

The incremental and cumulative effects of dynamic capabilities on service innovation in collaborative service organizations

ABSTRACT: Innovation in service is increasingly bought to market by a network of firms, or alliance networks, asset orchestration, knowledge sharing capabilities, resources and competencies, and operated in a coordinated manner. Recent literature has recognized the evolutionary nature of dynamic capabilities in that managers may adapt their alliance networks dynamically to sustain competitive advantage, but identified a continuing gap in the lack of empirical studies on feedbacks between network environments, dynamic capabilities, and innovation performance. In addition, other literature calls for more quantitative research on examining dynamic capabilities in a network environment to provide a better understanding of how firms should direct their resources and capabilities to successfully respond to competition. This study contributes towards closing both gaps by empirically examining the *cumulative and incremental* effects of fostering and deploying different dynamic capabilities on services innovation, and by quantifying their impact, thus providing managers with a better account of how services innovation comes about in a service value network. It does so using empirical data from 449 respondents from a telecommunications service provider in Australia and its partnering organizations, and through the use of Structural Equation Modeling.

Keywords – service value network, service innovation, collaboration, dynamic capability building, Structural Equation Modeling.

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INTRODUCTION

A paradigm shift is taking place in the way in which organizations create value. Dynamic capabilities complement the premise of the resource-based view of the firm, and the literature has recognized the evolutionary nature of dynamic capabilities in that managers may adapt their alliance networks dynamically to sustain competitive advantage (Teece, 2009). As such, managers are nowadays looking to develop collaborative relationships external to the organization for the value creation needed to survive in the current economic environment (Hammervoll, 2009). It is argued that service innovation is increasingly brought to market by a network of firms, selected for their unique assets, capabilities, resources and competencies, and operated in a coordinated manner (Agarwal & Selen, 2009, Teece, 2009). By deploying technologies and by leveraging their resources, collaborating service organizations are able to bring their intramural innovation accomplishments to market (Enkel et al., 2009). The innovation challenge is to overcome the longstanding “value-in-exchange thinking from a producer perspective” to “value-in-use thinking from a customer perspective” (Vargo, Maglio & Akaka, 2008). As such, partnering with stakeholders, be it customers or suppliers, is fundamental for delivering new kinds of services in complex service networks.

Within this context of bringing innovation to fruition through a network of firms, recent literature identified a continuing gap in the lack of empirical studies on feedbacks between network environments, dynamic capabilities, and innovation performance (Suli Zheng et al.,

2011). In addition, another review and research agenda calls for more *quantitative research* on examining dynamic capabilities in a network environment to provide a better understanding how firms should direct their resources and capabilities in search of sustained competitive advantage (Wang & Ahmed, 2007). This is also recognised by Teece (2009: xv), who states that different levels of “fitness” (dynamic capabilities) will drive growth, profitability and survival, and who calls for a comprehensive set of tests of dynamic capabilities to be conducted.

Our study will help close the first gap of lack of empirical study on feedbacks between network environments, dynamic capabilities, and innovation performance by examining the cumulative and incremental effects of fostering and deploying different dynamic capabilities to provide managers with a better account of how services innovation comes about in a service value network. It does so, using empirical data from 449 respondents from a telecommunications service provider in Australia and its partnering organizations. In particular, our research will investigate the cumulative and incremental effects of dynamic capabilities in the particular context of how collaboration (referred to as organizational relationship capital - ORC) impacts on service innovation (termed as elevated service offering - ESO), and whether this effect is direct, or mediated by other DCs of collaborative organizational learning (COL) and/or collaborative innovative capacity (CIC).. *Cumulative effects* refer to the overall effect of deploying different DCs in explaining services innovation; while *incremental effects* refer to which DC makes what contribution to explaining services innovation in its own right.

Our study also addresses the second gap of a lack in *quantitative research* on examining dynamic capabilities in a network environment by studying above mentioned effects quantitatively using a structural model.

The remainder of the paper is structured as follows: firstly, the theoretical background is presented, followed by justification of the research hypotheses. Next, a synopsis of the research design and research methodology, along with associated analyses and results, are presented. Subsequently, managerial implications, contributions, and main conclusions are discussed, followed by limitations of the study and suggestions for future research.

The theoretical background of this research study and resulting research hypotheses are discussed next.

THEORETICAL BACKGROUND

The Rationale of Collaborative Service Organizations

Service organizations are increasingly operating in collaborative networks to build and sustain competitive advantage (Achrol & Kotler, 1999, Das & Teng, 2000; Kogut, 2000; Powell, 1990). While teamwork and internal partnering are common ground in organizations, networking with external stakeholders requires expanding the understanding and knowledge base of relationships in order to build and establish different forms of collaboration. The capabilities to recognize the value of new knowledge, to assimilate it, and to apply it to commercial ends has been defined as *absorptive capacity* which influences the innovative performance of the firm (Cohen & Levinthal, 1990).

The network rationale suggests that partnering enables organizations to cope with uncertainties, complexity and associated risks through appropriate skill building and resource allocation (Cravens & Shipp, 1993). Each partner contributes part or whole of a core competence that other partners of the network lack, such as access to a market, technology or particular skills; all of which comprise the fundamental premise for collaboration. Agarwal and Selen (2011:1167) defined such a network of partners as a service value network (SVN):

“a network of value chains, which vibrates its essence from the combined core competencies of the stakeholders in the chain, mobilizes 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”.

Next, we discuss in greater detail how managers in collaborative service organizations can orchestrate service innovation. The resource-based view addresses the fact that firms operate in dynamic environments, and that resources valued or immobile in the current environment may not be valued or substitutable in tomorrow’s environment (Teece et al., 1997). Firms that can identify environment or market trends early by means of communicating with different stakeholders, and that can configure or reconfigure quickly to align their resources with the needs and demands of the new market and competitive situations, will operate with a competitive advantage. In addition to the typical physical, human, and organizational resources possessed by individual firms, firms can form and reform alliances with stakeholders, and through adoption of managerial practices can gain access and manage valuable, immobile, and rare resources in order to retain competitive advantages in dynamic environments (Yu C. & Hao J., 2011).

