

## Innovation in Services and its Measurement at Firm Level: A Literature Review

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### INTRODUCTION

Service enterprises constitute an overwhelmingly large proportion of the world economy, contributing almost 70 per cent of employment in Organisation for Economic Co-operation and Development (OECD) countries [1]. Their share is still expanding. In Australia today, the services sector accounts for 80 per cent of Gross Domestic Product (GDP) and around two-thirds of total tangible and intangible domestic investment. Around 84 percent of Australian firms are services firms which employ 85 per cent of the work force and 93 per cent of Australian university graduates [2]. With services representing over 80 per cent of the economy, a major source of future growth must be increased productivity in the services sector [2].

Though, services dominate the economies of developed countries, they are the least studied in many economies [3] [4]. In recent years, services have become more dependent on information communication technology (ICT). Extant literature suggests that ICT infrastructure facilitates shared ICT capabilities upon which the entire business depends [5], manages organization's information processing capacity [6], develops shared tangible ICT resources [7], and acts as a key source for innovation and attaining long-term competitive advantage [6]. In most of these innovations, ICT is generally perceived as a great enabler of service innovation, however, in other instances, ICT is more pervasive and closer to the supply-push, technology driven innovation that arises with new services or products. Further, services are increasingly being traded over long distances and across national

borders through the use and deployment of ICT, which has not only transformed the content, context, and scope of the offering but has also facilitated information flows over large distances with reduced unit transaction costs.

Irrespective of ICT's impact on innovation resulting in technological innovations, there are non-technological service innovations which also exist [8]. Innovation in services can be regarded as the interplay of service concepts, service delivery practices, client interfaces, and service delivery technologies [9]. Agarwal & Selen [10] replaced technological options with the organisational options. Service innovation for example, may include scenarios such as taking a test drive before buying a car, checking the images or videos on a television screen before buying a television, choosing fresh vegetables from supermarkets rather than purchasing packed vegetables and paying at e-pumps for petrol. There are an increasing number of examples illustrating that buyer or customer preferences are now considered in service institutions. Customer involvement has increased as an innovator [11] as 'a significant part of innovation and product development can be traced to consumer users' [11] [12]. However, innovation in services is by no means limited to buyer behaviour. It includes other factors such as business models, processes, and new channels to market.

Decades of innovation metrics have concentrated on 'traditional' indicators such as Research and Development (R&D) and patents. Although useful, these measurement indicators fail to capture the diversity and intricacy of innovation processes emerging from new trends, particularly in the majority of sectors which include services, where innovation rarely requires R&D. It is time to examine new ways of looking at and collecting innovation data [13]. Traditional innovation surveys provide the opportunity to construct complex innovation metrics that can substantially deepen our understanding of R&D and related activities, and broaden our understanding of other types of innovative activities. However, this is limiting, in the context of service innovation. Hence, there is a need to define, develop and measure new innovation performance indicators that are relevant for technological and non-technological innovations applicable to services at the firm level, with an increased focus for a resource-based perspective. In particular dynamic capabilities [14] [15] [16], need to be embedded in this definition of innovation measurement.

In past, numerous studies have conducted a literature review on measurement of innovation at a firm level [13] [17] [18] [19] [20] [21] [22]. The intent of this literature review specifically is to document and analyse extant literature relating to innovation in service and thereby deriving a

numerological framework for measurement of innovation in services. The paper is organised in the following sub sections:

- What is Innovation: This sub-section presents the meaning of innovation in a generic sense;
- Concept of Service Innovation: This section includes the meaning and nature of service innovation. It further explains the multi dimensional definition of service innovation;
- Typologies of Service Innovation: This section demonstrates the influence of typologies of service innovation which help shape the measurement of innovation in services; and
- Measurement of Service Innovation: This section includes the development of methods and techniques to measure innovation in services thereby a framework is suggested for the measurement of service innovation.

### **WHAT IS INNOVATION?**

According to the Oslo Manual [23, p.46] innovation is defined as:

*'...implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organisation or external relations.'*

