are key components of community of practice theory.

5.8 Control Factors' (CF) Role in Influencing RDTC

Role of Experience, Age and Gender

Experience factor in this thesis relates to the number of years or the length of time a GP has been in general practice, whereas ***Age*** and ***Gender*** are individual characteristics voluntarily supplied by each practitioner. Experience, Age and Gender have been adopted from the Unified Theory of Acceptance and Use of Technology by Venkatesh et al. (2003). Furthermore, studies have shown that user intention in fact predicts actual use, thus establishing a very positive correlation between the input and output (Osbourne and Clarke, 2008). According to Abrams, Burrill and Elsner (2018), virtual health care requires doctors to be additionally trained or retrained as consultations take place in a whole new setting to the way that they have been traditionally accustomed. This is recognised as a totally new domain and thus training and experience need to be formalised as these are essential to get it off the ground into the mainstream sector which inevitably influence the service design and workload, patient-doctor interaction patterns, addresses e-diagnosing, e-prescribing and data handling (Abrams, Burrill and Elsner, 2018). All of these elements are either directly or indirectly influencing the dependent variable as similarly demonstrated by the Unified Theory of Acceptance and Use of Technology (UTAUT). Furthermore, practitioners are likely to differ in terms of experience levels and/or experiential learning. Years spent in a particular practice by being exposed to particular technologies (Venkatesh et al. 2003) are likely to have an impact on individual practitioner's practice or routine clinical tasks. However, doctors with a shorter length of time and experience in a GP practice may be willing to try novel ways more readily than their older counterparts. In accordance with the above argumentation:

Length of time / experience in GP practice has an impact on readiness to develop telehealth capabilities.

In addition to experience, doctor's age, gender (Venkatesh et al. 2003) and specific role (Gagnon et al. 2014) might also contribute differently to the operationalisation of telehealth technologies in a telehealth network. Age is also likely to add to the complexity of adoption. Namely, younger GPs just coming out of college may be more inclined to explore novel options of care delivery as they are starting in a new career or have been in the field for only a few years as early career GPs. Whereas, older, more established practitioners who have been accustomed to certain ways of operating may be less inclined to change the status quo (Bresnick, 2015; Field Study, 2018; Muoio, 2019). According to Muoio (2019) study on telehealth adoption and utilisation, the most likely age group to utilise telehealth among health practitioners is the 35 to 44 year old physicians (77 % of respondents in a sample of 800 physicians), whereas those aged 55 and over are less inclined to do so (60% of respondents). Similarly, O‘Donnell et al. (2018) have concluded “younger, computer-literate primary care physicians, based in large/multi-group practices, were more likely to be positively inclined to EMR use than older physicians, less-skilled in technology use, based in solo practices” (p.1). Thus, the following may be stated in accordance with the above:

Age of a GP practitioner has an impact on readiness to develop telehealth capabilities.

Besides experience and age, the third control factor that is often used in studies as is in this one is gender. A very recent study by Albarrak et al. (2019) has reported findings on doctors‘ perceptions, level of knowledge and their willingness to adopt telemedicine in Saudi Arabia. Of the 391 respondents, 77% were males and 23% females. Most participants reported to have limited to medium levels of technological knowledge, and the overwhelming 77% recognised the ongoing need for training and 90% of respondents believing in time and cost saving potential through this delivery method. Furthermore, low experiential levels with telemedicine technologies were also reported with key concerns being privacy, equipment cost, absence of proper training and conversations among IT professionals and clinicians (Albarrak et al. 2019). Differences between genders in terms of adoption intention were however not reported. On the other hand, Hardyman et al. (2013) have explored differences between male and female trainee doctors in the use of smartphones for the purpose of accessing medical resources such as textbooks and other work-related materials. Of the 260 participants in this study, these authors have reported 80% usage by senior clinical members amongst whom males the most predominant user group of smartphones, whereas the most use of smartphones was reported by trainees in their first year due to enhanced responsibilities and limited experiential knowledge. Mobile technology has shown to be used for both simple data searching purposes as well as complex clinical problems and procedures. In accordance with the above empirical findings, it may be stated that:

Gender of a GP practitioner has an impact on readiness to develop telehealth capabilities.

5.9 Development of the Survey for the Quantitative Phase

For the purpose of data collection in the final and quantitative phase, a quantitative survey instrument that is in line with applicable literature, theoretical and empirical grounding needed to be developed. The survey and its accompanied documentation prior to data collection were approved by the UTS Human Research Ethics Committee. Its full contents are shown in the appendix section of this thesis.

5.9.1 Quantitative Survey Overview

Since early beginnings and survey planning phase, important attention was given to the selection of appropriate items that would address each construct and sub-construct of the proposed model. In order to ensure reliability and validity of the measurement model, several items were taken into consideration. The process started with an extensive review of applicable literature in relation to previously tested and empirically grounded survey instruments in the field of telehealth. This step was useful in pointing out to any items that could potentially be either adapted completely or modified where appropriate to suit the context of this project. If no items could be either adapted or modified, then novel items were to be developed in order to validly represent individual constructs and sub-constructs of the proposed framework.

Moreover, items prepared for the qualitative phase were also reviewed and considered for inclusion into the final survey for the purpose of strengthening its validity. Following these steps, the survey was then pre-tested in order to ensure further refinement where needed. The pre-testing procedure was presented in chapter three. Based on the field study and discussions with the experts in the field, the conceptual model as derived from literature was fine tuned. Finally, the refined research model of this study was comprised of 67 in addition to 8 demographic items. This final version of the survey became available for data collection and testing of the developed hypotheses presented in figure 12 at the end of the previous chapter. The survey is divided into eight sections. As mentioned, it consists of 67 items and 8 demographic closed-ended questions. A five-point Likert scale has been utilised for this purpose, giving the respondents multiple options to express their views (Blumberg, Cooper and Schindler, 2008; Zikmund et al. 2013). The introductory section includes definition of telehealth medical services and demographic items. This is followed by survey instructions for the forthcoming statements. Section two includes the first essential operational element – telehealth technology use consideration (higher order construct) of the proposed model with its three sub-constructs (data security, telehealthcare protocols and workload). Section three includes the second essential operational element – knowledge sharing with its sub-components (motivation to share, opportunity to share, ability to share, data exposure concerns and telehealth practice). Section four includes the third essential operational element – relationship management with its sub-constructs (communication, collaboration, trust and commitment). Section five sums up key telehealth service delivery process management steps, which is the fourth essential operational element of the proposed model. Section six represents the direct predicting construct – value creation with its items. Section seven is comprised of both general practitioners‘ individual and organisational enablers. Finally, section eight represents the dependent variable: readiness to develop telehealth capabilities through both technical and collaborative elements. Following these eight sections, the last stand-alone question posed to the respondents regarding expected timing for their readiness ends the survey.

5.9.2 Development of the survey instrument

As introduced above, the survey contains in total 67 items and 8 demographic closed-ended questions. Of the 67 items in the main section of the survey, all of them were reflective in accordance with the guiding rules recommended by Jarvis, MacKenzie and Podsakoff (2003) and operationalised as such. These guiding rules are explained in detail in the methodology chapter on page 138.

5.9.3 Survey instrument introductory section: demographics

Demographic dimensions were approached through a number of direct closed-ended questions for ease and speed of responding. These included: 1) the number of years in general practice by the responding GP; 2) affirmation or negation of health care home practitioner status; 3) age group; 4) gender; 5) awareness of existence of Medicare items in collaborative telehealth consultations in aged care; 6) affirmation or negation of usage of telehealth services; 7) affirmation or negation of aged care facilities‘ visits and if yes 8) confirmation or negation of the usage of telehealth facilities in aged care. Table 33 below shows all of the demographic dimensions employed by the survey instrument.

Table 33**:** Demographic dimensions

Item	Dimension	Measure
1	Number of years in general practice	0-5; 6-10; 11-15- 16-20; 21-25; 26-30; 31-35; 36+ years
2	Home health care practitioner status	Yes or No tick
3	Age group	25-34; 35-44; 45-54; 55-64; 65+ years of age
4	Gender	Male or Female
5	Awareness of Medicare items for collaborative telehealth consultation in aged care	Yes or No tick
6	Usage of telehealth services	Yes or No tick
7	Visits of aged care facilities	Yes or No tick
8	Usage of telehealth facilities in aged care facilities	Yes or No tick

As shown above, all of the demographic questions are represented by numeric values.

5.9.4 Survey instrument section two: telehealth technology use considerations (TTUC) elements

The aim of this segment of the survey was identification and measurement of telehealth technology use considerations elements through its sub-constructs: a) data security; b) telehealthcare protocols and c) workload. A five-point Likert scale was developed for this purpose with the following values: 1) strongly disagree; 2) agree; 3) neutral; 4) agree and 5) strongly agree. Every single item was evaluated against a reflective item measurement criteria recommended by Jarvis, MacKenzie and Podsakoff (2003) because the direction of causality is from constructs to items and items are manifestations of the concerned construct. Additionally, items are interchangeable and correlated with one another (Chin, 1998; Jarvis, MacKenzie and Podsakoff, 2003). These items are presented in table 34.

Data security refers to needs to safeguarded patient and GP data prior to any telehealth network building steps, during implementation, use and reuse and storage archival processes in order to preserve care quality, lower errors and improve transparency (Kumar, Durai & Vinotha, 2013). Data security measures were items (DS1 to DS3): total security of all patient/GP data; patient rights to withhold data & patient personal identity which must be linked only through secured authorised codes. These were amended from Wilkowska and Ziefle, (2012, p. 194) and also supported by previously reviewed and covered literature (Aleman et al. 2013; Caldicott, 2013; Dunnebeil et al. 2012, p. 754; Daker-White et al. 2015; Entzeridou, Markopoulou & Mollaki, 2018; Huang, Lee & Lee, 2011; Naeme, 2014; Jin, 2011; Raven, Butler and Bywood, 2013). The mentioned items were afterwards also validated through empirical interview findings.

Telehealthcare protocols are the necessary prerequisites and essential factors that guide users, and particularly practitioners and patients as protocols provide direction, clarify roles and accountabilities in relation to various aspects of the use of telehealth technologies. These were measured with items (PR1 to PR3): telehealth protocols must provide clarity in relation to GPs�``‘`` roles; telehealth protocols must clearly specify practitioner accountabilities before, during and after service delivery & cross-disciplinary care should be physician-led (Clarke et al. 2017; French et al. 2013; Gollnick et al. 2013; May et al. 2011; Keijser et al. 2016; Page, 2003; Rufo, 2012; Van Wormer et al. 2012). Items PR1 and item PR2 were derived from empirical field study interview findings. Importantly, all items also found support in applicable literature review and have been contextualised for the purpose of this project (view table 34 for more details). Moreover, no article in the literature could be found that has measured essential organisational protocols in evolutionary telehealthcare delivery nor its inevitable impact on practitioners‘ workload.

Workload relates to the amount of work assigned or accumulated in the course of provision of planned and/or unplanned clinical as well as non-clinical activities for the purposes of carrying out telehealth and other ongoing medical services. Workload was measured with items (W1 to W4): telehealth will negatively affect the conventional care delivery through reduced visits; telehealth will enable GP practitioners to work from any location; any telehealth platform needs to ensure stable workload distribution & telehealth services that are time efficient will help me manage my workload (Blount and Gloet, 2015; 2017; Brewster et al. 2014; Raven, Butler and Bywood, 2013; Kruse et al. 2017; Rosenzweig and Baum, 2013; Van Alstin, 2016; Varty, O'Neill and Hambley, 2017).

All of the items drew their support from literature. It also needs to be said that all of the items were supported by field study findings besides literature and were contextualised in line with empirical findings for the project at hand. All of the above introduced items went through a comparison phase with empirical interview data to validate their relevance.

Table 34**:** Telehealth technology use consideration (TTUC) items and relevant statements

Item	Variable	Statement	References	Explanation
DS1	Data security protection	Total security of all patient/GP data must be legislated	Wilkowska and Ziefle (2012, p. 194); Aleman et al. (2013); Caldicott (2013); Dunnebeil et al. (2012); Daker-White et al. (2015); Entzeridou, Markopoulou & Mollaki (2018); Hsu, Lee and Su (2013); Naeme (2014); Field study.	Amended from Wilkowska and Ziefle (2012, p. 194) and supported by the referred sources in other context as well as findings from the qualitative field study.
DS2	Patient rights	Patients must have rights to withhold data	Wilkowska and Ziefle (2012, p. 194); Hsu, Lee and Su (2013); Jin (2011); Raven, Butler and Bywood, (2013); Field study.	
DS3	Patient identity	Patient data must only be linked to personal identity through secured authorised codes	Wilkowska and Ziefle (2012, p. 194); Aleman et al. (2013); Caldicott (2013); Huang, Lee & Lee (2011); Hsu, Lee and Su (2013); Field study.	
PR1	Protocols' clarity	Telehealth protocols must provide clarity in relation to GPs' roles	New item derived from field study.	These items have not been measured in telehealth context. The
PR2	Practitioner accountability	Protocols must clearly specify practitioner accountabilities	New item derived from field study.	

		before, during and after service delivery		measurement items have been developed from the referred sources in other context as well as findings from the qualitative field study.
PR3	Cross-disciplinary care	Cross-disciplinary care should be physician-led	Clarke et al. (2017); Keijser et al. (2016); Page (2003); Rufo (2012); Field study.	
W1	Conventional care delivery	Telehealth will negatively affect conventional care delivery through reduced visits	Rosenzweig and Baum (2013); Van Alstin (2016); Field study.	
W2	Work location	Telehealth will enable GP practitioners to work from any location	Blount and Gloet (2015; 2017); Brewster et al. (2014); Van Alstin (2016); Varty, O'Neill and Hambley (2017); Field study.	
W3	Workload distribution	Any telehealth platform needs to ensure stable workload distribution	Blount and Gloet (2017); Brewster et al. (2014); Field study.	
W4	Time efficiency	Telehealth services that are time efficient will help me manage my workload	Kruse et al. (2017); Raven, Butler and Bywood (2013); Field study.	

DS=Data Security; PR=Telehealthcare Protocols; W=Workload

5.9.5 Survey instrument section three: knowledge sharing (KS) elements

The aim of this segment of the survey was identification and measurement of knowledge sharing elements through its sub-constructs: a) motivation to share; b) opportunity to share; c) ability to share; d) data exposure concerns and e) telehealth practice. Every single sub-construct with its items were evaluated against a reflective item measurement criteria as recommended by Jarvis, MacKenzie and Podsakoff (2003, p. 203) because “the direction of causality is from constructs to items and items are manifestations of the concerned construct”. Additionally, items are interchangeable and correlated with one another. Their theme is common and the items contain vey related content. Thus removing one of the items would not change the theoretical domain of the represented construct (Chin, 1998; Jarvis, MacKenzie and Podsakoff, 2003). These items are presented in table 35.

Motivation to share is an important prerequisite for any knowledge sharing activity whether it is at individual or organisational level. Motivation could directly influence the performance of an organisation or an individual (MacInnis, Moorman and Jaworski, 1991) and may also often act as a direct predictor of one‘s behavioural intention whereas opportunity and ability to share are moderating elements (Olander and Thogersen, 1995). Motivation to share was measured with items (MOT1 to MOT3): I intend to frequently share my knowledge/working experiences electronically with my colleagues; I will always give my knowledge to those who ask for it & I will always try to give my knowledge to others in the most efficient way possible (Bock et al. 2005; Hsu et al. 2007; Radaelli et al. 2014). These survey items were borrowed from Radaelli et al. (2014) with some modifications, that is, with the addition of the word ‗electronically‘ in them to reflect electronic knowledge sharing or telehealth context. They were also validated through empirical field study and its findings.

Opportunity to share as mentioned above, often acts as a moderator to motivation however without which sharing cannot take place, as both are essential elements. It was measured with items (OPP1 to OPP3): I can devote enough time to sharing my knowledge electronically; the climate in my organisation allows me to easily share my knowledge electronically; the climate in my organisation facilitates informal meetings where knowledge is shared (Bock et al. 2005; Hsu et al. 2007; Radaelli et al. 2014). In the same context as motivation to share, these items were borrowed from Radaelli et al. (2014) who also borrowed them from Bock et al. (2005) and Hsu et al. (2007) and they were once again validated through empirical interview data in a telehealth context.

Ability to share represents one‘s ability to apply a set of skills and/or utilise available technologies or other tools with those skills with the purpose of sharing information or knowledge. It is similarly to opportunity to share an important moderator to motivation as well as a directly affecting element influencing one‘s behavioural intention or behaviour. Its items were likewise borrowed from the same model by Radaelli et al. (2014) and were also earlier developed by Armitage and Connor (1999), thus having a long grounding in literature. The first two items added the word ‗electronically‘ whereas the third item was used as is in the original model developed by its authors. Its items in this project are (ABIL1 to ABIL3): I am fully capable of sharing my knowledge electronically with others at any time; if it depended on me, I would exhaustively share my knowledge electronically; & I am fully capable of articulating my knowledge in written or spoken form (Armitage and Connor, 1999; Radaelli et al. 2014). Once again, these were validated previously by other studies (Armitage and Connor, 1999; Radaelli et al. 2014) and by the field study in this project.

Data exposure concerns have been defined for the purpose of this thesis as concerns related to patient safety, potential legal and performance expectation issues. They can also be defined as a probability of danger through negative outcomes on ―physical, economic, personal, time, social, performance and privacy risk" (Wang and Li, 2010, p. 2956) and expected loss ―if consequences of an act were not favourable, and the individual subjective feeling of certainty that the consequences will be unfavourable" (Cunningham, 1967, p.37). No scale items could be found that have measured data exposure concerns. This sub-construct was measured with items (DEC1 to DEC3): misuse of electronic health records may threaten patient safety; electronic data might not meet expectations in terms of patient outcomes; & legal issues resulting from the use of telehealth may be serious (Anderson, 2010, p.1; Byrne, 2010; Greenhalgh et al. 2010; Cocosila and Archer, 2017; Featherman and Pavlou, 2003; Featherman, Valacich and Wells, 2006; Greenhalgh et al, 2010a; Greenhalgh et al. 2010b; Hsieh, 2015; Lim, 2003; Martins, Oliveira and Popovic, 2014). DEC3 was derived from field study. The items also went through both literature and empirical grounding processes to be validated prior to the beginning of quantitative data collection.

Telehealth practice refers to ‗remote medical practice' through various telehealth and telemedical services which is still in its infancy and which is not seen as responsible as a conventional delivery of care. Scale items that measure telehealth practice do not exist yet. For that reason, negotiations need to take place among various medical professions to develop new understandings in how it may be used properly and without causing any harm (Smith et al. 2008).

This sub-construct was measured with items (TP1 to TP3): TP1: new approaches addressing competition between GPs and specialists must be negotiated (which was derived from the field study); TP2: new approaches addressing clinical autonomy must be negotiated; & TP3: GPs should have legislated rights to freely choose the type of care delivery for each patient (Audet, Squires and Doty, 2014). This sub-construct besides literature grounding also underwent empirical field study grounding to ensure its validity prior to the quantitative data collection process. Table 35 details the knowledge sharing essential operational element with all of its items and their sources.

Table 35: Knowledge sharing (KS) items and relevant statements

Item	Variable	Statement	References	Explanation
MOT1	Knowledge / working experience	I intend to frequently share my knowledge/working experiences electronically with my colleagues	Radaelli et al. (2014); Bock et al. (2005); Hsu et al. (2007); Field study.	Adapted from Radaelli et al. (2014, p. 414)
MOT2	Share with those who ask	I will always give my knowledge to those who ask for it	Radaelli et al. (2014); Bock et al. (2005); Hsu et al. (2007); Field study.	Adapted from Radaelli et al. (2014, p. 414)
MOT3	Sharing efficiency	I will always try to give my knowledge to others in the most efficient way possible	Radaelli et al. (2014); Bock et al. (2005); Hsu et al. (2007); Field study.	Adapted from Radaelli et al. (2014, p. 414)
OPP1	Time sufficiency	I can devote enough time to sharing my knowledge electronically	Radaelli et al. (2014); Bock et al. (2005); Hsu et al. (2007); Field study.	Adapted from Radaelli et al. (2014, p. 414)
OPP2	Organisational approval	The climate in my organisation allows me to easily share my knowledge electronically	Radaelli et al. (2014); Bock et al. (2005); Hsu et al. (2007); Field study.	Adapted from Radaelli et al. (2014, p. 414)
OPP3	Informal sharing	The climate in my organisation facilitates informal meetings where knowledge is shared	Radaelli et al. (2014); Bock et al. (2005); Hsu et al. (2007); Field study.	Adapted from Radaelli et al. (2014, p. 414)
ABIL1	Sharing capability	I am fully capable of sharing my knowledge electronically with others at any time	Radaelli et al. (2014); Armitage and Connor (1999); Field study.	Adapted from Radaelli et al. (2014, p. 414)
ABIL2	Exhaustive sharing	If it depended on me, I would exhaustively share my knowledge electronically	Radaelli et al. (2014); Armitage and Connor (1999); Field study.	Adapted from Radaelli et al. (2014, p. 414)
ABIL3	Written & spoken	I am fully capable of articulating my	Radaelli et al. (2014); Armitage	Adapted from Radaelli

	capability	knowledge in written or spoken form	and Connor (1999); Field study.	et al. (2014, p. 414)
DEC1	Misuse of records	Misuse of electronic health records may threaten patient safety	Anderson (2010); Byrne (2010); Greenhalgh et al. (2010); Field study.	These items have not been measured in telehealth context. The measurement items have been developed from the referred sources in other context as well as findings from the qualitative field study.
DEC2	Patient outcomes	Electronic data might not meet expectations in terms of patient outcomes	Cocosila and Archer (2017); Featherman and Pavlou (2003); Featherman, Valacich and Wells (2006); Greenhalgh et al. (2010a); Greenhalgh et al. (2010b); Hsieh (2015); Lim (2003); Field study.	
DEC3	Legal issues	Legal issues resulting from the use of telehealth may be serious	New item derived from field study.	
TP1	Competition with specialists	New approaches addressing competition between GPs and specialists must be negotiated	New item derived from field study.	
TP2	Clinical autonomy	New approaches addressing clinical autonomy must be negotiated	Audet, Squires and Doty (2014); Field study.	
TP3	GPs legislated rights	GPs should have legislated rights to freely choose the type of care delivery for each patient	Audet, Squires and Doty (2014).	

MOT=Motivation to Share; OPP=Opportunity to Share; ABIL=Ability to Share; DEC=Data Exposure Concerns; TP=Telehealth Practice

5.9.6 Survey instrument section four: relationship management (RM) elements

The aim of this segment of the survey was identification and measurement of relationship management elements through its sub-constructs: a) communication; b) collaboration; c) trust; & d) commitment. No article in the literature could be found that has measured electronic communication, collaboration, trust and commitment amongst doctors. As was the case with the previous elements, in this section as well, every single sub-construct with its items was evaluated against a reflective item measurement criteria as recommended by Jarvis, MacKenzie and Podsakoff (2003, p. 203) because ―the direction of causality is from constructs to items and items are manifestations of the concerned construct". Additionally, items are interchangeable and correlated with one another. Their theme is common and the items contain vey related content. Thus removing one of the items would not change the theoretical domain of the represented construct (Chin, 1998; Jarvis, MacKenzie and Podsakoff, 2003). These items are presented in table 36.

Communication underpins every human and non-human interaction and activity. While it can be both spoken and written, verbal and non-verbal, cable and wireless, visible and invisible, it truly is a never-ending phenomenon. For the purpose of this thesis, communication is viewed through the lenses of GPs' and the clinicians that they formally interact with either verbally or in a written form in an alleged telehealth value network. According to Page (1984, p. 50) ―proper ***communication***' is a process ‗of achieving a fully reciprocal understanding between two (or more) people" In this process, ―one person (the sender) has to turn his thoughts or intentions into words (written or oral) which he intends to communicate to the other" (p.50).

It has been measured with items (COM1 to COM3): secure messaging channels between clinicians are essential; secure messaging channels between clinicians will ensure a continuous feedback loop; & patients must be clearly informed in decision making during their ongoing care (Cronin et al. 2015; Brady et al. 2017; Hoonakker, Carayon & Cartmill, 2017; Knight et al. 2016; Raghu et al. 2015; Rees and Williams, 2009; Shenson et al. 2016; Shimada et al. 2017; Sieck et al. 2017). All of the above items except COM1: ‗*secure messaging channels between clinicians is essential*' which originated from the field study were besides literature grounding also validated through empirical field study findings.

Collaboration is a crucial component of any teamwork activity particularly in the process of medical care in order to ensure effective and safe delivery. According to O'Leary et al. (2017), this is particularly important in the delivery of distant care by cross-disciplinary teams such as telehealth medical services which are by default cross-disciplinary and where practitioners may be as dispersed as the patients being cared for and where professional divisions prevail. Collaboration has been measured with items (COL1 to COL3): regular interdisciplinary meetings will improve collaboration; GPs' interest in a specific chronic condition will enhance ties; & Inter-disciplinary teams need to be resources well to effectively collaborate (O'Leary et al. 2017; O'Reilly et al. 2017). Besides literature, these items were also evaluated and validated through qualitative field study findings.

Trust plays an indispensable key role in the successful realisation of telehealth initiatives among cross-disciplinary practitioners. Trust is multidimensional however this thesis has adopted the following widely cited definition. Trust is ―a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviour of another" (Rousseau et al. 1998, p. 395). It has been measured with the following items (T1 to T3): telehealth will affect my ability to make an immediate relevant physical assessment; telehealth may cause deterioration of patient trust relating to physical assessment information; & telehealth introduces new negotiated approaches to trust between medical and IT professionals (May et al. 2011; Kayyali et al. 2017; Rousseau et al. 2008). The first two items were derived from the field study. Trust items have also been validated in literature.

Commitment particularly cross-disciplinary commitment has not been defined by literature, however organisational commitment which can be normative, affective and continuance based (Meyer et al. 2012) has been defined. According to Mowday, Steers and Porter (1979, p.226) ―organisational commitment is a relative strength of an individual‘s identification with and involvement in a particular organisation". Based on the principles of communities of practice theory (Lave and Wenger, 1991) practitioners are likely to become more prepared to commit to developing telehealth capabilities when their unidisciplinary or cross-disciplinary colleagues utilise telehealth technologies (Keijser et al. 2016; McKenzie and Williamson, 2016; Morilla et al. 2017; Saleh et al. 2016; Uscher-Pines and Mehrotra, 2017) in the provision of care.

Commitment was measured with items (CT1 to CT3): I have a strong desire to work with small, close-knit patient-centred teams; regular collegial support will maintain my positive commitment levels; & active telehealth engagement by colleagues will positively influence my commitment levels (Blount and Gloet, 2015; 2017; Keijser et al. 2016; McKenzie and Williamson, 2016; Morilla et al. 2017; Saleh et al. 2016; Spencer et al. 2015; Uscher-Pines and Mehrotra, 2017; Vassilev et al. 2015). CT3 was derived from the field study whereas CT1 and CT2 originated from the referred literature. The items are also supported by literature. Table 36 portrays all of the items with their sources.

Table 36**:** Relationship management (RM) items and relevant statements

Item	Variable	Statement	References	Explanation
COM1	Secure messaging	Secure messaging channels between clinicians are essential	New item derived from field study.	These items have not been measured in telehealth context. The measurement items have been developed from the referred sources in other context as well as findings from the qualitative field study.
COM2	Continuous feedback loop	Secure messaging between clinicians will ensure a continuous feedback loop	Cronin et al. 2015; Brady et al. (2017); Hoonakker, Carayon & Cartmill (2017); Raghu et al. (2015); Shenson et al. (2016); Shimada et al. (2017); Sieck et al. (2017); Field study.	
COM3	Decision making	Patients must be informed in decision making during their ongoing care	Rees and Williams (2009); Field study.	
COL1	Interdisciplinary meetings	Regular inter-disciplinary meetings will improve collaboration	O'Leary et al. (2017); O'Reilly et al. (2017); Field study.	
COL2	Chronic conditions	GPs' interest in a specific chronic condition will enhance ties	O'Leary et al. (2017); O'Reilly et al. (2017); Field study.	
COL3	Interdisciplinary resources	Inter-disciplinary teams need to be well resourced to effectively collaborate	O'Leary et al. (2017); O'Reilly et al. (2017); Field study.	
T1	Physical assessment	Telehealth will affect my ability to make an immediate relevant physical assessment	New item derived from field study.	
T2	Patient trust	Telehealth will cause deterioration of patient trust relating to physical assessment	New item derived from field study.	

T3	Medical & IT professionals negotiated approach	Telehealth introduces new negotiated approaches to trust between medical and IT professionals	May et al. (2011); Field study.	
CT1	Small close-knit teams	I have a strong desire to work with small, close-knit patient-centred teams	Spencer et al. (2015, p. 389); Field study.	
CT2	Collegial support	Regular collegial support will maintain my positive commitment levels	Keijser et al. (2016); McKenzie and Williamson (2016); Morilla et al. (2017); Saleh et al. (2016); Uscher-Pines and Mehrotra (2017); Field study.	
CT3	Collegial engagement	Active telehealth engagement by colleagues will positively influence my commitment	New item derived from field study.	

COM=communication; COL=collaboration; T=trust & CT=commitment

5.9.7 Survey instrument section five: process management (PM) elements

No article in the literature could be found that has either, dealt with, nor developed process management scale items in telehealth adoption. The aim of this segment of the survey was identification and measurement of process management steps through key elements derived from its sub-constructs: a) effective interoperability; b) speed of quality data at the point of care; c) productivity; d) routinisation & e) integrated care. As was the case with the previous elements, in this section as well, every single item was evaluated against a reflective item measurement criteria as recommended by Jarvis, MacKenzie and Podsakoff (2003, p. 203) because "the direction of causality is from constructs to items and items are manifestations of the concerned construct". Additionally, items are interchangeable and correlated with one another. Their theme is common and the items contain vey related content. Thus removing one of the items would not change the theoretical domain of the represented construct (Chin, 1998; Jarvis, MacKenzie and Podsakoff, 2003). These items are presented in table 37.

Effective interoperability consists of both one‘s computer self-effectiveness and interoperability of systems & applications. It was measured by the item (PM1): a simple/stable interoperable system with minimal interruption should be used (Baig, Hosseini and Connolly, 2015). Speed of quality data at the point of care may be defined as a value adding process to clinical coordination and integration of care through accurate, crucial patient data and information distribution to the right clinician/s or treating practitioner and/or patient healthcare treating team at the right speed, right time and amount of data & at the right point of care. It was measured by the items (PM2 and PM3): secure/uninterrupted high quality broadband speed needs to be maintained & patient health data must be curated properly to prevent falsely presented information (Artis et al. 2017; Gold et al. 2018; Hay, Lim and Wartena, 2012; Morrissey, 2016; Mosa, Yoo and Sheets, 2012; Rathore et al. 2018).

Productivity in a healthcare context may be defined as output outcomes or benefits gained through the effective engagement process of available resources and stakeholder efforts in the delivery of medical care to patients. It was measured by the item (PM4): personalised remote patient support in the measurement of vital signs needs to be provided (Carlisle, 2012; Tang and Ricur, 2014; Boehm, Muehlberg and Stube, 2015). Furthermore, routinisation or routine practice may be defined as a clinical methodology underpinned by ingrained characteristics of healthcare practitioners that they have willingly adopted and are readily utilising in their everyday practice for the purpose of medical service delivery to their patients. It was measured by the item (PM5): development of standard remote care protocols may create new work routines (De Souza et al. 2017; Zanaboni and Wootton, 2012).

And finally integrated health care has been defined as ―a client-centred model of care provided by a team of biomedical, allied and complementary health professionals, who work collaboratively and respectfully to deliver accessible, holistic, evidence-based, personalised, coordinated care that emphasises disease prevention and health, healing and wellness promotion" (Leach et al. 2018, p.55). It was measured by the item (PM6): integrated collaborative treatment phases need to be managed by physicians. In relation to all of the above described process management steps, it is important to state that each and every one were validated first in literature and then in detail in every single interview with GP respondents, thus these key telehealth service delivery process elements are expected to provide high validity and reliability in the proposed model. Table 37 below lists all of the process management items with their sources.

Table 37**:** Process management (PM) items and relevant statements

Item	Variable	Statement	References	Explanation
PM1	Interoperability	A simple/stable interoperable system with minimal interruption should be used	Baig, Hosseini and Connolly (2015); Field study.	These items have not been measured in telehealth context. The measurement items have been developed from the referred sources in other context as well as findings from the qualitative field study.
PM2	Uninterrupted data speed	Secure/uninterrupted high quality broadband data speed needs to be maintained	Hay, Lim and Wartena (2012); Morrissey (2016); Mosa, Yoo and Sheets (2012); Rathore et al. (2018); Field study.	
PM3	Curated data	Patient health data must be curated properly to prevent falsely presented information	Artis et al. (2017); Gold et al. (2018); Field study.	
PM4	Productivity	Personalised remote patient support in the measurement of vital signs needs to be provided	Carlisle (2012); Tang and Ricur (2014); Boehm, Muehlberg and Stube (2015); Field study.	
PM5	Routinisation	Development of standard remote care protocols may create new work routines	De Souza et al. (2017); Zanaboni and Wootton (2012); Field study.	
PM6	Integrated care	Integrated collaborative treatment phases need to be managed by physicians	Bentley et al. (2014); Kvedar, Coye and Everett (2014); Kivekas et al. (2016); Field study.	

PM1=process management element 1; PM2=process management element 2; PM3=process management element 3; PM4= process management element 4; PM5=process management element 5; PM6=process management element 6

5.9.8 Survey instrument section six: value creation (VC) elements

The objective of this segment of the survey was identification and measurement of value creation elements through key elements as perceived from GPs‘ angle or perspective. No article in the literature could be found that has developed or tested value creation scale items. This construct represents a directly predicting construct predicting the dependent variable: GPs‘ readiness to develop telehealth capabilities (RDTC), which also serves as a mediator between the above introduced key elements of the proposed model and the dependent variable, namely; telehealth technology use consideration (TTUC), knowledge sharing (KS), relationship management (RM) and process management (PM).

As was the case with the previous constructs, in this section as well, every single item was evaluated against a reflective item measurement criteria as recommended by Jarvis, MacKenzie and Podsakoff (2003, p. 203) because ―the direction of causality is from constructs to items and items are manifestations of the concerned construct". Additionally, items are interchangeable and correlated with one another. Their theme is common and the items contain vey related content. Thus removing one of the items would not change the theoretical domain of the represented construct (Chin, 1998; Jarvis, MacKenzie and Podsakoff, 2003). These items are presented in table 38.

Value creation for the purposes of this project has been defined as potential and realisable tangible and intangible benefits that are likely to be derived from the utilisation of a particular skillset or newly introduced technological innovations for the purposes of enhancing and/or enabling one‘s occupational or cross-disciplinary capabilities, communication, knowledge building, work effectiveness, efficiencies and credibility in one‘s operational environment or other settings. Value creation was measured by the items (VC1 to VC6): telehealth will provide GPs with clearly delineated Medicare items; telehealth will provide close experiential encounters with other healthcare practitioners; telehealth technologies designed for better integration will lead to GP paths to self-employment; telehealth will provide improved access to specialists; telehealth will reduce unnecessary patient transfers including reduced rehospitalisation & telehealth will provide cost efficient services (Andres et al. 2015; Bahous and Shadmi, 2016; Blount and Gloet, 2015; Moffatt and Eley, 2010; Park et al. 2015; Van Alstin, 2016; Venter et al. 2012).