Lee et al. (2009) argue that strong ties and linkages with other partnering organizations mitigate uncertainty and promote the ability to adapt through increased communication, information sharing, and transparency. Interactions with partnering organizations in a network allow entities to acquire new knowledge; thus allowing organizations to advance their competencies and build higher order capabilities (Agarwal & Selen 2009; Gupta &

Govindarajan, 2000; Ibarra, 1993). This is also reinforced by Chen et al. (2009) who state that the driving forces of the dynamic learning mechanism play a decisive role in the evolution of dynamic competitive capabilities that the resource-based view has failed to clearly identify. They also state that learning intent and embedded learning positively influence the drivers of dynamic learning mechanism and dynamic competitive capabilities development in high-level management of international strategic alliances. Extant literature has further indicated that when entities are loosely coupled, these partnering organizations are more motivated to share ideas, resources and competencies (Tsai, 2001; Uzzi, 1999), and it is through inter-organizational knowledge pooling that innovative outcomes can be attained. Henceforth, managers can foster complementary knowledge through structured collaboration (Gemunden et al., 1996; Rindfleisch & Moorman, 2001; Sparrowe et al., 2001), and open and transparent communication and cooperation which can lead to significant reductions in total costs for all parties involved (Gavirneni, 2002), hence enhancing overall service innovativeness (Goes & Park, 1997). Furthermore, recent research shows the role of collaborative networks in fostering business model innovation (Arana & Castellano, 2010).

After grounding the rationale for collaborating service networks in the literature, we next expand on the role of dynamic capabilities in service innovation.

Dynamic capabilities and their role in service innovation

Eisenhardt and Martin define dynamic capabilities (DCs) as *“the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve and die”* (2000: 1107). Zahra and George (2002) reviewed the literature on knowledge absorption and conceptualized absorptive capacity as a dynamic capability. DCCs

constitute a type of competitive advantage derived from organizational routines, which offer the greatest sustainable value (Prahalad and Hamel, 1990). Winter (2000, 2003) conceives of high level management routines as combinations of various small routines in an organizational system that exerts a key influence on organizational success, and states that DC development in high-level management not only assists a firm in facing external challenges, but also provides limitless competitive advantages. Because decision making power is generally concentrated among high-level managers, DC development in high-level managers via distinctive capabilities and specific processes can enhance success for a firm (Dierickx and Cool, 1989).

Dynamic capabilities have been contrasted to operational (ordinary) capabilities. An operational capability enables a firm to perform an activity on an on-going basis using more or less the same techniques on the same scale to support existing products and services for the same customer population. Such a capability is ordinary in the sense of maintaining the *status quo* (that is, not out of the ordinary) (Winter, 2003). In contrast, a dynamic capability is one that enables a firm to alter how it currently makes its living to constantly reconfigure, renew and redeploy resources and capabilities to exploit opportunities (Teece et al, 1997). Recent research by Helfat & Winter (2011) warn against a clear delineation between dynamic and operational capabilities based on numerous industry examples, and add further complexity to the issue of capabilities in industry by introducing dual-purpose and multiple-variant capabilities. They illustrate a multiple-variant capability in a network setting through an example of integrative capabilities, one which enable communication and coordination across organizational units and firms (Helfat and Campo-Rembado, 2010). These capabilities can serve an operational purpose, for example by facilitating shared activities that produce economies of scope across stages of production or product lines. Other types of integrative capabilities can make change possible,

such as through the coordination of design and manufacture in new product introduction (Iansiti and Clark, 1994). Thus, an integrative capability may be dynamic or operational, depending on the nature of the capability and its intended use (Helfat & Winter, 2011). As such, the notion of dynamic capabilities in our research is not to be contrasted to operational capabilities as defined earlier in the literature, but rather to encapsulate the dynamic nature of the capability as initially defined by Teece et al (1997) to capture an organisation's ability to achieve new and innovative forms of competitive advantage, and reinforced by Teece (2009).

Within this context, entering into an alliance can be an extremely useful strategy for cooperative partners, and can enable a firm to rapidly compete. A number of studies (Lane and Lubatkin, 1998; Zollo and Singh, 1998; Gulati, 1999) confirm that DCs can be derived from alliances or acquisitions, and that alliances can contribute new and useful resources to an organization. Teece (2010) links dynamic capabilities to business model innovation as “*Dynamic capabilities help govern evolutionary fitness, and help shape the business environment itself. Get the business model wrong, and there is almost no chance of business success - get it right, and customize it for a market segment and build in non-imitable dimensions, and it will contribute to the firm’s competitive advantage*” (Teece, 2010: 190-191). With this backdrop, tacit capabilities are becoming more strategically important and quantifying their impact even more relevant.

Within the services industry, on the basis of scholarly work by Makadok (2001), organisational capabilities for service innovation are defined as firm-specific resources that improve the productivity of the other resources of the organisation for the realisation of new service developments. Recently, several models analysing service innovation capabilities have been introduced, indicating growing interest attributed to understanding service innovation capabilities and their management. Prominent theoretical publications among these models on

service innovation capabilities are den Hertog et. Al. (2010), Hogan et al. (2011), and Kindström et al. (2012). Further, Agarwal & Selen (2009) have empirically shown that innovations are increasingly brought to market by networks of firms through a process of dynamic capabilities. They define service innovation in a service value network as an Elevated Service Offering (ESO), or “*a new or enhanced service offering which can only eventuate as a result of a collaborative arrangement, one that could not otherwise be delivered on individual organizational merits*” (Agarwal and Selen (2009: 432)). They empirically validate the theoretical concepts by Forfas (2006) and Voss and Zomerdiijk (2007) and show ESO as a three dimensional construct, encompassing *Strategic, Productivity and Performance* - dimensions (Agarwal & Selen, 2011).