Indeed, innovation involves the generation, derivation and interpretation of new or improved ideas and policies in an organisation or industry; where innovation in a firm follows a paradigm which includes - acquirement of new products and/or processes (technological and non-technological), inclination towards adoption of engineering techniques to illustrate productivity, compilation of old ideas or techniques into new ways and methods, investment in research and development (R&D) to accumulate the knowledge obtained and further utilise the knowledge derived for development of new methods or ideas [24]. Innovation in firms can be contextualised based on attributes of firms such as; types, shapes, sizes and nature. Researchers have further classified innovation into a wide range of dimensions, including product innovation (for example IKEA designed Flat Pack furniture), process innovation (for example, Wal-Mart has adopted RFID which resulted in a new business process to improve logistics), technological innovation (for example, Apple Inc. where an extensive use of technology is used to develop products iPad, iPhone, Mac Notebooks), radical innovation (Woolworths and Coles in Australia adopted online retailing of their products, to provide new service and effective delivery) and incremental innovation (such as Bankwest which started Kids Bonus accounts). Most of the scholarship documents and previous research focused on identifying R&D based innovations and concentrated narrowly on technological innovations. MIT researchers [25]

have measured and compared innovation resources (such as people and ideas) and innovation effort (measured by innovation expenditure of various categories). They also looked at the resulting innovation outcomes (including numbers of patents) and innovation performance (including the percentage of sales due to new products and services). In a similar vein, the McKinsey Global survey report [26] 'Assessing Innovation Metrics' examines the different types of innovations companies pursue, which ones companies measure and with what metrics, what goals they have in using metrics and how satisfied they are with the metrics they choose. Although none of the above metrics provides information on innovation which occurs through informal learning or tacit knowledge. Information on innovation resources expenditure, outcomes and performance attributed to intangible resources is sparse. This limits our ability to understand innovation-related strategies [13] in the context of services.

Attempts have been made to widen the area of innovation study through concentrating on the social shaping of innovative activities [27]. This concentrates on intangible assets such as human capital, management practices, education and skills, and organisational structure [10] [13] [28]. In summing the process of converting ideas into significant business value for a firm is described as innovation. Next, we describe the concept of innovation in service firms.

### **CONCEPT OF SERVICE INNOVATION**

According to Vargo and Lusch [29], the nature of service innovation is best understood in relations to the service user or customer as a co-creator of value. An extensive appreciation of services has been seen in recent years as being worthy of in-depth studies due to increasing scope and value of services [30] [31] [32] [33] [34]. Within this milieu, an extract from an editorial of *Managing Service Quality* is presented to contextualise and help understand the importance of service improvement and service measurement, as follows:

*'Many years ago, there lived a very kind and wise priest who was greatly loved and admired by everyone in the village. The priest often used his Sunday sermons.... to resolve the issues. One Sunday, as usual, the beloved priest highlighted a particular issue, emphasising further that it was a matter of some urgency and it would be to everyone's benefit if it were to be resolved promptly..... Although many noticed the repetitiveness of the sermon, no one wanted to risk appearing disrespectfully informing him of the fact. Finally, a few of the village elders gathered and decided to raise this issue of repetition with their beloved priest. "Father", they said, "we are not sure whether*

*you are aware that you have been repeating the same sermon for the last seven weeks?"The priest replied, "I'm glad that you have noticed that, at last. There is no point in giving a new sermon.....when the issue at hand has not been resolved'[35, p. 328].*

It is evident that the priest wanted his followers to demonstrate the human capital capability and capacity, required to implement the improvement rather than just listen to it repeatedly and do nothing. Perhaps, the same concept of implementation is fundamental to service innovation. This is still an obscure concept although considerable research has been explored on the nature and types of service innovation by various authors in an attempt to improve the understanding and the subsequent measurement of it. On this front, the researchers, scholars, policy makers and executives have actively participated in determining the features of service innovation [36], yet the economies of various countries suffer from paucity of data and proper analytical tools for measurement of innovation in the service sector [37].

Generally speaking, there are two national measures of innovation - R&D expenditure as a proportion of GDP, broken down by sector as well as the human resources devoted to R&D. These are the main national indicators of innovation used in Australia and by the OECD as well.

Thus, the contribution of services for increasing the GDP of Australia suggests improvements emerging through the lens of 'innovation' as defined by those who explore this concept in the service context. Embedded within this, with greater focus, innovation in services would contribute towards the value creation of both firms and the economy. Innovation at the firm level can be in the form of new or improved business models, customer interfaces and new service products [22]. This may imply creating new standards, better value propositions, and competitive edge through the development of new markets or reduction in the cost of production through innovative processes. Therefore, before identifying the interaction of all the above factors in service innovation, it is necessary to identify the meaning of services and how the various dimensions of innovation contribute towards service innovation.