It is important to state that the first measurement item (VC1) and fifth item (VC5) originated from qualitative field study findings in line with identified literature gaps. All of the other items have individually been grounded in literature as well as through every single qualitative interview with GP respondents thus they are expected to provide high reliability and validity in the final model. Table 38 below shows all of the mentioned items with their descriptions and sources.

Table 38: Value Creation (VC) items and relevant statements

Item	Variable	Statement	References	Explanation
VC1	Medicare items	Telehealth will provide GPs with clearly delineated Medicare items	New item derived from field study.	These items have not been measured in telehealth context. The measurement items have been developed from the referred sources in other context as well as findings from the qualitative field study.
VC2	Close encounters	Telehealth will provide close experiential encounters with other healthcare practitioners	Blount and Gloet (2015); Moffatt and Eley (2010); Field study.	
VC3	Self-employment	Telehealth technologies designed for better integration will lead to GP paths to self-employment	Van Alstin (2016); Field study.	
VC4	Access to specialists	Telehealth will provide improved access to specialists	Alkmim et al. (2012); Dharmar et al. (2013); Gillentine (2012); Rheuban (2013); Schwamm (2014); Field study.	
VC5	Reduced transfers / rehospitalisation	Telehealth will reduce unnecessary patient transfers including reduced rehospitalisation	New item derived from field study.	
VC6	Cost efficiency	Telehealth will provide cost efficient services	Park et al. (2015); Field study.	

VC1=value creation element 1; VC2=value creation element 2; VC3=value creation element 3; VC4=value creation element 4; VC5=value creation element 5 & VC6=value creation element 6

5.9.9 Survey instrument section seven: telehealth enablers (TE)

The objective of this part of the survey was identification and measurement of important telehealth enablers through both individual and organisational elements as perceived from GPs‘ angle. No article in the literature could be found that has measured telehealth enablers for the purpose of assessing doctors‘ readiness to develop technical and collaborative capabilities for telehealth medical services. This is a moderating construct which moderates the relationship between the key predicting construct: value creation (VC) and the dependent variable: GPs‘ readiness to develop telehealth capabilities (RDTC). Likewise in this important part, every single item was evaluated against a reflective item measurement criteria as recommended by Jarvis, MacKenzie and Podsakoff (2003, p. 203) because ―the direction of causality is from constructs to items and items are manifestations of the concerned construct". Additionally, items are interchangeable and correlated with one another. Their theme is common and the items contain vey related content. Thus removing one of the items would not change the theoretical domain of the represented construct (Chin, 1998; Jarvis, MacKenzie and Podsakoff, 2003). These items are presented in table 39.

Individual telehealth enablers for the purpose of this thesis represent healthcare practitioners‘ telehealth learning resources and/or technical support along with the accommodation of user needs throughout appropriate system design in addition to pressing local patient conditions whereas organisational telehealth enablers on the other hand represent the availability of skilled workforce, professional improvement advantages over current GP practice along with government funding support. These factors were measured by the items (TE1 to TE6): telehealth needs to accommodate GPs‘ user needs through appropriate system design; telehealth technical support is essential to GP users; telehealth needs to target GPs‘ most pressing local patient chronic/acute conditions/needs; telehealth platform should ensure sufficient availability of skilled workforce; telehealth needs to provide professional improvement advantages over GPs‘ current practice & telehealth platform needs to provide ongoing government funding support (Brewster et al. 2014; Gagnon et al. 2014; Shaw et al. 2013; Rho, Choi and Lee, 2014; Zhang and Walji, 2011).

Very importantly, all of the items were in addition to literature grounding validated individually through all GP interviews, that is, conducted field study which makes them reliable and valid measures in the context of telehealth medical services. Item (TE3) was derived from field study findings and is new addition to literature as a practical gap in the field of medicine and telehealth in particular. Table 39 below shows all of the items with their sources.

Table 39: Telehealth enablers (TE) items and relevant statements

Item	Variable	Statement	References	Explanation
TE1	System design	Telehealth needs to accommodate GPs' user needs through appropriate system design	Flores-Vaquero (2016); Gagnon et al. (2016); Holahan et al. (2004); Klein and Sorra (1996); Rodbard and Vigersky (2011); Mohktar et al. (2013); Zhang and Walji (2011); Field study.	These items have not been measured in telehealth context. The measurement items have been developed from the referred sources in other context as well as findings from the qualitative field study.
TE2	Technical support	Telehealth technical support is essential to GP users	Brewster et al. (2014); Gagnon et al. (2014; 2016); Field study.	
TE3	Pressing patient conditions	Telehealth needs to target GPs' most pressing local patient chronic/acute conditions/needs	New item derived from field study.	
TE4	Skilled workforce	Telehealth platform should ensure sufficient availability of skilled workforce	Darius (2015); Holahan et al. (2004); Klein and Sorra (1996); Shaw et al. (2013); Wilson (2017); Field study.	
TE5	Improvement advantages	Telehealth needs to provide professional improvement advantages over GPs' current practice	Rutledge et al. (2017); Sisi et al. (2017); Zhang and Walji (2011); Field study.	
TE6	Funding support	Telehealth platform needs to provide ongoing government funding support	Gagnon et al. (2016); Rho, Choi and Lee (2014); Field study.	

TE1=telehealth enabler element 1; TE2=telehealth enabler element 2; TE3=telehealth enabler element 3; TE4=telehealth enabler element 4; TE5=telehealth enabler element 5; TE6=telehealth enabler element 6

5.9.10 Survey instrument section eight: readiness to develop telehealth capabilities (RDTC) elements

This is the final section of the survey whose objective was identification and measurement of important elements both grounded in literature and/or developed to suit the purpose of the dependent variable that is targeting and thus evaluating GPs‘ readiness to develop telehealth capabilities through both technical and collaborative elements as perceived from GPs‘ angle. No article in the current literature has developed a scale that has measured either technical or additional collaborative telehealth capabilities by doctors. Scales by other authors are not very suitable for this purpose. This is the final and dependent variable construct to which all of the essential elements, predicting and moderating construct contribute through their direct and indirect effects. Likewise in this important part, every single item was evaluated against a reflective item measurement criteria as recommended by Jarvis, MacKenzie and Podsakoff (2003, p. 203) because ―the direction of causality is from constructs to items and items are manifestations of the concerned construct". Additionally, items are interchangeable and correlated with one another. Their theme is common and the items contain vey related content. Thus removing one of the items would not change the theoretical domain of the represented construct (Chin, 1998; Jarvis, MacKenzie and Podsakoff, 2003). These items are presented in table 40.

Readiness to develop telehealth capabilities has been defined for the purpose of this thesis as likelihood by a healthcare practitioner of developing both technical and additional collaborative skills to effectively engage with other health providers via telehealth technologies. It was measured in this project by the items (RDTC1 to RDTC6): my practice is technically unprepared for telehealth as I know little about its use; I am ready to develop technical capabilities to treat patients with chronic and acute conditions using telehealth technologies; telehealth technologies cannot fully replace physical clinical service delivery which makes me reluctant to embrace telehealth; telehealth will not receive full GP support as it reduces clinical interactions; I am ready to develop additional collaborative capabilities to treat patients with chronic and acute conditions using telehealth technologies; telehealth will have a negative impact on GPs‘ clinical autonomy making me reluctant to adopt it (Audet, Squires and Doty, 2014; Edwards, 2017; Blount and Gloet, 2015, Gagnon et al. 2014; 2016; Greenhalgh et al. 2015; Jennett et al. 2003a; 2003b; Lapointe and Rivard, 2005; Legare et al. 2010a; 2010b; Philips et al. 2017; Parasuraman and Colby, 2015; Shaw et al. 2013; Yusif et al. 2017). Item (RDTC1) came into existence through a personal conversation by Professor Emeritus Jenny Edwards following her suggestions on my ethics application and literature review clarification of the identified and practical gaps which have not been ever previously tested in the context that is set in this thesis project. All of the items also draw their support from the referred literature sources. It is also important to mention the items RDTC1, RDTC2, RDTC3, RDTC5 and RDTC6 were also validated in the field study with GP respondents. Table 40 shows item descriptions and their sources.

Table 40: Readiness to develop technical capabilities (RDTC) items and relevant statements

Item	Variable	Statement	References	Explanation
RDTC1	Perceived technical un-preparedness	My practice is technically unprepared for telehealth as I know little about its use	Edwards, 2017, pers. comm., 24 November; Jennet et al. (2003a); Jennet et al. (2003b); Legare et al. (2010a); Legare et al. (2010b); Field study.	These items have not been measured in telehealth context. The measurement items have been developed from the referred sources in other context as well as findings from the qualitative field study.
RDTC2	Technical readiness	I am ready to develop technical capabilities to treat patients with chronic and acute conditions using telehealth technologies	Jennet et al. (2003a); Jennet et al. (2003b); Legare et al. (2010a); Legare et al. (2010b); Philips et al. (2017); Field study.	
RDTC3	Perceived impact due to physical distance barriers	Telehealth technologies cannot fully replace physical clinical service delivery which makes me reluctant to embrace telehealth	Blount and Gloet (2015); Gagnon et al. (2012; 2014); Greenhalgh et al. (2015); Lapointe and Rivard (2005); Field study.	
RDTC4	Perceived impact on clinical interactions	Telehealth will not receive full GP support as it reduces clinical interactions	Gagnon et al. (2014); Lapointe and Rivard (2005).	
RDTC5	Collaborative readiness	I am ready to develop additional collaborative capabilities to treat patients with chronic and acute conditions using telehealth technologies	Henry et al. (2017); Parasuraman and Colby (2015); Morilla et al. (2017); Philips et al. (2017); Shaw et al. (2013); Yusif et al. (2017); Field study.	

RDTC6	Perceived impact on clinical autonomy	Telehealth will have a negative impact on GPs' clinical autonomy making me reluctant to adopt it	Audet, Squires and Doty (2014); Field Study.	

RDTC1=telehealth readiness element 1; RDTC2=telehealth readiness element 2; RDTC3=telehealth readiness element 3; RDTC4=telehealth readiness element 4; RDTC5=telehealth readiness element 5; RDTC6=telehealth readiness element 6

In addition to the eight discussed sections, the final completely separated question was developed by the supervisory panel and approved as such to stand on its own at the very end of the survey. Namely the item is coded as WN in the data set and the question is as follows: When do you think you might start using telehealth services? Tick only one option. There are four options provided: a) short term (within 12 months); b) medium term (within 1 to 5 years' time); long term (after 5 years) and d) never. The response from this question in fact supports the answers provided in the dependent variable section and may be considered as the final behavioural intention by the respondents.

5.11 Survey pre-testing

The quantitative survey was evaluated by a number of academics and GPs (general practitioners). Respondents were contacted both face to face and through email correspondence. Face to face encounters provided immediate and repeat feedback as the respondents in some cases needed more time to review the survey instrument, whereas email response took as long as the respondent needed to respond and then the feedback was incorporated into the final version. The respondents commented on any aspect of the survey that they deemed important and lacking and thus needing improvement. These aspects related to the content (question wording), comprehensibility and ambiguity if found anywhere in the text of the survey, survey layout, as well as time considerations given the fact that GPs are very busy health professionals and thus very time poor. A number of proposed items were accordingly clarified and made simpler and shorter, layout was improved, and number of items considerably reduced from over one hundred initial items to the final 67 in addition to demographic elements. The final questionnaire version was then approved by the supervisory panel before it was submitted with the full ethics application to the UTS Human Research Ethics Committee.

5.12 Chapter Summary

This fifth chapter has further developed a substantial number of hypothetical constructs that will be employed to test the hypotheses set in this model. It has also presented the process of development of the quantitative survey instrument and its sources. The entire research model with all of the hypothesised relationships is summed up in Figure 12. It presents all of its essential operational elements, direct predictor and moderating factor in an interdependent process leading to the dependent variable. The next chapter deals with quantitative data analysis through both measurement and structural model evaluations by employing structural equation modelling partial least square statistical method.

Chapter 6 Quantitative Data Analysis

6.1 Introduction

Chapter five has presented the qualitative data analysis procedure whereas chapter four has presented hypotheses development process in addition to the creation of the quantitative survey instrument. Following survey instrument preparation, the questionnaire then underwent a pre-testing process in order to identify any weaknesses, whether content based (words and text comprehensibility), construct and item relevance, layout appearance, and readability, ambiguity and time considerations with the purpose to improve its final version before data collection with the targeted respondents began. Upon the evaluation and refinement process and approval by the academic panel and subsequent human research ethics committee‘s approval, the survey instrument was then launched targeting GP respondents both nationally online and direct face to face offline encounters in exactly the same format. The vast majority of responses did however come from direct face to face encounters with GPs, though a percentage of respondents did respond online and a few have replied through emails. Mailed surveys did not generate any responses at all. Data collection findings are explicated and clarified throughout this chapter in a few different phases. Accordingly, this chapter is organized in the following order: it begins with introductory analysis of the collected data and then moves onto the utilisation of the PLS (partial least squares) approach based on the structural equation modeling (SEM). This modeling approach consists of two analytical segments: it firstly analyses the measurement framework and afterwards the structural framework.

6.2 Pilot Study

The quantitative survey was evaluated by a number of academics and GPs (general practitioners). Respondents were contacted both face to face and through email correspondence. Face to face encounters provided immediate and repeat feedback as the respondents in some cases needed more time to review the survey instrument, whereas email response took as long as the respondent needed to respond and then the feedback was incorporated into the final version. The respondents commented on any aspect of the survey that they deemed important and lacking and thus needing improvement. These aspects related to the content (question wording), comprehensibility and ambiguity if found anywhere in the text of the survey, survey layout, as well as time considerations given the fact that GPs are very busy health professionals and thus very time poor. A number of proposed items were accordingly clarified and made simpler and shorter, layout was improved, and number of items considerably reduced from over one hundred initial items to the final 67 in addition to demographic elements. After receiving feedback from the pre-testing of online and offline versions of the survey which are identical and making needed adjustments, quantitative data collection phase started with the aim to collect at least 40 responses in order to pilot test the data collected. Once the first fully valid 40 responses were collected, this data file was utilised for this purpose. A 5-point Likert scale has been utilised in this endeavour.

6.2 Pilot Study Demographics

Pilot study respondents provided answers to 8 demographic questions. This information is shown in the table below.

Table 41: GP respondent demographic information

GP Demographics		
Years in GP practice	Number of respondents	Percentage
0-5	6	15%
6-10	1	2.5%
11-15	4	10%
16-20	3	7.5%
21-25	8	20%
26-30	7	17.5
31-35	7	17.5%
36+	4	10%
Home Care Health Practitioner		
Yes	12	30%
No	28	70%
GP Age		
25-34	4	10%
35-44	5	12.5%
45-54	11	27.5%
55-65	15	37.5%
65+	5	12.5%
Gender		
Male	22	55%
Female	18	45%
Awareness of Telehealth MBS Items		
Yes	18	45%
No	22	55%
Current Use of Telehealth Services		
Yes	10	25%
No	30	75%
Aged Care Visits		
Yes	20	50%
No	20	50%
Telehealth Use among those who Visit Aged Care		
Yes	2	10%
No	18	90%

It can be seen from the above table that GPs of all levels of experience took part in the study. Similarly, all working ages are also represented starting with those just coming out of college and extending to those GPs with 36 years and over in GP practice. A substantial proportion of GPs also declared their health care home practitioner status (30%). Both genders are almost equally represented with slightly more male GPs (55%) than female GPs (45%). Of all the respondents, 45% knew of MBS Telehealth items, however only 25% declaring telehealth utilisation at this stage. Half of all the respondents also declared aged care visits and of those only 2 (10%) currently utilise telehealth technologies in aged care.

6.2.2 Descriptive Analysis

Upon collection of forty initial fully valid responses, data was then entered into SPSS version 25 for further analysis. No blank or missing value was found and all data was utilised. The table below presents concise descriptive statistical information for all of the analysed responses. Each response has been analysed in terms of standard deviation and mean. Additionally, kurtosis was also calculated and analysed with the purpose of identifying any potential outlier cases. Five point Likert scale has been utilised in the survey with ―1= strongly disagree, 2= disagree, 3=neutral, 4=agree and 5=strongly agree". The statistical table below shows mean range values between 2.5 and 4.475 and standard deviation values between 0.63851 and 1.26085. As these are not extreme values, they have been deemed acceptable for the purpose of this project (Cohen, 1977). Furthermore, kurtosis values were also examined as some of the items showed kurtosis values larger than 2 (PR1, PR2, W3, MOT3, COM1, COM3, CT3, PM1, PM2, TE1, TE2, TE3, TE4, TE5) which then underwent further scrutiny for potential outliers. Identified outliers were then normalised by replacing the indicated outlier with the average value of the representative column or the so called mean technique (Roth and Switzer, 1986).

Table 42: Descriptive statistics from the pilot study

Item	Mean	Standard Deviation	Kurtosis	Item	Mean	Standard Deviation	Kurtosis
DS1	4.400	0.7779	.980	T1	3.300	1.0907	-.929
DS2	4.000	.81650	.119	T2	3.125	1.0174	-.474
DS3	4.075	.94428	-.361	T3	3.900	.84124	-.423
PR1	4.150	.97534	3.770	CT1	3.625	.95239	.234
PR2	4.175	.93060	2.394	CT2	3.950	.63851	1.548
PR3	3.700	1.0669	-.344	CT3	3.825	.81296	2.914
W1	2.775	1.1206	-.528	PM1	4.350	.86380	4.447
W2	3.825	1.1522	.677	PM2	4.400	.84124	5.615
W3	3.850	.94868	2.382	PM3	4.400	.74421	1.416
W4	3.800	.91147	1.208	PM4	4.100	.84124	1.011
MOT1	3.375	1.0048	-.484	PM5	4.225	.73336	.785

MOT2	4.000	.87706	.091	PM6	4.050	.78283	-.286
MOT3	4.200	.79097	5.683	VC1	3.700	.88289	1.174
OPP1	3.200	.99228	-.956	VC2	3.750	.83972	1.854
OPP2	3.325	1.0225	-.617	VC3	3.325	.85896	.725
OPP3	3.600	.92819	.306	VC4	3.700	.93918	1.919
ABIL1	3.200	1.1368	-.833	VC5	3.800	.93918	.801
ABIL2	3.025	.89120	-.039	VC6	3.575	.98417	.744
ABIL3	4.050	1.0114	1.229	TE1	4.325	.88831	3.582
DEC1	4.350	.86380	-.130	TE2	4.375	1.0786	3.519
DEC2	4.025	.89120	.017	TE3	4.075	1.0225	2.224
DEC3	4.150	.92126	-.500	TE4	4.200	.79097	5.683
TP1	3.700	.64847	.716	TE5	4.125	.91111	2.508
TP2	3.775	.73336	-.332	TE6	4.175	.95776	1.865
TP3	3.750	1.1491	-.093	RDTC1	2.725	1.2606	-1.105
COM1	4.475	.78406	8.868	RDTC2	3.375	1.0048	-.572
COM2	4.050	.95943	1.673	RDTC3	2.500	1.2608	-1.109
COM3	4.325	.82858	5.360	RDTC4	2.850	1.1668	-1.115
COL1	3.900	.92819	1.043	RDTC5	3.6000	.92819	.499
COL2	4.000	.75107	-.050	RDTC6	3.200	1.1140	-.455
COL3	4.025	.97369	.882				

6.3 Survey Administration

Prior to the beginning of survey administration, initial government and non-government agencies contacted were the NSW Ministry of Health, the Australian Digital Agency, the Agency for Clinical Innovation and the Health Informatics Society of Australia as well as the Royal Australian College of General Practitioners (RACGP), Australian College of Rural and Remote Medicine (ACRRM) and Telstra Health. Following leads received from the Agency for Clinical Innovation, all primary health networks in the country were contacted via email correspondence and their participation was requested through the promotion of the study among their GP members. The quantitative data was collected through multiple data collection channels, most of which were direct face to face encounters with the target respondents. These encounters took place in a number of places and events. These places were national primary healthcare conferences and GP events organized by primary health networks (PHNs) each of which required approval by the organisers and PHN management.

In addition, various healthcare facilities throughout the country were contacted through multiple avenues such as phone calls and follow up emails where available. Invitation letters, explanation of the survey's objective, ethics approval and online link to the survey were sent to each contact made. Contact details of many privately run remote and metropolitan medical centres staffed by GP respondents were also collected inclusive of GP first names and surnames which were utilised in a mail survey. GP practices in all corners of metropolitan Sydney were also contacted face to face on multiple occasions and surveys were distributed initially to the gatekeepers and then directly to employed GPs. GP respondents were followed up on multiple occasions where responses did not occur or were not completed in the first encounter due to time restraints and very busy patient schedules. It was a challenging and lengthy eight months long data collection process.

Direct encounter response rates varied from event to event and from visit to visit to individual GP respondents' medical practices. In the case of conferences and health network GP seminars as these were one-off events, responses were collected during the first wave. However, in the case of metropolitan GP practices' visits, data were collected in a number of waves or follow-up visits. Accordingly, response rates were recorded as first, second, third, fourth and fifth wave responses. Combined face to face encounters generated 175 usable responses. The first wave generated 97 usable responses, second wave 42, third wave 24, fourth wave 5 and the fifth wave 7 usable responses. The total number of recorded responses through the online link was 31 of which 12 are usable. Direct mail did not generate any responses. Thus, the total number of usable responses is 187. The table below depicts these data collection results and associated percentages.

Table 43: Response rate from quantitative survey phase

GP respondents	Responses	Percentage (%)
Total sample response	206	100
First wave (direct encounter)	97	47.08
First wave (online response)	31	15.04
Online usable responses	12	5.82
Second wave (direct encounter)	42	20.38
Third wave (direct encounter)	24	11.65
Fourth wave (direct encounter)	5	2.42
Fifth wave (direct encounter)	7	3.39
Unusable responses	19	9.22
Total usable responses	187	90.77

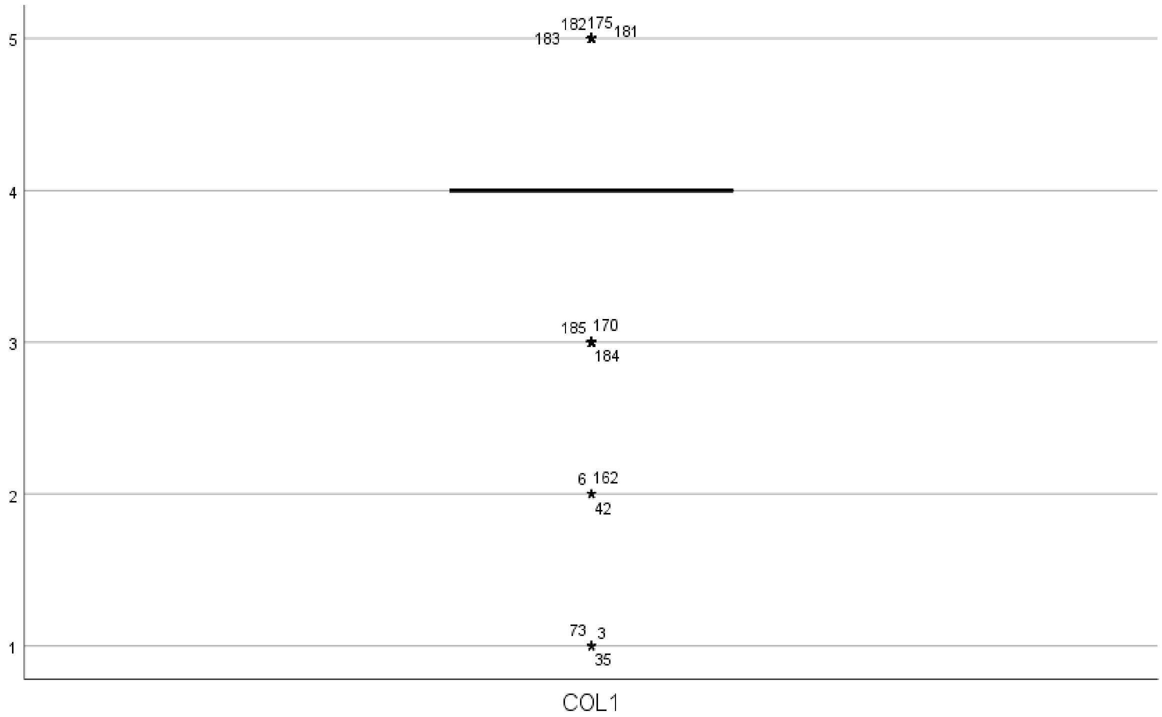
6.3.1 Data investigation

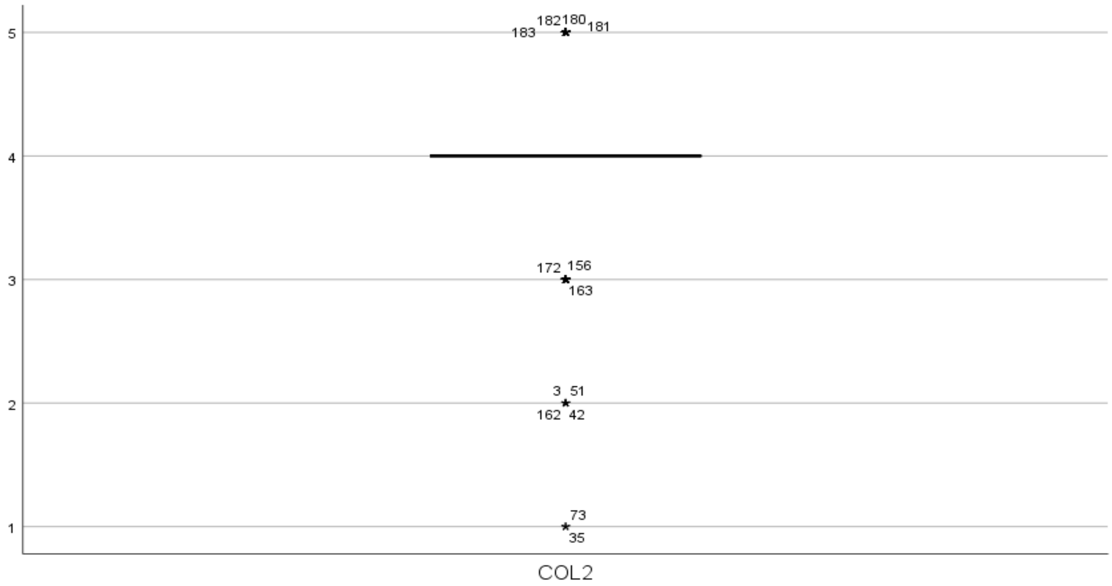
Data collected needed to be evaluated through its properties prior to the final examination or analysis. Each survey response also needed to be individually reviewed in order to be validated. It also needed to be edited where errors have occurred as well as properly coded before being transferred and entered into a statistical software program (Hair et al. 2019). Each response was individually examined for appropriateness of response and completeness in order for data to be determined as usable or unusable. Of the 206 total responses, 19 responses were partially completed and had been removed accordingly as these were deemed unusable. Data checking also detected a few blank or missing insignificant value spots. These blank spots were filled with the average score of the representative column or the so called estimated means technique (Roth and Switzer, 1995).

Table 44: Data investigation

Survey scale items	Identified outliers
COL1	3, 35, 73, 6, 42, 162, 170, 184, 185, 175, 181, 182, 183
COL2	73, 35, 3, 51, 162, 42, 172, 156, 163, 180, 181, 182, 183

Further evaluation of the data was subsequently carried out to find out if outliers existed in it. These are extreme cases which are typically positioned beyond both upper and lower boundary or in the case of Likert scale responses extremely deviate from the rest of the data set. This was performed in SPSS version 25 through the box plot analysis technique. The software calculated 1st, 2nd and 3rd quartiles, the interquartile range to determine the upper and lower boundary. Hoaglin and Iglewicz (1987) have suggested that the 1.5 multiplier was inaccurate approximately 50% of the time, and have recommended that 2.2 probably is more valid in a lot more cases. Out of the entire survey instrument, only 2 survey items were found with outliers. Those extreme individual responses were then normalized by assigning them with the mean or average value of the representative column for the concerned item. Box plot analysis for the extreme cases can be seen below.





6.3.2 Non-response bias and sampling errors

Quantitative survey methodology in general may come across validity and reliability concerns of which non-response bias is one such concern (Hair et al. 2019). These may also cause target population‘s representativeness limitation. Data sample needs to be representative of the targeted population and under such arrangements initial and subsequent wave of data collection should not substantially differ. In order to test data obtained in these waves of collection, the chosen scale‘s variances were evaluated. Prior to the actual non-response bias test, the test of normality was carried out in SPSS (Statistical Package for the Social Sciences) IBM SPSS package version

25. This was done through the Kolmogrov-Smirnov procedure that is used to evaluate data's normality distribution. Test results are seen in the table below.

Table 45: Kolmogrov-Smirnov normality test

Item	t-value	Significance	Item	t-value	Significance
DS1	.318	.000	T1	.234	.000
DS2	.269	.000	T2	.219	.000
DS3	.271	.000	T3	.270	.000
PR1	.269	.000	CT1	.206	.000
PR2	.273	.000	CT2	.296	.000
PR3	.257	.000	CT3	.263	.000
W1	.192	.000	PM1	.267	.000
W2	.265	.000	PM2	.266	.000
W3	.297	.000	PM3	.270	.000
W4	.248	.000	PM4	.264	.000
MOT1	.215	.000	PM5	.256	.000
MOT2	.277	.000	PM6	.260	.000
MOT3	.306	.000	VC1	.254	.000
OPP1	.206	.000	VC2	.238	.000
OPP2	.193	.000	VC3	.268	.000
OPP3	.245	.000	VC4	.232	.000
ABIL1	.171	.000	VC5	.252	.000
ABIL2	.215	.000	VC6	.231	.000
ABIL3	.301	.000	TE1	.266	.000
DEC1	.260	.000	TE2	.261	.000
DEC2	.281	.000	TE3	.247	.000
DEC3	.231	.000	TE4	.284	.000
TP1	.236	.000	TE5	.291	.000
TP2	.249	.000	TE6	.253	.000
TP3	.246	.000	RDTC1	.243	.000
COM1	.293	.000	RDTC2	.227	.000
COM2	.261	.000	RDTC3	.199	.000
COM3	.300	.000	RDTC4	.182	.000
COL1	.310	.000	RDTC5	.238	.000
COL2	.320	.000	RDTC6	.193	.000
COL3	.293	.000			

The table above reveals that the evaluation at 99% confidence interval ($p<0.001$) was significant. Accordingly, an alternative hypothesis can be accepted, as data distribution in this case is not normal. This therefore requires further non-parametric testing. In order to assure data suitability, data underwent non-response bias evaluation. This was done by utilising the Mann-Whitney data test which is commonly utilised for the purpose of evaluating differences among 2 independent samples (Chen, Wu and Thompson, 2016). This test also may assure that the data in the sample does not differ from its population (Groves, 2006). To carry out the investigation, the Mann-Whitney test has scrutinized the dissimilarities between first wave responses (n=109) and late responses (n=78). All responses were scrutinized in relation to the dissimilarities in responses to the survey instrument and its construct items. The original assumption made was that differences between the two data collection waves existed. Full data sample from at least one item from each sub-construct belonging to all of the proposed model's elements were selected, and which then underwent further analysis. Results from the Mann-Whitney test are presented in the table below.

Table 46: Mann-Whitney test outcome

Construct elements	Z-value	Significance (2-tailed)
ABIL1	-1.270	.204
PM1	-.863	.388
VC1	-1.654	.098
TE4	-.211	.833
DCTC1	-1.854	.064
DS2	-1.363	.173
PR2	-.068	.946
OPP2	-1.616	.106
DEC 1	-.116	.908
TP2	-.914	.361
COL3	-.331	.741
MOT3	-1.233	.218
T3	-.213	.831
COM2	-1.094	.274
W4	-.425	.671

Table 34 reveals final investigation results which show that there is no significance at the 95% interval (p=.05) among Z-values. Accordingly, the proposed assumption has been rejected as there was no dissimilarity between the two response waves which underwent statistical scrutiny. Based on this statistical outcome, a conclusion can be made which states that a non-response bias in the examined data was non-existent.

6.3.3 Common method difference

Another quantitative survey's data limitation is the frequency of a common method differences or variances caused by a potential response bias. These concerns may potentially threaten data's validity (Hair et al. 2019; Podsakoff et al. 2003). Due to these concerns, a number of concrete steps were actioned. The first such step was to ensure that data is only collected from experienced practicing GPs (general practitioners) who represent the wider GP population of the country. To avoid the above bias, various data collection methods and both larger institutional and smaller organisational avenues were chosen. Various organisations and institutions were invited to participate in this survey, some of which represent thousands of GP members such as RACGP (The Royal Australian College of General Practitioners) and Australian College of Rural and Remote Medicine (ACRRM) and some of which are smaller local medical centres within both metropolitan and remote areas of the country.

All primary health networks (PHNs) in the country were contacted and the study‘s documentation with the online link to the survey was sent to each PHN in the country. Besides PHNs, various government and other relevant organisations were contacted and requested to assist in the promotion of the study. Among these were RACGP (The Royal Australian College of General Practitioners) and Australian College of Rural and Remote Medicine (ACRRM), the Australian Digital Agency, the Agency for Clinical Innovation, Health Informatics Society of Australia (HISA) and Telstra Health. Email and mail correspondence channels were also utilised. This was in addition to a very active physical presence of the key researcher on the project in various GP seminars and conferences organized by different institutions and primary health networks as well as personal visits to medical centres and direct encounters with GPs.

All respondents were also assured of their anonymity as well as the anonymity of responses and legally binding obligations on the part of the research team to protect anonymity at all times now and in the future. Survey items also underwent checks for simplicity in comprehension so that there is no ambiguity with terminology and associated responding. Full instructions were also provided for each group or category of questions which were designed to be simple to follow and respond to.

Avoidance of double-barreled items was also upheld through a detailed pre-checking by a number of practitioners and academics. Dependent variable and independent variables were also distanced apart from each other (Podsakoff et al. 2003). This thesis project also employed the so called Harman one factor testing method that is commonly utilised to search for common method variances in a data sample. All of the items from the data set were initially examined.

The extraction method used in this dimension reduction factor analysis, was ‗principal axis factoring‘ that was analysed as a correlation matrix, displayed through ‗unrotated factor solution‘ based on Eigen value and fixed number of extracted factors. The cumulative factor variance extracted was 28.171% and no individual item accounted for covariance majority (greatest variance was 29.084%) in the data set (Johnson, Rosen and Djurdjevic, 2011; Podsakoff and Organ, 1986). Additionally and very importantly, this project has also employed the so called ‗ideal marker' dimension technique (Chowdhury, Quaddus and Agarwal, 2019; Lindell and Whitney, 2001) by utilising 2 ideal marker variables ―I don't have a preferred colour" and ―I like travelling by sea" in order to evaluate their correlations with the other model's elements. The latent variable correlations matrix table proves that there is a very low correlation of the 2 ideal marker variables with the other constructs. Accordingly, it can be concluded that a common method variance does not present a concern in this project (Chowdhury, Quaddus and Agarwal, 2019; Lindell and Whitney, 2001).