Our research will address the *cumulative* and *incremental* effects of dynamic capabilities on services innovation in a service value network, by extending a recent study of Agarwal & Selen (2009) on the use of dynamic capabilities in service value networks for achieving service innovation. Understanding such cumulative and incremental effects of deploying particular dynamic capabilities for achieving service innovation, and quantifying their effect, will provide valuable insights for practitioners to implement better decision-making mechanisms, and processes and practices. In addition, such understanding will focus attention to relevant skill development, human capital development, and workplace practices for fostering innovation when working in partnership in alliance collaborative networks. In particular, our research will investigate how collaboration (referred to as organizational relationship capital - ORC) impacts on service innovation (termed as elevated service offering - ESO), and whether this effect is direct, or mediated by other DCs of collaborative organizational learning (COL) and/or collaborative innovative capacity (CIC)..

Next the research questions and resulting hypotheses are elaborated on for demonstrating the cumulative and incremental effects of deploying dynamic capabilities of bi-directional learning and knowledge sharing, as well as developing collaborative innovative capacity with its enabling skills, on service innovation in a service network.

RESEARCH QUESTIONS AND HYPOTHESES

Relationship capital is an antecedent to knowledge management, implying knowledge assimilation and creation within the firm (Bonner et. al 2005). As such, relationship capital is seen as a critical firm resource (Pollard & Jemicz 2010; Chrisholm & Nielsen 2009; Locket et. al. 2009), which provides resources of value. In the context of a service value network, *Organizational Relationship Capital* (ORC) is key to the creation of higher-order competencies when collaborating with customers and suppliers, and is a dynamic capability made up of close, personal interaction between the partners at multiple levels, characterized by mutual respect, trust and high reciprocity between the partners at multiple levels, as well as an ability to establish long term relationships (Agarwal & Selen, 2009).

According to Das & Teng (2000), firm resources provide a relevant basis for partnering organizations as partnerships are most likely to be formed when there is a crisis in resources, or when they are likely to share valuable resources they possess. As such, leveraging a required set of skills and/or resources/competencies that each partnering organization do not possess is advantageous to both parties (Cravens & Shipp, 1993), and through a rapid diffusion of new technologies mutual learning across both partners is enhanced (Lorange & Roos, 1991). Thus, resources, dynamic capabilities and knowledge are intertwined and closely interrelated, and provide organizations a capacity to continually reconfigure, and hence become a source of

competitive advantage (Barney et al., 2001). *Collaborative Organizational Learning* (COL) in our research is composed of the focal company's learning, or *collaborative organizational learning – yours*, and comprises learned or acquired new or important information/knowledge from the partner, including weakness, strength, gaps and discontinuities, learned or acquired new critical capability or skill from the partner; enhancing its existing capabilities/skills as a result of the partnership and through working with partners increasing contextual capability and overall knowledge. In a similar vein, the second dimension of COL, or *collaborative organizational learning–partners*, comprises of items such as collaborative arrangements that helped the partner learn or acquire new critical capability or skill, acquire new or important information/knowledge including weakness, strength, gaps, and discontinuities, as well as has helped the partner enhance their existing capabilities/skills.

Collaborative innovative capacity (CIC) is seen as a dynamic skill which is developed when collaborating with partners, and comprises of an ability that evolves over time within individuals or groups. In this context, Lawson and Samson (2001: 384) define innovation capability as “*the ability to continuously transform knowledge and ideas into new products, processes and systems for the benefit of the firm and its stakeholders*”, which facilitates transformation of knowledge and ideas into practical insights. This capability is both operational and strategic and requires “*a higher-order integration capability to mould and manage multiple capabilities*” (Lawson and Samson, 2001: 384). Furthering this argument, Fuchs et al. (2000) in the context of dynamic capabilities claim innovation as a higher order integration capability, which means that organizations need to constantly manage their knowledge and skill base in search of innovation. Further, CIC promotes lateral thinking, equips partnering organizations with an ability to cross fertilize ideas, apply and diffuse knowledge, and allow the application of

ideas within and across industry sectors (Ganesan et al., 2005); thus broadening horizons. In this study, CIC is made up of a continuous and plentiful supply of good ideas from partners and customers, collaboratively coming up with novel and interesting ideas when solving problems, and lastly working in tandem to produce perceptual and cognitive sets of information as a result of lateral and fresh thinking.

From the above discussion, it is shown that organizational relationship capital has a positive influence on organizational learning, and innovation in a supply chain context. As such, members of the service value network who possess relational competencies are expected to positively influence the innovation outcome (ESO), organizational learning within the network, and enable innovativeness of all partners, including customers. In other words, deliberate learning efforts will code, articulate and assimilate collective knowledge, and in the case of a service value network these deliberate efforts translate into managerial skills and competencies through which the network may modify its strategic assets and operational processes, routines and tasks, in pursuit of greater effectiveness and improved efficiency. Thus, organizational learning of the concerted team members will in turn enhance the ability to come up with new ideas and innovations, and hence will act as a mediator between organizational relationship capital and collaborative innovative capacity.

Therefore it is hypothesized that:

H1a: Organizational Relationship Capital has a positive influence on Elevated Service Offering.

H1b: Organizational Relationship Capital has a positive influence on the Collaborative Organizational Learning of the service value network partners.

H1c: Organizational Relationship Capital has a positive influence on the Collaborative Innovative Capacity of the service value network partners.

H1d: Collaborative Organizational Learning of the partners mediates the relationship between Organizational Relationship Capital and the Collaborative Innovative Capacity of the service value network partners.