Various authors have studied services as a product where a service is introduced to people as a commodity or a public service [30]. Service is also recognised as a value creation process, where the value is created through the interaction of multiple parties i.e. providers or clients, by making use of one another's resources through continuous access [38] [39] [40]. Interaction can also be between man and machines, for example an accounting service provided by accounting programs or

statistical analysis provided by statistical programs. The nature of services is intangible, perishable, inseparable and heterogeneous [41] [42] [43] as the nature of services functions as a vanguard of innovation issues in the service sector. The dependence of innovation on the nature of services should be emphasised. The innovation activities and outputs which determine innovation should be illustrated through statistical techniques and outcomes that can be analysed and recorded. With this setting, a comprehensive definition for services by Agarwal & Selen [10] is:

*'the application of competencies (knowledge, skills and experience) of stakeholders, whereby customers provide themselves, or provide significant inputs into the service production process and in the best case are transformed by the simultaneous consumption – the experience' [10, p.8]*

This definition presents the importance of processes, skills, user experience in the delivery of service: all important facets of human capital in the contemporary service and knowledge-based economies. Agarwal & Selen [10] [16] have argued that the importance of user involvement, more so the customer, as a co-creator of value, is remarkable for service innovation in service value networks. As an example, if a patient visits a doctor for treatment, the service provided by the doctor is of intangible nature, where the level of satisfaction or relief that the patient derives from the service or treatment (physical or mental) is unmeasurable, unaccountable and possibly unique for this patient. It is this service innovation and unique experience, for a customer that we wish to focus on in this paper by deriving a numerical framework for measurement of service innovation.

The goal of introducing services was suggested by Service Innovations in Ireland - Options of Innovation Policy as; *'...to create wealth through the fulfilment of customer needs' [22, p.14]*. Another major goal for firms is to survive in a competitive environment. Perhaps, the two goals stated above are intertwined. For a firm to survive it is important to meet and exceed customer needs. Hence, to establish an edge in competitive markets it is useful to innovate in services. Thus, a more appropriate definition of innovation is:

*'...a new or significantly improved idea, good, service, process or practice which is intended to be useful, also needs to be implemented' [22, p.14]*.

According to an industrial classification in 2006 ANZIC; services are classified into 16 subcategories as; electricity, gas, water and waste services, construction services, information and media

telecommunications, financial and insurance services, wholesale trade service, retail trade service, accommodation and food service, rental, hiring and real estate services, transport, postal and warehousing services, professional, scientific and technical services, public administration and safety services, education and training services, administration and support service, art and recreation services, health care and social assistance services and other services [44]. As such, measuring innovation in services across various service verticals is not only complex but challenging – ‘One size fits all’ notion may not necessarily apply; thus warranting a new method of measuring and evaluating the innovation metrics.

Kadampully [35], through his earlier depicted story rationalised the fundamentals of service, rather than redefining service from a different perspective. This assimilation of service and innovation generates a new approach to services. For example, The Bank of Amsterdam started in 1604 but, people still traded and used gold, silver, copper coins. The introduction of banks added a new dimension by way of introducing service in the economy. The aim was to manage the financial status of the economy and to ease financial conditions for people in order to enhance transparency and competency of the whole economy. Therefore, the introduction of new services including the advancements adapted in the banking industry can be categorised as innovation in the banking sector at the time. This also reinforces the idea of value creation and, with the introduction of regulation around standards, can also help in furthering value creation for the general public. Advancements in the banking industry have been evolving through the use and involvement of technology, [45] [46] for example, the introduction of ATMs, centralised banking systems, online payment systems etc. This use of technology has expanded to other service verticals such as finance, insurance, the health sector, retail, transportation, communication and warehousing.

A synergistic and multidimensional nature of service innovation was introduced by Van and den Hertog,

*‘A new or considerably changed service concept, client interaction channel, service delivery system or technological concept that individually, but most likely in combination leads to one or more (re)new(ed) service functions that are new to the firm and do change the service/good offered on the market and do require structurally new technological, human or organisational capabilities of the service organisation’ [cited in 22, p. 17].*

Services are inherently complex, multi-dimensional and vary significantly. Their typology and nature give us an idea of the diversity and variability that exists in services. Subsequently, the requirements in innovation and measurement of innovation across different service verticals may also differ due to their individual contextualisation as well as the inherent multi-dimensional nature of services. Next, we discuss the various typologies of service innovation before developing a measurement framework.

## **TYOLOGIES OF SERVICE INNOVATION**

To understand the uniformity and reliability of innovation in services, it is necessary to classify service innovation in broad aspects. However, it is important to acknowledge the objective behind innovation; 'to expand the market share, to improve quality, to increase product diversification and to reduce costs' [20], so that a clearer picture can be analysed before improving or developing services. Previously, service innovation was classified by way of new and emerging business models, new customer interface, new service offerings, new process or system innovation, and new channels to markets [10] [22] [47]. All these authors concluded that the above typologies are interrelated and intertwined as empirically evidenced by Agarwal & Selen [10] [16].

Hence, a brief explanation for these typologies is discussed next in an attempt to study the link between the measurement of service innovation and different typologies of services.