Table 47: Latent variable correlations among first-order constructs

	ABIL	COL	COM	CT	DEC	DS	MOT	Marker1	Marker2	OPP	PM	PR	RDTC	T	TE	TP	VC	W
ABIL	**0.7795***																	
COL	0.3748	**0.7979***																
COM	0.3441	0.6213	**0.8873***															
CT	0.4048	0.6039	0.5501	**0.8664***														
DEC	0.0276	0.1455	0.3238	0.2632	**0.8268***													
DS	0.2068	0.2747	0.4879	0.2928	0.4005	**0.8144***												
MOT	0.6081	0.521	0.4666	0.5475	0.1036	0.1972	**0.8564***											
Marker1	0.083	0.0874	0.0416	0.1555	-0.189	-0.036	0.0889	**1****										
Marker2	0.0666	0.126	0.0617	0.0815	-0.086	-0.015	0.1153	0.6831	**1****									
OPP	0.6501	0.2094	0.2507	0.2762	0.0611	0.1475	0.464	0.0546	-0.0444	**0.8896***								
PM	0.395	0.6057	0.5722	0.6588	0.2897	0.3405	0.5409	0.1476	0.1426	0.278	**0.824***							
PR	0.2071	0.3744	0.5703	0.3358	0.4181	0.7299	0.2366	-0.0333	0.013	0.1414	0.392	**0.8534***						
RDTC	0.5428	0.4425	0.3611	0.4806	-0.14	0.0671	0.5059	0.1956	0.1359	0.3957	0.4	0.0318	**0.7443***					
T	0.0983	0.3565	0.3858	0.433	0.3834	0.2464	0.2834	0.0033	-0.0095	0.126	0.407	0.3447	0.0348	**0.7571***				
TE	0.4449	0.5609	0.4796	0.5326	0.2045	0.2913	0.5977	0.1843	0.1484	0.3104	0.792	0.3335	0.5192	0.3555	**0.8234***			
TP	0.1503	0.2503	0.4586	0.2446	0.5877	0.3886	0.1237	-0.098	-0.0151	0.0212	0.269	0.4892	-0.007	0.2994	0.2518	**0.8401***		
VC	0.496	0.518	0.4655	0.5749	0.1055	0.1855	0.6004	0.1865	0.1232	0.3937	0.655	0.2311	0.4764	0.3868	0.6493	0.1362	**0.8534***	
W	0.4606	0.4468	0.6013	0.4728	0.229	0.4578	0.4077	0.0727	0.1281	0.2922	0.493	0.5484	0.3293	0.3053	0.414	0.363	0.4591	**0.8419***

* AVE's square root for reflective first-order constructs higher than correlation coefficients for other constructs. **Ideal markers' correlation coefficients.

6.3.4 Sample's demographic data

The tables below present key demographic data on GP respondents in terms of 8 key variables: a) number of years of experience in general practice; b) health care home practitioner status; c) age group and d) gender data for male and female GP respondents. These are followed by e) GP status in terms of awareness of Medicare items for collaborative telehealth consultations in aged care; f) recognition of use of telehealth services; g) recognition of visits of aged care patients in aged care facilities; and if yes, h) recognition of utilisation of telehealth facilities in aged care.

Table 48: GP Respondent Demographics

Years in GP practice	Number of respondents	Percentage
0-5	32	17.1%
6-10	18	9.6%
11-15	22	11.8%
16-20	18	9.6%
21-25	21	11.2%
26-30	20	10.7%
31-35	25	13.4%
36+	31	16.6%

It can be observed from the above table that the largest group of GP respondents have between 0 to 5 years‘ experience in GP practice (32%), which is closely followed by those with over 36 years of experience in GP practice (16.6%).

A substantial cohort of GP respondents is represented in the 31-35 year bracket (13.4+%), 11-15 year bracket (11.8%), 21-25 year bracket (11.2%), 26-30 year bracket (10.7%) and 6-10 and 16-20 year brackets with (9.6%) respectively. Thus, we can see that all experience categories with a number of years in GP practice have been substantially represented with those most experienced practitioners leading the categories (36+ and 31-35 years in GP practice represented by 16.6% and 13.4% respectively).

Health Care Home Practitioner		
Yes	50	26.7%
No	137	73.3%

In terms of health care home practitioner status, less than one third of all GP respondents have declared they are practicing health care home practitioners (26.7%) with 73.7% not being health care home practitioners in this national population sample.

GP Age		
25-34	18	9.6%
35-44	29	15.5%
45-54	44	23.5%
55-65	62	33.2%
65+	34	18.2%

It can also be observed from the above table that the largest cohort of GP practitioners belong to the 55-64 age group (33.2%), followed by the 45-54 age group (23.5%). A substantial cohort is also represented by the 65+ age group (18.2%), 35-44 age group (15.5%) and 25-34 age group (9.6%).

Gender		
Male	98	52.40%
Female	89	47.59%

Of those respondents, 52.40% were male GPs and 47.59% female GP respondents.

Awareness of Telehealth MBS Items		
Yes	78	41.7%
No	109	58.3%

The data table also shows that the vast majority of GP respondents were not aware of the existence of telehealth MBS items in collaborative telehealth consultations (58.3%) with 41.7% being aware of the items.

Current Use of Telehealth Services		
Yes	18	9.6%
No	169	90.4%

Similarly, 90.4% of all respondents stated no usage of telehealth services with only 9.6% currently utilising telehealth services.

Aged Care Patient Visits		
Yes	74	39.6%
No	113	60.4%

In terms of seeing aged care patients in aged care facilities, the largest cohort (60.4%) stated that they do not visit aged care patients whereas 39.6% stated that they do attend to aged care patients through visits to aged care facilities.

Telehealth Use among those who Visit Aged Care		
Yes	4	5.3%
No	71	94.7%

The final demographic data relates to telehealth service utilisation by those GPs who visit aged care patients in aged care facilities. It can be seen that of those who attend to aged care patient needs in aged care facilities from the prior table (n=74 or 39.6%) respondents, 71 GPs (94.7%) do not utilise telehealth facilities in aged care at all with only 4 GPs (5.3%) currently utilising such available facilities. It can also be noted that of the 113 GPs who do not visit aged care facilities as seen from the table representing aged care visits, one GP did declare utilisation of telehealth facilities in aged care, though when asked whether he or she is seeing patients in aged care facilities, the response was negative. That is why the total number of respondents equals 75 as opposed to 74.

6.4 Partial Least Square Structural Equation Modeling Analysis

This project has utilised the structural equation modeling method through the application of partial least square technique. This data analysis technique was needed due to the study's objectives and the appropriateness to evaluate the data and hypothesized relationships. The partial least square approach generally conducts two types of evaluations which appear in sequential order:

- Evaluation of the measurement framework, which is followed by the
- Evaluation of the structural framework.

The sequential evaluations were carried out in order to test the reliability and validity of the measurement framework and its constructs (elements). This was done to ensure that the links between the constructs are both reliable and valid before the framework could be finalized. These evaluation items are presented in the table below.

Table 49: Sequential evaluations of the framework

Ph	Analysis	Analysis	Elements
1	Evaluation of the measurement framework	a- Internal consistency b- Item Reliability c- Discriminant validity	Reflective Reflective Reflective
2	Evaluation of the structural framework	a- Path coefficient (β) b- Variance explained (R^2) c- *t*-values' statistical significance	Reflective Reflective Reflective

These sequential evaluations are further debated in the following sections.

6.4.1 Evaluation of the measurement framework

The detailed framework in this project consists of 7 constructs inclusive of 12 sub-constructs. Some of these are first order whereas others second order constructs. All of them are reflective as determined by Jarvis, Mackenzie and Podsakoff (2003) measurement decision rules in table 13 on pages 93-94. Among the constructs, telehealth technology use considerations (TTUC), knowledge sharing (KS) and relationship management (RM) are multidimensional and as such second order constructs, whereas the rest are all first order constructs. As stated above in accordance with measurement decision rules, they were measured as reflective elements. Telehealth technology use considerations (TTUC) construct was measured by data security (DS), telehealthcare protocols (PR) and workload (W) sub-constructs, knowledge sharing (KS) was measured by motivation to share (MOT), opportunity to share (OPP), ability to share

(ABIL), data exposure concerns (DEC) and telehealth practice (TP), while relationship management (RM) was measured by communication (COM), collaboration (COL), trust (T) and commitment (CT).

Among first order constructs are process management (PM), value creation (VC), telehealth enablers (TE) and dependent variable readiness to develop telehealth capabilities (RDTC). As mentioned in the above table, the reflective framework was measured by the internal consistency, factor loading of items, average extracted variance, construct correlation and cross-loadings of items. Model's properties with final results that were measured based on the PLS algorithm analysis are presented next.

6.4.1.1 Evaluating reflective measurement framework

This study's framework consists of four first order and three second order elements. Thus, the first phase of the measurement process was the evaluation of the first order measurement framework. It can be seen from figure 17 that sixteen reflective elements / constructs are included in the study's framework. These are: data security (DS), telehealthcare protocols (PR), workload (W), motivation to share (MOT), opportunity to share (OPP), ability to share (ABIL), data exposure concerns (DEC), telehealth practice (TP), communication (COM), collaboration (COL), trust (T), commitment (CT), process management (PM), value creation (VC), telehealth enablers (TE) and readiness to develop telehealth capabilities (RDTC). These model's elements together with their measurement dimensions were evaluated through factor loading values of individual items, composite reliability otherwise known as internal consistency and discriminant validity in line with referenced literature (Barclay, Higgins and Thompson, 1995; Hair et al. 2019; Hair, Ringle and Sarstedt, 2011).

Item reliability

In line with literature recommendations (Barclay, Higgins and Thomson, 1995; Hair, Ringle and Sarstedt, 2011) suggested minimum value of 0.50 was utilised in this project as acceptable minimum factor loading value for individual items. The table on the next page shows factor loading values for individual items together with construct composite reliability (CR) and average variance extracted (AVE) as well as *t*-values statistical significance.

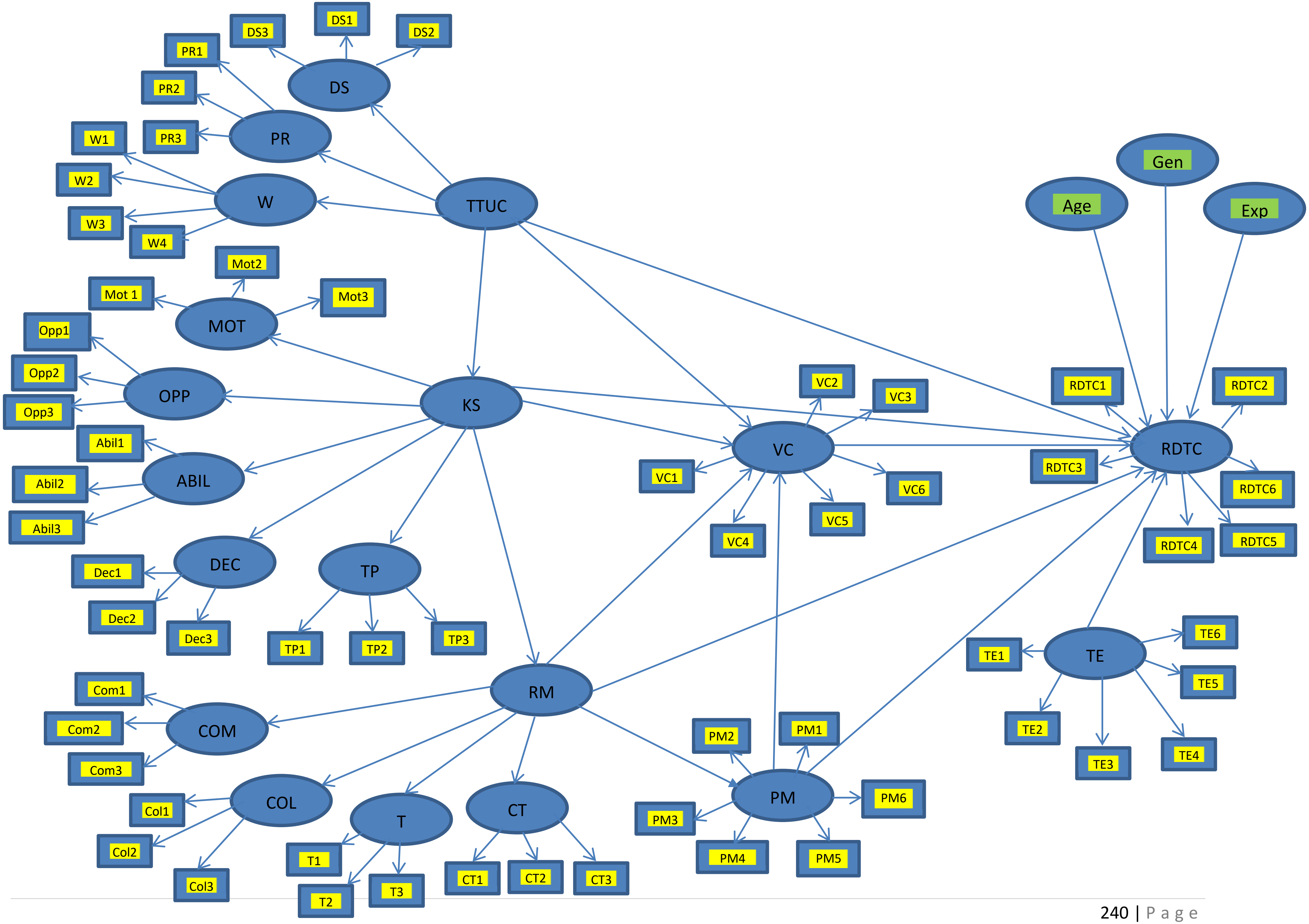


Figure 17: Detailed Framework

Table 50: Evaluation of Item Reliability, CR and AVE for first-order constructs

Constructs	Items	Factor Loadin	*t*-Value	AVE	CR
Data Security (DS)	DS1 - Total security of all patient/GP data must be legislated	0.8313	14.4826	0.6632	0.855
	DS2 - Patients must have rights to withhold data	0.7651	8.9246		
	DS3 - Patient data must only be linked to personal identity through secured authorised codes	0.8445	22.1604		
Telehealthcare Protocols (PR)	PR1 - Telehealth protocols must provide clarity in relation to GPs' roles	0.9097	33.8734	0.7284	0.8883
	PR2 - Protocols must clearly specify practitioner accountabilities before, during and after service delivery	0.9173	39.4389		
	PR3-Cross-disciplinary care should be physician-led	0.7185	9.5127		
Workload (W)	W1 - Telehealth will negatively affect conventional care delivery through reduced visits	0.1456	0.6334	0.4856	0.7588
	W2 - Telehealth will enable GP practitioners to work from any location	0.7623	4.9304		
	W3 - Any telehealth platform needs to ensure stable workload distribution	0.8413	10.5008		
	W4 - Telehealth services that are time efficient will help me manage my workload	0.7951	5.1951		
Motivation to share (MOT)	MOT1 - I intend to frequently share my knowledge/working experiences electronically with my colleagues	0.8255	19.6273	0.7336	0.892
	MOT2 - I will always give my knowledge to those who ask for it	0.8883	29.2387		
	MOT3 - I will always give my knowledge to others in the most efficient way possible	0.8547	22.1203		
Opportunity to share (OPP)	OPP1 - I can devote enough time to sharing my knowledge electronically	0.8293	22.3203	0.6953	0.8723

	OPP2 - The climate in my organisation allows me to easily share my knowledge electronically	0.8857	28.1938		
	OPP3 - The climate in my organisation facilitates informal meetings where knowledge is shared	0.7834	12.7096		
Ability to share (ABIL)	ABIL1 – I am fully capable of sharing my knowledge electronically with others at any time	0.861	24.2263	0.6087	0.822
	ABIL2 – If it depended on me, I would exhaustively share my knowledge electronically	0.7954	13.2481		
	ABIL3 I am fully capable of articulating my knowledge in written or spoken form	0.6723	5.4622		
Data exposure concerns (DEC)	DEC1 Misuse of electronic health records may threaten patient safety	0.8611	1.6181	0.6758	0.8614
	DEC2 Electronic data might not meet expectations in terms of patient outcomes	0.7312	1.1592		
	DEC3 Legal issues resulting from the use of telehealth may be serious	0.8667	1.4845		
Telehealth Practice (TP)	TP1 - New approaches addressing competition between GPs and specialists must be negotiated	0.8406	1.4462	0.7059	0.8777
	TP2 – New approaches addressing clinical autonomy must be negotiated	0.9004	1.5333		
	TP3 – GPs should have legislated rights to freely choose the type of care delivery for each patient	0.7749	1.6169		
Communication (COM)	COM1 – Secure messaging channels between clinicians are essential	0.9157	34.7007	0.7874	0.9174
	COM2 Secure messaging between clinicians will ensure a continuous feedback loop	0.8864	29.8872		
	COM3 – Patients must be clearly informed in decision making during their ongoing care	0.859	14.8921		
Collaboration (COL)	COL1 – Regular inter-disciplinary meetings will improve collaboration	0.8142	16.3147	0.637	0.8403

	COL2 – GP's interest in a specific chronic condition will enhance ties	0.7968	13.3953		
	COL3 – Inter-disciplinary teams need to be well resourced to effectively collaborate	0.7831	15.4002		
Trust (T)	T1 – Telehealth will affect my ability to make an immediate relevant physical assessment	0.7639	4.1411	0.5721	0.7959
	T2 – Telehealth may cause deterioration of patient trust relating to physical assessment information	0.5822	2.3833		
	T3 – Telehealth introduces new negotiated approaches to trust between medical & IT professionals	0.891	19.6016		
Commitment (CT)	CT1 – I have a strong desire to work with a small, close-knit patient-centred teams	0.7971	12.7138	0.7507	0.9
	CT2 – Regular collegial support will maintain my positive commitment levels	0.9118	40.9481		
	CT3 - Active telehealth engagement by colleagues will positively influence my commitment levels	0.8862	32.8544		
Process Management (PM)	PM1 – A simple/interoperable system with minimal interruption should be used	0.8441	18.9851	0.6791	0.9269
	PM2 – Secure/uninterrupted high quality broadband data speed needs to be maintained	0.849	20.0918		
	PM3 – Patient health data must be curated properly to prevent falsely presented information	0.8117	14.3233		
	PM4 – Personalised remote patient support in the measurement of vital signs needs to be provided	0.8424	20.5674		
	PM5 – Development of standard remote care protocols may create new work routines	0.8126	15.0863		
	PM6 – Integrated collaborative treatment phases need to be managed by physicians	0.7824	12.8423		
Value Creation (VC)	VC1 – Telehealth will provide GPs' with clearly delineated Medicare items	0.7871	12.7447	0.7109	0.9364

	VC2 – Telehealth will provide close experiential encounters with other healthcare practitioners	0.8396	18.7446		
	VC3 – Telehealth technologies designed for better integration will lead to GP paths to self-employment	0.808	14.061		
	VC4 – Telehealth will provide improved access to specialists	0.8781	28.7431		
	VC5 – Telehealth will reduce unnecessary patient transfers including reduced rehospitalisation	0.8722	29.4515		
	VC6 – Telehealth will provide cost efficient services	0.8698	28.6746		
Telehealth Enablers (TE)	TE1 - Telehealth needs to accommodate GPs' user needs through appropriate system design	0.7962	3.558	0.6775	0.9264
	TE2 – Telehealth technical support is essential to GP users	0.8665	3.6505		
	TE3 – Telehealth needs to target GPs' most pressing local patient chronic/acute conditions/needs	0.8271	3.749		
	TE4 – Telehealth platform should ensure sufficient availability of skilled workforce	0.8315	3.8662		
	TE5 – Telehealth needs to provide professional improvement advantages over GPs' current practice	0.8203	3.6253		
	TE6 – Telehealth platform needs to provide ongoing government funding support	0.7949	3.6696		
Readiness to Develop Telehealth Capabilities (RTDC)	RDTC1 – My practice is technically unprepared for telehealth as I know little about its use	0.5168	2.2278	0.4443	0.8183
	RDTC2 – I am ready to develop technical capabilities to treat patients with chronic and acute conditions using telehealth technologies	0.8411	4.1853		

	RDTC3 – Telehealth technologies cannot fully replace physical clinical service delivery which makes me reluctant to embrace telehealth	0.4331	1.519		
	RDTC4 – Telehealth will not receive full GP support as it reduces clinical interactions	0.5883	2.1613		
	RDTC5 – I am ready to develop additional collaborative capabilities to treat patients with chronic and acute conditions using telehealth technologies	0.8891	4.592		
	RDTC6 – Telehealth will have a negative impact on GPs‘ clinical autonomy making me reluctant to adopt it	0.6061	2.3353		

The above table has revealed three items below the acceptable minimum item factor loading value of 0.50. These items (W1 and RDTC3) had low loadings in addition to (RDTC1) which encountered a cross-loading problem (see cross loading matrix table below) were therefore considered as inadequate to stand in the subsequent PLS analysis attempt and as such deleted from the model based on recommendations of Barclay, Higgins and Thompson (1995), Hair et al. (2019) and Hair, Ringle and Sarstedt (2011).

Composite reliability / internal consistency

The proposed model can also be evaluated for internal consistency via composite reliability values of all of the model‘s constructs. It can be seen that the values for internal consistency surpass the minimum cut-off value of 0.70 as recommended by Barclay, Higgins and Thompson (1995), Fornell and Larcker (1981), Hair et al. (2019) and Hair, Ringle and Sarstedt (2011). It is likewise worthy to be mentioned that all of the models‘ elements have composite reliability (internal consistency) of more than 0.80 except two elements; that is trust (T=0.7959) and workload (W=0.7588).

Average variance extracted (AVE)

Besides the reliability of items and internal consistency values, this project has likewise evaluated average variance extracted for each of the model‘s constructs. The above table presents the AVE values. It can be seen that all of the elements have average variance extracted (AVE) values higher than the widely accepted suggested cut-off point of 0.50 (Fornell and Larcker, 1981; Hair, Ringle and Sarstedt, 2011; Henseler et al. 2009) except for two elements;

workload (W=0.4856) and the dependent variable; readiness to develop telehealth capabilities (RDTC=0.4443).

However, further literature review has revealed that average variance extracted that is lower than 0.50 but at least 0.40 is also acceptable where composite reliability values are bigger than 0.60 for the same construct (Fornell and Larcker, 1981; Hair et al. 2009). Therefore, we can still accept that the above constructs: RDTC with composite reliability value of (CR=0.8183) and W with composite reliability value of (CR=0.7588) are still adequately valid in terms of their convergent validity (AVE) as values are higher than 0.60. As such, the two mentioned constructs‘ convergent validity still presents adequate value (Fornell and Larcker, 1981; Hair et al. 2009).

Discriminant validity

In order to confirm every construct‘s discriminant validity, the square root of the AVE (average variance extracted) for every individual construct was calculated and was then compared with the other model‘s constructs‘ inter-correlational values. This calculation method is in line with Fornell and Larcker (1981). These AVE values are presented in bold and run diagonally in the table below. Other model‘s constructs inter-correlation values are positioned underneath each construct‘s AVE value. As it can be seen, the AVE value at the top and all the way diagonally to the very end of the table is higher than all of the other constructs‘ values which are underneath. At this stage of the evaluation process there was no identified problem with discriminant validity in the proposed model as evident in the table below.

Furthermore, discriminant validity was also assessed by close screening and checking a cross-loading matrix for any cross-loading problems with the model‘s first-order constructs‘ individual items. The cross-loading table below has identified 3 individual items belonging to 2 different constructs which were then considered for removal. These 3 items are RDTC1, RDTC3 and W1 as highlighted in yellow in the table below after the first PLS run. Following the removal of these items, in the second PLS Algorithm evaluation, additional 4 items were identified due to cross-loading issues (W4, OPP1, VC4 and VC5). These items were also removed from the model and the subsequent PLS run showed all individual item factor loadings higher than the recommended threshold of 0.50, composite reliability / internal consistency was above 0.70, AVE values also improved and were acceptable and there were no concerns with discriminant validity as evident below in the second PLS run which shows values after the identified items were deleted.

Table 51: Construct correlations among first order elements after first PLS run (Smart PLS generated)

	ABIL	COL	COM	CT	DEC	DS	MOT	OPP	PM	PR	RDTC	T	TE	TP	VC	W
ABIL	**0.7801**															
COL	0.3715	**0.7981**														
COM	0.3374	0.6209	**0.8873**													
CT	0.4043	0.6039	0.5502	**0.8664**												
DEC	0.0244	0.1533	0.3351	0.2718	**0.822**											
DS	0.1956	0.2748	0.4885	0.2936	0.4106	**0.8143**										
MOT	0.6119	0.5211	0.4643	0.5481	0.1042	0.1924	**0.8565**									
OPP	0.7084	0.2947	0.2742	0.3757	0.0177	0.1321	0.5611	**0.8338**								
PM	0.393	0.6055	0.5722	0.6591	0.2904	0.341	0.5394	0.3484	**0.824**							
PR	0.1931	0.3736	0.5694	0.3356	0.4228	0.7293	0.2321	0.1256	0.3921	**0.8534**						
RDTC	0.5305	0.3956	0.3214	0.4273	-0.15	0.0054	0.478	0.5052	0.326	-0.0153	**0.6665**					
T	0.0984	0.3568	0.3869	0.4342	0.384	0.2464	0.2828	0.1659	0.4081	0.3445	-0.0129	**0.7563**				
TE	0.4426	0.5607	0.4788	0.5331	0.2021	0.2905	0.597	0.373	0.7916	0.3309	0.4551	0.3556	**0.8231**			
TP	0.1378	0.2499	0.4584	0.2445	0.5867	0.3887	0.1186	0.0089	0.2678	0.4887	-0.0273	0.2987	0.2497	**0.8401**		
VC	0.5091	0.5146	0.4739	0.6079	0.0807	0.1918	0.6052	0.5125	0.6483	0.2305	0.4924	0.3495	0.667	0.1388	**0.8431**	
W	0.4875	0.4802	0.594	0.5491	0.2519	0.4729	0.4547	0.3677	0.5353	0.5558	0.3365	0.3822	0.4542	0.386	0.5517	**0.6968**

Table 52: Cross-loading values among first-order elements after first PLS run (Smart PLS generated)

	ABIL	COL	COM	CT	DEC	DS	MOT	OPP	PM	PR	RDTC	T	TE	TP	VC	W
ABIL1	0.861	0.3124	0.2847	0.3681	0.0211	0.1523	0.5125	0.6788	0.3206	0.1297	0.4737	0.0998	0.3282	0.0802	0.4388	0.4106
ABIL2	0.7954	0.2458	0.1658	0.2934	-0.1502	-0.0108	0.5412	0.5707	0.2894	-0.026	0.4476	0.0483	0.3498	-0.0518	0.4139	0.309
ABIL3	0.6723	0.3155	0.35	0.278	0.2079	0.34	0.3681	0.3797	0.3133	0.3796	0.306	0.0807	0.3678	0.3243	0.3316	0.4285
COL1	0.295	0.8142	0.4469	0.4786	0.1185	0.1982	0.3524	0.2485	0.4665	0.2359	0.325	0.1877	0.3761	0.1239	0.4093	0.3456
COL2	0.3153	0.7968	0.3749	0.4761	0.036	0.0761	0.3854	0.2345	0.4243	0.1717	0.3685	0.1315	0.3674	0.1026	0.4464	0.3239

COL3	0.2817	0.7831	0.632	0.488	0.1942	0.3511	0.493	0.2237	0.5431	0.4514	0.2648	0.4889	0.5709	0.3407	0.382	0.4616
COM1	0.284	0.5647	0.9157	0.5163	0.3134	0.4612	0.4491	0.2436	0.586	0.5194	0.3097	0.2941	0.4988	0.4256	0.4151	0.5337
COM2	0.375	0.5859	0.8864	0.5293	0.2803	0.3551	0.4225	0.2986	0.4822	0.5039	0.3155	0.3715	0.4235	0.4059	0.4789	0.5508
COM3	0.2319	0.4978	0.859	0.4118	0.2995	0.4921	0.36	0.1814	0.451	0.4923	0.2244	0.3667	0.3456	0.3878	0.3617	0.4942
CT1	0.2639	0.4609	0.3913	0.7971	0.255	0.21	0.3891	0.2795	0.4567	0.22	0.2664	0.4059	0.3563	0.2301	0.4424	0.3948
CT2	0.337	0.5603	0.5259	0.9118	0.2204	0.2803	0.5177	0.3186	0.6185	0.324	0.3676	0.3583	0.4787	0.1788	0.5163	0.519
CT3	0.441	0.5429	0.5035	0.8862	0.2358	0.2681	0.5088	0.3745	0.6255	0.3201	0.4652	0.3717	0.5391	0.2313	0.614	0.505
DEC1	0.0691	0.1396	0.3495	0.2864	0.8611	0.3957	0.1193	0.0217	0.2561	0.3927	-0.0902	0.3396	0.1644	0.5048	0.0872	0.277
DEC2	-0.0847	0.0142	0.1111	0.0965	0.7312	0.1805	0.0048	-0.0488	0.2067	0.2538	-0.217	0.2762	0.1713	0.4505	0.0119	0.0897
DEC3	0.0139	0.169	0.2832	0.2234	0.8667	0.3632	0.0897	0.0362	0.2474	0.3596	-0.1251	0.3248	0.1754	0.4993	0.0715	0.1939
DS1	0.1918	0.2674	0.4478	0.2954	0.3848	0.8313	0.1432	0.143	0.3322	0.634	0.0588	0.207	0.2963	0.3413	0.1974	0.3994
DS2	0.0934	0.1506	0.276	0.1105	0.3138	0.7651	0.1251	0.0851	0.158	0.5183	-0.0655	0.171	0.1606	0.2845	0.0429	0.2799
DS3	0.182	0.2421	0.4507	0.2899	0.3048	0.8445	0.1968	0.0921	0.3234	0.6209	0.0078	0.22	0.2417	0.3208	0.2086	0.4592
MOT1	0.5335	0.45	0.3482	0.4998	-0.0233	0.0834	0.8255	0.5818	0.3983	0.1484	0.4511	0.2448	0.458	-0.0101	0.5159	0.3657
MOT2	0.5127	0.4336	0.3579	0.4243	0.0378	0.0704	0.8883	0.4531	0.4825	0.0747	0.3958	0.1347	0.515	0.0539	0.5272	0.3412
MOT3	0.5247	0.454	0.483	0.4823	0.2479	0.334	0.8547	0.4075	0.5034	0.3662	0.3812	0.3421	0.5586	0.2557	0.5114	0.458
OPP1	0.6095	0.3548	0.239	0.4353	-0.0587	0.075	0.5644	0.8293	0.3713	0.0695	0.5096	0.1845	0.3755	-0.0101	0.508	0.3657
OPP2	0.6235	0.2023	0.2276	0.2905	0.0136	0.0687	0.4395	0.8857	0.2298	0.0782	0.4056	0.1258	0.2611	-0.0449	0.3985	0.2986
OPP3	0.5342	0.1698	0.2184	0.2002	0.0992	0.1952	0.39	0.7834	0.2655	0.1736	0.3388	0.0999	0.2927	0.0842	0.3678	0.2486
PM1	0.3489	0.4744	0.4047	0.5406	0.1693	0.2482	0.5038	0.3542	0.8441	0.2546	0.326	0.341	0.7377	0.1695	0.5675	0.3761
PM2	0.3326	0.525	0.5085	0.541	0.219	0.2802	0.5127	0.3099	0.849	0.3076	0.309	0.2932	0.7875	0.241	0.5821	0.4058
PM3	0.2667	0.4726	0.4838	0.4272	0.2886	0.2817	0.4391	0.2415	0.8117	0.3063	0.1476	0.3507	0.6005	0.2713	0.4605	0.3974
PM4	0.307	0.5503	0.4972	0.5314	0.2481	0.3055	0.4181	0.2346	0.8424	0.347	0.2394	0.3432	0.6302	0.2005	0.5638	0.4799
PM5	0.3531	0.4807	0.4092	0.5872	0.2025	0.2008	0.3953	0.2842	0.8126	0.2491	0.3414	0.2293	0.5959	0.1543	0.5413	0.4522
PM6	0.327	0.486	0.5277	0.6168	0.3188	0.3714	0.3938	0.2912	0.7824	0.4754	0.2283	0.4672	0.5469	0.2964	0.4765	0.5328
PR1	0.2245	0.3873	0.5751	0.3643	0.4115	0.7056	0.2339	0.1345	0.3954	0.9097	0.0212	0.3213	0.3657	0.4457	0.2296	0.5372
PR2	0.1807	0.3397	0.5512	0.2766	0.3992	0.7032	0.2061	0.123	0.325	0.9173	-0.0249	0.3405	0.2564	0.4455	0.1975	0.4749
PR3	0.0656	0.2063	0.29	0.2011	0.2508	0.4185	0.1442	0.0514	0.2747	0.7185	-0.0455	0.203	0.2113	0.3532	0.1568	0.4025
RDTC1	0.248	0.0423	0.0278	0.0576	-0.073	-0.192	0.1614	0.2744	-0.0428	-0.1235	0.5168	-0.0836	0.0457	-0.0545	0.0593	0.055