In our earlier discussion, it was stated that collaborative learning of our customers, suppliers and other stakeholders is core to innovation in service networks. Such deliberate efforts translate into higher-order managerial skills and dynamic capabilities, through which the service value network is likely to modify its strategic and operating routines in pursuit of greater effectiveness and improved efficiency. Thus, it is hypothesized that COL influences CIC, and eventually the innovation outcome or ESO. [Similarly, it is also believed that CIC will in turn enhance the ability to come up with new ideas and innovations, and hence will act as a mediator between COL and delivery of innovation in services – our notion of ESO.](#)

Therefore we hypothesize that:

H2a: Collaborative Organizational Learning has a positive influence on the Collaborative Innovative Capacity of the service value network.

H2b: Collaborative Organizational Learning will have a positive influence on the outcome Elevated Service Offering.

H2c: Collaborative Innovative Capacity will mediate the relationship between Collaborative Organizational Learning and Elevated Service Offering of the service value network partners.

Organizations that possess innovation capability have the ability to integrate key capabilities and resources of their firms to successfully stimulate innovation (Fuchs et al., 2000). In the context of service value networks, CIC may broaden the perspectives and enable partnering organizations to foster, fertilize, and apply ideas within and across industry sectors, and also promote the ability to think laterally. Consequently, this innovative capability of partnering organizations may induce an “ordinary discovery”, generally referred to as incremental innovation, or an “extraordinary discovery” referred to as radical innovation (Yu, 2001), resulting in successful outcomes in the form of an ESO.

Therefore it is hypothesized that:

H3a: Collaborative Innovative Capacity will have a positive influence on the outcome Elevated Service Offering.

H3b: Collaborative Organizational Learning will mediate the relationship between Organizational Relationship Capital and Elevated Service Offering, of the service value network partners.

The key contribution of our research is the investigation of the *cumulative and incremental* effects of deploying dynamic capabilities for achieving service innovation. In particular, how collaboration (ORC) impacts on service innovation (ESO), and whether this effect is direct, or mediated by dynamic capabilities of collaborative organizational learning and/or organizational innovative capacity in the service network. This results in three distinct research models, as follows:

In Model 1, collaboration (ORC) is assumed to directly affect service innovation (ESO), *without mediating effects from other dynamic capabilities in the network*. In other words, how well does ORC explain ESO, without any cumulative effects of other dynamic capabilities.

Model 2 tests whether collaborative service organizations create and deliver elevated service offerings, *mediated through Collaborative Organizational Learning capability building*.

Model 3 finally investigates whether collaborative service organizations create and deliver elevated service offerings, *fully mediated through Collaborative Organizational Learning and Collaborative Innovative Capacity capabilities*. This is the model in which cumulative and incremental effects of dynamic capabilities of COL and CIC can be observed, and be investigated how much better services innovation (ESO) is explained as a result of such dynamic capability deployment.

The full research model, encompassing models one to three, is illustrated in Figure 1 below.

Insert Figure 1 about here

As such, this research attempts to capture the cumulative and incremental effect of deploying dynamic capabilities of *bi-directional* learning and knowledge sharing, as well as development of collaborative innovative capacity with all its enabling skills as defined earlier, in order to more fully explain the innovation process and how service innovation comes about in a service value network. Next, the research design and methodology are elaborated on.

RESEARCH DESIGN AND METHODOLOGY

Sampling and Data Collection

Based on the theoretical grounding for our research framework, a survey instrument was designed and pilot tested on 79 employees belonging to a major Australian telecommunications service provider and its partnering organizations, followed by a main round online survey circulated to an additional 1,717 individuals across the chosen telecommunications service network. Embedded in the organizational philosophy of this telco lays the concept of partnering for value creation; and as such this telco, along with its partnering organizations, became a good sampling frame for a service network in action. The main round survey lasted for a period of four weeks, with a follow-up email sent to all participants after a period of two weeks. There were 380 valid and completed responses received, showing a response rate of 22.13%, out of which approximately 31%, 22% and 47% of the responses were submitted by respectively the partnering organization, customer organizations, and the parent telecommunications organization. Data records with greater than 25% missing data entries were deleted, as a result of which 2 data entries were deleted from the pilot stage data, and 8 records deleted from the main round data set, leaving 77 and 372 data items, respectively. In total, less than 5% of the sample size was lost. Missing Value Analysis using Expectation Maximization treatment (Little & Rubin, 1987; Graham et al., 1996) was used, resulting in a fully populated combined data set with 449 sample observations.

The sample demographics are listed in Table 1. The data was subsequently randomly split in equal proportion (data set 1 (DS1) and data set 2 (DS2)) to fulfill data requirements for

subsequent EFA-, CFA one-factor congeneric-, and SEM exploratory model and validation phases (Anderson & Gerbing, 1988; Gerbing & Hamilton, 1996).

Insert Table 1 about here

Construct Development

Our research will address the *cumulative* and *incremental* effects of dynamic capabilities on services innovation in a service value network, by extending a recent study of Agarwal & Selen, 2009 on the use of dynamic capabilities in service value networks for achieving service innovation. As such, the constructs of organizational relationship capital, collaborative organizational learning – yours and partners, collaborative innovative capacity and elevated service offering were taken from Agarwal & Selen (2009). All measurement items of the above constructs are measured using a 5-point Likert scale with “1” for “strongly disagree” and “5” for “strongly agree”. The measurement items were confirmed through 1-factor congeneric modeling using CFA for each construct, and the constructs used are summarized in Appendix A.

Non-response and Common Method Bias

Non-response bias differentiates between answers given by non-respondents and respondents at a statistical level (Lambert & Harrington, 1990). In this study, we used the method as adopted by Paulraj (2002). Data were collected in two waves, with the first group comprising of 281 responses and the latter producing 99 responses. A set of 25 random variables were chosen for a t-test analysis, with the results indicating no significant statistical difference

across the two groups (at 95% confidence interval) for the survey items tested, which means that non-response bias is not a major concern in our study.