### **New Business Models**

Innovation in organisational strategies, mechanisms for fostering skill and capability development, defining new business structures and financial models are aspects of business model innovation. These business strategies are designed to meet the interests of stakeholders of the organisation through reduction in costs, flexible strategies, specialization in business management techniques and exploitation of new markets and product opportunities [18]. Business designs or business models in services also illustrate the importance of coping with competition and other innovative businesses in the market. Thus, the importance of strategies in a business to convert raw ideas into value cannot be ignored. Nevertheless, the resources of an organisation need to be utilised efficiently for delivering better value to their customers than their competitors; it is not just about cost cutting [22] [48] [49].



Influenced by globalisation and outsourcing for the development of business models [22] [47] [50] one of the resources on which the business models are dependent is the degree of technology used in the business. For example, IT solutions have made remarkable changes in the telecommunication industry where the network is managed with new technology. In addition, to redesign their customer service strategy, the telecommunication companies have outsourced their call centres to other companies in different parts of the world (India and Philippines). This has led not only to a potential increase in the customer base, but has helped in integrating small and medium enterprises (SMEs) with larger organisations; thus identifying and developing new talent in the SME space [22].

Development of business models is similar to developing corporate strategies globally [51] where alternative strategies are compared and the best one is put into practice. For instance, Apple Inc. focuses on developing business models by rewriting the rules in the industries in which they operate [51] as follows:

*'Apple has been focusing on its product design which can be evidenced with an extra increase in the creating more Apples rather than focussing on creation of Operating System (OS) standards, whereas Microsoft had a very different business design as they licensed OS rather than creating it' [52].*

Further changes in business models are also suggested through changing the activities of companies. This may include outsourcing of services, the merger of two small competitors to fight against a big competitor and so on; thus providing a better model for industries to cope with increasing competition. As a result, structural choices taken by a business allow it to maximise the utility to customers, and further augment the interests of the stakeholders through value proposition tools, thereby substantially changing the way profits are earned in competitive markets.

### **New Customer Interface**

The transformation of the relationship of customers with organisations has led to a dynamic exchange of information in services. New customer interfaces mean changes in the communication process between customer and service providers [22]. Voss and Zomerdijk [49] describe service as a journey experienced by the customer which extends beyond the sales experience through the service delivery process and also includes after-sales service. Customer interaction and involvement in the business processes emphasises the importance of innovation in service.

Though customer experiences are directly or indirectly related to market innovations, face-to-face services require interaction or customer involvement; an essential and crucial ingredient for the survival of the organisation in a volatile economy [53]. McDonald's is well known for its value for money offerings, friendly staff that are service oriented, good physical environment and ambience (including neat and tidy kitchens) and user involvement and engagement in meeting the requirements in their process delivery. As though there are many fast food take-away and eat-in establishments, McDonald's has always maintained its brand by discovering what the customer wants and by subsequently providing them. User involvement in this context relates to McDonald's ability to cater for the needs of different countries, e.g. in United Emirates, halal meat is used to cater the population; consequently McDonald's have changed their recipes to suit the taste of these users. Though the burgers all around the world may have consistency in their look and feel, the customer taste, preference and involvement is a key to McDonald's success and sustainability. This demonstrates that the customer in this context is a key resource for the business, and can be classified as a 'partial employee' of the firm [54] [55] [56]. Though the customer does not enjoy the benefits of an employee, he/she can be still treated as an asset, an intangible resource in many instances, as such is deeply involved in the innovation of new ideas.

*Another example often cited is Dell computers. The focus of Dell has always been what the customer wants, and hence the products are delivered and organised according to the customer needs. Dell start their innovation process with asking their customers, 'What would you really want this thing to do? Is there a different way to accomplish that?' Then they meet with their suppliers and ask, 'Can we do this in a different way?' Then they try to come up with a totally different approach that exceeds the original objectives. To constantly bring information from the outside world into Dell, with an eye towards staying as competitive as they can, Michael Dell employs a range of innovative approaches. Michael quotes, 'I also enjoy roaming around outside the company to see what people think of us. On the Web that is the best platform to get feedback through communities at Face book, Twitter etc, nobody knows I'm a CEO. I'll hang out in chatrooms where actual users commonly chat about Dell and our competitors.' Michael listens to its users discussions as they talk about their purchases and their likes and dislikes, thereby giving him a wonderful learning opportunity and also getting feedback from customers and suppliers [57].*

### **New Service/Product Offerings**

A new service or product created by a business in a specific industry to compete in the market is generally termed a service innovation. The customer involvement as an active member in

the development of goods and services has led to a paradigm shift in global value chains and their business structures to another level. This shift is seen in activities such as networking or brokerage services (linking consumers, firms and supply chains to improve and allocate diligently the distribution of information), utilities and infrastructure (telecoms, waste disposals etc.), knowledge intensive business services (KIBS, collaborating with customers to upgrade technology and business processes and models) to impact the value chain as a whole [47]. The examples of new product offerings in brokerage web-based services can include web auctions (ebay), distance learning education (provided by different educational institutions); and crowd sourcing. In these instances, the services used are technically sophisticated and the developer introduces these services to the customers, with the developer acting as an intermediary or the seller himself.