RDTC2	0.5587	0.4367	0.3741	0.4665	-0.1023	0.1515	0.5026	0.4909	0.4308	0.1071	0.8411	0.1167	0.5476	0.0478	0.4935	0.4144
RDTC3	0.077	-0.0303	0.0052	-0.0661	-0.1699	-0.1762	0.0433	0.1954	-0.2049	-0.1682	0.4331	-0.2407	-0.1299	-0.0636	0.0389	-0.098
RDTC4	0.147	0.0968	0.009	0.0514	-0.22	-0.2315	0.13	0.1811	0.0085	-0.2827	0.5883	-0.1843	0.0954	-0.1914	0.1567	-0.0751
RDTC5	0.5097	0.4466	0.3894	0.5158	-0.0587	0.108	0.5158	0.4572	0.4187	0.0944	0.8891	0.1103	0.5113	0.0446	0.5665	0.423
RDTC6	0.2048	0.1354	0.0471	0.1299	-0.1676	-0.1131	0.1158	0.2282	0.0444	-0.1216	0.6061	-0.2824	0.1153	-0.1385	0.1837	0.068
T1	-0.0265	0.2341	0.2478	0.1863	0.2902	0.2184	0.0725	0.01	0.1704	0.2633	-0.2269	0.7639	0.0834	0.193	0.1171	0.2559
T2	-0.1586	0.0553	0.0231	0.0795	0.3095	0.1581	-0.0275	-0.0861	0.1029	0.1769	-0.3791	0.5822	0.0268	0.2136	-0.0309	0.073
T3	0.1949	0.3746	0.4179	0.5092	0.3243	0.199	0.3776	0.2559	0.4748	0.3122	0.1969	0.891	0.4652	0.2772	0.4503	0.3951
TE1	0.4331	0.4487	0.4128	0.4324	0.1267	0.2936	0.4442	0.2792	0.6947	0.3543	0.3681	0.2431	0.7962	0.2453	0.5896	0.4547
TE2	0.3526	0.4527	0.3987	0.4454	0.1704	0.2682	0.5117	0.279	0.6785	0.3034	0.4065	0.2587	0.8665	0.2104	0.5458	0.3416
TE3	0.3991	0.4581	0.3886	0.4666	0.1541	0.185	0.5206	0.3514	0.636	0.1381	0.4436	0.2551	0.8271	0.1997	0.5732	0.3934
TE4	0.3549	0.4915	0.4162	0.4407	0.2461	0.275	0.4948	0.3353	0.6392	0.3454	0.3398	0.4181	0.8315	0.253	0.558	0.39
TE5	0.332	0.4903	0.3465	0.4389	0.097	0.1697	0.5149	0.3355	0.6217	0.1955	0.3845	0.2514	0.8203	0.0973	0.5116	0.3106
TE6	0.2901	0.4253	0.4201	0.3942	0.242	0.2711	0.445	0.239	0.6481	0.3641	0.2495	0.3871	0.7949	0.2558	0.5083	0.3556
TP1	0.0914	0.1435	0.2453	0.1858	0.45	0.2185	0.0347	0.0043	0.1983	0.2655	-0.0171	0.1531	0.2103	0.8406	0.1542	0.2103
TP2	0.1283	0.2254	0.4028	0.2142	0.5202	0.3513	0.1155	0.0292	0.2021	0.406	0.0234	0.2337	0.1575	0.9004	0.0763	0.3316
TP3	0.1226	0.2487	0.4825	0.2123	0.4994	0.3896	0.1364	-0.0137	0.2725	0.5367	-0.0787	0.3516	0.2668	0.7748	0.1297	0.4114
VC1	0.4039	0.3999	0.4108	0.4325	0.1383	0.2058	0.4775	0.3503	0.5755	0.2433	0.2947	0.3038	0.5218	0.1219	0.7871	0.4317
VC2	0.4426	0.49	0.4438	0.5203	0.1364	0.1691	0.5427	0.4153	0.6051	0.2297	0.3655	0.3677	0.5847	0.1403	0.8396	0.4823
VC3	0.4013	0.4266	0.3379	0.4937	0.1195	0.156	0.4857	0.3757	0.5425	0.1446	0.3128	0.3661	0.5308	0.1376	0.808	0.4058
VC4	0.437	0.4258	0.4231	0.5433	0.0162	0.1953	0.5051	0.4844	0.5199	0.1853	0.4879	0.2242	0.5556	0.102	0.8781	0.494
VC5	0.4434	0.4168	0.3882	0.5645	0.0326	0.1423	0.5119	0.4569	0.5357	0.1947	0.5471	0.2388	0.6038	0.1389	0.8722	0.4673
VC6	0.4451	0.4457	0.3935	0.5101	-0.0148	0.1095	0.5382	0.4951	0.5129	0.1718	0.4486	0.2869	0.5726	0.0646	0.8698	0.5037
W1	-0.0889	-0.0869	-0.0391	-0.0989	0.2035	0.2284	-0.1738	-0.0837	-0.1022	0.2277	-0.3864	0.1819	-0.1615	0.2248	-0.1202	0.1456
W2	0.4085	0.4183	0.4675	0.4771	0.1289	0.2749	0.4026	0.3027	0.4518	0.3279	0.3328	0.2485	0.3876	0.2035	0.5018	0.7623
W3	0.3727	0.3529	0.542	0.3496	0.2521	0.4702	0.3054	0.282	0.3965	0.5631	0.1732	0.2684	0.3263	0.3821	0.3318	0.8413
W4	0.4592	0.4552	0.4517	0.5891	0.1472	0.3061	0.4946	0.3563	0.5187	0.3571	0.4949	0.364	0.4765	0.2572	0.6032	0.7951

Table 53: Evaluation of Item Reliability, AVE and CR after item deletion

Constructs	Items	Factor Loading	*t*-Value	AVE	CR
Data Security (DS)	DS1	0.8301	13.5995	0.6633	0.8551
	DS2	0.768	11.5902		
	DS3	0.8432	19.6953		
Telehealthcare Protocols (PR)	PR1	0.9109	34.3327	0.7283	0.8882
	PR2	0.9188	41.4968		
	PR3	0.7147	10.0221		
Workload (W)	W1			0.7089	0.8289
	W2	0.7804	6.5174		
	W3	0.8993	30.3851		
	W4				
Motivation to share (MOT)	MOT1	0.8154	16.8517	0.7335	0.8918
	MOT2	0.8885	28.5433		
	MOT3	0.8638	20.4652		
Opportunity to share (OPP)	OPP1			0.7914	0.8835
	OPP2	0.8916	30.305		
	OPP3	0.8876	23.2151		
Ability to share (ABIL)	ABIL1	0.8553	23.3732	0.6077	0.8219
	ABIL2	0.7766	11.6047		
	ABIL3	0.6989	6.3612		
Data exposure concerns (DEC)	DEC1	0.8455	1.5533	0.6837	0.8661
	DEC2	0.7675	1.1823		
	DEC3	0.8645	1.389		
Telehealth Practice (TP)	TP1	0.8407	1.446	0.7058	0.8776
	TP2	0.8975	1.5638		
	TP3	0.7779	1.669		
Communication (COM)	COM1	0.9157	30.2065	0.7874	0.9174
	COM2	0.8863	28.9063		
	COM3	0.8592	15.8814		
Collaboration (COL)	COL1	0.8138	17.3515	0.6368	0.8402
	COL2	0.7961	15.3578		
	COL3	0.7839	16.183		
Trust (T)	T1	0.7659	4.3671	0.5733	0.7968
	T2	0.5855	2.5465		
	T3	0.8891	18.2872		
Commitment (CT)	CT1	0.7972	13.8346	0.7507	0.9

	CT2	0.9118	37.7109		
	CT3	0.8861	29.5277		
Process Management (PM)	PM1	0.8439	17.0179	0.6791	0.9269
	PM2	0.8484	18.509		
	PM3	0.8121	12.59		
	PM4	0.8431	18.7007		
	PM5	0.8123	16.649		
	PM6	0.7825	14.5739		
Value Creation (VC)	VC1	0.8488	20.4641	0.7283	0.9146
	VC2	0.8876	30.5217		
	VC3	0.8426	17.5388		
	VC4				
	VC5				
	VC6	0.8335	23.4898		
Telehealth Enablers (TE)	TE1	0.7993	11.9919	0.678	0.9266
	TE2	0.8654	20.8257		
	TE3	0.8233	13.7217		
	TE4	0.8309	11.9656		
	TE5	0.8198	17.1424		
	TE6	0.7998	11.4473		
Readiness to Develop Telehealth Capabilities (RTDC)	RDTC1			0.5541	0.8223
	RDTC2	0.899	21.4522		
	RDTC3				
	RDTC4	0.518	2.7193		
	RDTC5	0.9285	36.8562		
	RDTC6	0.5271	2.9291		

Table 54: Construct correlations among first order elements after deletion of items (Smart PLS generated)

	ABIL	COL	COM	CT	DEC	DS	MOT	OPP	PM	PR	RDTC	T	TE	TP	VC	W
ABIL	**0.7795**															
COL	0.3748	**0.7979**														
COM	0.3441	0.6213	**0.8873**													
CT	0.4048	0.6039	0.5501	**0.8664**												
DEC	0.0276	0.1455	0.3238	0.2632	**0.8268**											
DS	0.2068	0.2747	0.4879	0.2928	0.4005	**0.8144**										
MOT	0.6081	0.521	0.4666	0.5475	0.1036	0.1972	**0.8564**									
OPP	0.6501	0.2094	0.2507	0.2762	0.0611	0.1475	0.464	**0.8896**								
PM	0.395	0.6057	0.5722	0.6588	0.2897	0.3405	0.5409	0.278	**0.824**							
PR	0.2071	0.3744	0.5703	0.3358	0.4181	0.7299	0.2366	0.1414	0.3922	**0.8534**						
RDTC	0.5428	0.4425	0.3611	0.4806	-0.14	0.0671	0.5059	0.3957	0.3999	0.0318	**0.7443**					
T	0.0983	0.3565	0.3858	0.433	0.3834	0.2464	0.2834	0.126	0.4074	0.3447	0.0348	**0.7571**				
TE	0.4449	0.5609	0.4796	0.5326	0.2045	0.2913	0.5977	0.3104	0.7921	0.3335	0.5192	0.3555	**0.8234**			
TP	0.1503	0.2503	0.4586	0.2446	0.5877	0.3886	0.1237	0.0212	0.2685	0.4892	-0.0071	0.2994	0.2518	**0.8401**		
VC	0.4959	0.518	0.4656	0.5749	0.1059	0.1856	0.6003	0.3934	0.6549	0.2313	0.4761	0.387	0.6492	0.1364	**0.8534**	
W	0.4606	0.4468	0.6013	0.4728	0.229	0.4578	0.4077	0.2922	0.4931	0.5484	0.3293	0.3053	0.414	0.363	0.459	**0.8419**

Table 55: Cross-loading values among first-order elements after deletion of items (Smart PLS generated)

	ABIL	COL	COM	CT	DEC	DS	MOT	OPP	PM	PR	RDTC	T	TE	TP	VC	W
ABIL1	0.8553	0.3123	0.2847	0.3681	0.013	0.1521	0.5116	0.6407	0.3204	0.1303	0.4777	0.0986	0.3282	0.0798	0.417	0.3956
ABIL2	0.7766	0.2456	0.1658	0.2934	-0.1607	-0.011	0.5379	0.4656	0.2894	-0.026	0.461	0.0473	0.3496	-0.052	0.4146	0.2787
ABIL3	0.6989	0.3156	0.35	0.278	0.2079	0.3399	0.3713	0.3941	0.3131	0.3801	0.3257	0.08	0.3678	0.325	0.3262	0.3965
COL1	0.2977	0.8138	0.4468	0.4786	0.1092	0.1982	0.3507	0.1663	0.4665	0.2363	0.3726	0.1873	0.3761	0.1235	0.3947	0.3258
COL2	0.314	0.7961	0.3748	0.4761	0.0317	0.0755	0.383	0.129	0.4243	0.1718	0.3873	0.1305	0.3664	0.1027	0.4446	0.3116
COL3	0.2876	0.7839	0.632	0.488	0.1886	0.3506	0.4958	0.1976	0.5432	0.4519	0.3084	0.4884	0.5716	0.3409	0.4032	0.4174

COM1	0.2892	0.5651	0.9157	0.5163	0.3055	0.4603	0.4511	0.2438	0.5859	0.5201	0.35	0.293	0.4992	0.4259	0.4012	0.5455
COM2	0.3795	0.586	0.8863	0.5293	0.2674	0.3546	0.423	0.238	0.4823	0.5047	0.3368	0.3704	0.4242	0.4059	0.4737	0.5532
COM3	0.2406	0.4982	0.8592	0.4118	0.2904	0.4917	0.3641	0.1818	0.4512	0.4933	0.2702	0.3662	0.3467	0.388	0.3592	0.4994
CT1	0.2624	0.461	0.3913	0.7972	0.2459	0.2092	0.3879	0.2032	0.4567	0.2197	0.3143	0.4054	0.356	0.2301	0.4054	0.3232
CT2	0.3374	0.5604	0.5259	0.9118	0.2126	0.2796	0.5181	0.2378	0.6183	0.3242	0.4184	0.3573	0.4785	0.1791	0.4976	0.4467
CT3	0.4433	0.5429	0.5034	0.8861	0.2299	0.2675	0.5078	0.2739	0.625	0.3206	0.5055	0.37	0.5387	0.2313	0.5823	0.4494
DEC1	0.0784	0.1398	0.3495	0.2864	0.8455	0.3953	0.1246	0.0612	0.2563	0.3931	-0.0841	0.3397	0.1648	0.505	0.1017	0.2527
DEC2	-0.073	0.0143	0.1111	0.0965	0.7675	0.1812	0.0078	0.0237	0.2069	0.2542	-0.1989	0.2768	0.1722	0.4505	0.0374	0.0805
DEC3	0.0221	0.169	0.2832	0.2234	0.8645	0.3633	0.0939	0.0569	0.2475	0.3598	-0.1014	0.3252	0.1761	0.4994	0.1061	0.1928
DS1	0.2004	0.2677	0.4478	0.2954	0.3696	0.8301	0.1478	0.1663	0.3322	0.6348	0.0978	0.2069	0.2968	0.3414	0.1733	0.3831
DS2	0.1043	0.1509	0.2761	0.1105	0.3139	0.768	0.1288	0.0901	0.1582	0.5192	-0.0136	0.1715	0.1621	0.2844	0.0484	0.2665
DS3	0.1912	0.2423	0.4507	0.29	0.2962	0.8432	0.2005	0.1007	0.3236	0.6212	0.0691	0.2201	0.2427	0.3209	0.2152	0.453
MOT1	0.5274	0.45	0.3482	0.4998	-0.0265	0.0834	0.8154	0.4657	0.3982	0.1485	0.4781	0.2437	0.4579	-0.011	0.4947	0.3162
MOT2	0.5064	0.4336	0.3578	0.4243	0.0336	0.07	0.8885	0.3745	0.4823	0.0749	0.4213	0.1335	0.514	0.0538	0.5367	0.3185
MOT3	0.5284	0.4544	0.4831	0.4823	0.2402	0.334	0.8638	0.3581	0.5033	0.3662	0.4048	0.3411	0.5578	0.2559	0.5109	0.4062
OPP2	0.6183	0.2022	0.2275	0.2905	0.0116	0.0686	0.4361	0.8916	0.2297	0.0784	0.3862	0.1248	0.2603	-0.046	0.3715	0.2912
OPP3	0.5377	0.1701	0.2184	0.2002	0.0978	0.1949	0.3891	0.8876	0.2652	0.1739	0.3172	0.0991	0.2924	0.0843	0.3282	0.2281
PM1	0.3504	0.4746	0.4046	0.5406	0.1718	0.2479	0.5047	0.2969	0.8439	0.2547	0.3878	0.3399	0.7378	0.1699	0.5699	0.3549
PM2	0.3366	0.5253	0.5085	0.541	0.2166	0.2795	0.5148	0.2745	0.8484	0.3078	0.3662	0.2919	0.7878	0.2421	0.5728	0.3866
PM3	0.2677	0.4729	0.4838	0.4272	0.289	0.2812	0.442	0.2186	0.8121	0.3062	0.2019	0.3504	0.6013	0.2719	0.4829	0.379
PM4	0.3076	0.5504	0.4972	0.5314	0.2429	0.3047	0.4191	0.1526	0.8431	0.3469	0.3072	0.3424	0.6313	0.2011	0.586	0.4387
PM5	0.3522	0.4806	0.4092	0.5872	0.2015	0.1999	0.3961	0.1926	0.8123	0.2491	0.4018	0.2283	0.5968	0.1542	0.531	0.4063
PM6	0.3311	0.4861	0.5277	0.6168	0.3205	0.371	0.3944	0.2375	0.7825	0.475	0.2939	0.4666	0.5479	0.2966	0.4851	0.4712
PR1	0.2362	0.3876	0.5751	0.3643	0.4068	0.7052	0.2368	0.1345	0.3954	0.9109	0.0726	0.321	0.3673	0.446	0.2287	0.5464
PR2	0.1947	0.34	0.5512	0.2765	0.3953	0.7033	0.2107	0.149	0.3252	0.9188	0.0138	0.3404	0.2591	0.4459	0.207	0.4733
PR3	0.074	0.2065	0.29	0.2011	0.2462	0.4181	0.1479	0.0662	0.2749	0.7147	-0.018	0.2032	0.2138	0.3542	0.1471	0.3678
RDTC2	0.5558	0.4367	0.3741	0.4665	-0.1111	0.151	0.5008	0.3895	0.4305	0.1071	0.899	0.1149	0.5467	0.0477	0.4462	0.3696
RDTC4	0.1426	0.0967	0.009	0.0514	-0.2252	-0.231	0.1289	0.1572	0.0082	-0.282	0.518	-0.186	0.0937	-0.192	0.1171	-0.096
RDTC5	0.5086	0.4465	0.3894	0.5158	-0.0632	0.1075	0.5143	0.3549	0.4183	0.0947	0.9285	0.1083	0.51	0.0441	0.5077	0.3574

RDTC6	0.2044	0.1351	0.0471	0.1299	-0.175	-0.113	0.1152	0.1935	0.044	-0.122	0.5271	-0.2838	0.114	-0.139	0.1168	0.0605
T1	-0.026	0.2345	0.2479	0.1864	0.2899	0.2186	0.0729	-0.0006	0.171	0.2633	-0.1852	0.7659	0.0855	0.1934	0.1673	0.2129
T2	-0.157	0.0556	0.0232	0.0795	0.315	0.1584	-0.025	-0.0815	0.1034	0.1768	-0.3323	0.5855	0.0273	0.2136	0.0278	0.0236
T3	0.1959	0.375	0.4179	0.5092	0.3218	0.1987	0.3795	0.2041	0.4749	0.3128	0.2353	0.8891	0.4658	0.2778	0.4648	0.3198
TE1	0.4382	0.4489	0.4128	0.4324	0.1289	0.293	0.4443	0.2417	0.6945	0.3543	0.4365	0.2421	0.7993	0.2458	0.567	0.3925
TE2	0.3597	0.453	0.3987	0.4453	0.1706	0.2678	0.5138	0.241	0.6779	0.3035	0.4535	0.2575	0.8654	0.211	0.519	0.3149
TE3	0.3979	0.4582	0.3886	0.4665	0.1566	0.1845	0.5216	0.2723	0.6357	0.1382	0.4942	0.2539	0.8233	0.2004	0.555	0.3569
TE4	0.3555	0.4918	0.4162	0.4407	0.2445	0.2747	0.4985	0.3025	0.6391	0.3456	0.3867	0.417	0.8309	0.2541	0.5697	0.3578
TE5	0.3314	0.4905	0.3465	0.4389	0.0987	0.1694	0.5147	0.2712	0.6213	0.1955	0.4389	0.2501	0.8198	0.0983	0.4855	0.2936
TE6	0.2911	0.4256	0.4201	0.3941	0.2448	0.2712	0.4462	0.192	0.6479	0.3639	0.3096	0.3861	0.7998	0.2571	0.5103	0.3301
TP1	0.0982	0.1435	0.2453	0.1858	0.4552	0.2183	0.0391	0.0047	0.1983	0.2657	-0.0061	0.153	0.211	0.8407	0.1354	0.1696
TP2	0.1373	0.2256	0.4028	0.2142	0.5216	0.3513	0.1195	0.037	0.2022	0.4062	0.0247	0.2339	0.1582	0.8975	0.0669	0.3253
TP3	0.1377	0.2492	0.4825	0.2123	0.4955	0.3896	0.1412	0.0084	0.2726	0.5363	-0.0384	0.3516	0.2682	0.7779	0.1476	0.3955
VC1	0.4057	0.3999	0.4108	0.4325	0.135	0.2052	0.479	0.2804	0.5755	0.2432	0.3463	0.303	0.5228	0.1223	0.8488	0.3865
VC2	0.4421	0.4901	0.4438	0.5203	0.1342	0.1684	0.5431	0.35	0.605	0.23	0.4105	0.3663	0.5855	0.141	0.8876	0.414
VC3	0.3987	0.4265	0.3379	0.4937	0.1162	0.1556	0.4848	0.2878	0.5425	0.145	0.3818	0.3654	0.5306	0.1386	0.8426	0.3309
VC6	0.4428	0.4457	0.3934	0.5101	-0.0183	0.1089	0.5368	0.4158	0.5128	0.1716	0.4792	0.2855	0.5724	0.0654	0.8335	0.4303
W2	0.4091	0.4182	0.4675	0.477	0.1195	0.2741	0.4019	0.1981	0.4517	0.3282	0.3696	0.2477	0.3885	0.2036	0.4743	0.7804
W3	0.3795	0.3532	0.542	0.3496	0.2473	0.4698	0.3081	0.2837	0.3967	0.563	0.2174	0.2679	0.3266	0.3821	0.3315	0.8993

Following the above model results and analysis, in relation to the reliability of items, the model‘s composite reliability or internal consistency as well as its discriminant validity, the measurement model is evidently showing satisfactory outcome and meets convergent validity acceptable criteria with (loadings > 0.50, composite reliability CR>0.70, average variance extracted AVE>0.50) as well as discriminant validity criteria with (average variance extracted AVE > higher than the model constructs‘ correlations). On the basis of these results, the measurement model for first order constructs can be confirmed as satisfactory and will therefore be utilised in the evaluation of the structural framework in the following section.

6.4.1.2 Evaluation of the structural framework

As previously introduced, this stage of the evaluation process serves to assess how significant path loadings and path coefficients with resultant t-values are between the model‘s constructs (Hair et al. 2019; Hair, Ringle and Sarstedt, 2011). Additionally, the proposed framework was also assessed on the basis of its explanatory power through the estimation of the (R2) squared value or explained variance percentage for the dependent variable (Hair et al. 2019). Furthermore, multidimensional elements of the framework were assessed for nomological validity as well as predictive validity. To assess the link between the model‘s constructs in conjunction with the PLS (partial least square) approach of the structural equation modelling (SEM), literature studies also recommend that two non-parametric techniques be considered and used. The first one is the jackknife technique whereas the second one bootstrapping technique (Gefen et al. 2000; Santosa et al. 2005). For the purposes of this project and the analysis of its data, the second bootstrapping technique is considered more superior and advanced and as such was selected over the other technique (Chin, 1998a).

6.4.1.3 Assessing path coefficient (β) value and t-value

Both path coefficient and their resultant t-values were assessed in order to test the relationships between the proposed model‘s elements and the stated hypotheses (Barclay, Higgins and Thompson, 1995; Ringle, 2012). A value which is positive demonstrates a positive link among the indicated model‘s constructs. On the contrary, a negative value demonstrates a negative link or relationship between the constructs. The resultant t-value tests the statistical significance of the proposed or hypothesised relationship. These values are shown in the figures below and the subsequent table. The framework is also assessed for the impact of the engaged control factors, namely; age, gender and experience on the dependent variable.

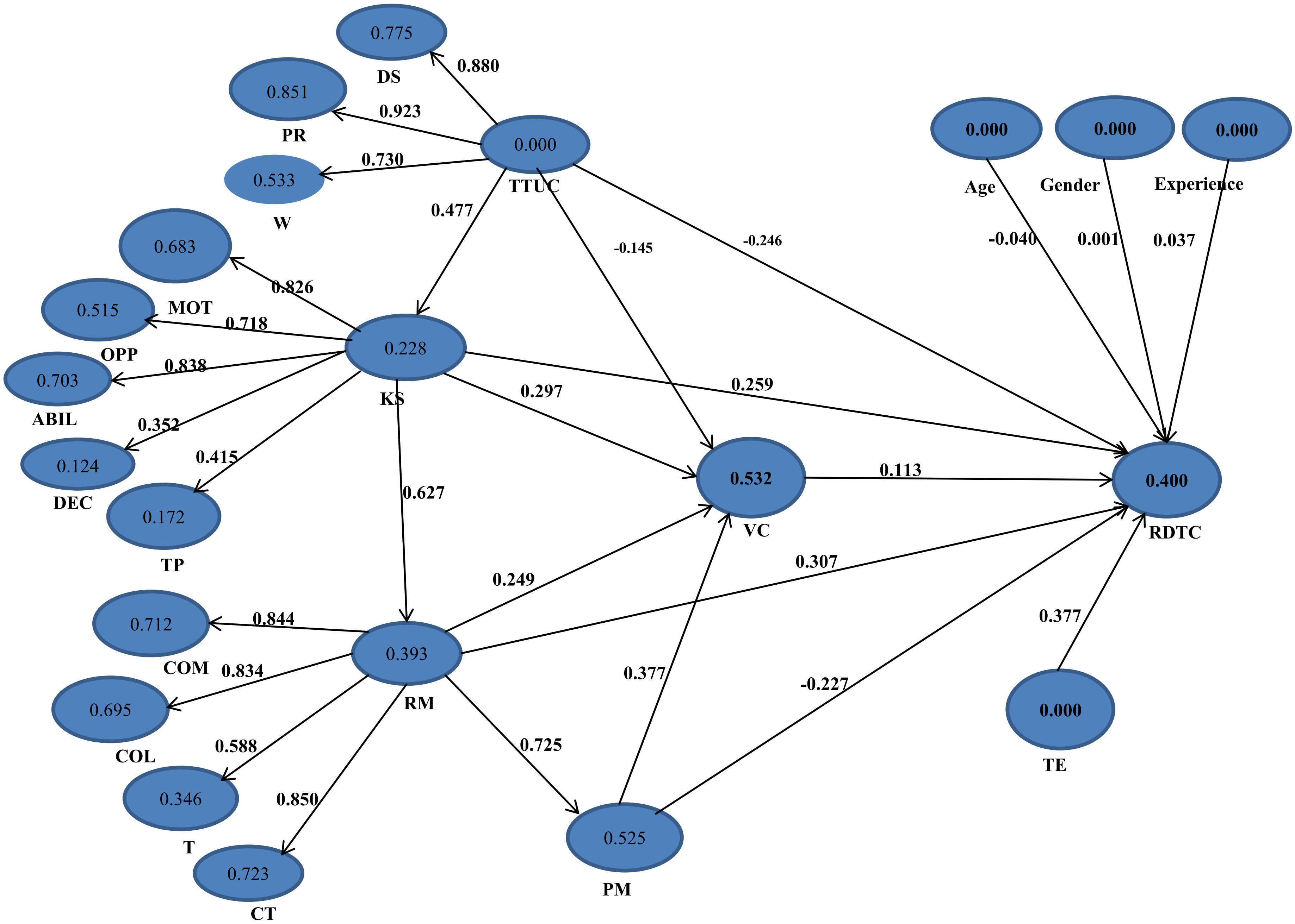


Figure 18: Model‘s PLS algorithm output for path coefficient values

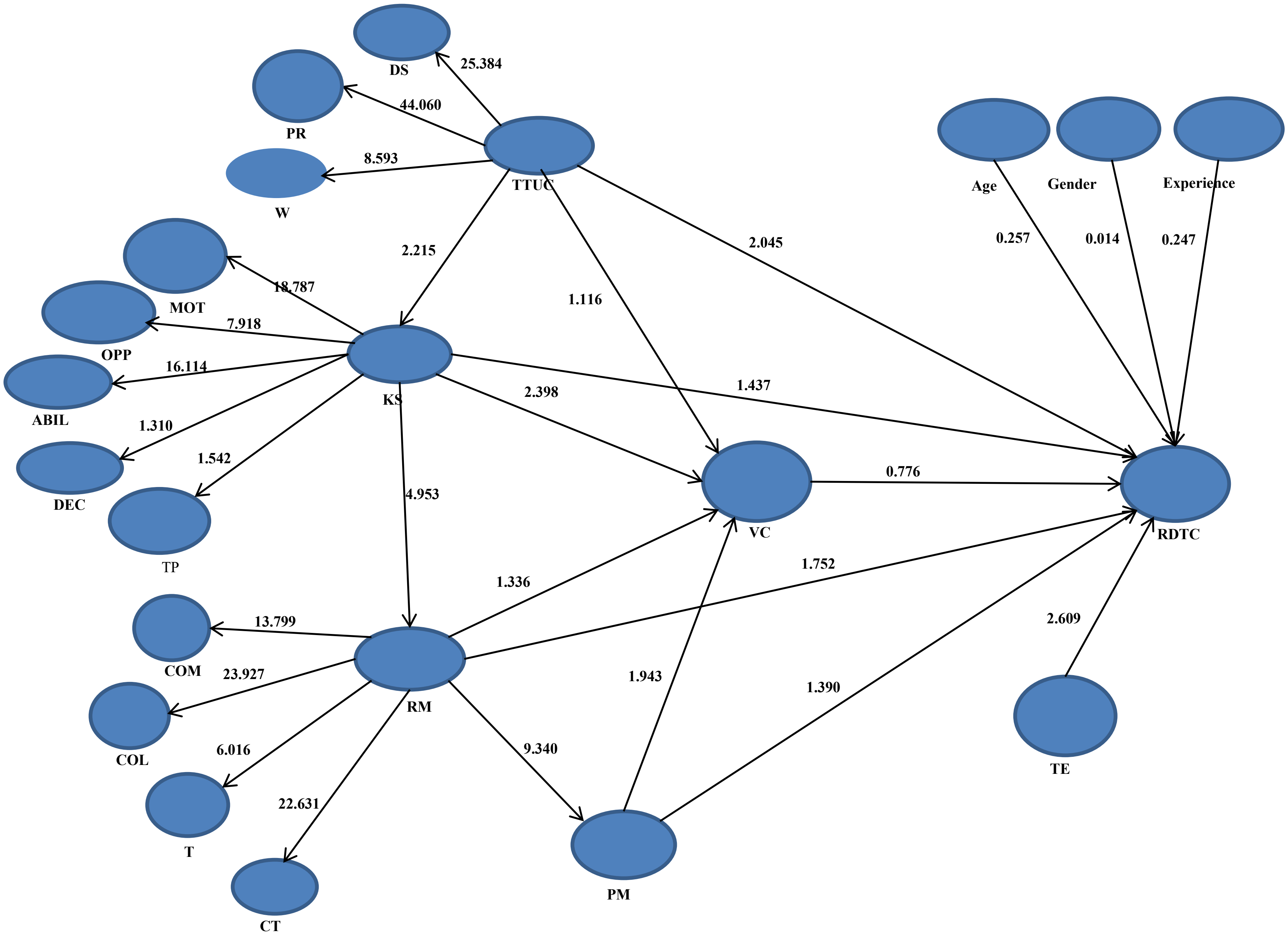


Figure 19: Model's bootstrapping output for t-values

Table 56: Path coefficients (β) and *t*-values (direct relationships)

Hypothesis	**Link**	**Path coefficient standardised**	***t*-Value**	**Outcome**
H1	TTUC→VC (+)	-0.1455	1.1164	Not Supported
H3	KS→VC (+)	0.2971	2.3975***	Supported
H5	TTUC→KS (+)	0.4775	2.2148**	Supported
H6	RM→VC (+)	0.2492	1.3346	Not Supported
H8	KS→RM (+)	0.6269	4.9532***	Supported
H9	PM→VC (+)	0.3766	1.9433*	Supported
H11	RM→PM (+)	0.7249	9.3399***	Supported
H12	VC→RDTC (+)	0.113	0.7763	Not Supported

*Statistical significance at ***$p<0.005$, **$p<0.01$, * $p<0.05$* and critical values are 2.32 at p=0.005; 1.96 at p=0.01; and 1.645 at p=.05.

6.4.1.4 Assessment of R2 (coefficient of determination)

The value of R2 assesses the framework‘s ability in terms of how it explains or predicts the dependent variable (Hair, Ringle and Sarstedt, 2011). The R2 (coefficient of determination) value of the dependent variable: GPs‘ readiness to develop telehealth capabilities is **0.4001.** This value indicates a medium to large explanatory ability of the model to explain the dependent variable (Cohen, 1977; Hair, Ringle and Sarstedt, 2011). This value likewise endorses the nomological validity of the dependent construct in relation to its independent constructs.

Furthermore, the framework has higher than large weight (Cohen, 1977) from the aspect of its most important directly predicting construct ‗Value Creation‘ being able to explain 53.21% and the final key pillar of the proposed model; Process Management being able to explain 52.55% variance, whereas the most important dependent variable is able to explain 40.01% variance of GPs‘ readiness to develop capabilities for telehealth medical services. This R2 value is also strong (Hair et al. 2017) as it is considered large by (Cohen, 1988) R2 effect size weight measure index (small>0.02; medium>0.13 and large>0.26 (Wetzels, Odekerken-Schroder and van Oppen, 2009, p. 187). Very importantly, it can thus be noted that all of the R2 values are large and only the first dependent construct: knowledge sharing is in the medium to large range however a lot closer to the large coefficient value with subsequent constructs being progressively larger.

Table 57: R2 Coefficient of determination values for the endogenous latent model‘s constructs

Model‘s Endogenous Constructs	R2
Knowledge Sharing	0.228
Relationship Management	0.393
Process Management	0.5255
Value Creation	0.5321
GPs‘ Readiness to Develop Telehealth Capabilities	0.4001

Levels of acceptable strength also depend on the field under inquiry as for instance in the case of physics and chemistry acceptable levels are much higher. However, the other endogenous constructs‘ R2 values above are also acceptable according to Henseler, Ringle and Sinkovics (2009) and Mooi and Sarstedt (2011) as they are in social sciences.

6.4.1.5 Evaluating predictive strength or validity/relevance

After R2 measurement of predictive accuracy, this project has also utilised the Q2 Stone-Geisser test (Geisser, 1975; Stone, 1974) to evaluate the model‘s predictive relevance for all of the endogenous constructs. To do that, the blindfolding technique was carried out in Smart PLS and endogenous constructs‘ cross-validated redundancy values were computed to complete the evaluation. Results are presented in the table below.

Table 58: Predictive relevance for TTUC

Predictive relevance for TTUC	Q2 values
KS	0.0697
PM	0.3318
RM	0.1616
VC	0.3846
RDTC	0.1922

According to Cohen (1988) criteria for Q2 size index values (0.02=small; 0.15=medium & 0.35=large), the endogenous constructs in this model portray mainly medium predictive validity strength. However, the most important direct predicting construct (VC) demonstrates large predictive relevance (0.3846), that is, large predictive validity. It is followed by the final model‘s pillar (PM) construct demonstrating just below large predictive relevance strength Q2 values (0.3318). Finally, the dependent variable (RDTC) demonstrates medium predictive relevance (0.1922).

6.4.1.6 Effect size (f Square)

Upon examining R Square and Q Square results, f Square or effect size for the dependent constructs was likewise computed. Effect size (f Square) is a calculation or measurement of the impact of a particular predictor (independent) construct on a criterion or dependent construct (Cohen, 1988; Newsome, 2006). It measures relationship strength between predictor and criterion constructs.

Table 59: Effect size (f Square)

	KS	RM	PM	VC	RDTC
TTUC	0.295			0.029	
KS		0.647		0.107	
RM			1.107	0.048	
PM				0.138	
VC					0.009

Table 59 presents calculated f Square or effect size values of the independent constructs: TTUC, KS, RM and PM on VC as 0.029, 0.107, 0.048 and 0.138 respectively. Similarly, it also shows the impact of TTUC on KS as having an effect size value of 0.295, KS on RM as 0.647 and RM on PM as having an effect size impact of 1.107. According to Cohen (1977, p. 83) effect size index, 0.10 represents small, 0.30 medium and 0.50 or higher large values. The table also shows an f Square value of 0.009 between the key predicting variable VC and RDTC, which is very low. This index is suggested to be generally applicable in most social sciences however effect size does depend on what is being measured, thus, the discipline it relates to.

6.4.1.7 Hypotheses evaluation results (direct relationships)

Outcomes from eight directly hypothesised relationships are portrayed in the hypotheses table above. One moderating and four mediating hypotheses are presented in a separate section that is to follow this section. All proposed relationships were hypothesised to have a positive and significant link. 5 out of 8 directly hypothesised relationships have been supported as the corresponding t-values for each of those hypotheses have exceeded the critical statistically significant levels and 3 directly hypothesised relationships have been rejected (see hypotheses table 56 above).