According to Spector (1987) common method variance is an artifact of measurement that biases results when relations are explored among constructs measured by the same method. We adopted the methods involving discriminant validity and convergent validity as a safeguard against common method variance. Furthermore, the overarching empirical study validated the research model using a triangulation research methodology, initially with a qualitative case-study method, which was underpinned by convergent interviewing; followed by quantitative research involving EFA, one-factor congeneric modeling with item parceling for construct validation, followed by SEM model building and model validation, as detailed in Agarwal and Selen (2009).

Reliability and Validity

A rigorous process was used to develop and validate the survey instrument. Prior to data collection, content validity was supported by evidences from extant literature, executive interviews, organizational documents and pilot tests. This was followed by a rigorous testing of reliability and validity of the constructs. Narasimhan and Jayaram's (1998) two-step method was deployed to test construct reliability, employing EFA to ensure unidimensionality of the scales, followed by Cronbach's alpha (Cramer, 2003) for assessing construct reliability. Results showed the constructs used to be valid, reliable, and unidimensional. Cronbach alpha values for the constructs are shown in Table 2.

Insert Table 2 about here

Next, discriminant validity and convergent validity were tested using CFA (O’Leary-Kelly & Vokurka, 1998). In the model, each item is linked to its corresponding construct and the covariances among those constructs are freely estimated. A construct with either loadings of indicators of at least 0.5, a significant t-value ($t > 2.0$), or both, is considered to be convergent valid (Fornell & Larcker, 1981). Data set 2 ($n=224$) is used to examine and validate the factor structure prior to its use in SEM. Our analysis showed all factor loadings to be greater than 0.50, and all t-values to be greater than 2.0, thereby demonstrating convergent validity. Finally, the inter-correlations between the item scales were computed and confirmed discriminant validity between all the latent variables for both data sets.

Item Parceling

According to Kishton & Widaman (1994) item parceling is a technique whereby parcels are constructed from summing or averaging a number of item responses from a construct that is assumed to be unidimensional. In these instances, these parcels can then be used as indicator variables of latent constructs for further SEM analysis provided they meet the Cronbach’s alpha reliability standard of values equal to or greater than 0.5 (Pedazur & Schmelkin, 1991), and are unidimensional as indicated by scree plots (Cattell, 1966). After completing EFA, and one-factor congeneric model analysis checking for unidimensionality via scree plots, item parceling was conducted. Item parceling reduces the number of parameters estimated, resulting in more stable parameter estimates and proper solutions of model fit (Bandalos & Finney, 2001; Little et al., 2002). Through the use of item parceling the number of measured items was reduced. After item

parceling, ORC and CIC constructs were shown to be single-factor latent constructs, whereas COL and ESO represented higher-order constructs, each containing 2 to 3 parceled indicator variables. The inter-correlations between the item parceled scales were computed and also confirmed discriminant validity between all latent variables for both data sets.

SEM MODEL ANALYSIS AND RESULTS

As stated earlier, a methodology of a split sample was used for, on the one hand, estimating the appropriate structural equation model (n=225), followed by a holdout sample for model validation (n=224). SEM estimates using AMOS 7.0 (Arbuckle, 2006) were generated, and the maximum likelihood estimation method was applied to data set 1 and data set 2. In SEM, there is no single test of significance that can absolutely identify a correct model based on the sample data (Holmes-Smith et al., 2005; Shah & Goldstein, 2006). Many goodness-of-fit criteria have been established to assess acceptable model fit, and in this study the recommended fit indices as suggested by Kline (2005) were adopted.

Research Model 1: ORC as a Driver of ESO, without Mediation

In the first research model, organizational relationship capital (ORC) serves as the sole predictor variable of service innovation, operationalized as an ESO consisting of strategic, productivity, and performance dimensions. Figure 2 shows the standardized parameter estimates for hypothesis H1a, for data set 1 (n=225) in the initial and validated (n=224) study.

Insert Figure 2 about here

Above each of the rectangles the square of the variable's standardized loading is displayed; which indicates what percentage of the variance is explained. For example, the factor loading for the relationship between Organizational Relationship Capital and ESO is 0.46, with 55% of the variance explained for ESO_Strategic, 53% for ESO_Productivity, and 53% for ESO_Performance (the three sub-constructs of ESO). Further, the model fit indices are all within their acceptable ranges ($\chi^2=1.726$, $n=225$, $df=2$, $CMIN/DF=0.863$, $p=0.422$, $GFI=0.996$, $AGFI=0.981$, $TLI=1.004$, $CFI=1.000$, $RMR=0.0167$, and $RMSEA = 0.000$). The standardized factor loading for the ORC→ESO causal path is 0.46. This means that for a one standard deviation change in ORC, the ESO outcome is predicted to increase by 0.46. Further, the factor loading from ORC to ESO is statistically significant at the 0.05 level. Thus, the overall results reveal a significant relationship between the ORC and the ESO outcome, and hence hypothesis H1a is supported. The next step was to conduct a validation study using data set 2 ($n=224$), the results for which are summarized in Figure 2. Model fit indices are ($\chi^2=8.608$, $n=224$, $df=2$, $CMIN/DF=4.304$, $p=0.014$, $GFI=0.982$, $AGFI=0.912$, $TLI=0.936$, $CFI=0.979$, $RMR=0.0303$, and $RMSEA = 0.122$). The R^2 value of 0.21 and 0.27, respectively, indicates that 21/27 percent of the variation in ESO outcome is explained by ORC for the initial and validated model analyses. Further, in the direct relationship mode between ORC and ESO, the factor loading is statistically significant at the 0.05 level for both studies. With the RMSEA slightly higher than the generally accepted value for satisfactory fit of 0.1 (Browne & Cudeck, 1989), and all the other fit statistics within range, the model fit statistics can be accepted. The results imply that

collaboration with customers, suppliers and other stakeholders is pivotal for the creation of value in the form of ESO outcomes – the premises for innovation in a service network.

Next, to start investigating the mutual, cumulative and incremental effect of dynamic capability deployment, a more comprehensive research framework is tested, in which organizational relationship capital is mediated by the dynamic capability of collaborative organizational learning.