### **New Process/System Innovation**

A process innovation may be defined as change in the process or the system structure of the organisation for the development of service in a particular industry. Process innovation focuses its development on the operational side of the businesses R&D; similar to the manufacturing sector [49]. Process innovation includes aspects related to task redesign, process routing, and resource reallocation. It requires training and up skilling of employees resulting in a systemic innovation which is usually to increase the effectiveness of the overall organisation and employees. As an example, the process of ordering consumer goods by Woolworth's petrol stations from its certain suppliers (such as British American Tobacco, Philip Morris and Coca Cola) has changed. Instead of placing orders via fax or over the phone, the introduction of e-orders using work available internet (technology) means the ordering process design has completely changed. In order to implement this change successfully, Woolworths had to train its managers and staff with new processes and systems.

Other factor that may influence an organisation's ability to redesign innovation systems relates to an organisation's ability to cope with sustainable growth in a competitive and ever changing environment [47] [58]. In Western countries, the innovation process or system design caters for the whole of life cycle of the product or the service. McKinsey [58] in its survey to issues suggested most organisations are seeking organic growth through new products or services or new customers in existing markets. Process innovation warrants long term solutions such as climate change, pollution, water shortages and preservation of diversity [47]. However, steps taken by these firms will allow them to respond to the needs of different economies, thus allowing them to build capability and capacity in a range of spheres by using supporting regulations and standards, infrastructures and

market structures in such a manner that the new process systems will intertwine with the emerging business models.

### **New Channels to market**

New ways of marketing services or products have been growing at an unprecedented rate; even more so with emerging technologies. With the introduction and deployment of technology in service industries [22] [45] [59], new ways of interaction with customers are developed such as the use of semantic web technologies, new sensors and interoperable broadband channels which provide a link between firms and customers through fixed and mobile networks provide where opportunities for gathering, processing, analysing and re-bundling information [47] is possible. Services are influenced by the availability of the internet for example; online food delivery services and online counselling services have made new ways for owners to market the products.

In concluding, and reinforcing what other authors have suggested, it is important to understand that these different typologies are interdependent. For example, processes and business models are dependent upon customers' input; and new channels to markets are dependent upon the customer or user interface. This understanding of service innovation and customer's implicit interconnectedness gives us the ability to think and manoeuvre ways in which measurement of innovation is possible. Next, the paper focuses on the development of the innovation measurement framework at firm level.

### **MEASUREMENT OF SERVICE INNOVATION**

The literature on innovation in services emphasises some important functions related to organisational activities such as the intangible nature of organisational products, high level of user involvement, dominance of technology in service related innovations and increasing supremacy of non-technological innovations in organisations. To date, macro level innovation surveys have been used to measure innovation activity for policy formation, for statistical measures and information gathering [60]. However, a need to develop a survey instrument which covers aspects of innovation that are considered cutting-edge, relevant and crucial for the economic growth of nations at a firm level is needed.

Although, much has been written on the subject of service innovation, very little of service innovation is actually measured in its true sense, partly because we do not have appropriate indicators to measure innovation, we are ignorant about the changes/improvements happening

around us in the form of innovation we are unaware of innovations that happen during interactions/engagements with customers as they are generally intangible in nature.