The first direct hypothesised relationship that TTUC (telehealth technology use considerations) will have a positive relationship with VC (value creation) did not gather sufficient support and the hypothesis was rejected due to a negative path coefficient value (β=-0.1455) and insignificant t-value (t=1.1164). This essential link represents the greatest challenge in this technologically-driven proposed model. However, a close examination of this relationship will be undertaken and reported in the next section which evaluates the impact of the direct relationship of these two constructs when another mediating variable is present. This is the initial hypothesis and foundational for the rest of the model. However its impact based on the structure of the model could also be assessed last as the strengths of the other key model's elements are likely to more indirectly and positively impact upon it.

It is demonstrated in the statistically positive indirect effect between telehealth technology use consideration (TTUC) and the final dependent variable: GPs' readiness to develop telehealth capabilities (RDTC) via mediation of value creation (VC) which will be discussed in the next section on mediating hypotheses. This project has also sought to investigate and examine the relationship between the third essential element (RM) and the key predicting construct (VC). In a similar context, the hypothesis that RM (relationship management) will have a positive relationship with VC (value creation) has been affected by low path coefficient (β=0.219) and insufficient corresponding t-value (t=1.335) for which reason it has been rejected as it is below the minimum accepted threshold. Likewise, as in the case above, the impact between these two constructs will be examined more closely through a regression based analysis in the next section where another mediating variable is present.

Furthermore, the hypothesis that value creation (VC) will have a sufficiently positive direct relationship with the dependent variable (RDTC) also produced a low path coefficient value of (β=0.113) and corresponding t-value of (t=0.7763) due to which it has likewise been rejected. Similarly, the interplay of these two variables will be examined closely through a regression-based analysis with a third mediating factor and evaluated closely in the next section. In addition, a deeper analysis of the remaining hypothesised relationships has revealed a more positive cumulative effect. This will be presented in the next section. Of the other five direct hypotheses which have been confirmed through positive statistically significant relationships, the most influential is the proposed relationship between relationship management (RM) and process management (PM) with the highest path coefficient (β=0.725) and corresponding t-value (t=9.340, p=0.005). These results have validated the significance of the relationship management construct as a solid backbone to effective telehealth process management. It is followed by the link between knowledge sharing (KS) and relationship management (RM) with path coefficient (β=0.627) and t-value (t=4.9532, p=0.005). This result has uncovered a statistically significant justification to prove that there is a strong positive relationship between knowledge sharing (KS) and relationship management (RM). This is followed by the link between knowledge sharing

(KS) and value creation (VC) with a path coefficient (β=0.297) and t-value (t=2.398, p=0.005) and the relationship between telehealth technology use consideration (TTUC) and knowledge sharing (KS) with path coefficient value (β=0.4775) and t-value (t=2.2148, p=0.01). Finally, the project's statistical findings have revealed a statistically significant justification to prove that there is strong positive relationship between the final element of the proposed telehealth service value network: process management (PM) and value creation (VC) with a path coefficient value of (β=0.377) and t-value (t=1.9433, p=0.05). Next we present analysis on mediation.

6.5 Hypotheses analysis of mediating (indirect) relationships

Mediation is existent in a relationship where at the very minimum one variable intervenes or mediates the link between the predicting variable and the predictor that has an impact on their relationship (Baron and Kenny, 1986; Hayes, 2009; Hayes, 2013). Below is an example of a mediating template provided by Hayes (2013) that is applicable in this study.

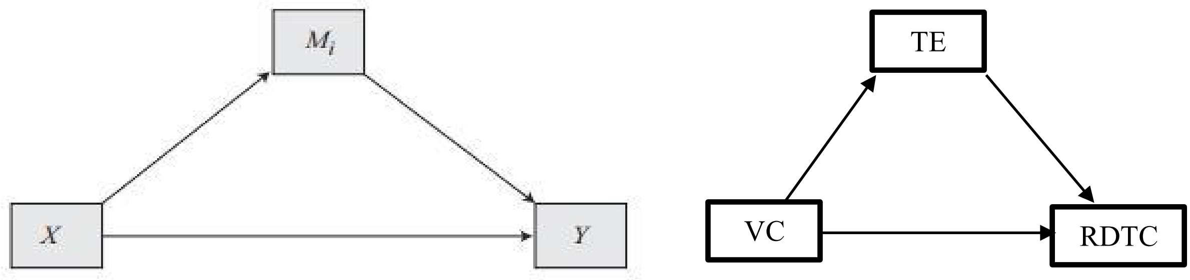


Figure 20: Mediation framework

Mediation framework with a single mediating variable where X represents the independent variable, M represents the mediating variable and Y represents the endogenous variable.

This model has utilised Hayes (2013; 2017) mediation bootstrapping technique in conjunction with SPSS PROCESS macro regression-based statistical mediating and moderating analysis (Hayes, 2013; Hayes and Rockwood, 2017), which is more precise and more advanced than the previously widely used Barron and Kenny (1986) mediating causal steps method or Sobel-test (Stone and Sobel, 1990) that has major weaknesses (Bollen and Stine, 1990). Alternative M-test (Holbert and Stephenson, 2003) is still weaker than bootstrapping that is now widely utilised in structural equation modelling to evaluate indirect mediating effects between multiple variables (Hayes, 2009; 2013; 2017). According to this modern approach, the final mediation analysis focus needs to be on all relevant path coefficient and t-values or confidence intervals and the greatness or degree of indirect effects (Rucker et al. 2011). Hypotheses H2, H4, H7 and H10 portray the results of the mediating relationships.

Table 60: Mediation analysis results (indirect relationships)

Hypothesised relationship	**Structural framework**	**Path coefficients and confidence intervals (*t*-values)**					**Standard Error**
		Model 1	**Model 2**	**Model 3**	**Model 4**		
		DV=RDTC IV=TTUC	DV=VC IV=TTUC	DV=RDTC IV=VC	DV=RDTC IV=TTUC&VC	VAF	
H2 (VC mediates the relationship between TTUC and RDTC)	TTUC-RDTC (without mediation)	β=.139 (*t*=1.903*)			β= -.0141 (*t*=-.2057)		.073
	TTUC-VC		β=.318 (*t*=4.556***)		β=.3171 (*t*=4.5479***)		.070
	VC-RDTC			β=.476 (*t*=7.365***)	β=.4812 (*t*=7.0424***)		.065
	Indirect effect from TTUC to RDTC via VC				β=.1526 LLCI=.0271 ULCI=.3112	0.728	.0737
	Indirect effect				136.229		
	Direct effect				187.003		
		DV+RDTC IV=KS	DV=VC IV=KS	DV=RDTC IV=VC	DV=RDTC IV=KS&VC		
H4 (VC mediates the relationship between KS and RDTC)	KS-RDTC (without mediation)	β=.501 (*t*=7.875***)			β= .3369 (*t*=4.3974***)		.064
	KS-VC		β=.594 (*t*=10.031***)		β=.5936 (*t*=10.0324***)		.059
	VC-RDTC			β=.476 (*t*=7.365***)	β=.2768 (*t*=3.6129***)		.065
	Indirect effect from KS to RDTC via VC				β=.1643 LLCI=.0532 ULCI=.2873	0.990	.0594
	Indirect effect				185.051		
	Direct effect				187.003		
		DV=RDTC IV=RM	DV=VC IV=RM	DV=RDTC IV=VC	DV=RDTC IV=RM&VC		
H7 (VC mediates the relationship between RM and RDTC)	RM-RDTC (without mediation)	β=.468 (*t*=7.199***)			β=.2791 (t=3.4771***)		.065
	RM-VC		β=.623 (*t*=10.841***)		β=.6233 (t=10.8407***)		.057
	VC-RDTC			β=.476 (*t*=7.365***)	β= .3027 (t=3.7712***)		.065
	Indirect effect from RM to RDTC via VC				β=.1887 LLCI=.0697 ULCI=.3757	0.957	.0792
	Indirect effect				179.022		
	Direct effect				187.003		

		DV=RDTC IV=PM	DV=VC IV=PM	DV=RDTC IV=VC	DV=RDTC IV=PM&VC		
H10 (VC mediates the relationship between PM and RDTC)	PM-RDTC (without mediation)	β= .400 (*t*=5.935***)			β=.1538 (t=1.8106*)		.067
	PM-VC		β= .655 (t=11.788***)		β= .6545 (t=11.7754***)		.056
	VC-RDTC			β= .476 (t=7.365***)	β= .3760 (t=4.4256***)		.065
	Indirect effect from PM to RDTC via VC				β=.2461 LLCI=.1185 ULCI=.3871	0.521	.0695
	Indirect effect				97.340		
	Direct effect				187.003		

*Statistical significance at ***p<0.005, **p<0.01, * p<0.05* and critical values are 2.32 at *p*=0.005; 1.96 at *p*=0.01; and 1.645 at *p*=.05. Note: *VAF=variance accounted for=indirect effect/total effect*

The above table analyses the effects of mediation in the proposed framework. In the first instance, the links between the independent predictor variable and the mediating variable was assessed which was followed by the assessment of the link between the mediating variable and the dependent variable and the link between the independent predictor variable and the dependent variable without the influence of the mediating variable.

VC as mediator between TTUC and RDTC

Contrary to the above structural equation modelling partial least square findings, this analysis has produced a positive and statistically significant result. Contrary to the above structural equation modelling partial least square findings, this analysis has produced a positive and statistically significant result with a path coefficient value (β=.318) and t-value (t=4.556, p=0.005). The link between VC and RDTC in this mediation has also returned highly positive statistically significant results: path coefficient (β=.476), t-value (t=7.365, p=0.005). The relationship between the independent predictor variable (TTUC) and the dependent variable (RDTC) without the mediator‘s (VC) influence is likewise significant with a path coefficient (β=.139) and t-value (t=1.903, p=0.05). Finally and most importantly, the indirect effect from TTUC to RDTC via VC has been confirmed as statistically significant with path coefficient (.1526), LLCI (.0271) and ULCI (.3112) since both values are positive. This relationship has also explained 72.8% of the variance between TTUC and RDTC (see mediation results in table 60). This mediating hypothesis has also uncovered an important finding in relation to the H1 above when the direct link between TTUC and VC is examined through regression-based analysis. Therefore, we can conclude that VC mediates the relationship between TTUC and RDTC and therefore accept hypothesis H2 on this statistical basis.

The outcome of the statistical analysis has also uncovered a statistically significant justification to prove that a positive relationship between the first essential operational element ‗telehealth technology use considerations' (TTUC) and second operational element ‗knowledge sharing' (KS) does exist. The analysis has also extracted statistically significant results of this relationship between the first two essential elements of the proposed telehealth service value network with a path coefficient value of (β=.477) and t-value of (t=2.215, p=0.01). Whereas telehealth technology use considerations are prerequisites to the use of telehealth technologies, knowledge sharing almost imminently becomes a by-product.

VC as mediator between KS and RDTC

The study's data results have confirmed the significance of the mediating role of VC in the relationship between KS and VC and VC and RDTC. Similarly to the above scenario, the table above depicts the relationship between the independent predictor variable (KS) and the mediator (VC) as highly statistically significant. This direct effect of the link between KS and VC has revealed statistically significant results with a path coefficient (β=.594) and t-value (t=10.031, p=0.005) in addition to the link between VC and the dependent variable (RDTC) also being statistically significant with a path coefficient (β=.476) and t-value (t=7.365, p=0.005). The relationship between the independent predictor variable (KS) and the dependent variable (RDTC) without the mediator's (VC) influence is likewise significant. This direct unmediated relationship has produced path coefficient (β=.501) and t-value (t=7.875, p=0.005). And most significantly, the indirect effect in the KS-RDTC relationship with path coefficient results (β=.1643), LLCI (.0532) and ULCI (.2873) is statistically significant as both values are positive. This indirect effect has explained 99% of the variance between KS and RDTC (see mediation results table 60). Consequently, we can conclude that VC mediates the relationship between KS and RDTC and accordingly accept hypothesis H4 on this statistical basis.

VC as mediator between RM and RDTC

The statistical results of this study have investigated and affirmed the mediating influence of Value Creation (VC) between RM and VC and RDTC.

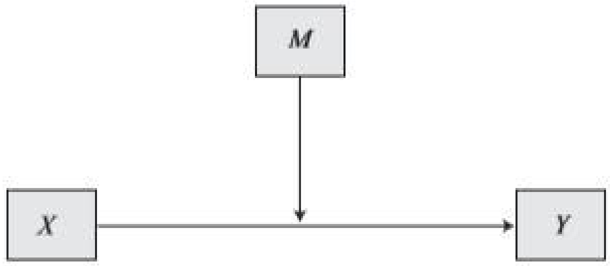
The third proposed hypothesis as shown in the table above portrays that the direct effect of the relationship between the independent variable (RM) and the mediator (VC) is statistically significant with a path coefficient (β=.623) and t-value (t=10.841, p=0.005) in addition to the direct link between VC and the dependent variable (RDTC) also being statistically significant with a path coefficient (β=.476) and t-value (t=7.365, p=0.005). The relationship between the independent variable (RM) and the dependent variable (RDTC) without the mediator's (VC) influence is also statistically significant with a path coefficient (β=.468) and t-value (t=7.199, p=0.005). Finally and most importantly, the indirect effect in the RM-RDTC relationship with path coefficient results (β=.1887), LLCI (.0697) and ULCI (.3757) is statistically significant as both values are positive. This indirect effect has explained 95.7% of the variance between RM and RDTC (see mediation results table 60). Therefore, we can make a conclusion that VC mediates the relationship between RM and RDTC and likewise accept hypothesis H7 on this statistical ground.

VC as mediator between PM and RDTC

The statistical results from this study have established the mediating influence of VC between PM and VC and VC and RDTC. The above table also shows that the direct effect in the final mediating relationship between the independent predictor variable (PM) and the mediator (VC) is statistically significant with a path coefficient (β=.655) and t-value (t=11.788, p=0.01) in addition to the direct effect of the link between VC and the dependent variable (RDTC) likewise being statistically significant with a path coefficient (β=.476) and t-value (t=7.365, p=0.005). The results have confirmed the direct effect in the relationship between the independent predictor variable (PM) and the dependent variable (RDTC) even without the mediator's (VC) influence as being highly statistically significant with a path coefficient (β=.400) and t-value (t=5.935, p=0.005). And most crucially, the indirect effect in the PM-RDTC relationship with path coefficient results (β=.2461), LLCI (.1185) and ULCI (.3871) is likewise statistically significant as both values are positive thus confirming a positive and significant relationship. Variance accounted for (VAC) result has revealed the value of 0.521, which explains 52.1% of the variance between PM and RDTC (see mediation results table 60). Due to these statistical results, we can conclude that VC mediates the relationship between PM and RDTC and consequently accept hypothesis H10 on these grounds.

6.6 Hypotheses analysis of moderating (indirect) relationships

Moderation (indirect) influences are existent in a relationship where at the very minimum one variable intervenes or moderates the link between the independent variable and the dependent variable that has an impact on their relationship (Baron and Kenny, 1986; Hayes, 2009; Hayes, 2013). Below is an example of a moderating template provided by Hayes (2013) that is applicable in this study.



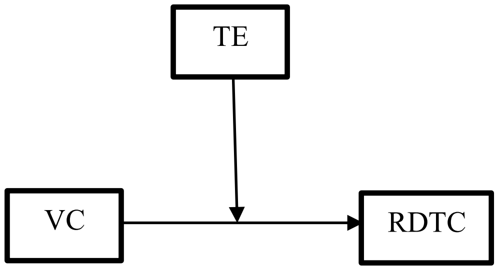


Figure 21: Moderation framework

Moderation framework with a single moderating variable where X represents the independent variable, M represents the moderating variable and Y represents the endogenous variable.

Table 61: Moderation analysis results

Hypothesised relationships	**Structural framework**	**Model 3**	**Model 1**	**Model 2**
		DV=RDTC IV=VC&TE	DV=RDTC IV=VC	DV=RDTC IV=TE
H13 (TE moderates the relationship between VC and RDTC)	VC	β=(.2423) *t*=2.9878)	β=(.476) *t*=(7.365) p=0.000	
	TE	β=(.3403) *t*=(3.7338)		β=(.519) *t*=(8.263) p=0.000
	VC x TE	β=(-.0185) *t*=(-.5350)		

According to the above results, moderating effect is not supported as it is insignificant (at 95% confidence level interval) and negative (beta coefficient path = -.0185 and t = -.5350).

Additionally, post hoc analysis shows that:

at TE = avg - 1^{δ}, the effect is .2608 @ t=2.9333
at TE = avg, the effect is .2423 @ t=2.9878
at TE = avg + 1^{δ}, the effect is .2238 @ t=2.5590

Direct relationship between the independent variable (VC) and the dependent variable (RDTC) is statistically significant (beta coefficient β=.476 and t=7.365, p=0.000). Likewise, direct relationship between the moderating variable (TE) and the dependent variable (RDTC) is also statistically significant at (beta coefficient β=.519 and t=8.263, p=0.000). The statistical examination evaluating whether telehealth enablers moderate the relationship between Value Creation (VC) and RDTC has produced a moderating effect which is insignificant because beta coefficient path (β=-.0185) and t value (t=-.5350) are not significant at 95% confidence level interval. Additional post hoc analysis shows that at TE = avg - 1^{δ}, the effect is .2608 @ t=2.9333; at TE = avg, the effect is .2423 @ t=2.9878 and at TE = avg + 1^{δ}, the effect is .2238 @ t=2.5590. More detailed analysis and justification for this statistical outcome is provided in the discussion chapter below.

6.7 Statistical analysis of the impact of control variables (Age, Gender and Experience)

The first examined variable was age and the statistical result has revealed the insignificance of the relationship between age and RDTC with a negative path coefficient value (β= -0.0399) and low t-value of (t=0.257). Even after splitting the file into male and female respondent data, the impact of age amongst male GPs was as insignificant with negative path coefficient (β= -0.0399) and low t-value of (t=0.2614) as was for female GPs with a negative path coefficient value (β= -0.0399) and low t-value of (t=0.2405).

The second examined variable was gender and the statistical result has revealed a very low path coefficient value (β= 0.0012) and low t-value of (t=0.014). After splitting the data file into male and female respondents, the whole model was run separately and on each occasion, differences were almost non-existent. The statistical findings have revealed the following path coefficient between male GPs and RDTC (β= 0.0012) and low t-value of (t=0.0148). Similarly the path coefficient between female GPs and RDTC revealed (β= 0.0012) and low t-value of (t=0.0137).

The third and final control variable was experience and the statistical findings have again revealed a low path coefficient value (β= 0.037) and low t-value of (t=0.2469). These low values were further validated when the whole model was run separately for male and female GP respondents with a low path coefficient value for males (β= 0.037) and low t-value of (t=0.2161) compared to almost identical values for female GPs (β= 0.037) and low t-value of (t=0.2233).

Goodness of Fit Evaluation

This project has appraised the measurement index called Goodness-of-Fit in order to measure the proposed framework's general fit. In light of partial least square path modelling (PLS), this measure which has been suggested by Tenenhaus et al. (2005) is also known as the R^2 and AVE's geometric mean for the dependent elements or constructs. Goodness of Fit serves to explain a PLS model's path for various data sets (Henseler and Sarstedt, 2013; Tennehaus, Amato and Vinzi, 2004; Tenenhaus et al. 2005).

To compute the Goodness of Fit indices in a partial least square path modelling (Henseler and Sarstedt, 2013; Wetzels, Odekerken-Schroder and van Oppen, 2009), this process required dependent constructs' R2 and AVE (average variance extracted) values. Below are presented R2 and AVE values for the dependent elements of this model.

Table 62: R2 and AVE values for the dependent constructs

Dependent Constructs	R2	AVE
KS	0.228	0.3
RM	0.393	0.4298
PM	0.5255	0.6791
VC	0.5321	0.7283
RDTC	0.4001	0.5441

AVE's geometric means =

$$\sqrt[5]{0.3 \times 0.4298 \times 0.6791 \times 0.7283 \times 0.5441}$$

$$= 0.5105$$

R^2 geometric means =

$$\sqrt[5]{0.228 \times 0.393 \times 0.5255 \times 0.5321 \times 0.4001}$$

$$= 0.3983$$

$$\text{Goodness of Fit} = \sqrt{\overline{R^2} \times \overline{AVE}} = \sqrt{0.3983 \times 0.5105} = 0.4509$$

The Goodness of Fit produced in this project is 0.4509 which is large as per measure index set recommended by Wetzels, Odekerken-Schroder and van Oppen (2009) and supported by Cohen (1988) whose R2 values have been utilised by Wetzels, Odekerken-Schroder and van Oppen (2009, p.187) to produce the Goodness-of-Fit measure criteria with values > 0.1 as low;

>0.25 as medium and >0.36 as large. Consequently, according to Wetzels, Odekerken-Schroder and van Oppen (2009) global measure of PLS models' validation, the Goodness of Fit index in this PLS framework is considered sufficiently strong.

Statistical Power Evaluation

This project has utilised G*Power 3.1.9.4 (Faul et al. 2009) in order to acquire its framework's statistical power. The outcome of the analysis is presented in the figure below which reveals that the model's general power is 95.08043 and critical t-value 1.9879342. As the model's statistical power is above the 80% threshold recommended by Cohen (1988), accordingly the project provides sufficient assurance in the hypothesised model's relationships. The calculation has also shown that the model's overall power increases with an increase in the size of the sample. For example, given the size of the sample above 89, the statistical power is larger than 95%. This result shows that the size of the sample in this project is sufficient to validate its proposed framework.

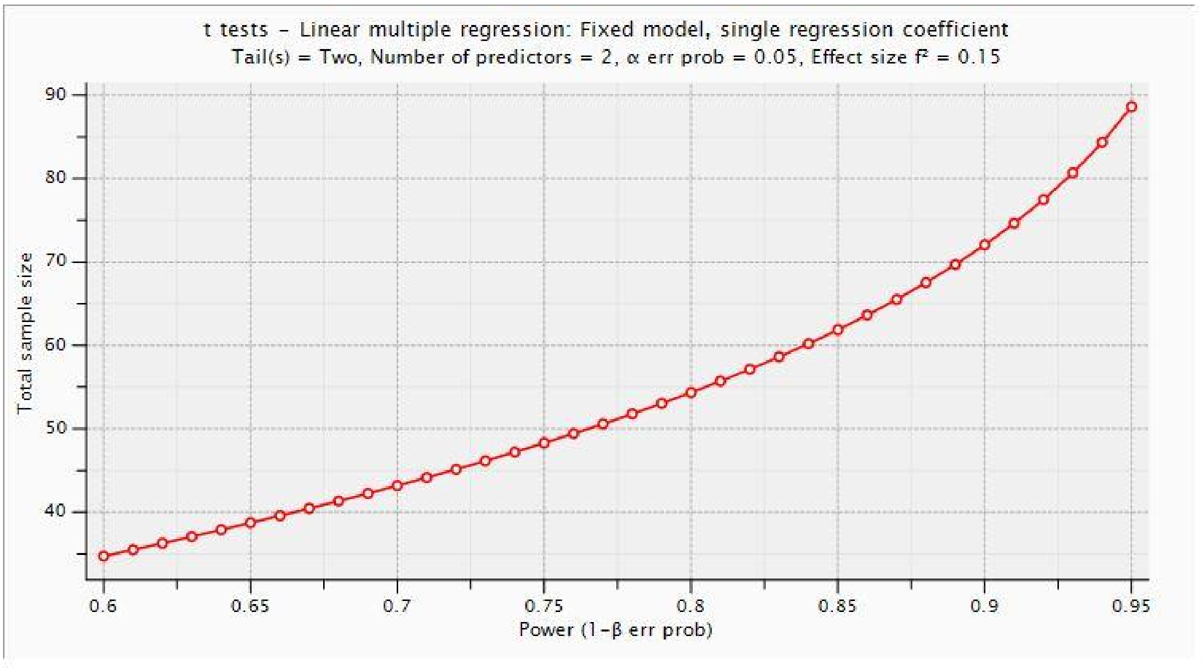


Figure 22: Model's statistical power

6.8 Summary of the chapter

This chapter has explained the pilot study phase of the first valid 40 responses followed by the analysis of the full quantitative study starting by the descriptive statistics of the demographics and moving onto analysing the rest of the data set through a number of investigations such as normality test, non-response bias and sampling error test and common method variance. Following these introductory tests, the measurement model was then assessed through reflective measurements (item reliability, internal consistency, discriminant validity, construct correlations and cross-loading matrix tables of first order constructs before and after item deletion. The structural model was subsequently examined by assessing path coefficients, variance explained and t-values of significance. Finally, the goodness of fit test has assessed the proposed model's general fit and statistical power of the model was calculated. The next chapter analyses findings in terms of each individual hypothesis and each individual research objective.

Chapter 7 Discussion

7.1 Introduction

This chapter's purpose is to debate the findings from empirical data that was presented in chapter 6. This debate shall attempt to focus on relevance in theory and significance in practice. The results from empirical data are debated consistently in line with both the hypothesised links between different model's constructs and the study's objectives. In line with the key research question and its sub-questions, this project has aimed to expose some important findings and evaluate different hypothesised relationships that had neither previously been attempted nor addressed in literature, especially in the context of telehealth service value networks with GPs at the centre. This particular project's contribution is in its empirical exploration in terms of GPs' readiness to develop telehealth capabilities which was tested through the Structural Equation Modelling Partial Least Square approach (Chin, 2010; Ringle, Sarstedt and Straub, 2012). Empirical results are debated in the sections below in light of statistical justification, proposed theories and practical implications.

The following section discusses the proposed hypothesised relationships that are inherent components of the proposed framework which is followed by the discussion of the impact of the control dimensions and debate in terms of the objectives set in this study. The chapter concludes with a short summary.

7.2 Results from the hypotheses

H1 hypothesis: There is a positive relationship between Telehealth Technology Use Considerations (TTUC) and Value Creation (VC)

This project has examined the link between TTUC and VC which is in line with the first research objective. From the analysis of statistical findings, it has been revealed that the hypothesis cannot be accepted due to a low path coefficient (β=-0.145) and insignificant t-value (t-1.116). This is the first hypothesis and one which represents the greatest challenge in this technologically-driven proposed model.

The main reason that it is such a challenging hypothesis is that the intended recipients and proposed users of telehealth technologies, namely; general practitioners in this model are still very sceptical of its fitness for purpose and the perceived giving up of the current model that works well according to the field study findings. Telehealth is perceived by the GP respondents in this study only as a potential extension to the current model of care for existing patient relationships which is also supported by literature (Botrugno, 2017, Eccles, 2015; Worth, 2015). In particular and in line with literature grounding, most interviewed and surveyed GPs were concerned with the value of data security (Dunnebeil et al. 2012; Hall and McGraw, 2014), confidentiality of both patient and practitioner data (Kumar, Durai and Vinotha, 2013) and patient privacy/identity (Huang, Lee and Lee, 2012; Jin, 2011) as well as remote safety safeguards (Daker-White et al. 2015; Hsu, Lee and Su, 2013; Kumar, Durai and Vinotha, 2013). Moreover, a lack of cross-disciplinary resource management mechanism/s through appropriately negotiated and stable workload distribution (Brewster et al. 2014; Rosenzweig and Baum, 2013; Van Alstin, 2016) and non-availability of currently widely accepted telehealth care protocols (Taylor, 2015) with clearly spelled out roles and accountabilities before, during and after service delivery (French et al. 2013; Gollnick et al. 2013; Van Wormer et al. 2012) which are all essential elements, make it a more challenging value proposition as the field of telehealth in primary care is still in its infancy.

Furthermore, not being able to diagnose properly from a distance or being dependent on other professionals who may not be appropriately trained as experienced GP interviewees are used to making assessments themselves is another perceived negative value domino effect according to field study findings. Doctors need to be assured that they are assessing and diagnosing properly by hearing, seeing and touching. On the contrary, only enhanced care quality and reduced rehospitalisation would work in telehealth‘s favour (Worth, 2015). This is evident in the current pandemic environment as telehealth in fact allows for care from a distance, which brings about reductions in travel time, exposure risks and face to face visits with health practitioners and potentially lower expenditures. There are however, other unexamined factors that this thesis has not addressed which also may significantly impact on this hypothesis. That is why, to better understand GPs‘ motives and reasons, additional research needs to be undertaken that explores and tests other complex individual psycho-social and GP practice-related factors that were not examined by this thesis.

H2 hypothesis: There is a positive relationship between Telehealth Technology Use Considerations (TTUC) and GPs' readiness to develop telehealth capabilities (RDTC), which is mediated by Value Creation (VC)

This thesis has also sought to investigate the mediation role of VC in the relationship between TTUC and VC and VC and RDTC. The study‘s findings confirmed the statistical influence of the relationship between TTUC and RDTC without mediation as the effect is statistically significant with a path coefficient value (β=.139) and t-value (t=1.903, p=0.05). This mediating hypothesis has also uncovered an important finding in relation to the H1 above when the direct link between TTUC and VC is examined through regression-based analysis.

Contrary to the above structural equation modelling partial least square findings, this analysis has produced a positive and statistically significant result with a path coefficient value (β=.318) and t-value (t=4.556, p=0.005). The link between VC and RDTC in this mediation has also returned highly positive statistically significant results (β=.476), (t=7.365, p=0.005). And finally and most importantly, the indirect effect from TTUC to RDTC via VC has been confirmed as statistically significant with a path coefficient value (β=.1526, LLCI=.0271 and LLCI=.3112) which has also explained 72.8% of the variance between TTUC and RDTC (see mediation analysis table 60 in chapter 6). Consequently, it can be concluded that VC mediates the relationship between TTUC and RDTC, thus confirming H2 (Hayes, 2013; Hayes and Rockwood, 2017). Once again, these findings justify the significance of the compounding effect of VC on TTUC and its link with the dependent variable RDTC. These findings also reinforce the central role of VC as a direct predictor and driver of value to GP practitioners.

What the above statistical findings show is that provided that patient and GP data security, privacy and confidentiality and remote patient safety are adequately addressed, GP physicians do not have other major concerns regarding use of telehealth technologies. If these are supported by well-defined and enforced protocols and stable workload distribution mechanisms in addition to value creation benefits from GPs‘ angle, the cumulative outcome of these most essential telehealth technology use considerations will have a statistically positive impact on GPs‘ readiness to develop necessary capabilities for telehealth medical services as validated by the results. These findings are proven by both qualitative statements by GPs during the field study as well as herein evident quantitative results. The three addressed areas of concern however do remain serious ongoing challenges that need to be very seriously addressed in order to convince GPs and other clinicians in the effectiveness of telehealth and reinforcement of its benefits. Current positive GP results would be enhanced and strengthened by these.

H3 hypothesis: There is a positive relationship between Knowledge Sharing (KS) and Value Creation (VC)

The results of the statistical analysis have uncovered a statistically significant justification to prove that a positive relationship between knowledge sharing (KS) and value creation (VC) does exist. The analysis has extracted statistically significant results of this relationship between knowledge sharing and key predicting variable: value creation with a path coefficient value of (β=.297) and t-value of (t=2.398, p=0.005).

Indeed, the results have proven the indispensable value of knowledge sharing in the creation of value for this proposed telehealth service value network proposition with general practitioners at the centre as central reference, coordination and treating points. GPs perceive telehealth as a great opportunity to learn from their interactions with specialists. What this also shows is that the greater the perceived value of experiential knowledge sharing, the greater the importance of creation of value to the proposed service value network and its members. In other words, if general practitioners perceive and experience the benefits of knowledge sharing, they are likely to want more of the same, thus contributing to the creation of value in the network even more.

However, ongoing concerns do exist which may preclude the sharing of knowledge on a wider scale if not properly addressed to the satisfaction of the concerned GP population. These are crucial elements grounded in literature as well as the field study such as data exposure concerns in relation to threats to remote and ongoing patient safety and misuse of electronic health records (Anderson, 2010; Byrne, 2010), performance expectations in terms of patient outcomes (Cocosila and Archer, 2017; Featherman and Pavlou, 2003; Lim, 2003; Martins, Oliveira and Popovic, 2014), privacy and confidentiality of both patient and GP data and potential legal issues (Bullock, 2014; Raven, Butler and Bywood, 2013; Jang-Jaccard et al. 2014; Petersen and Bertelsen, 2012; Wade and Hamlyn, 2013) from the use of telehealth platform.

The findings have also pointed to the necessity for telehealth practice negotiations in terms of competition, clinical autonomy and GP rights to choose the type of care delivery for each patient on an individual basis (Audet, Squires and Doty, 2014). Since a lot of GP knowledge is tacit acquired over many years of practice, the telehealth platform essentially needs to be supported by a whole set of newly negotiated rules on care delivery (Botrugno, 2019; Chaet et al. 2017; Eccles, 2015; Oliver, 2013; Worth, 2015) to make this platform a workable one from a GP perspective as it cannot be run on old rules. These findings are supported by both; qualitative field study and quantitative survey results.

H4 hypothesis: There is a positive relationship between Knowledge Sharing (KS) and GPs' readiness to develop telehealth capabilities (RDTC) which is mediated by VC

The study's data results have confirmed the significance of the mediating role of VC in the relationship between KS and VC and VC and RDTC. In fact, the findings have revealed a statistically significant relationship between KS and RDTC without any mediation or influence of a mediator. This direct unmediated relationship has produced a path coefficient value of

(β=.501) and t-value (t=7.875) at (p=0.005). The direct effect of the link between KS and VC has also revealed statistically significant results at path coefficient (β=.594) and t-value (t=10.031, p=0.005) as well as a direct link between VC and RDTC uncovering a statistically significant outcome with a path coefficient of (β=.476), t-value (t=7.365, p=0.005). Most importantly, the indirect effect from KS to RDTC via VC has been confirmed as statistically significant with a path coefficient (β=.1643) and (LLCI=.0532; ULCI=.2873) and has explained 99% of the variance between KS and RDTC (see mediation results table 60 in chapter 6). These findings also confirm positive beliefs among general practitioners that knowledge sharing can create value which they can benefit from as well as contribute to. These results are also grounded in literature with the perceived belief that telehealth will enable easy sharing of patient health updates in real-time (Blumenthal and Squires, 2014; DesRoches et al. 2008; Rho, Choi and Lee, 2014), fast referrals of remote patients to an appropriate specialist (Caffery et al. 2016; Dharmar et al. 2013; Prestwich, Richmond and Nobakht, 2014), minimise misdiagnosis through better transparency (Bahous and Shadmi, 2016), enable specialist assistance in an emergency (Alkmim et al. 2012; Gillentine, 2012, Rheuban, 2013) and fast specialist second opinion when required (Dharmar et al. 2013; Schwamm, 2014) for which organisational support to share information electronically is essential (Radaelli et al. 2014). However, with that in mind, GPs nonetheless have voiced their concerns in both interview phase and survey results in terms of data exposure concerns and essential negotiations on legally binding telehealth practice which can both strengthen or weaken value creation depending on the level of legal assurances, safety measures and performance outcomes achieved.