Research Model 2: ORC as a Driver of ESO, Mediated by COL

In this model, Organizational Relationship Capital (ORC) serves as the predictor variable for ESO, with Collaborative Organizational Learning (COL) as the mediating variable. COL was earlier defined as a higher order construct, made up two sub-constructs: *collaborative organizational learning–yours*, and *collaborative organizational learning–partners*. There are benefits to each of the partners as each firm will develop enhanced set of skills and/or resources that it lacks in, and that both partner firms will stimulate rapid diffusion and deployment of new technologies and create elevated service offerings as a result of mutual learning. The standardized parameter estimates, using the initial dataset, for hypothesis H1b and H2b are as shown in Figure 3.

Insert Figure 3 about here

Results from the validation study using data set 2 (n=224) yield standardized coefficients as displayed in Figure 4.

Insert Figure 4 about here

The fit indices for both the initial and validation studies are summarized in Table 3.

Insert Table 3 about here

The standardized factor loading for the ORC→COL and COL→ESO causal path for the initial and validation study are 0.67 and 0.59, and 0.79 and 0.63, respectively. The R² value of 0.35 and 0.40 indicates that 35/40 percent of the variation in ESO outcome is explained together by ORC and COL across the two studies. Further, the factor loading from ORC→COL and COL→ESO is statistically significant at the 0.05 level. Thus, the overall results reveal a significant relationship between ORC, COL and the ESO outcome, and hence hypotheses H1b and H2b are supported. This model demonstrates the incremental value-add in the explanatory power of ESO with the role played by collaborative organizational learning as an additional capability of the organization.

Next, we test the most comprehensive framework in which organizational relationship capital is mediated by both collaborative organizational learning and collaborative innovative capacity to investigate the cumulative and incremental effect of deploying all dynamic capabilities considered in this study.

Research Model 3: ORC as a Driver of ESO, Mediated by COL and CIC

In the context of model 3, Figure 5 shows the standardized parameter estimates, using the estimation data set 1 (n=225) for the best fit (initial) model. The factor loading for the relationship between Organizational Relationship Capital and Collaborative Organizational Learning is 0.63, with 64% of the variance explained for your learning, and 39% of the variance explained for the partners' learning (the two sub-constructs of collaborative organizational learning).

Insert Figure 5 about here

Results of the validation study using data set 2 (n=224) are displayed in Figure 6. The fit indices for both the initial and validation studies are summarized in Table 4.

Insert Figure 6 about here

Insert Table 4 about here

The factor loading for all the paths in the matching validation study were statistically significant at the 0.05 level, except for the causal path from Organizational Relationship Capital to Collaborative Innovative Capacity. This was in contradiction with the initial study findings.

The Bollen-Stine p -value was applied to test the overall model fit, and corrected standard errors of the parameter estimates show statistically significant path coefficients (Nevitt & Hancock, 2001). Using the procedure by (Cumming & Finch, 2005), it was concludes that hypothesis H1c, or the Organizational Relationship Capital to Collaborative Innovative Capacity path, was not supported.

The mediation and cumulative effect of dynamic capabilities of Collaborative Organizational Learning and Collaborative Innovative Capacity in explaining the incremental increase in R^2 value of the dependent variable service innovation (ESO) is evident, as summarized in Table 5.

Insert Table 5 about here

From our analysis of the three postulated research models, there is a pronounced cumulative and incremental effect of deploying additional dynamic capabilities in the creation and delivery of ESO. Results of the postulated research hypotheses are summarized in Figure 7.

Insert Figure 7 about here

This research study demonstrates for organizations and managers alike, the ability to magnify and take advantage of cumulative effects of various strategic and operational dynamic

capabilities in delivering ESO's. The key outcome being that the concerted efforts of partners are core to innovation. Additionally, managers need to understand the importance and value of co-creation, intertwined processes and interdependencies resulting in cumulative knowledge assimilation and creation processes, in combination with the deployment of higher order capabilities, and whether they captured innovative ideas for implementation at a later stage. Subsequently, the managerial focus needs to be centered on skill and human capital development, and values and practices underpinning workplace culture.

Next, theoretical and managerial implications from the study findings are discussed.

THEORETICAL AND MANAGERIAL IMPLICATIONS

This research provides the magnifying and cumulative effect of different DC's, thus a method for quantification and measurement of DC's and their impact on firms' innovation outcomes. This research contributes to strategic management theory, innovation theory and DC theory by providing a framework/tool for assessing capabilities and their impact on firms competitive positioning through its DC building to enhance service innovation. In particular, this research shows that the relationship between ORC to ESO is fully mediated by the COL and CIC capabilities, congruent with several empirically supported studies which have demonstrated the key role of collaboration, learning, and innovative capacity in small firms and supply chains (de Jong et al., 2003; de Jong & Marsili, 2006; Douglas & Fredendall, 2004; Panayides & So, 2004; Perks, 2004).

Managerial implications of these research findings are profound. Collaborative Organizational Learning and Collaborative Innovative Capacity are important capabilities to be

developed, fostered and utilized. In our study, Organizational Relationship Capital leads to *learning and knowledge assimilation* on *both* sides of the partnership (*your* learning and the *partner's* learning), and not just one partnering organization. This is consistent with the collective application of knowledge leading to significant improvements in services (Leiponen, 2005). Managerially, in the context of service networks, this means that *new knowledge is created through the conversion of tacit and explicit knowledge, and establishment of new connections with other partners*. Knowledge and learning is the currency for innovation, thus the effect of COL on CIC is significantly enhanced through socialization and collaboration, leading to creativity, enhancement of innovation and competitive advantage.

Furthermore, our empirical evidence demonstrates the evolutionary process and the key role dynamic capabilities of ORC, COL and CIC collectively play in *improving service network effectiveness* through the cumulative and mutual effects of various distinct capabilities. Managerially, our empirical evidence shows this takes place *through strategic innovations, as well as operational efficiencies via productivity and performance improvements*, our notion of an elevated service offering (ESO).