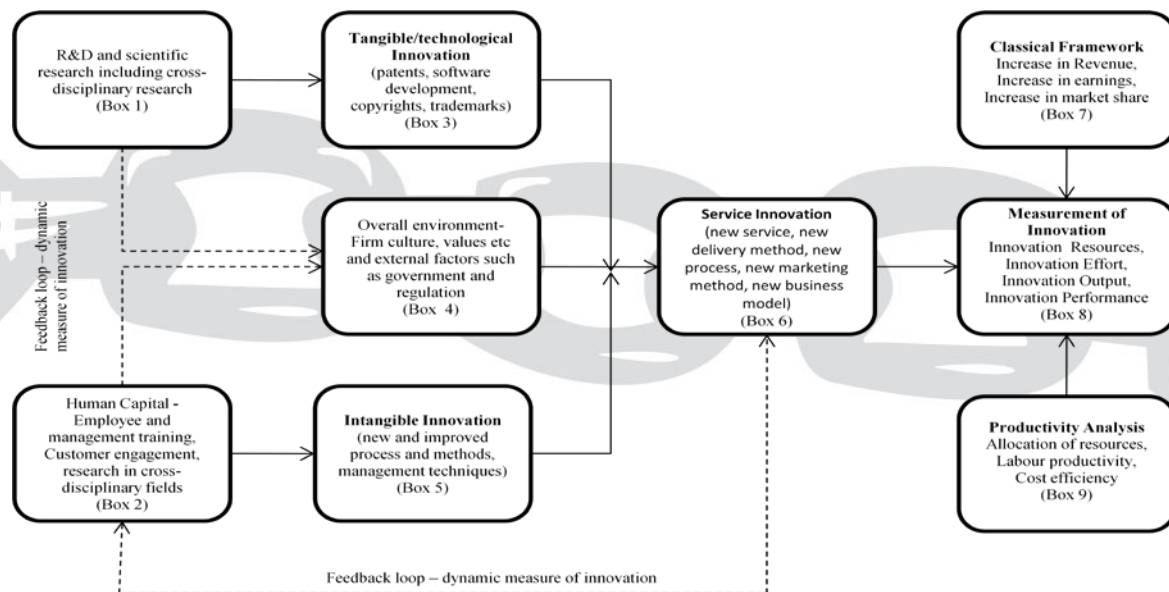
We now show how individual elements of our proposed measurement framework are supported by previous research. Based on studies conducted by MIT, McKinsey's global surveys and human based accounting adopted in some Indian firms the measurement indicators are discussed below.

Measurement indicators of the varying activity of innovation as it evolves in its intangible form within a firm are minimally developed as compared to R&D based innovations (Box 1 in figure 1). However, their development has greater potential for social impact because innovation is no longer confined to the laboratory. It is a market place phenomenon, a real-time based event, one that involves evolution as interaction takes place, and has more immediate impact than R&D which can take years to effect change through innovation. This results in the evolution of an innovation system even at firm level where innovation is not an isolated phenomenon and, as a consequence, a systems approach to its description is mandated. Hence we have developed a measurement framework for innovation in services at firm level (Figure 1).

Besides R&D, human capital is another important means by which a firm can acquire new information and knowledge that can facilitate innovation related activities in an organisation (Box 2 in figure 1). However, there is expenditure on training employees in an organisation in relation to innovation related developments. Current expenditure is focused on general training and marketing [23] [36]. Some companies understand the importance of their employees. In India these companies have human resource accounting also known as human asset accounting. This involves the identification, tracking the potential of the human resources of the company and communicating their development to the stakeholders. This also helps to maintain the culture of the organisation [61]. Trigo [36], encouraged organisations to qualify their employees for a job because he suggested that either their lack of qualification and training can be a barrier to the development of the organisation. Nevertheless, the overall environment also plays an important role in the process of development in an organisation (Box 4 in figure 1). Therefore the focus is on developing mental models of the organisations rather than just changing normal routines [62]. If the culture of the organisation is motivating and friendly, employees can participate in achieving organisational needs and goals. Robson and Ortman [63] stated that in small enterprises the government regulations plays a very important role. Hence it is important to be noted that the tax credits on research and development projects can be beneficial to organisations. The government plays an important role in

the academic research programs [19] such as Australian Research Council. Hence, the overall environment is affected both by human capital and R&D developments (including cross disciplinary research) in service innovations through technological and non-technological innovations.

Some authors suggest that diffusion and combination of technological and non-technological or organisational innovations is an appropriate measurement method [64], while others believe in identifying the special features of a particular service and measuring changes in the industry as a consequence of this as another form of measurement method [17]. The measurement of service innovation at the firm level and also at the economy level is an important concept that needs to be fully understood as it evolves dynamically and responds to growing world competition [13] [19].



**Figure 1** Framework for Measurement of Service Innovation at Firm Level

The premise of the service innovation measurement framework is firstly underpinned by a firm's ability to identify innovation appended with the adeptness to identify the type of service innovation, as well as the ability to measure innovation at the firm level. Is the innovation in an organisation, tangible or intangible? The method of measurement for the two types of innovation may differ. Tangible innovation (Box 3 in figure 1) such as technology decision includes the use of self-service technology based innovations such as ATMs, checkout counters at supermarkets, automatic payments at petrol pumps, tax preparation software, and blood pressure machines [65]. However, intangible innovations (Box 5 in figure 1) relate to innovations resulting from transformations and changes in the organisational structure, culture, policies, employee up-skilling (human talent) and

training; yet they have an impact on the productivity and growth of a firm and the overall economy. Most of the innovations are affected by government policies and organisational culture at firm level, as explained before. The various typologies of service innovation (Box 6 in figure 1) are discussed in detail in the paper above which is due to the combination of tangible and intangible innovation and are also influenced by the overall environment. Having identified the type of innovation, the next step is to identify the appropriate method for its measurement.