These concerns are also supported by published literature on concerns of patient safety (Anderson, 2010, Byrne, 2010), electronic data shortcomings to meet expectations in terms of patient outcomes (Cocosila and Archer, 2017; Featherman and Pavlou, 2003; Featherman, Valacich and Wells, 2006; Greenhalgh et al. 2010a; Greenhalgh et al. 2010b; Hsieh, 2015; Lim, 2003) and potentially serious legal issues resulting from the use of telehealth (Cocosila and Archer, 2017; Featherman and Pavlou, 2003; Lim, 2003, Martins, Oliveira and Popovic, 2014). Study's findings strengthen the need for essential negotiations on competition in this remote collaborative work between GPs and specialists, particularly in terms of roles and accountabilities before, during and after service delivery. Findings also suggest the necessity for negotiations on new approaches to clinical autonomy and assurances of legislated rights of GPs to freely choose the type of care delivery for each patient (Audet, Squires and Doty, 2014; Caine and Tierney, 2015; Bullock, 2014; Petersen and Bertelsen, 2012; Raven, Butler and Bywood, 2013; Jang-Jaccard et al. 2014; Wade, Whittaker and Hamlyn, 2013).

H5 hypothesis: There is a relationship between Telehealth Technology Use Considerations (TTUC) and Knowledge Sharing (KS)

The outcome of the statistical analysis has uncovered a statistically significant justification to prove that a positive relationship between telehealth technology use considerations (TTUC) and knowledge sharing (KS) does exist. The analysis has also extracted statistically significant results of this relationship between the first essential element of the proposed telehealth service value network, namely; telehealth technology use considerations and the second key element: knowledge sharing with a path coefficient value of (β=.477) and t-value of (t=2.215, p=0.01). These statistical findings effectively support the above hypothesis. Indeed, these measurement and structural results have proven the indispensable connection and inseparability between the first two essential operational elements of this proposed telehealth service value network proposition with general practitioners at the centre as central reference, coordination and treating points.

What this also demonstrates is that telehealth technology use considerations serve little purpose without electronic knowledge sharing and vice versa, electronic knowledge sharing cannot become effective without telehealth technology use. The above field study findings are also in line with literature on knowledge sharing in which organisational climate plays an omnipotent role, in addition to individual health practitioners' motivation and opportunity to share (Bock et al. 2005; Hsu et al. 2007; Radaelli et al. 2014) as well as ability to share (Armitage and Connor, 1999) information and knowledge with other health practitioners (Smith et al. 2008; Zeng, 2016).

This also could be summed up as: the greater the perceived value of experiential knowledge sharing, the greater the perceived and actual importance of telehealth technology use in the proposed service value network amongst its members. In other words, as GPs perceive and experience the benefits of knowledge sharing, they are likely to enhance the use of telehealth technologies to serve distant patients, thus making knowledge sharing and telehealth technologies more intertwined. On a more positive note, quantitative results have shown that GPs are slightly more motivated to share knowledge, then opportunities present themselves which sheds some light on infrastructure, managerial arrangements and organisational support. However, ongoing concerns do exist which may preclude the sharing of knowledge on a wider scale if not properly addressed to the satisfaction of the concerned GP population. These are crucial elements grounded in literature as well as the field study such as previously introduced and explained data exposure concerns and negotiations on legally binding telehealth practice.

H6 hypothesis: There is a positive relationship between Relationship Management (RM) and Value Creation (VC)

This project has also sought to investigate and examine the relationship between the third essential element of the proposed telehealth service value network: Relationship Management (RM) and the key predicting construct: Value Creation (VC). The results of the partial least square analysis have revealed a path coefficient value of (β=.219) and t-value (t=1.335) which are below the accepted minimum threshold for acceptance of the hypothesis. Thus, the hypothesis has been rejected on these statistical grounds.

Based on these findings, it could be interpreted that relationship management has serious considerations and implications in the process of creation of value as perceived by GPs. Relationship management is a very challenging endeavour in a single discipline and not to mention in a cross-disciplinary scenario. As telehealth is a cross-disciplinary platform by default, it is only natural that cross-disciplinary challenges can be expected. In fact, the very beginning of this thesis explains these challenges which are solidly grounded in literature. Namely, interprofessional and/or interdisciplinary disparities are evident throughout the health system due to strong interprofessional and interdisciplinary divisions along opposing objectives, skills, values and professional loyalties (The Institute of Medicine, 2015; Meleis, 2016). These unresolved divisions are blocking reform and slowing acceptance of new innovations in health (Health Workforce Australia, 2011; 2012) such as telehealth technologies and technology-based medical services. According to Taylor (2013) and Wade, Eliott and Hiller (2014), telehealth sustainability is far more dependent on acceptance of technology-based services and telehealth technologies by clinicians than on advances in telehealth technologies alone, which is why the main onus in this project is on GPs and their interactions with other health practitioners.

The above evidence from literature is also in line with field study data. Thus, some GPs have voiced their wait and see approach in the field study as attested by R2: ―*I am unsure if the telehealth model as it stands adds much to what currently exists. So, that is what I am yet to see what the benefits of it are over well-coordinated care"*. And R3 clearly indicated a lack of comprehension of what telehealth entails by stating: ―*I'd like to know more about what it involves*". R5 had expressed conflicting issues with specialists such as ―*duplication of care*", whereas others were concerned with ―*specialists" delays in responsiveness"* and particularly ―*mutual teleconferencing availability*" for which reason arranged fixed time slots was the proposed solution by the interviewed GPs as the only way forward for this collaborative framework between GPs and specialists.

Relationship management construct was measured by the very essential and important elements of communication, collaboration, trust and commitment. Communication is the essence of all human interrelationships of which collaboration is a by-product. Enhanced collaboration leads to higher trust which then leads to commitment. All of the items belonging to these elements have survived all assessments and as such have been validated empirically as well as theoretically. Besides the abovementioned, the ‗trust sub-construct‘ which is concerned with a) GPs‘ ability to make an immediate relevant physical assessment, b) potential deterioration of patient trust relating to physical assessment information and c) introduction of new negotiated approaches to trust between medical and IT professional is substantially contributing to this outcome as the most concerning sub-construct which is proven through quantitative statistical (β=.588; t=6.015) and qualitative data results. As attested by R10: ―*trust and privacy can be affected, loss of trust can ensue in the long-term, and relationships can be highly seriously affected*". Since this proposed delivery is still in its infancy, these challenges are to be expected as in all novel frameworks. There are however proposed solutions to this problem which will be revealed in recommendations to policy makers in chapter 8. Consequently, it can be said that there was enough theoretical justification for a completely opposite hypothesis, which was once again validated by empirical findings in this study that are in line with literature.

H7 hypothesis: There is a positive relationship between Relationship Management (RM) and GPs' Readiness to Develop Telehealth Capabilities (RDTC), which is mediated by Value Creation (VC)

The statistical results of this study have investigated and affirmed the mediating influence of Value Creation (VC) between RM and VC and VC and RDTC. The study‘s findings have confirmed the statistical significance of the above relationship even in the absence of mediation as the direct effect between RM and RDTC is statistically significant with a path coefficient value of (β=.468) and t-value (t=7.199, p=0.005). The direct effect of the link between RM and VC has also revealed statistically significant results at path coefficient (β=.623) and t-value (t=10.841, p=0.005) as well a direct link between VC and RDTC uncovering a statistically significant outcome with a path coefficient of (β=.476), t-value (t=7.365, p=0.005). Most importantly, the indirect effect from RM to RDTC via VC has been confirmed as statistically significant with a path coefficient (β=.1887) and (LLCI=.0697; ULCI=.3757) and has explained 95.7% of the variance between RM and RDTC (see mediation results table 60 in chapter 6).

These findings also confirm important beliefs among general practitioners that good relationship management represents the backbone of the proposed cross-disciplinary platform to which individual practitioners' contribution is as important as the contribution of the rest of the involved team members as attested by interview participants in the qualitative phase of this study. These results are likewise grounded in literature (Brady et al. 2017; O'Reilly et al. 2017; Petri, 2010), however this is the first study that examines the perceived belief that well-managed and effective communication, collaboration, trust and commitment are essential components of the higher order construct: relationship management in telehealth and health context in general and which clinicians so much depend on to remain effective and efficient healthcare practitioners.

To utilise the proposed platform, general practitioners are primarily concerned with the way communication channels are managed, which is confirmed by the field study and is also grounded in literature where only protected communication channels will ensure —continuous feedback loop” between clinicians (Brady et al. 2017, p.930) and where patients need to be kept well informed from the very beginning and throughout their treatment process (Rees and Williams, 2009). The influence of VC is likely to become more strengthened with regular inter-disciplinary meetings of teams that are well resourced and where practitioners share common interest in specific conditions (O'Reilly et al. 2017) thus perceiving and experiencing positive, feasible teamwork benefits (Macfarlane et al. 2004).

These are all likely to improve trust among practitioners which represents the key role in the successful realisation of telehealth initiatives and is a by-product of VC (Rousseau et al. 1998). The above interactions and outcomes may likewise be explained by communities of practice theory (Lave and Wenger, 1991) used in this thesis. Trust can however be strengthened by telehealth technologies which provide safeguarded —technical reliability backed by transparent data storage policy” (Van Velsen et al. 2016, p.1) and close working relationships between IT professionals and doctors. And finally commitment which can also be explained by communities of practice theory can provide value in the form of regular collegial support (Blount and Gloet, 2015; 2017) and active telehealth engagement by colleagues particularly among —small, close-knit patient centred” teams (Spencer et al. 2015, p. 389) or doctors in primary settings practicing within a larger network or group of practices (DesRoches et al. 2008).

H8 hypothesis: There is a relationship between Knowledge Sharing (KS) and Relationship Management (RM)

The findings of the statistical analysis have uncovered a statistically significant justification to prove that there is a strong positive relationship between knowledge sharing (KS) and relationship management (RM). The analysis has also extracted statistically significant results of this relationship between the second key element of the proposed telehealth service value network, namely; knowledge sharing (KS) and the third essential element: relationship management (RM) with a path coefficient value of (β=.627) and t-value of (t=4.493, p=0.005). These statistical results in fact support the proposed hypothesis. Indeed, these measurement and structural results have proven the indispensable connection and inseparability between the second and third key element of this proposed telehealth service value network proposition with general practitioners at the centre as central reference, management/coordination and treating points.

What this also demonstrates is that knowledge sharing cannot exist without effective relationship management and vice versa, relationship management in a telehealth service delivery platform depends for survival and success on knowledge sharing. Even though the interaction of knowledge sharing and relationship management among health practitioners is perceived as a very important endeavour, it is not without major challenges according to field study results. Amongst these are time scheduling with specialists in particular with a preference for fixed time slots in a working shift, practitioner willingness and commitment in both time allocation and effort to share one‘s knowledge and working experiences electronically, organisational climate and its support or lack of it, facilitation of informal meetings and regular interdisciplinary meetings and adequate resources for effective collaboration. Besides, practitioners‘ inability to conduct an immediate relevant physical assessment may affect patient trust regarding that assessment. Moreover, legal issues and handling of patient data are serious practitioner concerns.

A substantial proportion of GPs according to quantitative study results have reported motivation (49.2%), opportunity (34.7%) and ability to share knowledge electronically (38.9%), whereas some GPs have also in the qualitative phase reported utilisation of the My Health Record through the uploading of patient results, receipt of electronic discharge summaries from hospitals and issuing of electronic referrals. The above results show some discrepancies between clinicians‘ motivation and opportunities to share knowledge. In fact, their motivation is slightly higher than opportunities to share, which sheds some light on organisational and managerial support and infrastructural needs. GPs focusing on the aged sector also access aged care facilities‘ databases remotely, whereas most staff utilise the database on site and generate reports for requesting specialists, who also write notes in a cloud system that GPs can access if needed as they look after the same patients. Most interviewed GPs also strongly expressed their concerns regarding electronic patient data exchange as it poses a real risk that can turn into a real danger for patient safety.

Furthermore, a considerable percentage of the interviewed GPs believe that electronic information sharing should not be used for the acutely unwell because of remote patient safety concerns as GPs cannot assess patients properly remotely especially if they are complex cases or new patients. Besides, there may be hearing impairment and other communication barriers and loss of crucial communication despite third party assistance. All of the above examples from the field study are strong indicators that remote medical practice needs to think well in advance of all of the potential scenarios and strategies in overcoming them to make knowledge sharing and relationship management work more stably. These interactions are also well explained by the Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003) and Communities of Practice Theory (Lave and Wenger, 1991).

H9 hypothesis: There is a positive relationship between Process Management (PM) and Value Creation (VC)

The project's statistical findings have revealed a statistically significant justification to prove that there is a strong positive relationship between the final essential operational element of the proposed telehealth service value network: Process Management (PM) and the key predicting variable: Value Creation (VC). The analysis has also extracted statistically significant results of this relationship between these variables with a path coefficient value of (β=.377) and t-value of (t=1.943, p=0.05). These statistical results do support the proposed hypothesis. They have proven through both measurement and structural results the significance of the connection between the final fourth key element of this proposed telehealth service value network and service value proposition with general practitioners at the centre as central reference, coordination/management and treating points.

These statistical results also demonstrate the importance of essential process elements which are supported by literature and have been overwhelmingly validated by the respondents in the field study and quantitative findings, all of which make contribution towards value creation. These are interdependent and sequential process elements as follows: effective interoperability, speed of quality data at the point of care, productivity, routine practice and integrated care due to the cross-disciplinary nature of telehealth delivery of care. Out of these elements, all of the proposed steps have been validated by the findings: 1) a simple/stable interoperable system with minimal interruption should be used; 2) secure/uninterrupted high quality broadband data speed needs to be maintained; 3) patient health data must be curated properly to prevent falsely presented information; 4) personalised remote patient support in the measurement of vital signs needs to be provided; 5) development of standard remote care protocols may create new work routines and 6) integrated collaborative treatment phases need to be managed by doctors.

In addition to these crucial steps, field study also justifies the importance of continuing telehealth education for GP practitioners, the creation and instilling of standardised, easy to follow protocols regarding safety mechanisms / red flags / danger signs into the platform and assurances of remote patient safety, cost efficiencies and finally, all needs to be well documented. The one thing that some GPs find disturbing is: ~~–th~~*the idea of the whole consult being recorded, a bit like a video procedure*" (R14) which also may cause some serious legal implications (see chapter 4 for detailed analysis).

Theoretically, these phases can be explained by the Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003) as the first prerequisite for the functioning of telehealth platform followed by Communities of Practice (Lave and Wenger, 1991) that explains cross-disciplinary interactions and outcomes and finally the Multi-Grounded Theoretical approach (Goldkuhl and Cronholm, 2003) which recognises the contribution of the above two theories in addition to new empirical findings as potential contributors for the creation of a novel theory in telehealth context.

H10 hypothesis: There is a positive relationship between Process Management (PM) and GPs' readiness to develop telehealth capabilities (RDTC), mediated by Value Creation (VC)

The statistical results from the field study have established the mediating influence of VC between PM and VC and VC and RDTC. The results also confirmed that the direct effect between PM and RDTC is in fact statistically significant even in the absence of VC (β=.400) and t-value of (t=5.935, p=0.005). The findings likewise confirmed the direct effect of PM on RDTC being highly statistically significant at (β=.655) and t-value of (t=11.788, p=0.005) as well as the direct effect of VC on RDTC also being statistically significant at (β=.476) and t-value of (t=7.365, p=0.005). Finally and most importantly, the indirect effect between PM and RDTC via VC has revealed a beta coefficient value (β=.2461) and confirmed a positive and significant relationship (LLCI=.1185 and ULCI=3871). Variance accounted for (VAC) result has revealed the value of 0.521, which explains 52.1% of the variance between PM and RDTC (see mediation results table 60 in chapter 6).

These findings in fact strongly confirm the importance of the evaluated and validated process management elements as a contribution to knowledge by this thesis for the delivery of care from a distance starting with a) a simple/stable interoperable system with minimal interruption; b) maintained secure/uninterrupted high quality broadband data speed; c) patient health data being properly curated to prevent falsely presented information; d) personalised remote patient support in the measurement of vital signs; e) development of standard remote care protocols that may create new work routines and f) integrated collaborative treatment phases managed by doctors. GP respondents have overwhelmingly supported the above steps as crucial process elements.

These steps are also in line with literature, either as an extension to the current GP care model or an alternative offering for common routine checks in chronic aged care conditions such as diabetes (Voruganti et al. 2017) and hypertension (Benedetto et al. 2010; Hovey et al. 2011; Luo et al. 2017; Paterson, McAuley and McKinstry, 2017) and field study results as stated below by R3: ―*well, look, it's an aging population, this could potentially increase the efficiency of certain medical services, so that would be helpful. It could perhaps make certain consults more - it'll save time. So if there are some simple problems you could potentially deal with them this way. It'll save you time travelling to the healthcare facility*". R9 has also elaborated further: ―*I think it's more an adjunctive support for ongoing regular care to patients. So, if patients have got a good rapport and relationship with their GP, this is an extension of providing that service through inability for distance and availability to come to a surgery. I've got a few home patients who are elderly, who can't come in. I'm doing home visits with them at the moment. If this tool was available, this technology, I probably would do probably more regular interactions with my patients through the Telehealth".*

These findings further justify and validate the value of process elements that have been in GP practice for a long time as well as the perceived value of telehealth by GPs, however also their lack of awareness that it even exists in their GP domain as such and that telehealth MBS items are available. Consequently, in order for telehealth in GP domain to move forward, more awareness about telehealth MBS items amongst GPs is needed, which is another important finding in light of this hypothesis.

H11 hypothesis: There is a relationship between Relationship Management (RM) and Process Management (PM)

The above hypothesis that RM will have a positive relationship with PM has been strongly supported by the statistical findings with a path coefficient value (β=.726) and t-value of (t=9.340, p=0.005). These results have also validated the significance of the relationship management construct as a solid backbone to effective telehealth process management. The results imply a significantly positive influence of RM on PM suggesting that RM assists in achieving PM steps. In simple language, communication, collaboration, trust and commitment between clinicians support effective telehealth process management elements.

These results are also in line with literature on communication (Knight et al. 2016; Brady et al. 2017; Rees and Williams, 2009 and Voruganti et al. 2017), collaboration (O‘Reilly et al. 2017 and Petri, 2010), trust (Hall and McGraw, 2014; Hsieh, 2015; Kayyali et al. 2017; Krontiris, Langheinrich and Shilton, 2014; McDonald, Jayasuriya & Harris, 2012; May et al. 2011; Rousseau et al. 1998; and Van Velsen et al. 2016) and commitment (Herian, Shank & Abdel-Monem, 2012; Keijser et al. 2016; McKenzie and Williamson, 2016; Meyer et al. 2012; Morilla et al. 2017; Mowday, Steers and Porter, 1979; Saleh et al. 2016; Spencer et al. 2015; Uscher-Pines and Mehrotra, 2017).

What the empirical data has revealed is the strong significance of secure messaging communication channels between clinicians, clarity of information to patients in decision making during their ongoing care, regular interdisciplinary meetings, GPs‘ interest in specific chronic conditions and well-resourced teams. These are further supported by a considerable number of individual GP‘s desire to work with small, close-knit patient-centred teams, regular collegial support and active telehealth engagement by colleagues that influence commitment levels. The crucial aspect of trust has also been validated with strong mistrust towards technology‘s ability to make an immediate relevant physical assessment (61%) and potential deterioration of trust relating to physical assessment information in addition to a necessity for very important negotiations approaches between medical and IT professionals (64.7%). Therefore, good relationship management needs to address these GP concerns in order to further strengthen process management effectiveness. For instance, the first two process delivery elements support secure communication channels and continuous feedback loop amongst clinicians. Besides essential communication dimensions, they also support collaboration in real time, whereas the other process delivery elements support dimensions of trust and commitment. Process management truly serves to both support previous elements as well as a gap closing tool that makes sure that all essential elements are functioning well.

H12 hypothesis: Value Creation (VC) has a positive relationship with GPs' readiness to develop telehealth capabilities (RDTC)

The final direct hypothesis stating that the relationship between the most direct predictor in the model, namely; Value Creation (VC) and the dependent variable (RDTC) is a positive one has been rejected due to a low path coefficient value (β=.113) and low t-value of (t=0.776).

The outcomes of the field study have pointed to important considerations that GPs still perceive and see as troublesome to rely one hundred percent on telehealth technologies in the delivery of care to their patients. Some of the issues that have strongly come out as concerning are reliability of internet and technology used especially in terms of speed, clarity of communication and accuracy of data and precision of diagnosis, delays in communication with specialists, indispensability of physical presence to assess and assist promptly and adequately. On a more positive note, GPs are likely to consider telehealth for current patients that they know well in order to ensure continuity of care for those patients' inability to come to a surgery and it is not a preferred method for new patients.

The one aspect that most interviewed GPs agreed upon is potential telehealth value to be gained from time efficiencies and close interactions with specialists that would further add value to their experiential learning. Some have also supported the potential for independence through more integrated technologies. However, GPs did express strong scepticism that even more funding and other benefits do not seem to be able to overcome at this stage. The following short statement by R7 to a direct question on value through funding and support incentives sums it up: ―*If the government can increase the rates, can provide you more money, and more funding, more support. Would you consider that? Would it be a good value to you?*" the response was: ―*Not really*". R11 has further added as follows: ―*I say, whole new rules need to be written for it. It is a scam now, so we cannot compare with old rules now*".

These research outcomes are also supported by literature concerns regarding patient privacy and safety (Yarmand, Sartipi and Down, 2012; Hsu, Lee and Su, 2013; Huang, Lee & Lee, 2012; Jin, 2011; Daker-White et al. 2015; Van Velsen et al. 2016), potential misuse of electronic health records which may threaten patient safety (Anderson, 2010; Byrne, 2010; Greenhalgh et al. 2010) and seriousness of potential legal issues resulting from the use of telehealth (Cocosila and Archer, 2017; Featherman and Pavlou, 2003; Lim, 2003).

Besides the above negatives, the study has validated value creation (VC) data on telehealth provision of clearly delineated Medicare items, close experiential encounters with other healthcare practitioners, design of better integration leading to GP paths to self-employment and provision of value through cost efficient services.

In the qualitative phase, two thirds out of fifteen interviewed respondents had expressed some form of readiness or that they would consider it once more information and assurances were provided, whereas in the large quantitative study's readiness to develop telehealth capabilities (RDTC) section, 47.2% of the respondents expressed their readiness to develop collaborative capabilities and 45.4% to develop technical capabilities with 39.1% being openly concerned with a negative impact of telehealth on GPs clinical independence and 25.2% of respondents stating that telehealth will not receive full GP support as it reduces clinical interactions. Furthermore, the RDTC construct could explain 40% of variance in GPs' readiness according to the structural equation modelling partial least square results. These results further advocate the need for meaningful engagement into negotiations with GPs at the present moment as the sustainable way forward. Furthermore, GPs want to make sure that they are investing themselves in a system that will be long lasting as they have invested heavily into the process of becoming GP practitioners and ways of practicing for a lengthy period of time.These suggestions are also in line with literature by de Grood et al. (2016) who have suggested that doctor' viewpoints need serious consideration for the creation of a telehealth enabling environment.

H13 hypothesis: Telehealth enablers (TE) moderate the relationship between value creation (VC) and GPs' readiness to develop telehealth capabilities (RDTC)

The statistical examination of this hypothesis has produced a moderating effect which is insignificant because beta coefficient path = (β=-.0185) and t = (t=-.5350) are not significant at 95% confidence level interval. Additionally, post hoc analysis shows that: at TE = avg - 1^{δ}, the effect is .2608 @ t=2.9333; at TE = avg, the effect is .2423 @ t=2.9878 and at TE = avg + 1^{δ}, the effect is .2238 @ t=2.5590.

This result infers that as moderator (TE) increases, the moderating effect on the dependent variable (RDTC) decreases. What the results from this moderating relationship also portray is that no matter how high the perceived importance of telehealth enablers amongst GP practitioners is, they are still not well understood or trusted to be better utilised by the intended GP recipients and proposed users of this technologically-driven service platform. A lot more education and comprehension is needed as attested by the field study participants for these enablers to have a more positive moderating effect on RDTC through VC. R1 besides other GP respondents who agreed with this point did clarify in the field study: ―*yeah, more support, more training, and I think once I have the training, I need to become confident in what I am doing, otherwise, that is the biggest dilemma with all the doctors. If I am not 100% sure, I am not going to take any chance to make a diagnosis or chance to do the treatment. So, you need to be 100%*". Besides, online care delivery is being perceived as a scam at the present moment as attested in the following statement by R11: ―*Doctors should be easily available for the data, who wants to own that data, then the law has to change, doctors have to change, there are a lot of other legal changes. Right now, I own this file, I am responsible for all the data for* *you but when this data has gone in the cloud, I say, whole new rules need to be written for it. It is a scam now, so we cannot compare with old rules now*".

For these reasons, these telehealth enablers are not strong enough assurances and ultimate motivators that GPs could rely 100% on telehealth delivery because of their lack of understanding how telehealth works and concerns for remote patient safety, as a number 1 priority in addition to reduced physical clinical interactions and potential impact on clinical autonomy as attested by field study findings. These findings are also in line with literature (Artis et al. 2017; Anderson, 2010; Audet, Squires and Doty, 2014; Brewster et al. 2014; Byrne, 2010; Greenhalgh et al. 2010; Cocosila and Archer, 2017; Featherman and Pavlou, 2003; Featherman, Valacich and Wells, 2006; Greenhalgh et al, 2010a; Greenhalgh et al. 2010b; Hsieh, 2015; Lim, 2003; Martins, Oliveira and Popovic, 2014; Hall and McGraw, 2014, Jin, 2011). Because value to GPs in the proposed platform only reflects the level of understanding that they currently have of telehealth and awareness of collaborative telehealth MBS items, which is insufficient for a substantial proportion of GP respondents as affirmed by the study's results. Moreover, no matter how willing GPs may be to develop telehealth capabilities, if the practice that they are working for is not adopting this platform or supporting it, the impact is that most GPs want to make sure that they continue being employed. R11 has clarified this issue in the interview phase: ―*suppose my practice where I am working here is not willing to adopt as a group. This technology, I may be enthusiastic and then it's a very good thing if I have to get up and go to work, and sit down and do something else, I want to make sure my kids are not hungry, because that will depend on remuneration*".

Importantly, telehealth platform is also perceived by GPs as being pushed without proper consultation with them who are between 3 to 5 years away at the present moment according to field study results to pursue this model of care due to a lack of understanding of the essential elements and how things work. Furthermore, the platform has not fully addressed GPs' feelings and beliefs in terms of which approach should fit which scenario for which reason meaningful negotiations, education and experience is needed. This is also in line with literature on doctors' substantial uncertainty regarding telehealth adoption consequences some of which are certainly their financial and time resources in addition to ongoing GP practice and final patient care outcomes (de Grood et al. 2016).

7.3 Control variables and their impact

Besides the above discussed direct, indirect and moderating hypotheses, this project has also evaluated the influence of the following control variables on the dependent variable (RDTC).

The control variables examined in this study were age, gender and experience. The first examined variable was age and the statistical result has revealed the insignificance of the relationship between age and RDTC with a negative path coefficient value (β= -0.0399) and low t-value of (t=0.257). Even after splitting the file into male and female respondent data, the impact of age amongst male GPs was as insignificant with negative path coefficient (β= -0.0399) and low t-value of (t=0.2614) as was for female GPs with a negative path coefficient value (β= -0.0399) and low t-value of (t=0.2405). Based on these findings, age does not appear to have an impact on GPs‘ readiness to develop telehealth capabilities. Field study results have also revealed that older GPs who have been practicing for over 20 or even 30 years are not necessarily less or more enthusiastic about adopting telehealth capabilities than their younger counterparts who have been practicing for less than five years. In fact, in some instances, younger GPs have expressed less enthusiasm than their older counterparts and in other cases older GPs did express their problems with technological adoption. This is contrary to the predominant perception that the younger generation and thus its younger members are early adopters and drivers of change. What has been shown is that the age factor is neither the rule nor the exception in technology adoption and that it varies from individual to individual GP as shown by literature as well (Gagnon et al. 2014; 2016). This point has also been proven by another study of 604 clinicians amongst whom 534 doctors across fourteen Greek hospitals by Melas et al. (2011) who have found that while older doctors do perceive to be less technologically savvy, the longer they have been in practice, the lower that perception becomes, which provides a very strong case for ongoing professional development which diminishes the perceived age factor.

The second examined variable was gender and the statistical result has revealed a very low path coefficient value (β= 0.0012) and low t-value of (t=0.014). On the basis of this statistical finding, gender likewise does not seem to appear as a significant factor that may impact on RDTC. Gender differences were also explored in this project. After splitting the data file into male and female respondents, the whole model was run separately and on each occasion, differences were almost non-existent. The statistical findings have revealed the following path coefficient between male GPs and RDTC (β= 0.0012) and low t-value of (t=0.0148). Similarly the path coefficient between female GPs and RDTC revealed (β= 0.0012) and low t-value of (t=0.0137). This is statistical evidence based on the sample of 187 respondents that no statistical differences exist between male and female GPs in terms of their readiness to develop telehealth capabilities (RDTC). Thus, gender has no impact on RDTC.

According to a German study on gender differences in health and patient-doctor online relationship, it was exposed that female patients are more likely to utilise the internet to search for information related to health, tend to be more aware of health and nutritional needs, however view themselves as having lower digital competence than men and are more reluctant to use virtual medical assistance. Males on the other hand were seen as more likely to interact with doctors in the virtual environment than women (Bidmon and Terlutter, 2015). However, when it comes to differences between male and female physicians and in particular GPs in terms of intention to adopt technology, literature shows similar results as portrayed in this project. Namely, a study where these differences were tested was carried out in Canada by Gagnon et al. (2014) and among these three control variables, none has shown statistically significant differences in terms of their relationship with intention to adopt electronic health records.

The third and final control variable was experience and the statistical findings have again revealed a low path coefficient value (β= 0.037) and low t-value of (t=0.2469). These low values were further validated when the whole model was run separately for male and female GP respondents with a low path coefficient value for males (β= 0.037) and low t-value of (t=0.2161) compared to almost identical values for female GPs (β= 0.037) and low t-value of (t=0.2233). What these study results have also shown is that there is no significant difference between those GPs who have been practicing for over 20 or even 30 years and those GPs who have been in practice for 10 or even less than 5 years in terms of impact of their length of experience on RDTC whether they are male or female practitioners. This is despite the fact that some older GPs did report lower perceived competence levels during the qualitative field study phase. These statistical findings are also in line with other literature on physician acceptance studies where the impact of experience on the adoption of electronic health records was measured and produced no statistically significant outcomes (de Grood et al. 2016; Gagnon et al. 2014). It is not known whether a larger sample size would have produced a more statistically significant result. Such an outcome can be observed in a study of 604 clinicians of whom 534 doctors by Melas et al. (2011) who found that even though desire for knowledge among doctors drives technological experience, their study reported the following p value (p=0.354) which is statistically insignificant. According to this study‘s results, it can also be concluded that GP length of experience has no statistically significant impact on RDTC.

7.4 Statistical findings in terms of research objectives

This part of the thesis intends to discuss findings in terms of research objectives set at the beginning of the study. The first research objective explores essential operational elements for telehealth medical services whereas the second research objective measures the relationships between these essential operational elements. The third research objective corresponds to the investigation of the relationship between these essential operational elements and GP readiness to develop telehealth capabilities that could be implemented in the treatment and management of locally pressing aged care chronic and acute medical conditions. And the final fourth research objective examines the impact of value creation (VC) on GPs' readiness to develop telehealth capabilities that could be implemented in the treatment and management of locally pressing aged care chronic and acute medical conditions. It is of value to mention that all objectives except the first one were already discussed in the hypotheses section above through both direct and indirect hypothesised relationships. Namely, the first research objective has been addressed through the discussion on service value network elements and telehealth essential operational constructs from a service value network perspective and the section that has discussed sub-constructs and their items for measuring GP readiness for telehealth medical services. The second research objective has been addressed by H5, H8 and H11, whereas the third and fourth research objectives have been together addressed by H1, H2,H3, H4,H6, H7, H9, H10 and H12. Therefore, this section will only summarise those findings.

In terms of the first research objective, four essential operational elements or factors from a service value network perspective have been strongly established in literature and these are a) telehealth technology use considerations which was validated with sub-constructs of data security, telehealthcare protocols and workload inherent sub-constructs; b) knowledge sharing which was validated with motivation, opportunity and ability to share, data exposure concerns and telehealth practice sub-constructs; 3) relationship management which was validated with communication, collaboration, trust and commitment inherent sub-constructs and d) process management which was validated with six key service delivery process elements that are essential in the telehealth context from a service value network angle.

In terms of the second objective, the statistical analysis has uncovered a statistically significant positive relationship between telehealth technology use considerations (TTUC) and knowledge sharing (KS) with a path coefficient value of (β=.477) and t-value of (t=2.215, p=0.01). It demonstrates the importance of this relationship through the perceived value of knowledge sharing facilitated by telehealth technologies, organisational climate, individual GPs' motivation, opportunity and ability to share information and knowledge with health colleagues to serve remote patients as long as patient data is secure and no harm can be done.

The relationship between knowledge sharing (KS) and relationship management (RM) has also been proven statistically significant with a path coefficient value of (β=.627) and t-value of (t=4.493, p=0.005). This has demonstrated that knowledge sharing cannot exist without effective relationship management and vice versa, relationship management in a telehealth service delivery platform depends for survival and success on knowledge sharing. The greatest identified barriers were fixed time slots in a working shift, practitioner willingness and commitment in both time allocation and effort to share one‘s knowledge and working experiences electronically, organisational climate and its support or lack of it, facilitation of informal meetings and regular interdisciplinary meetings and adequate resources for effective collaboration. One‘s inability to conduct an immediate relevant physical assessment in addition to legal issues and handling of patient data were also identified as serious practitioner concerns. And the final interaction between essential operational factors relationship (RM) and process management (PM) has also been proven as statistically significant with a path coefficient value (β=.725) and t-value of (t=9.340, p=0.005). It in fact implies a significantly positive influence of RM on PM suggesting that RM assists in achieving PM steps. In simple language, communication, collaboration, trust and commitment between clinicians support effective telehealth process management elements. The above relationships have been strongly validated and supported by both quantitative data and qualitative results.

In terms of the third research objective, it is important to mention that the research framework does not expect direct relationships between essential operational factors and the dependent variable GP readiness (RDTC) and instead proposes indirect links which are mediated by value creation (VC). Therefore, both the third and fourth research objective can be assessed together. Furthermore, both direct and indirect results are reported and discussed herein.

To start with, the first operational element has validated essential TTUC elements of data security, telehealthcare protocols and workload and evaluated their foundational impact on both the mediator (VC) and criterion or final outcome (RDTC). The direct effect between TTUC and RDTC has produced statistical significance (t=2.045) and the indirect relationship has also been proven as significant even in the absence of the mediator (β= .319 and t=1.903, p=0.05). Moreover, the mediating role of VC has reaffirmed its statistical significance in this important relationship by being able to explain 72.8% of the total impact of TTUC on RDTC with (β= .1526; LLCI=.0271 & LLCI=3112). Therefore, telehealth technologies use considerations (TTUC) have been validated as very important elements in the evaluation of GPs‘ readiness to develop telehealth capabilities. These are also grounded in literature (Aleman et al. 2013; Blount and Gloet, 2015; 2017; Brewster et al. 2014; Caldicott, 2013; Dunnebeil et al. 2012; French et al. 2013; Gollnick et al. 2013; Jin, 2011; May et al. 2011;

Raven, Butler and Bywood, 2013; Van Wormer et al. 2012; Van Alstin, 2016; Varty, O'Neill and Hambley, 2017).