Importantly, the research findings open up pathways of how managers can better understand the use of organizational processes and capabilities involved to facilitate innovative outcomes within collaborating service organizations. While most recent studies deal with the structural aspects and nature of dynamic capabilities, our research demonstrates the increasing percent of variation in the service innovation outcome explained by the gradual deployment of learning and innovative capabilities. Through quantification of their impact, our research findings show managers that there are *distinct cumulative and incremental* effects on service innovation by fostering *collaboration, bi-directional learning and knowledge sharing*, as well as

the ability to continuously *transform and orchestrate knowledge and ideas into new products, processes and systems.*

Henceforth, managers of service organizations need to *understand the underpinning benefits of true and effective collaboration.* Building trust internally with customers and suppliers, and engaging with them as well as collaborating with other external partners, are crucial to relationship capital building. Managers should focus on targeted skill and human capital development, and adopt practices that foster a workplace culture where orchestration of knowledge and learning is embedded in the organization's fabric. Irrespective, one could envision managerial scenarios where relationships with partners were either not established or managed effectively, with organizations held hostage by conflict management; or where not enough time or resources were invested in effective knowledge management, or existing ideas were not captured and/or potential ideas ignored. In such situations innovation is expected to be hampered, and more interestingly, nurturing specific capabilities as discussed will yield incremental and cumulative benefits towards reaping tangible innovation benefits.

CONCLUSIONS AND LIMITATIONS

This study illustrates that, as organisations increasingly collaborate, dynamic capabilities have a profound impact on service innovation in a service network. In particular, this research highlights the cumulative and incremental effects of organizational relationship capital, collaborative organizational learning, and collaborative innovative capacity to help create and deliver service innovation in a service network. The research has important managerial implications by demonstrating distinct cumulative and incremental effects on service innovation

by fostering collaboration, bi-directional learning and knowledge sharing, as well as the ability to continuously transform knowledge and ideas into new products, processes and systems.

This study also has its limitation in that empirical data were collected from a single large telecommunications service provider organization, and its partnering organizations. Future research may seek to collect data from the entire telecommunications industry sector and their partnering organizations, across other service sectors, or even any other partnering organizations where collaboration is pivotal to their success, in order to generalize and validate findings within and across industries.

Building on our research findings, future research may investigate which component of the knowledge management process ie. creation, storage, retrieval, transfer or application, is most pertinent or influential in increasing innovative capacity or service innovation outcomes. Further, longitudinal studies should be conducted to research the dynamics over time of dynamic capabilities on service innovation, as it takes time for people to attain, internalize, diffuse, adopt and employ new knowledge to produce innovative solutions. Therefore, influences of knowledge management on individual and organisational creativity and innovation may be significantly distinguishable only after some time has elapsed. Other future research could examine the consequences of network changes, such as how different actors (be they individuals, groups, or organizations) envision and manage the evolving agential properties of service value networks to achieve desired ends. Further, dynamic capability as discussed may be further investigated in the context of different firm size or firm ownership structures – be it small and medium enterprises, non-government, government, domestically owned, or multinational; or even emerging economies versus developed economies. Added to these, it would also be interesting to research how partnering firms belonging to a service value network may benefit individually – flow-on

effects of dynamic capabilities affecting individual firm capability building. Furthermore, it may be worthwhile to investigate what relative proportion of innovative outcomes are attributed to which partners' capabilities, eg the focal firm vs other partners in the service network. Another perspective worth considering could be how such service innovation process may pan out under different scenarios – eg. outsourcing, offshoring and internationalization strategies. Finally, prior research has indicated that the culture of a host country may influence workplace cultures and relationships (Kickul et al., 2004), prompting further studies on the cross-cultural dimension of dynamic capabilities in firms from different economies.

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TABLE 1:
SAMPLE DEMOGRAPHICS

<i>Characteristics</i>	<i>Data Set 1 (n=225)</i>		<i>Data set 2 (n=224)</i>	
	Count	Percentage (%)	Count	Percentage (%)
Employee Organization				
Parent	101	44.88	110	49.1
Parent Partner	55	24.44	42	18.75
Parent Supplier	21	9.33	13	5.5
Parent Customer	45	20.0	54	24.1
Intermediary	0	0.00	0	0.0
Other	3	1.33	6	2.6
Rank in Organization				
Staff member	64	28.44	74	33.03
Supervisor/Team Leader	14	6.22	12	5.35
Manager	95	42.2	80	35.71
General Manager, Managing Director	38	16.8	49	21.87
Group Managing Director, COO, CEO	4	1.77	3	1.33
Other	10	4.44	6	2.66

TABLE 2
RELIABILITY ANALYSIS

<i>Construct</i>	<i>Number of Items</i>	<i>Cronbach's alpha</i>
Organizational Relationship Capital	5	0.870
Collaborative Organizational Learning		
a. your organizational learning	4	0.813
b. your partner organizational learning	3	0.897
Collaborative Innovative Capacity	3	0.715
Elevated Service Offering		
a. strategic	5	0.828
b. performance	4	0.876
c. productivity	3	0.879

Taken from Agarwal & Selen (2009:449).