A recent study conducted by MIT [25] in United Kingdom and United States of America covered all manufacturing sectors and selected business services sectors such as advertising, management, technical and professional consultancy, and telecommunications. The researchers measured and compared innovation resources (such as people and ideas) and innovation effort (measured by innovation expenditure of various categories). They also looked at the resulting innovation outcomes (including number of patents) and innovation performance (including the percentage of sales due to new products and service). With this setting, we feel the need for innovation requiring some form of quantification. Though the Australian Bureau of Statistics, through its innovation survey, collects data on innovation practices, limited focus is given to the service sector [25]. This study examined ways to identify areas of innovation capability strengths and weaknesses which can prepare firms for their next stage of economic development. Perhaps, the identification of an appropriate and consistent set of innovation indicators provides an initial solution for measurement in the service innovation. The MIT survey identified metrics such as innovation resources (for example people, ideas, finance, location, competitive position, innovation barriers etc.); innovation effort (for example motivation, innovation expenditures, R&D and scientific/technological staff, collaboration, managerial talent); innovation outcomes (for example patents, other methods of protection); and innovation performance (for example as the percentage of sales due to innovated products, company growth and financial performance). Hence, on the basis of this study the next step in the framework is the measurement of innovation (Box 8 of figure 1) which is affected by all of the above discussed factors. A McKinsey survey [26] included eighteen different metrics, of which three were the most common, and the order in which they used the metrics was similar to the Cambridge-MIT survey. These three common metrics were revenue growth (due to new innovations introduced), customer satisfaction (with new products and services), and the number of ideas or concepts in the pipeline. As a few organisations in the McKinsey survey also used metrics based on accounting, a comparison was made between R&D with sales or increase in sales due to development, return on investment, and so on. The proportion of former accounting based metric was quite near to the third metric used in the McKinsey survey.

Two common measurement frameworks which are used to measure service innovation to-date one the classic accounting framework [19] [66] and the productivity analysis framework [19]. Both, of these are important as they provide evidence, are reliable and address the measurement objective for assets and liabilities used to deliver outcomes. The classic accounting framework (Box 7 in figure 1) is governed by accounting rules with the motivation of understanding value creation in a firm. As Jarboe says, '*Accountants are perfectly capable of measuring intangibles, just as they are capable of measuring tangibles, so long as there is a transaction*' [67, p.14]. Further, the classic accounting framework can use different techniques to measure transactions such as market value, book value and income approach [67] [68] to assess value creation. Consequently, an analysis of revenue, earnings and market share needs to be done, where the increment in the revenue or sales of a service as a result of a new service innovation can be quantified. In the same view, an increase in shareholder value can be analysed through return on equity and investment in innovative activities [19].

On the other hand, the productivity analysis framework (Box 9 in figure 1) allows for strengthening managerial strategies for planning, organising, directing and controlling within a firm and providing an overview of the efficiency gaps within the firm. Productivity measures are effective comparisons of performance within an industry and even with different industries where the changes can be measured by output per man-hour, yield increases or increases in quality [69]. Productivity analysis can be classified in several ways namely allocative efficiency, cost efficiency, labour efficiency and scale efficiency [70]. The total productivity model (TPP) allows productivity to be measured; Profitability Productivity Price (PPP) is another model which can be used for analysis where the profitability is equal to the sum of the productivity and price [71]. The allocation of resources can be done through a production possibility frontier where the resources used can be allocated to maximise efficiency. Cost efficiency is necessary to analyse whether the innovation is productive in terms of investment made; that is, analysing the cost and benefits of this approach. Labour efficiency means analysing the increase in labour or employee efficiency with the introduction of a new service innovation. Scale efficiency includes an analysis of economies and diseconomies of scale, where the impact of the organisation's operations may affect the innovation. For example, IBM is a large firm, which can afford innovation inputs and is also more likely to innovate than small companies.



While conducting analysis on the actual performance of a firm, the correlation of particular measures can be tested with known innovations and can also include innovation in the firm and its impact on the firm's performance [19]. A study conducted using statistical measurement tools on the correlation between the fundamental characteristics of airline companies and some activity indicators showed that there was a significant productivity increase due to certain of the analysed characteristics [68]. Hence in the above suggested framework, comprising resources and other factors of measurement with the sales and productivity, is suggested to see whether the configuration of the different strategies has an impact on the innovation.