Furthermore, the second essential operational factor being assessed, namely knowledge sharing (KS) has been validated with five inherent sub-elements. These are motivation to share, opportunity to share, ability to share, data exposure concerns and telehealth practice sub-constructs. The direct link between knowledge sharing (KS) and GP readiness (RDTC) has not produced a significant result with (t=1.437), however the effect of knowledge sharing (KS) on VC has produced a statistically significant impact with (β= .297 and t=2.398, p=0.005). Likewise, when tested through VC as the mediator, the indirect effect of KS on RDTC has also been proven statistically significant even in the absence of the mediator (VC) with a path coefficient (β= .501 and t=7.875, p=0.005). Furthermore, the mediating role of VC has reaffirmed its statistical significance in this important relationship by being able to explain 99% of the total impact of KS on RDTC with (β= .1643; LLCI=.0532 & LLCI=.2873). Accordingly, it can be concluded that the evaluated knowledge sharing considerations are all important elements which may influence GPs' telehealth capabilities development readiness which also have literature support (Radaelli et al. 2014; Bahous & Shadmi, 2016;Bock et al. 2005; Gillentine, 2012; Hsu et al. 2007; Anderson, 2010; Cocosila and Archer, 2017; Featherman and Pavlou, 2003; Featherman, Valacich and Wells, 2006; Greenhalgh et al. 2010a; Greenhalgh et al. 2010b; Hsieh, 2015; Lim, 2003; Martins, Oliveira and Popovic, 2014; Audet, Squires and Doty, 2014; Bullock, 2014; Raven, Butler and Bywood, 2013; Jang-Jaccard et al. 2014; Peterson and Bertelsen, 2012; Wade and Hamlyn, 2013).

The third and fourth research objective have also shed light on cross-disciplinary relationships and the third key element of the proposed model, namely; relationship management (RM) with communication, collaboration, trust and commitment as its essential sub-constructs under investigation. These elements are also grounded in literature (Blount and Gloet, 2015; Brady et al. 2017; Kayyali et al. 2017; Knight et al. 2016; Keijser et al. 2016; McKenzie and Williamson, 2016; May et al. 2011; Morilla et al. 2017; O'Leary et al. 2017; O'Reilly et al. 2017; Rees and Williams, 2009; May et al. 2011; Saleh et al. 2016; Uscher-Pines and Mehrotra, 2017; Spencer et al. 2015). The direct impact of RM on RDTC has produced a statistically significant relationship (t=1.752) while the indirect relationship has also been proven as significant even in the absence of the mediator (β= .468 and t=7.199, p=0.005). Moreover, the mediating role of VC has reaffirmed its statistical significance in this important relationship by being able to explain 95.7% of the total impact of RM on RDTC with (β= .1887; LLCI=.0697 & LLCI=.3757). Consequently, it can be concluded that communication, collaboration, trust and commitment could assist in identifying GPs‘ state of readiness to develop telehealth capabilities that could be implemented in the treatment and management of locally pressing aged care chronic and acute conditions.

Additionally, lights are shed on the final essential operational factor and its proposed key telehealth service delivery process management elements. These in fact represent key building phases and were all individually validated through both exploratory interviews and quantitative survey data. They relate to a) simple/interoperable system capabilities with minimal interruption (Baig, Hosseini and Connolly, 2015); b) secure/uninterrupted high quality broadband data speed (Hay, Lim and Wartena, 2012; Morrissey, 2016; Mosa, Yoo and Sheets, 2012; Rathore et al. 2018); c) properly curated patient health data to prevent falsely presented information (Artis et al. 2017; Gold et al. 2018); d) personalised remote patient support in the measurement of vital signs (Carlisle, 2012; Tang and Ricur, 2014; Boehm, Muehlberg and Stube, 2015); e) development of standard remote care protocols (De Souza et al. 2017, Zanaboni and Wootton, 2012) and f) integrated collaborative treatment phases managed by doctors (Bentley et al. 2014; Kvedar, Coye and Everett, 2014; Kivekas et al. 2016). The direct effect of PM on RDTC has not produced a significant result (t=1.390) whereas, the direct impact of PM on VC has revealed a statistically significant relationship (β= .377 and t=1.943, p=0.05).

On the other side, when tested through mediation, the indirect relationship between PM and RDTC has also been proven as statistically significant even in the absence of the mediator (β= .400 and t=5.935, p=0.005). Furthermore, the mediating role of VC has reaffirmed its statistical significance in this important relationship by being able to explain 52.1% of the total impact of PM on RDTC with (β= .2461; LLCI=.1185 & LLCI=.3871). As a result of the above results, it can be said that the proposed process management elements in this pioneering telehealth service value network model with GPs at the centre may act as important building blocks towards GPs‘ readiness to develop telehealth capabilities. The above statistical results also validate Value Creation (VC) as a very important mediator between essential operational elements and GPs‘ readiness to develop telehealth capabilities.

And finally, the direct hypothesis stating that the relationship between the direct predictor in the model, namely; Value Creation (VC) and the dependent variable (RDTC) is a positive one has been rejected due to a low path coefficient value (β=.113) and low t-value of (t=0.776). These outcomes were explained in H12 above and in summary it can be restated that GPs still perceive that they cannot rely one hundred percent on telehealth technologies in the delivery of care to their patients. They are only interested in investing their time and resources in a long lasting system. Currently, they are concerned about the reliability of internet and technologies used especially in terms of speed, clarity of communication, accuracy of data and precision of diagnosis. Doctors also have substantial uncertainty regarding telehealth adoption consequences such as their financial and time resources in addition to ongoing GP practice and final patient care outcomes. GPs did also express strong scepticism that even more funding and other incentives do not seem to be able to overcome at this stage as reiterated by R 11: ―*whole new rules need to be written for. It is a scam now so we cannot compare with old rules now*". On a more positive note though, GPs did state perceived time and cost efficiencies and expected professional benefits from close interactions with specialists as well as potential for independence through more integrated technologies which could offset some of the above mentioned concerns and serve as important adoption drivers.

7.4.1 Predictive strength or validity of the TTUC construct

This project has used the Q2 test by Stone-Geisser (Geisser, 1975; Sone, 1974) by utilising the so called cross-validated redundancy method which has produced a Q2 result of 0.0697 for knowledge sharing (KS); 0.3318 for process management (PM); 0.616 for relationship management (RM); 0.3846 for value creation (VC) and 0.1922 for readiness to develop telehealth capabilities (RDTC). Table 55 shows these values. In order to assure high predictive strength or validity of the model, the above test needs to produce Q2 values higher than zero (Fornell and Larcker, 1981). Based on these criteria, the outcomes of this test have demonstrated the predictive strength of the telehealth technologies use considerations construct (TTUC) to be medium to mainly large (Cohen, 1988).

7.5 Chapter summary

Chapter seven has offered important insight into the statistical findings that were obtained through a structural equation modelling partial least square approach, which were discussed in chapter six. In relation to telehealth use considerations, the telehealth platform essentially needs to have a well-managed cross-disciplinary resource management mechanism/s through appropriately negotiated and stable workload distribution supported by widely accepted telehealth care protocols. The greatest concerns however remain GP and patient data security, privacy and confidentiality and remote patient safety. If these are addressed adequately, GPs do not have other major concerns in the pursuit of utilising telehealth technologies. These safeguards would also ensure the effectiveness of telehealth and reinforcement of its benefits.

In terms of knowledge sharing, GPs‘ motivation to share knowledge electronically appeared higher then opportunity and ability to share which is shedding light on organisational support, technical and collaborative know how and infrastructure. Perceived value through experiential encounters with specialists is an important driver of GPs‘ willingness to adopt telehealth. This ultimately adds to the creation of value from a GP perspective. In other words, as general practitioners perceive and experience the benefits of knowledge sharing, they are likely to want more of the same, thus contributing to the creation of value in the network even more. The main concerns in this element are data exposure concerns in relation to threats to remote and ongoing patient safety and misuse of electronic health records, performance expectations in terms of patient outcomes, and potential legal implications from the use of telehealth. The above also points to the necessity for negotiations between key clinical stakeholders and writing of new rules, so that quality care is not jeopardised as knowledge needs to come from a better source, whether it be the specialists or another clinician group in the proposed telehealth ecosystem.

Relationship management has proven to be the most challenging operational element particularly when it comes to trusting the platform in relation to conducting relevant physical assessments. These may negatively affect patient trust. Some of the key issues are concerns around communication channel management, cross-disciplinary resource/team and data management, lack of clarity in what it involves, its outcomes compared to the conventional system and clinicians‘ availability and commitment to collaborate in real time. The final element, process management has validated the importance of interoperability of systems, speed of quality data at the point of care, productivity measures, routine practice and integrated care. Finally, value creation targeting presumed benefits that would stimulate GP readiness has endorsed clearly delineated Medicare items, close experiential encounters with other healthcare practitioners, design of better integration leading to GP paths to self-employment and cost efficiencies as key drivers of value.

The first research objective was addressed through conceptually and empirically validated service value network essential operational constructs and their inherent sub-constructs. The second objective was addressed through individual evaluation and validation of links between the essential operational elements and their levels of significance. Results have shown that essential technology use considerations such as data security, telehealthcare protocols and workload remain fundamental prerequisites for knowledge sharing, relationship and process management. Subsequently, evaluated links between knowledge sharing, relationship and process management have proven increasing relational strength. The third and fourth research objectives were addressed through mediated hypotheses between the four essential elements and the dependent variable. All of the hypotheses have produced statistically significant results and validated those relationships. The only unsupported hypothesis was the link between value creation and GP readiness. This can be explained by findings on GPs' perceptions that telehealth cannot be relied upon one hundred percent due to internet reliability concerns, clarity of communication, data accuracy, precision of diagnosis and GPs' interest to invest only in a long lasting system. Besides, substantial uncertainties around time and financial resources, patient final outcomes and absence of proper and fit legal framework add additional tensions. Lastly, the moderating construct and control variables have shown no statistical impact on GP readiness.

Chapter 8 Conclusion and way forward

8.1 Overview

The central emphasis of this research project which has utilised the mixed methods approach was to evaluate the hypotheses and their relationships in the proposed framework. In particular, the model has evaluated the hypothesised links between the four essential operational elements of service value network in a telehealth context, namely; telehealth technology use considerations (TTUC), knowledge sharing (KS), relationship management (RM) and process management (PM) and the key predicting variable value: creation (VC) as well as indirect relationships between the four essential elements and the dependent variable (RDTC). It has also examined the direct impact of VC on RDTC and the moderating impact of telehealth enablers (TE) on RDTC via VC in addition to the assessment of a potential impact by control variables (age, gender and experience). This final chapter firstly provides a research summary on key process steps and findings which is followed by the contributions to theory and practice. Lastly, the chapter concludes by the discussion on the project‘s limitations and suggests some recommendations for future work in this field.

8.2 Research summary

Telehealth is a recent phenomenon whose capacities can complement conventional medical treatment methods for a variety of medical conditions, particularly in the aged and distant care sector. In some situations, it may serve as a substitute for some conventional approaches such as in the provision of essential and timely health consultations to distant patients. Its key stakeholders are health practitioners, platform developers, governments and patients (Jang-Jaccard et al. 2014). Of all of the above stakeholders, health practitioners hold the key to telehealth success or failure, thus these technologies target clinicians and their practices as key intended users (Taylor, 2013). However, similarly to other forms of service value networks, telehealth care networks are also being challenged with their developmental problems. According to Health Workforce Australia (2012), these characteristically relate to technological, cultural and organisational (both intra and/or inter-organisational) issues. This project has dealt with the key issue identified by literature, that is, slow acceptance by clinicians (Taylor, 2013, 2015; Wade, Eliott and Hiller, 2014). However, the thesis has found a critical gap not researched before, namely, lack of readiness to develop telehealth capabilities by primary care clinicians also known as GP practitioners, particularly in metropolitan areas. Due to the fact that GPs are and have been primary reference and treating points for the wider population for a long time, these clinicians are positioned at the centre of the proposed telehealth service value network and this research project. Because telehealth is a cross-disciplinary platform by default, it requires contribution of multiple disciplines to effectively function. Its associated progress stages require a fundamental shift in inter-professional, interdisciplinary, multidisciplinary and transdisciplinary (in one word; cross-disciplinary) thinking from the long outdated professional divisions (Health Workforce Australia, 2012) and consequently, a different theoretical advancement (Mann, 2011) that may be built on the existing communities of practice theory. With this background conceptual grounding, this study has attempted to devise a novel telehealth service value network model with general practitioners at the centre through the revision of relevant and up to date literature on technology acceptance by doctors and other clinicians, service value network literature with a particular emphasis on technology use considerations, sharing of knowledge, relationships and process management elements. To assure the conceptual foundation of the proposed theoretical framework, the proposed elements and the hypothesised links were rationalised through the Unified Theory of Acceptance and Use of Technology (UTAUT), communities of practice and multi-grounded theory. Lastly, the initial conceptual framework‘s constructs and its dimensions were operationalised and validated through a qualitative empirical project phase.

Due to data saturation levels, the qualitative empirical phase included fifteen in-depth semi-structured interviews with 15 general practitioners who are practicing in different parts of the greater Sydney metropolitan area. By utilising a developed and pre-approved protocol by the human research ethics committee, the collected qualitative data was analysed. The content analysis method was utilised for this purpose. Based on empirical qualitative findings, a field framework was created. Finally, the comparison between the initial theoretical framework and the empirical framework has led to the eventual research framework. This framework then needed to be validated through a larger quantitative survey study method according to the mixed methodology approach employed.

The eventual research framework contained the following constructs, namely; telehealth technology use considerations, knowledge sharing, relationship management, process management, value creation, telehealth enablers, control variables (age, gender and experience) and the dependent variable; readiness to develop telehealth capabilities. Factor measurements for this project were sourced both from existing literature and theories on the topic of inquiry, some of which were amended to suit this study‘s context and some were derived out of the qualitative empirical study findings. These were further utilised in the development of the quantitative survey‘s items which also underwent pre-testing and refinement. Following this process, data collection process began and 187 out of 206 responses were confirmed valid and usable. The data was then analysed through a structural equation modelling and partial least square technique (details in chapter six). Partial least square algorithm was conducted first in order to evaluate the measurement and bootstrapping technique to examine the structural framework. During the evaluation of the measurement framework, items that produced low values in terms of reliability or were causing cross-loading issues were deleted. Following item deletion, the refined framework produced adequate reliability of the remaining items as well as discriminant and convergent validity. Then, the structural framework was examined which uncovered that the key predictor construct: value creation (VC) can explain 72.8% of the variance between TTUC and RDTC, 99% of the variance between KS and RDTC, 95.7% of the variance between RM and RDTC and 52.1% of the variance between PM and RDTC. Out of the 13 hypothesised relationships, 4 hypotheses were rejected and 9 accepted. Importantly, all mediating hypotheses were statistically supported with corresponding significance (see Table 60: Mediation analysis results). The proposed framework has also confirmed the predictive strength or validity/relevance of the construct: telehealth technology use considerations (TTUC). These outcomes do have research and managerial implications. The section that follows outlines the contributions of this project to both theory and practice.

8.3 Theoretical contributions

Successful and sustainable telehealth network cross-disciplinary collaboration initiatives are likely to unlock key success ingredients and competitive advantages for healthcare supply chains in the 21st century. Irrespectively of the latest technologies, human factors in operations management and especially in healthcare networks play key roles. That is why, understanding factors that may shape GPs' readiness to develop essential telehealth skills which are driven by expected or projected outcomes for aged care patient chronic and acute medical conditions are significant not only for patient health improvements but also for other cross-disciplinary healthcare developments.

The proposed multi-grounded theoretical framework which allows for contributions from existing theories in addition to empirical findings is expected to play a significant role in this project. Namely, both the Unified Theory of Acceptance and Use of Technology and Communities of Practice theories could demonstrate reasons for GP adoption of telehealth technologies as well as how these impact on cross-collaborative interactions under the proposed service value network scenario. Under this scenario, GPs and essential service value network elements of technology, knowledge, relationship and process management play central role in the delivery of distant telehealth medical services to aged care residents. In addition to the four essential operational factors, key predictors / mediators in this research that may stimulate GPs' readiness to develop capabilities for telehealth medical services are _value creation' dimensions.

These may also be used for further research into measuring readiness by other health service networks to develop their cross-disciplinary capacities.

This developed research framework points to a few areas where theory may benefit from this project. The first major theoretical contribution is the idea around which the whole concept has evolved, namely; the positioning of general practitioners at the centre of telehealth service delivery as ongoing central reference, treating/management and referral points for the aged care and remote care sector, being the first study of its kind according to the author‘s best knowledge. While the qualitative phase has focused primarily on GPs‘ readiness to develop telehealth capabilities for the aged and remote care sectors, the much larger quantitative phase in addition to the aged and remote care sector has focused on a more general setting that may be applicable to the wider patient population. This is particularly important for the sustainability of cross-disciplinary interactions as they increasingly grow in significance especially in the context of remote care. It is also believed that this study will be cited in other telehealth and remote care studies with a research emphasis and interest in telehealth application interactions with the wider population. This research has also provided a more insightful comprehension than is currently available in literature in relation to essential telehealth technologies GP user considerations and acceptance factors by evaluating and validating the proposed framework‘s properties. Besides telehealth technologies GP user considerations, the framework has also described important links between knowledge sharing, relationship and process management constructs as well as key predictor: value creation and telehealth individual and organisational enablers with the dependent variable: GPs‘ readiness to develop telehealth capabilities. These are new contributions and extensions to the Unified Theory of Acceptance and Use of Technology when applied in telehealth context particularly through the validation of the key predictor: Value Creation construct. Communities of Practice Theory has also benefited through both novel findings and recommendations directly from general practitioners to their clinician colleagues, technology developers, providers and policy makers. While an extensive research did identify substantial disparities, this project proposed to fill them by offering novel and insightful contributions through a newly developed framework. Moreover, the developed framework was first contextualised through an empirical qualitative study. The resulting research framework has pointed to key elements which if properly addressed may lead to GPs‘ readiness to develop telehealth capabilities. Since the field of telehealth is still in its infancy, there is an ongoing debate in literature on the various factors that could enhance better comprehension of the targeted user groups and other potential adopters of these novel technologies. This project has also empirically validated four essential service value network operational elements in telehealth context, namely; telehealth technology use considerations, knowledge sharing, relationship management and process management, all of which contain multiple sub-constructs and dimensions. This is the first study that has combined these four service value network elements in a telehealth context which were supported both empirically and theoretically by relevant literature. These are uniquely targeted dimensions of: a) data security, telehealthcare protocols and workload as parts of the first element; b) motivation, opportunity and ability to share, data exposure concerns and telehealth practice constructs as parts of the second element; c) communication, collaboration, trust and commitment as parts of the third element and d) process management key steps as parts of the fourth element. Consequently, this thesis has enriched literature in the field of telehealth and associated studies.

This thesis has also taken a unique approach to improve telehealth technology acceptance levels amongst clinicians by utilising chronic and acute conditions currently overburdening the health system as potential drivers among other factors. This is a new thinking paradigm that starts with critical patient needs and outcomes facilitated by non-rivalling / complementary cross-disciplinary clinicians‘ small, close-knit team efforts with general practitioners as central reference, treating and management/co-management points. In relation to these drivers, it is the first study that has proposed such factors and validated them empirically. As such, it is a novel and higher health service proposition and new contribution to knowledge.

While there are other empirical studies which have predominantly evaluated existing theoretical models with a single methodology used (Gagnon et al. 2014; Jennett et al. 2003; Razmak, Belanger and Farhan, 2018; Rho, Choi and Lee, 2014), this study has utilised a mixed-methods approach which has provided richness of information and which has empirically validated a novel empirical model with ‗value creation‘ from a clinicians‘ perspective being centrally positioned and a potential to develop a novel theory. This study has explored multiple relationships between different constructs and is the first one to test the mediating role of value creation between the four service value network elements and GPs‘ readiness to develop telehealth capabilities. It is believed that these mediating links have never been empirically evaluated in any study yet. This study has also made theoretical contribution to the service operations management and management literature by creating a means to define and measure levels of acceptance for telehealth services through the establishment of a set of variables and units of measurement that are highly contextual, very unique and that can be applied across all health services sectors. And finally, this study‘s contribution lies in the way the Unified Theory of Acceptance and Use of Technology and Communities of Practice theories combined effort under a Multi-Grounded theoretical framework allow for a potential generation of a novel theory. The combination of these theories can explain both technological and human factors, which are grounded in theory and empirical data. According to the author‘s best knowledge, this is also the first study that has engaged simultaneously these three theories in a telehealth readiness context.

8.4 Practical contributions

From a practical and managerial perspective, it is important to comprehend the issues and other elements that may have an influence on the functioning of the proposed health care delivery model. For telehealth frameworks which are still in their infancy, all new findings whether they are positive or negative in nature are useful for the planning ahead. This study has uncovered important insights into GP perspectives and decision making. Thus, this study‘s initial and real practical contribution is to the field of management where GPs‘ readiness to develop telehealth capabilities to use technology based services & telehealth technologies has been evaluated through GPs‘ roles. The telehealth platform is also likely to benefit from the findings of this study through a suggestion that may be derived from the proposed key elements and key predictor, whether directly or indirectly in the way that the telehealth platform should be set up and run, particularly in terms of essential safeguards, protocols, cross-collaborative resource distribution and workload management, key health conditions to be targeted, process phases and necessary capabilities. More explicitly, managers and other decision makers can utilise the proposed and validated framework to modify their current thinking patterns and processes and invest energy and resources into essential negotiations with clinicians towards addressing areas of identified concerns in this study. In relation to designing or re-designing the telehealth platform, it is important that the proposed small, close-knit cross-collaborative patient –centred team approach be exercised and executed gradually and that all discussed safeguards, protocols and stable workload distribution and workload management aspects be implemented beforehand. The proposed model can also be utilised as an improvement tool in areas where other models are already in operation.

This model will also allow government authorities, policy makers and managers to obtain important insight into crucial facilitating elements aimed at telehealth improvement through the preparation of appropriately made strategies and policies. The evaluated elements of telehealth technology use consideration, knowledge sharing, and relationship and process management are providing significant contribution to decision makers and managers in order to enhance telehealth frameworks. Very specifically, the model demonstrates the significance of data security, protocols, workload, data exposure and telehealth practice concerns, and the role of communication, collaboration, trust and commitment as well as essential training and technical support, funding and skilled workforce issues. It details key areas that the government and management need to address through individually validated items / dimensions and also points out to the need for ongoing consultations with general practitioners in order to overcome their concerns and safeguard effective practice. This particular study considers Australian general practitioners however its implications are likely to also be significant in the context of other countries‘ telehealth platforms.

The application of this model also provides practitioners with a new set of measures for levels of acceptance and probable implementation of new technologies with which to assess telehealth service performance. And lastly, a very significant contribution of this model lies in the potential derived from cross-disciplinary collaboration encounters and efforts facilitated by the herein proposed effective small close-knit patient-centred teams through telehealth technologies which may enable the transfer of tacit medical expert knowledge into more explicit forms and support GPs‘ paths to independence. To that end, this research has provided invaluable insight into GPs‘ perspectives and views as well as experiential affirmations into what works for them.

8.5 Recommendations and Implications

In view of the above findings, the following list of recommendations to GPs, Software Developers and Technology Providers and Policy Makers is over 95% derived from GP interviewee respondents and study‘s quantitative results. Below presented recommendations are in line with key model‘s constructs and associated elements and each point is explained individually, which is followed by the relevant recommendation and likely outcomes if implemented.

8.5.1 Recommendations to Australian GP practices and GPs and Associated Implications

Telehealth technology use considerations

GP practices need to become involved in negotiations with respective PHNs, RACGP and AMA in the creation and instilling of standardised, easy to follow telehealth protocols in the best interest of patient care.

- PHNs, RACGP and AMA have been identified as key bodies representing GP practice and as such are in the best position to assist the creation of essential telehealthcare protocols in consultations and negotiations with GP practices.
- If negotiations were conducted and agreed upon by GP practices, these would ensure consequential commitment to these.

According to field results, telehealth is not to be used in acutely unwell patients (e.g. *―patient may report having a cough and not being able to breathe – patient may have pneumonia in which case it is both medically and ethically wrong to treat through telehealth”*).

- Consequently, patient safety needs to be ensured so if there are any concerns or danger signs being present, physical assessment must be carried on site and cannot be substituted by telehealth as patient safety must not be compromised. Thus, safety mechanism thresholds such as danger/trigger signs or red flags and assurances of remote patient safety and documenting procedures need to be built into the telehealth platform and stringently followed.
- If these safety mechanisms are implemented and stringently followed, these would support patient safety and that correct procedures are adhered to in the best interest of patient care.

Knowledge sharing

GP practices need to become involved in negotiations regarding the handling of electronic health records/patient data, competition, clinical autonomy and legal issues that may arise from the use of telehealth as well as legislated rights to freely choose the type of care delivery for each patient.

- As centrally positioned and targeted clinical users of telehealth technologies, GPs' participation in negotiations is essential to make things work.
- A legally binding agreement between key stakeholders would support the rollout and mainstreaming of telehealth medical services.

Relationship management

GP practices can capture many gains from telehealth if GPs are trained as computer engineers, programmers or analysts.

- GP practices should encourage GP practitioners to become computer engineers/programmers/analysts and involved in the running of telehealth services in order to become less dependent on IT professionals.
- If implemented, these steps would achieve cost efficiencies and other capabilities that can serve in the training of other staff and patients as well as reassurances to patients. These steps may also ensure clinical ownership of telehealth services which are important motivators to clinicians in whose interest it is to preserve trust from their established doctor/patient relationships.

Process management

Telehealth requires new capabilities from GPs to sustain the practice and fulfil patient demand.

- GPs need training in (e.g. remote identification of patients and cross-verification of test results, e-consulting with specialists, e-consulting with patients, e-referrals, e-prescribing, patient e-support in the measurement of vital signs, e-diagnosis, e-pathway management etc…).
- GPs also need training with diagnostic procedures to prevent misdiagnosis (e.g. ~~c~~*concern with cellulitis, ask nurse to send photos, verify that it is not an ulcer first and then diagnose…receive an emailed chart of medication, order medication from the chemist"*).
- The above training can be in-house or provided by PHNs, which if implemented would support effective running of targeted telehealth services.

Value creation

Current awareness amongst GPs of telehealth MBS items is inadequate;

- Department of Health, PHNs and GP practices need to provide better information to practicing GPs about telehealth MBS items.
- If awareness programs are adequately implemented, more GPs would start utilising the telehealth platform.

Telehealth will provide close experiential encounters with other healthcare practitioners.

- GPs' are likely to benefit professionally from close experiential encounters particularly from better knowledge sources such as specialists.
- This is a high adoption driver for GPs.

Telehealth platform designed for better integration will lead to GP paths to self-employment.

- Consequently, ongoing close experiential encounters in patient-centred solutions through integration and linkages with other remote practitioners such as for instance specialists, pathology, medical imaging practitioners and nurses in nursing homes will ensure receipt of timely feedback and follow up on the proposed treatment and diagnosis.
- If implemented, GPs will be able to connect to various clinicians and provide care from any location. The above are all important uptake drivers.

Telehealth will provide cost efficient services.

- As many retiring long-term patients move out of cities to more remote areas, it is in GPs' interest to maintain these relationships. GPs would need telehealth capabilities to continue providing care to these long-term patients.
- If implemented, telehealth capabilities would provide important value to both GPs and their long-term patients who have moved to more remote areas. Metropolitan GPs could also assist in addressing round the clock workforce shortages on demand in underserved areas.

Telehealth enablers

Individual enablers

GP interest in continuing telehealth education through skilling and up-skilling is an important telehealth driver to remotely serve existing patients with simple issues.

- Telehealth training should target GPs' most pressing local patient chronic conditions/needs.
- If implemented, GPs are likely to benefit from the training and consequently apply it in practice.

Organisational enablers

There should be targeted purposeful investment in telehealth training to provide patient-centred solutions through the establishment of small close-knit cross-disciplinary teams.

- Government funding support in the establishment and running of well-trained close-knit cross-disciplinary teams will ensure both sufficient availability of skilled telehealth workforce and professional improvement advantages over GPs' current practice as well as its application in practice.

Readiness to develop telehealth capabilities

Telehealth is likely to affect face to face brick and mortar visits thus reduce clinical interactions.

- Very importantly, case by case patient circumstances need to be given serious thought and considerations as this model of care if not properly managed may bring about less clinical interactions and consequently more isolation for those in most need, that is, chronically ill elderly aged care patients who are less technologically savvy. This could exacerbate their conditions as opposed to improve them.

- If appropriately implemented through proper assessment and consideration of individual patient needs and circumstances, it then should not affect the quality and volume of clinical interactions.

Telehealth is likely to have a negative impact on GPs‘ clinical autonomy.

- GPs need to be actively involved in negotiations with their respective practices, PHNs and other relevant bodies so that their concerns are satisfactorily addressed.
- If appropriate negotiations take place, the negotiated outcomes should have a positive end effect on multi-disciplinary collaborative practice and implementation of telehealth in GP domain.

8.5.2 Recommendations to Software Developers and Technology Providers and Associated Implications

Telehealth technology use considerations

It is important that technology providers and software developers work transparently in line with clinically approved telehealth practices, guidelines and protocols.

- RACGP, AMA and/or other approved relevant telehealth guidelines and standards for both video and non-video care delivery need to be followed by technology providers and software developers.
- These are essential requirements prior to implementation.

There is value in pre-installing approved standard remote care protocols.

- Once approved by relevant bodies in negotiations with GP practices, ensure that approved standard remote care protocols are pre-installed and practitioners are reminded of these before or during the service delivery process as appropriate and not to disturb more urging matters;
- If implemented, these pre-installed protocols would serve as important reminders and not as distractors of important remote health delivery processes at hand.

Safety mechanism thresholds are crucial telehealth care elements that support proper patient care.

- Design and pre-install programmed safety mechanism thresholds/red flags/danger triggers into telehealth devices that recognise acutely unwell conditions and warn the practitioner of the required protocol steps in such cases. Safety mechanisms need to be standardised for ease of following (e.g. *“chest pain, shortness of breath or abdominal pain require on site doctor assessment or an ambulance”*).

- If implemented, all of the above stated elements would support GP acceptance and proper and effective service delivery.

Relationship management

Telehealth devices should be as much as possible distraction free and capable to show multiple images in real time on the same screen.

- Design devices that minimise or eliminate distraction with capacities to show the image of the patient and a sharing running platform between the patient and a specialist and/or the patient and a GP or all three stakeholders in one teleconference. Device should be to able to show for instance blood results and make it easy to see and point to those, *“rather than clicking back and forward”* and losing track of important thoughts and steps in the delivery process.
- The implementation of the above or similar examples would enhance effective telehealth communication and care delivery.

There may be hearing impairment and other communication barriers which may result into loss of crucial communication despite third party assistance.

- Design devices which assist hearing and improve patient communication - improve capacities to communicate non-verbally with hearing impaired.
- If implemented, the above communication improvements would support effective remote care delivery.

Process management

Long lasting hardware and software are essential tools in remote care delivery.

- Design long lasting hardware and stable software that can carry enormous data and ensure safe and effective delivery of care (with enormous battery capacities, multiple recharging capacities such as wireless charging, power points, solar, vehicle recharging etc..). Software needs to be stabilised in order to ensure its longevity.

Clinicians prefer that the telehealth platform is simple and interoperable with minimal or no interruptions.

- A simple/interoperable system with minimal interruptions should be sustained.

- If the designed system is simple and interoperable, then ~~it~~ *should be something standard, like most of the doctors use, so that they would not have any problem with accessing the data… it would need to be something that we are all using: medical director, best practice"…*

Clinicians also expect secure/uninterrupted high quality broadband speed that is well maintained, which is not the standard yet.

- Ensure secure/uninterrupted high quality broadband data speed which is well maintained.
- If implemented, it will enable effective care delivery and the communication will not drop in and out.

Patient identification is crucial as is the importance of properly curated health data.

- *"Technology must correctly identify the patient first"* with the latest recognition tools and allow practitioners to cross-verify with other practitioners and patients from whom results are derived that health data has been curated and falsely presented information ruled out.
- If implemented, these would ensure elimination of potential medical errors and unnecessary patient and practitioner consequences, thus assist proper delivery of care.

Personalised remote patient support in the measurement of vital signs is very important.

- Design devices that provide personalised remote patient support capacities in the measurement of vital signs.
- If implemented, these would timely assist the patient concerned and support effective remote care delivery.

Telehealth enablers

It is important that the system does not take too long to set up.

- Ensure that set up requirements are minimised to increase time efficiencies during the consultations.
- If implemented, these will greatly assist practitioners and patients.

Clinicians recommend that telehealth platform should be accessible and run on mobile phones as all clinicians including GPs carry and use mobile phones.

- Design an adequate platform for mobile phones, trial it with clinicians and roll it out.
- If implemented, this platform could be accessible by any clinician at any time.

Technology should employ effective time scheduling and workload distribution management mechanism.

- Design technology that automatically switches over from one GP to the GP practitioner starting the next shift at a particular point in time.
- If implemented, the above are important telehealth service facilitators recommended and preferred by GPs.

8.5.3 Findings and Recommendations to Policy Makers and Associated Implications

Data security

GPs are concerned with the value of data security; confidentiality of both, patient and practitioner data; and patient privacy/identity (*“there are so many people who are non-medical people, non-technical people, they are involved and all sorts of brains are looking into this electronic data”*).

- Total security of all patient/GP data must be legislated and strongly protected to ensure a stable bridge between all the stakeholders.
- *Safety nets or safeguards need to be built into the telehealth platform so that the likelihood of patient harm occurring or misdiagnosis occurring or mismanagement occurring is neutralised*.
- If the above GP recommendations are implemented, GPs will have confidence and trust in the system and thus be more willing to utilise it to its full potential.

Telehealthcare Protocols

Non-availability of currently widely accepted telehealth care protocols with clearly spelled out roles and accountabilities before, during and after service delivery.

- *“Protocols should be designed in the best interest of the care for the patient”* and must clearly specify practitioner accountabilities before, during and after service delivery.
- Respective PHNs, RACGP, AMA and other relevant bodies should design in consultation with GP practices telehealthcare protocols for both video and non-video care delivery and these must be clinically owned to become effective in practice.
- If implemented, approved telehealthcare protocols would ensure GP support and effective application in practice.

Workload

There is a lack of cross-disciplinary resource management through appropriately negotiated and stable workload distribution. Time scheduling with specialists is critical. GPs prefer fixed time slots in a working shift (*“efficient start and finish time if obtaining an opinion from a specialist, who is booked in for a certain time that's mutually convenient so that it is fixed / blocked out”*). GPs presently perceive significant barriers in terms of this collaborative approach with specialists to work smoothly.

- Stable cross-disciplinary time scheduling resource management and workload distribution mechanisms need to be designed and sustained.
- Dedicated trained and well-resourced small close-knit cross-collaborative patient-centred team approach should be employed as it could overcome the above barriers.
- If implemented, stable workload distribution mechanisms would receive GP support and become effective in practice.

“More geriatricians doing aged care through telehealth would make GPs happy” due to workload management and workforce shortages.

- More government investment in geriatrician training or targeted specialisation programs for GPs to become geriatricians is needed to support the aged care sector and ageing population.
- If implemented, these would support workforce and skills shortages and the telehealth platform in general.

Knowledge sharing

Motivation/opportunity/ability to share

In terms of motivation, opportunity and ability to share knowledge, GPs hold positive beliefs that cross-disciplinary knowledge sharing particularly with specialists can create which they can benefit from as well as contribute to.

- Keep promoting and reinforcing these positive beliefs.
- If well promoted and reinforced, these will positively facilitate the adoption of telehealth.

The My Health Record documenting requirements are currently causing triplication for GPs focused on aged care (one record for the nursing home‘s database, one for the MHR online repository and one for the GP himself).

- The My Health Record documenting process should be streamlined and centralised into one documenting entry.
- If implemented, these would save GPs a lot of time on documenting requirements and act as a positive adoption driver.

Data exposure concerns

Potential legal issues from handling of patient data are serious practitioner concerns.

- Newly negotiated cross-disciplinary telehealth codes of practice enforceable by law must stipulate how much access to electronic patient records individual practitioners are granted, which must be adhered to at all times.
- If implemented, potential legal issues will be minimised and accountability tracked and upheld.

GPs find disturbing the idea of the whole consult being recorded, like a video procedure which also may cause some serious legal implications.

- Government needs to provide adequate safeguards that protect practitioners' intellectual property, privacy and confidentiality thus reducing potential lawsuits.
- If implemented, GPs will feel reassured of their protections.

GPs have data exposure concerns in relation to threats to remote patient safety and misuse of electronic health records.

- Legislated total security of all patient/GP data, enforceable codes of practice in addition to other built-in safety mechanisms need to be enforced.
- If implemented, these will serve as strongly protected assurances of a stable bridge between all the stakeholders and provide sufficient cover.

GPs have concerns with telehealth performance expectations in terms of patient outcomes as remote patients just cannot be assessed properly and adequately (GPs are concerned about not being able to diagnose properly by hearing, seeing and touching from a distance or being dependent on other professionals who may not be appropriately trained as experienced GPs are used to making assessments themselves and not depend on somebody else's ears, eyes and hands).

- Adequate telehealthcare protocols need to be stringently followed for each medical condition.
- If implemented, these would reassure GPs of system's effectiveness and reliability.

Telehealth practice

GPs are very sceptical of telehealth fitness for purpose and the perceived giving up of the current model that works well.

Currently, *GPs and specialists share information and exchange thoughts for quality care; as knowledge has to come from a better source*. However, the current telehealth platform has not fully addressed GPs' feelings and beliefs in terms of which approach should fit which scenario.

If telehealth is to successfully get off the ground in the GP-specialist domain, *“negotiations are needed, otherwise quality care will be jeopardised”* (i.e. since a lot of GP and specialist knowledge is tacit acquired over many years of practice, *“the telehealth platform essentially needs to be supported by a whole set of newly negotiated rules on care delivery to make this platform a workable one as it is perceived a scam now and cannot be compared with old rules (once data is in electronic form and online, who is responsible for it?*”).

- Negotiations need to address competition, clinical autonomy, health data ownership and GP rights to choose the type of care delivery for each patient on an individual basis.
- Furthermore, negotiations are needed with GPs to discuss and agree on what medical conditions should be treated through telehealth, how and under what circumstances as the internet cannot support every condition (e.g. by GP respondent focused on aged care: *“some of the post-trauma, post-fracture views, any skin condition. Specialists check and give a diagnosis and then on the spot biopsy is done*”. More examples: prevention of self-harm-suicide prevention; lack of access-remoteness; fall detectors in aged care etc…). This is also in line with literature on doctors‘ substantial uncertainty regarding telehealth adoption consequences some of which are certainly their financial and time resources in addition to ongoing GP practice and final patient care outcomes (de Grood et al. 2016).
- Additionally, before telehealth is implemented in metropolitan areas, expert panels representing the medical profession, IT and the medical software companies are needed where *“they could discuss the various possibilities and all the various issues that are involved to make sure everything is covered”*.
- If the above steps are implemented, these will serve as solid foundations and make the proposed platform effective in practice.

Relationship management

Communication

General practitioners are concerned with the way communication channels are managed, where only protected communication channels will ensure *“continuous feedback loop”* between clinicians (Brady et al. 2017, p.930) and where patients need to be kept clearly and well informed in decision making from the very beginning and throughout their treatment process (Rees and Williams, 2009).

- Secure messaging and other preferred GP-specialist and GP-patient communication channels need to be promoted and supported. GPs need to be consulted on their preferred channels.

- If implemented, these will facilitate remote care delivery and serve as significant drivers of adoption.

Collaboration

Regular inter-disciplinary meetings of teams that are well resourced and where practitioners share common interest in specific conditions are likely to perceive and experience positive, feasible teamwork benefits. These are all likely to improve trust among practitioners which represents the key role in the successful realisation of telehealth initiatives.

- Non-rivalling cross-disciplinary teams centred on key medical conditions of interest need good funding and communications need to be regularly sustained. These are likely to be most effective among small close-knit cross-disciplinary teams.
- If implemented, these are likely to serve as strong motivators for ongoing utilisation of the proposed model.

Trust

GPs strongly think that *telehealth "should not be used for acutely unwell patients"* because of safety concerns, as patients just *"cannot be assessed properly"*.

- *Telehealth could be used for existing well-known patients with simple issues*, however not for complex cases or with new patients.

GPs' have limited trust in remote care delivery model.

- Trust can however be strengthened by the creation of value through safeguarded ―technical reliability backed by transparent data storage policy" (Van Velsen et al. 2016, p.1) and close working relationships between IT professionals and doctors.
- If implemented, safeguarded technical reliability and GP training in IT or close working relationship with IT professionals would help overcome trust concerns between medical and IT professionals. With more doctors trained as computer engineers and/or programmers and analysts the above concerns can be addressed directly by doctors who have a solid trusting relationship with patients. That will also increase ease and efficiency and reduce costs of running this model by GPs and other medical professionals. Medical staff trained in stable technologies could then train and assist patients in the realisation of the proposed care delivery model.

Commitment

Commitment can be strengthened by regular collegial support (Blount and Gloet, 2015; 2017) and active telehealth engagement by colleagues particularly among ―small, close-knit patient centred" teams (Spencer et al. 2015, p. 389).

- Sufficient resources should be provided to endorse champions, good teamwork and collegial support. These are likely to be more effective among close-knit, patient-centred teams.
- Uptake could also be accelerated by forming larger primary care networks with medical centres/GP surgeries actively participating in them which make streamlined services easier to implement and facilitate as these are more likely to utilise electronic data exchange (DesRoches et al. 2008).
- If implemented, these actions would have a significant impact on practitioner commitment and program realisation.

Process management

Key elements strongly supported by GPs are:

1) Simple/stable interoperable system with minimal interruption should be used;

2) Secure/uninterrupted high quality broadband data speed needs to be maintained;

3) Patient health data must be curated properly to prevent falsely presented information;

4) Personalised remote patient support in the measurement of vital signs needs to be provided;

5) Development of standard remote care protocols may create new work routines and

6) Integrated collaborative treatment phases need to be managed by doctors (thus must be clinically owned).

- The solution is in driving interoperability by the value it brings to clinical processes and patient outcomes and not through vendor driven technologists. Interoperability directly impacts quality data speed. *To ensure quality care, technology needs to be sound, long lasting and a stable bridge between all the stakeholders. The long term benefit of this depends on how stable this technology is how long it can be maintained and the information retrieved. Software stability is key to this (e.g. if a software company goes and nobody updates, what will happen to a particular medical director's data? What measures policy makers should take and for how long their measure is full-proof, for how many generations will data be readable with many computer languages obsolete today, software and software being tossed over and new ones introduced so frequently just for the sake of innovation or minor improvements? It would need to be stabilised".*
- If implemented, the above phases would ensure successful and sustainable delivery of remote care.

Value creation

There is currently very limited awareness amongst metropolitan GPs of telehealth MBS items.

- Due to a lack of awareness more promotion of telehealth MBS items amongst GPs in needed.

Incentives are important uptake drivers and these are not only financial. Besides clearly delineated MBS items, professional and patient-wise benefits in terms of communication and access to specialists and other clinicians for close experiential encounters, telehealth technologies designed for better integration leading to GP paths to self-employment, cost savings and time efficiencies are all important uptake drivers.

- Specific promotions around these uptake drivers should target GPs.
- If implemented, these steps would further endorse GPs‘ stance and encourage adoption.

There are some GPs who are enthusiastic about telehealth, however as the practice within which they work is not willing to adopt as a group are not able to compromise their jobs. Thus, that will depend on remuneration.

- Government programs should target enthusiastic GPs and link them with like-minded specialists and other clinicians that would become newly created teams. These teams would need to be trained in remote care delivery, funded and supported.
- If these programs were implemented, they would ensure telehealth realisation in practice.

If telehealth platform is implemented, costs related to caring for people with disabilities are likely to reduce significantly and the loss of productivity by taking time off work or days off of those involved in care provision will be minimised or eliminated which will reduce social security expenditure as a lot of people are currently being paid unnecessarily. One hopes that the government will see these benefits.

On the patient side, telehealth value creation is seen through:

- Improved access to specialist services – getting better care from the specialists;
- Timely, effective, specialist opinion and advice to advise the patients due to limited GP knowledge in some areas – well-coordinated care with the specialists who can fill the topic and expand the answers thus improving care for the patients in addition to quick diagnosis and quick treatment;
- Specialist support in decision making with patients, family and carers.
- Reduction in unnecessary patient transfers, investigations, test duplications – instead of doing this and that and then getting an opinion (e.g. in case of a chronic disease, a GP

should obtain an opinion from a specialist first to rule out unnecessary things and commit to early involvement and correct tests which is beneficial and also saves money (e.g. currently only a specialist can order free MRI. If GP orders one, the patient pays for it). Telehealth would streamline these.

- If realised, the above elements would definitely enhance care quality, reduce rehospitalisation and these would all work significantly in telehealth's favour (Worth, 2015).

Telehealth Enablers

GP practices need to undergo essential restructuring and adaptation (supported by appropriate system design to accommodate GP user telehealth needs; essential technical support; technologies targeting GPs' most pressing local patient chronic/acute conditions/needs; ensuring of sufficient skilled workforce support; professional improvement advantages over GPs' current practice & ongoing government funding support). Besides essential, stable technological support and training, GPs crucially need to become confident in diagnosing remote cases, otherwise they *will not take any chances to make a diagnosis or chances to do the treatment*.

- The above enablers need to receive serious attention by the telehealth platform as GPs lack essential understanding of how telehealth works and if adequately addressed these would serve as critical uptake drivers.

Readiness to develop telehealth capabilities

GPs hold ethical concerns regarding reduced clinical interactions particularly with less technologically savvy and/or distance aged care patients which may cause more isolation and exacerbate their health conditions.

- Ethical concerns need to be addressed and patients protected and properly supported.
- If implemented, these would ensure proper services for appropriate patients.

In case of palliative care, telehealth is the preferred option as currently GPs are distant from both the palliative care teams and patients and have no insight into what is happening.

- Telehealth in palliative care should be promoted amongst GPs as their preferred option to continue caring for their patients who can no longer see them in person.
- If implemented, this would provide necessary support to the patient and patient's family as well as the palliative care team that does home visits, which also serves as an important telehealth adoption driver among GPs and other clinicians.

In terms of technical and collaborative readiness, about two thirds of all GP respondents have expressed readiness (Mean=3.23 and 3.27 respectively) to develop capabilities for telehealth medical services (see figure 21 below). Column 1 indicates short term adoption timeframe (within 12 months), column 2 indicates medium term (within 1 to 5 years), column 3 indicates long term adoption timeframe (after 5 years) and column 4 indicates no intention to adopt at all (never). Importantly, telehealth is perceived by GPs as being pushed without proper consultation with them who are between 3 to 5 years away at the present moment according to field study results (Mean=2.49) to pursue this model of care due to a lack of understanding of the essential elements and how things work.

- Department of Health, PHNs, RACGP and AMA need to continue to provide ongoing GP telehealth education and address all GP concerns and queries adequately.
- These will ensure that telehealth adoption is progressive and effectively tracked.

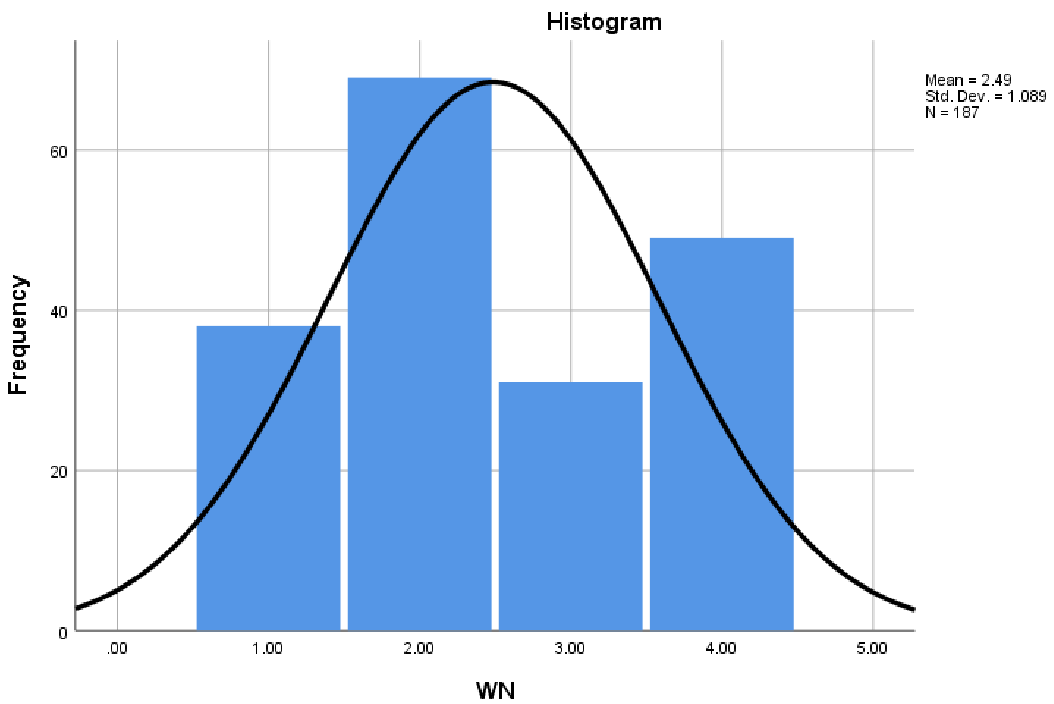


Figure 23: Forecasted timeframe for telehealth implementation in GP domain

Recommendations in a nutshell

- As most suburban medical practices have 10 or even less GPs on site - allocate one medical centre with cross-disciplinary resources (GPs, specialists, pathology, medical imaging, nurses and other staff) to look after an individual aged care facility.

- Establish small close-knit patient-centred cross-disciplinary teams (train a GP, a specialist, pathologist and medical imaging practitioner who are assisted by nurses and other practice staff), fund it and run it.
- These team structures vary across different conditions as specialists only specialise in a specific condition and should lead specialised treatment phases for their specialty whereas GPs could generally lead the rest.
- In practices which are members of a larger network, this can be multiplied as resources are larger and these are more likely to exchange health data electronically.

8.6 Study's limitations

Each research design and approach has its limitations and drawbacks (Cresswell, 2003). This project likewise has a few limitations. Some of these are worthy of mention. First of all, this project has adopted a cross-sectional approach. Its key drawback is that it can investigate the phenomenon under inquiry at the single point in time of research being conducted. Therefore, assessment of telehealth readiness by general practitioners could have been pursued within a longer time frame, by pursuing a longitudinal study, had the time been made available. In other words, readiness could have been analysed at the time of data collection and analysis and during and after period of telehealth implementation in those same practices with the same respondents which in fact could become the next research project if resources are granted. This approach would capture true dynamics of telehealth development stages in GP practices in real time.

Secondly, this project has only analysed general practitioners and their perspectives, whereas practice management and other disciplines such as nurses, pathologists and specialists as well as patients were not analysed. The project could have been more inclusive with the above mentioned disciplines.

Thirdly, even though this project has utilised a mixed-methods approach with semi-structured interviews and quantitative surveys, its findings could also have benefited from the qualitative observation approach.

Fourthly, the study was carried out in one country and within a single health discipline. Though telehealth is similar in principle, the results of this study if replicated in other countries would enhance the empirical model in this project.

Lastly, a potential argument amongst researchers regarding the mediated hypotheses in this study may be brought by the results of the testing of the mediated relationships which showed statistical significance when tested through regression based mediation analysis (Hayes, 2013;

Hayes, 2017, Hayes and Rockwood, 2017), however insignificant outcomes when tested through Smart PLS as part of the entire model. It is not known whether a covariance based statistical approach could have produced a different outcome, however what is known is that according to most recent mediation analysis in social sciences developed by Hayes (2013, 2017), also known as SPSS Process macro regression-based statistical mediating and moderating analysis, not all links in the fully tested model need to be significant for mediation purposes. In comparison with the outdated approach by Baron and Kenny (1986) where all links needed to be significant, Hayes (2013, 2017) suggests that these are not necessary. Instead, mediation should be tested separately with only the concerned constructs to evaluate their true effects. When the whole model is tested and then mediation evaluated from it, the direct effect from the hypothesised elements is reduced due to a confounding effect. Future research could also in addition to the Hayes approach utilise a covariance based technique.

The reason that this model has utilised mediation bootstrapping technique in conjunction with SPSS Process macro regression-based statistical mediating analysis (Hayes, 2013; Hayes and Rockwood, 2017), is that it is more precise and more advanced than the previously widely used Barron and Kenny (1986) mediating causal steps method or Sobel-test (Stone and Sobel, 1990) that has major weaknesses (Bollen and Stine, 1990). Alternative M-test (Holbert and Stephenson, 2003) is likewise still weaker than bootstrapping that is now widely utilised in structural equation modelling to evaluate indirect mediating effects between multiple variables (Hayes, 2009; 2013; 2017). According to this modern approach, the final mediation analysis focus needs to be on all relevant path coefficient and t-values or confidence intervals and the greatness or degree of indirect effects (Rucker et al. 2011). Hypotheses H2, H4, H7 and H10 demonstrate the positive and confirmatory results of the mediating relationships and their effects.

8.7 Research way forward

This project has generated multiple opportunities and potential avenues for future research. Some of these are summed up below:

This project has employed a qualitative study approach aimed to contextualise the theoretical framework which was built based on ideas from literature and subsequently empirically validated through the research framework and the quantitative survey methodology. The triangulation methodological principle aimed to validate this framework could be introduced in future research work. In depth case studies could also be conducted at an institutional state-wide level following ethics approval.

Likewise in response to the study‘s methodological constraint, a longitudinal project should be conducted which assesses telehealth effectiveness/outcomes by general practitioners during and after telehealth implementation. This approach would uncover further influencing factors important for telehealth delivery. Also, due to the fact that this project has only considered clinicians within a single discipline, future work could focus on multiple disciplines working collaboratively. Besides, either a separate patient-focused or combined patient-clinician study could be conducted with the same health discipline or even multiple disciplines.

Future research should also in addition to mixed-methods approach be complemented with the observation methodology. As this is a complex model, future work could focus in a more detailed study separately on individual service network elements as well as the key predictor ‗value creation‘ in order to fully explore every potential avenue and associated challenges. This approach would enable in-depth exploration of constructs and their dimensions, scenarios and issues herein not covered.

What has not been overlooked, however due to feasibility reasons left out is research on other important variables that would contribute important insight to better understand clinicians‘ motivations and situations in which they wish to pursue telehealth technologies in their line of duty. There are a number of psycho-social and other technological, organisational and individual factors that have not been examined by this work and these could be pursued in future projects.

This research work could also be extended to other areas of health research, for instance to adoption of remote patient monitoring by community pharmacies through the adaptation of its survey instrument for this consumer facing field compared to the clinician-clinician telehealth interactions in the present study. As such, it may be useful to adapt it to other health sectors and future work opportunities exist in those areas too. Furthermore, it has been stated at the very beginning of this thesis that future research needs to also include patients and their carers and/families who are amongst the most critical stakeholders to make this platform workable. Besides these, there is plenty of scope for future work with other stakeholders such as developers, policy makers, communities, government institutions and payment providers, likewise being essential stakeholders that have not been researched thus far.

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Appendix 1: Qualitative interview invitation and protocol

UTS UNIVERSITY OF TECHNOLOGY SYDNEY

GP! ARE YOU READY FOR TELEHEALTH
GPs WANTED

Dear GP Respondent,

It is my pleasure to introduce this telehealth research. Your participation is voluntary. You are assured in writing of your complete privacy, confidentiality and anonymity which is legally binding upon me and the supervisory panel at all times now and in the future. All data will be aggregated as we are only interested in general trends, and not in any particular organisation or individual. You can withdraw from this study at any time without having to give any reason.

We are conducting this research to evaluate GPs‘ readiness to develop telehealth capabilities that are likely to be utilised in the management of chronically ill aged care patients through collaborative telehealth consultations.This study is part of my PhD thesis.

You have been invited to participate in this study because of the professional expertise and mix of resources available, telehealth eligibility and the importance of telehealth in your local area and practice. If you agree to participate, a 30 minute interview will address common considerations around the use of telehealth, electronic health records and potential knowledge sharing with practitioners involved in cross-disciplinary provision of care to aged care patients (GPs, specialists and other eligible providers).

As GPs are substantially overburdened with the workload of patients that they see in their practice, their needs for cross disciplinary collaboration in order to cater to distant aged care patients effectively and efficiently through a provision of better integrated care is significant. Department of Health has issued a number of Medicare items that are available to GPs serving aged care patients through telehealth technologies.

WHEN: The proposed study is planned between mid-October and December 2018.

This work provides managerial and practical significance through close experiential encounters with specialists and other providers. You will be offered the results of the complete study. It also adds theoretical contribution to telehealth service research. Your participation is a valuable contribution to knowledge and I would be glad to contact you. Please feel free to contact me Brett Sukara on [redacted] or at Brett.Sukara@uts.edu.au; or any of the supervisory panel members: Dr Md Maruf Hossan Chowdhury on 9514 5440 or at Maruf.Chowdhury@uts.edu.au; Dr Bruce Perrott on 9514 3524 or at Bruce.Perrott@uts.edu.au; and Dr Moira Scerri on 9514 5496 or at Moira.Scerri@uts.edu.au.

Note:
This study has been approved by the University of Technology Sydney Human Ethics Research Committee [UTS HREC]. If you have any concerns or complaints about any aspect of the conduct of this research, please contact the Ethics Secretariat on +61 2 9514 2478 or email: Research.Ethics@uts.edu.au and quote the UTS HREC reference number ETH17-1275. Any matter raised will be treated confidentially, investigated and you will be informed of the outcome.

Interview Protocol Questions

1) Do you currently provide any telehealth services to aged care patients?

2) What do you consider important for the use of telehealth technology?

Probing if needed

i. Data, protocols, impact on work (safety, privacy, workload etc…)

3) Who do you share patient data with?

Probing if needed

i. Do you share data with specialists, pathology and other clinicians or only with patients?

4) How are you doing it?

Probing if needed

i. Electronic health record, fax, phone, letter
ii. Do you exchange patient data with anyone?

5) Please feel free to comment on any issues of interest to you in relation to telehealth communication and collaboration with specialists.

Probing if needed

i. Do you think that it is a good idea to collaborate with specialists?
ii. Do you have any particular concerns?

6) What do you think of the following elements in terms of telehealth service delivery process:

- simple interoperable system,
- uninterrupted broadband speed,
- properly curated health data,
- personalised remote patient support in the measurement of vital signs,
- development of standard remote care protocols,
- integrated collaborative treatment phases managed by doctors?

7) Can you think of any other important service process elements from your angle?

8) What value / benefit to you do you expect from collaborative telehealth technologies?

Probing if needed

i. Would telehealth MBS items mean a value to you?
ii. What about close encounters with specialists and other clinicians?
iii. Potential path to self-employment, cost efficiencies etc…

9) What individual and organisational factors would be influencing you to enhance telehealth capabilities?

Probing if needed

i. What about appropriate system design accommodating your user needs?
ii. Is technical support essential to you?
iii. Aged chronic/acute conditions…
iv. Availability of sufficient skilled workforce, professional improvement advantages over your current practice, ongoing government funding support etc…

10) What is your opinion regarding your readiness to develop technical and collaborative capabilities for telehealth medical services in aged care?

Thank you very much for the dedicated time and effort.

Appendix 2: Quantitative Survey Questionnaire

INFORMATION SHEET AND CONSENT FORM FOR ANONYMOUS SURVEYS

GPs' Readiness to Develop Capabilities for Telehealth Medical Services (UTS HREC ETH17-1275)

Dear GP Respondent,

My name is Brett Sukara and I am a doctoral candidate at UTS. (My principal supervisor is Dr Maruf Chowdhury; alternate supervisor Dr Bruce Perrot and co-supervisor Dr Moira Scerri).

Department of Health has issued a number of Medicare items that are available to GPs serving aged care patients through telehealth technologies. This work provides managerial and practical significance through close experiential encounters with specialists. You will be offered the results of the complete study. It also adds theoretical contribution to telehealth service research.

We are conducting this survey to find out about the prevalence of GPs' readiness to develop technical and collaborative capabilities for telehealth medical services to manage chronic and acute conditions of aged care patients through collaborative telehealth consultations with specialists and nurses.This study is part of my PhD thesis.

Your participation is voluntary. You are assured in writing of your complete anonymity, privacy and confidentiality which is legally binding upon me and the supervisory panel at all times now and in the future. All data will be aggregated as we are only interested in general trends, and not in any particular organisation or individual.

You have been invited to participate in this study because you are centrally positioned medical professionals serving as central reference, treating and management points, therefore, you are in the best position to provide valuable information regarding the use of telehealth, knowledge sharing, relationship and process management, value creation, telehealth enablers and readiness to develop technical and additional collaborative capabilities.

The survey will ask you to tick appropriate responses as viewed from your perspective, which should take approximately 10 - 15 minutes of your time. You can change your mind at any time and stop completing the survey without consequences.

If you agree to be part of the research and to research data gathered from this survey to be published in a form that **does not** identify you, please continue with answering the survey questions.

If you have concerns about the research that you think I or my supervisors can help you with, please feel free to contact me directly on [redacted] or via email at [redacted]@student.uts.edu.au or my supervisors at Maruf.Chowdhury@uts.edu.au or on 9514 5440; Bruce.Perrott@uts.edu.au or on 9514 3524; or Moira.Sceri@uts.edu.au or on 9514 5496.

If you would like to talk to someone who is not connected with the research, you may contact the Research Ethics Officer on 02 9514 9772 or Research.ethics@uts.edu.au and quote this number ETH17-1275.

GPs' Readiness to Develop Capabilities for Telehealth Medical Services

Demographic non-identifiable data in this anonymous survey is only used for statistical purposes.

Your number of years in general practice: 0-5☐ 6-10☐ 11-15☐ 16-20☐ 21-25☐ 26-30☐ 31-35☐ 36+☐
Are you a health care home practitioner? YES □ NO □

Age group:25-34☐ 35-44☐ 45-54☐ 55-64☐ 65+☐ Gender: Male ☐ Female ☐

Telehealth Medical Services refer to the provision of medical services through a joint visual and audio link between an eligible health provider and patient end and specialist end via the internet / intranet or other cable & wireless technologies.

Are you aware that Medicare items are available for collaborative telehealth consultations in aged / chronic care? YES ☐ NO ☐
Are you using telehealth services? YES □ NO □
Do you see patients in aged care facilities? YES □ NO □ If yes, do you utilise telehealth facilities in aged care? YES □ NO □

Below are statements about selected aspects of telehealth technology. Please read each statement carefully and circle or tick your level of agreement. There are seven sets of statements covering: 1) use considerations, 2) knowledge sharing, 3) relationship management, 4) process management, 5) value creation, 6) telehealth enablers & 7) readiness to develop telehealth capabilities.

	Telehealth Technology Use Considerations refers to Data Security, Telehealthcare Protocols and Workload.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
DS1	Total security of all patient / GP data must be legislated	1	2	3	4	5
DS2	Patients must have rights to withhold data	1	2	3	4	5
DS3	Patient data must only be linked to personal identity through secured authorised codes	1	2	3	4	5
PR1	Telehealth protocols must provide clarity in relation to GPs' roles	1	2	3	4	5
PR2	Protocols must clearly specify practitioner accountabilities before, during and after service delivery	1	2	3	4	5
PR3	Cross-disciplinary care should be physician-led	1	2	3	4	5
W1	Telehealth will negatively affect conventional care delivery through reduced visits	1	2	3	4	5
W2	Telehealth will enable GP practitioners to work from any location	1	2	3	4	5
W3	Any telehealth platform needs to ensure stable workload distribution	1	2	3	4	5
W4	Telehealth services that are time efficient will help me manage my workload	1	2	3	4	5

	Knowledge Sharing refers to Motivation to Share, Opportunity to Share, Ability to Share, Data Exposure Concerns and Telehealth Practice.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
MOT1	I intend to frequently share my knowledge / working experiences electronically with my colleagues	1	2	3	4	5
MOT2	I will always give my knowledge to those who ask for it	1	2	3	4	5
MOT3	I will always try to give my knowledge to others in the most efficient way possible	1	2	3	4	5
OPP1	I can devote enough time to sharing my knowledge electronically	1	2	3	4	5
OPP2	The climate in my organisation allows me to easily share my knowledge electronically	1	2	3	4	5
OPP3	The climate in my organisation facilitates informal meetings where knowledge is shared	1	2	3	4	5
ABIL1	I am fully capable of sharing my knowledge electronically with others at any time	1	2	3	4	5
ABIL2	If it depended only on me, I would exhaustively share my knowledge electronically	1	2	3	4	5
ABIL3	I am fully capable of articulating my knowledge in written or spoken form	1	2	3	4	5
DEC1	Misuse of electronic health records may threaten patient safety	1	2	3	4	5
DEC2	Electronic data might not meet expectations in terms of patient outcomes	1	2	3	4	5
DEC3	Legal issues resulting from the use of telehealth may be serious	1	2	3	4	5
TP1	New approaches addressing competition between GPs and specialists must be negotiated	1	2	3	4	5
TP2	New approaches addressing clinical autonomy must be negotiated	1	2	3	4	5
TP3	GPs should have legislated rights to freely choose the type of care delivery for each patient	1	2	3	4	5

	Relationship Management represents Communication, Collaboration, Trust and Commitment.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
COM1	Secure messaging channels between clinicians are essential	1	2	3	4	5
COM2	Secure messaging channels between clinicians will ensure a continuous feedback loop	1	2	3	4	5
COM3	Patients must be clearly informed in decision making during their ongoing care	1	2	3	4	5
COL1	Regular inter-disciplinary meetings will improve collaboration	1	2	3	4	5
COL2	GP's interest in a specific chronic condition will enhance ties	1	2	3	4	5
COL3	Inter-disciplinary teams need to be well resourced to effectively collaborate	1	2	3	4	5

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
T1	Telehealth will affect my ability to make an immediate relevant physical assessment	1	2	3	4	5
T2	Telehealth may cause deterioration of patient trust relating to physical assessment information	1	2	3	4	5
T3	Telehealth introduces new negotiated approaches to trust between medical & IT professionals	1	2	3	4	5
CT1	I have a strong desire to work with small, close-knit patient-centred teams	1	2	3	4	5
CT2	Regular collegial support will maintain my positive commitment levels	1	2	3	4	5
CT3	Active telehealth engagement by colleagues will positively influence my commitment levels	1	2	3	4	5

Process Management sums up key telehealth service delivery process elements.		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
PM1	A simple/ stable interoperable system with minimal interruption should be used	1	2	3	4	5
PM2	Secure / uninterrupted high quality broadband data speed needs to be maintained	1	2	3	4	5
PM3	Patient health data must be curated properly to prevent falsely presented information	1	2	3	4	5
PM4	Personalised remote patient support in the measurement of vital signs needs to be provided	1	2	3	4	5
PM5	Development of standard remote care protocols may create new work routines	1	2	3	4	5
PM6	Integrated collaborative treatment phases need to be managed by physicians	1	2	3	4	5
N/A1	I don't have a preferred colour	1	2	3	4	5

Value Creation represents **Value for GP**s as perceived from GPs' angle.		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
VC1	Telehealth will provide GPs with clearly delineated Medicare items	1	2	3	4	5
VC2	Telehealth will provide close experiential encounters with other healthcare practitioners	1	2	3	4	5
VC3	Telehealth technologies designed for better integration will lead to GP paths to self-employment	1	2	3	4	5
VC4	Telehealth will provide improved access to specialists	1	2	3	4	5
VC5	Telehealth will reduce unnecessary patient transfers including reduced rehospitalisation	1	2	3	4	5
VC6	Telehealth will provide cost efficient services	1	2	3	4	5
N/A2	I like travelling by sea	1	2	3	4	5

Telehealth Enablers represent personal and organisational GP practitioner's motivating factors.		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
IE1	Telehealth needs to accommodate GPs' user needs through appropriate system design	1	2	3	4	5
IE2	Telehealth technical support is essential to GP users	1	2	3	4	5
IE3	Telehealth needs to target GPs' most pressing local patient chronic/acute conditions/needs	1	2	3	4	5
OE1	Telehealth platform should ensure sufficient availability of skilled workforce	1	2	3	4	5
OE2	Telehealth needs to provide professional improvement advantages over GPs' current practice	1	2	3	4	5
OE3	Telehealth platform needs to provide ongoing government funding support	1	2	3	4	5

Readiness to Develop Telehealth Capabilities represents your likelihood of developing both technical and additional collaborative skills to effectively engage with other providers via telehealth technologies.		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
RDTC1	My practice is technically unprepared for telehealth as I know little about its use	1	2	3	4	5
RDTC2	I am ready to develop technical capabilities to treat patients with chronic and acute conditions using telehealth technologies	1	2	3	4	5
RDTC3	Telehealth technologies cannot fully replace physical clinical service delivery which makes me reluctant to embrace telehealth	1	2	3	4	5
RDTC4	Telehealth will not receive full GP support as it reduces clinical interactions	1	2	3	4	5
RDTC5	I am ready to develop additional collaborative capabilities to treat patients with chronic and acute conditions using telehealth technologies	1	2	3	4	5
RDTC6	Telehealth will have a negative impact on GPs' clinical autonomy making my reluctant to adopt it	1	2	3	4	5

When do you think you might start using telehealth services? Tick only one option.

a) Short term (within 12 months) □
b) Medium term (within 1 to 5 years' time) □
c) Long term (after 5 years) □
d) Never □

Thank you so much for your dedicated contribution towards this important project!