There is inadequate accounting for intangible assets including copyrights, patents and trademarks. "Many investments in intangible assets go unrecorded in the national accounts"[36]. Another area which motivates firms to innovate in the service sector was identified by the global survey conducted by McKinsey [58] in which 'Innovation Audits' is a mechanism where firms can scan use to identify whether their goals are met or not. For, firms who see innovation as a strategic priority, the McKinsey global survey findings [26] bring a mix of metrics to measure innovation pattern customer satisfaction, the number of ideas in the pipeline, and R&D spending as a percentage of sales. It was suggested in this report, a way of structuring the right measurement tools might be companies paid deeper attention to input metrics as well as output metrics, benchmarked against their competitors and studied the relationship between spending on innovative activities (including R&D) and shareholder value. The measurement of innovation should not follow a stagnant approach. It should be treated as an iterative and dynamic process post any innovation [19]. As described earlier, the need for a systems approach for innovation in services is implicit in both the Oslo Manual and in the OECD Innovation Strategy [72] [73] [74]. Customers, stakeholders or economic agents engage in activities, are linked to each other within the network via communities of practice resulting in outcomes including short term outcomes, such as jobs and growth, and longer term impacts, such as well being, cultural change of global influence [60].

Apart from qualitative measures, some of the approaches for measuring innovation in services at the intangible level require customer interface monitoring and management which is possible via qualitative methods such as experiments, observations (for example Michael Dell's approach), surveys or personal interviews. It is important to understand that innovation and its impact can be measured in a number of ways, though none of them is perfect [66]. Canibano et al. [20] point out that innovations due to organisational capabilities and human resource management have not been properly analysed. We recommend that the financial accounting of both tangible assets and

intangible assets should be adopted by all firms, underpinned by a sound measurement tool. The effects arising from innovation in services can be displayed via the use of graphs which illustrate change in organisational sales, productivity and efficiency of employee performance, but also demonstrate value creation due to intangible innovations. These in turn, will lead to further policy decision making, thereby, facilitating better forecasting and resulting in economic growth of firms and even the economy.

Appended to the above, the value analysis for measurement of service innovation can also be commented out through surveys, personal interviews and observation of customers, entrepreneurs, employees and managers, as a proxy measure for the determination of customer satisfaction level due to service improvements/developments; a common method readily adopted in today's date. Though, this is a subjective approach, the accounting of stakeholders who are involved with the change, needs to be determined. It is proposed that for any firm the satisfaction of its customer and employees is equally important and they are both an important resource in the service delivery process [75]. Steve Jobs, Apple Inc CEO, said in one of his interviews to software developers, '*You have to start with the customer experience and work back to the technology not the other way round*' [47]. This explains the success of Apple Inc and its expert panel strategy where the customer experience is considered as the priority for the innovation (product) introduced.

## **CONCLUSION**

This literature review presents the growing importance of the service sector in world economies. The paper elaborates on the typologies of innovation in services along with reference to studies from MIT and McKinsey Global Surveys as a model towards the development of a framework for measurement of service innovation. Identification of innovative resources, efforts, outcomes and performances will give organisations an opportunity to identify value creation due to their people, processes and emerging systems.

The McKinsey study points out that around 30 per cent of the CEOs of interviewed firms were unaware of the type of innovation occurring in their companies. Consequently, ongoing audits for innovation in services should be a strategic approach in ongoing actions. The service innovation framework presented here brings about the social impacts of the development of innovation indicators at the firm level – tangible and intangible; all arising as part of a social process with norms evolving as a result of the interactions of a community of practice. It is anticipated that the users of

these measurements will also form communities of practice, within government departments and internationally as part of the policy process resulting in considerable impact on people, firms, regions and countries. Lastly, an important aspect of this work is that service innovation is dynamic and allows for changing emphasis in response to economic and social conditions; it expands the domain of discourse through extending coverage of the service sector, thereby revising the concepts and definitions that underlie the measurement, analysis and social impact of innovation in services.

Some gaps and practical issues are expected in the proposed framework which will be identified in the future research. The findings of this study have non-trivial consequences for service operations management theory and practice; however there are limitations to the extent human dynamics can be measured. Future research can help develop an integrated measurement instrument and empirically test the developed framework across different service verticals. New approaches will become necessary to integrate the interrelations between various typologies of innovation in services and associated metric indicators. Thus, the future research is directed to empirically test the typologies of service innovation at the firm level which will involve analysis of the measurement of innovation in services at a system level [76] from an accounting, productivity and human-capital perspective. In particular, the investigation of the co-evolution of a firm, its intangible resources and the changing dynamics associated with continuous innovation is a challenging empirical task when measuring innovation in services. The development of an innovation metrics at a firm level if attained can help explain economic and social impacts of innovation and can guide and evaluate policy making for the future.

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