TABLE 3

**FIT INDICES SUMMARY FOR INITIAL AND VALIDATION STUDIES –
RESEARCH MODEL 2**

<i>Scale</i>	χ^2	<i>dF</i>	<i>Probability</i>	<i>CMIN/ DF</i>	<i>GFI</i>	<i>AGFI</i>	<i>TLI</i>	<i>CFI</i>	<i>RMSEA</i>	<i>RMR</i>	<i>CAIC</i>
Acceptable Level for Excellent Fit			p>0.05 BSP=>0.05	Up to 3	>0.95	>0.95	>0.95	>0.95	<0.05	<0.05	
Acceptable Level for Reasonable Fit			p≥0.05 BSP≥0.05	Up to 5	≥0.90	≥0.90	≥0.90	≥0.90	≤0.10	≤0.10	
Initial Study	18.610	8	p=0.017	2.326	0.973	0.929	0.944	0.970	0.077	0.0377	102.018
Validation Study	23.789	8	p=0.002	2.974	0.965	0.907	0.944	0.970	0.094	0.0449	107.141

TABLE 4

**FIT INDICES SUMMARY FOR INITIAL AND VALIDATION STUDIES –
RESEARCH MODEL 3**

Note: * RMSEA slightly higher than the generally accepted value for satisfactory fit of 0.1(Browne and Cudeck, 1989)

<i>Scale</i>	χ^2	<i>dF</i>	<i>Probability</i>	<i>CMIN/DF</i>	<i>GFI</i>	<i>AGFI</i>	<i>TLI</i>	<i>CFI</i>	<i>RMSEA</i>	<i>RMR</i>	<i>CAIC</i>
Acceptable Level for Excellent Fit			p>0.05								
Acceptable Level for Reasonable Fit			BSP=>0.05	Up to 3	>0.95	>0.95	>0.95	>0.95	<0.05	<0.05	
			p≥0.05								
			BSP≥0.05	Up to 5	≥0.90	≥0.90	≥0.90	≥0.90	≤0.10	≤0.10	
Best Fit Initial Study	19.473	12	p=0.078	1.622	0.976	0.945	0.973	0.984	0.053	0.0313	122.131
Best fit Validation Study	29.150	12	p=0.004	2.429	0.965	0.918	0.951	0.972	0.080	0.0450	131.736
			BSP=0.104								
Matching Fit Validation Study	41.233	12	p<0.001	3.427	0.951	0.885	0.917	0.953	0.105*	0.0668	143.820
			BSP=0.010								

TABLE 5

**CUMULATIVE AND INCREMENTAL EFFECT OF DYNAMIC CAPABILITIES -
INCREMENTAL INCREASE IN R² VALUE OF THE DEPENDENT VARIABLE ESO**

<i>Research Model</i>	<i>R² Value of ESO across initial and validation study</i>	<i>Additional Higher Order Dynamic Capability(ies) included</i>
Research Framework 1	0.21/0.27	Organizational Relationship Capital
Research Framework 2	0.35/0.40	Collaborative Organizational learning
Research Framework 3	0.63/0.47	Collaborative Innovative Capacity

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FIGURE 1

**FULL RESEARCH MODEL (MODEL 1, 2 & 3 COMBINED):
ORC TO ESO MEDIATED VIA COL AND CIC**

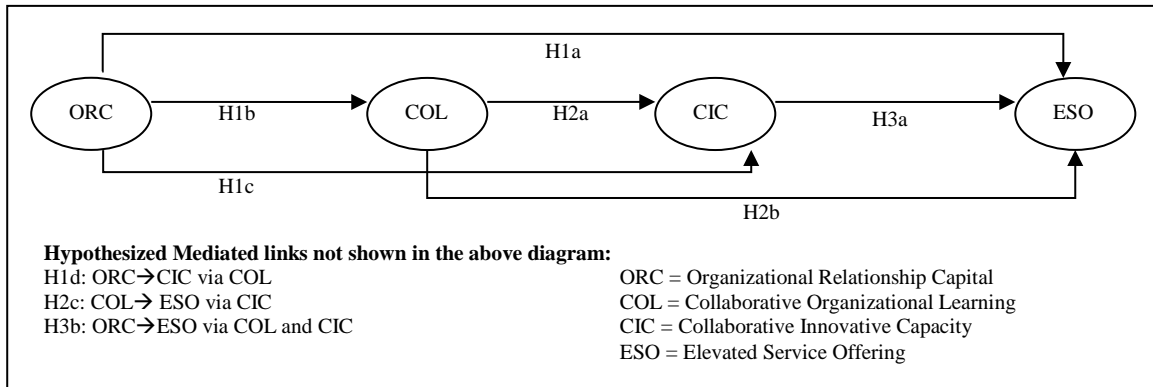


FIGURE 2

RESEARCH MODEL 1 – INITIAL AND VALIDATION STUDY

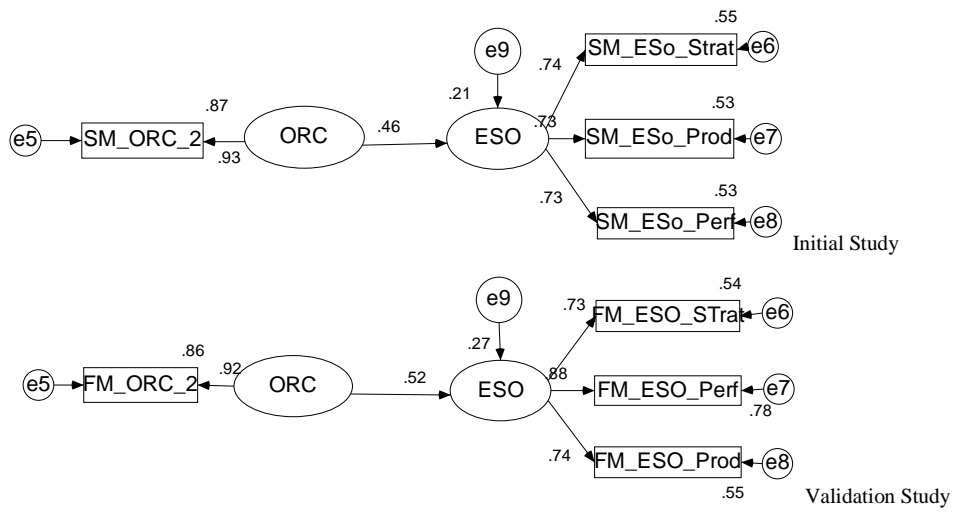


FIGURE 3
RESEARCH MODEL 2 - INITIAL STUDY

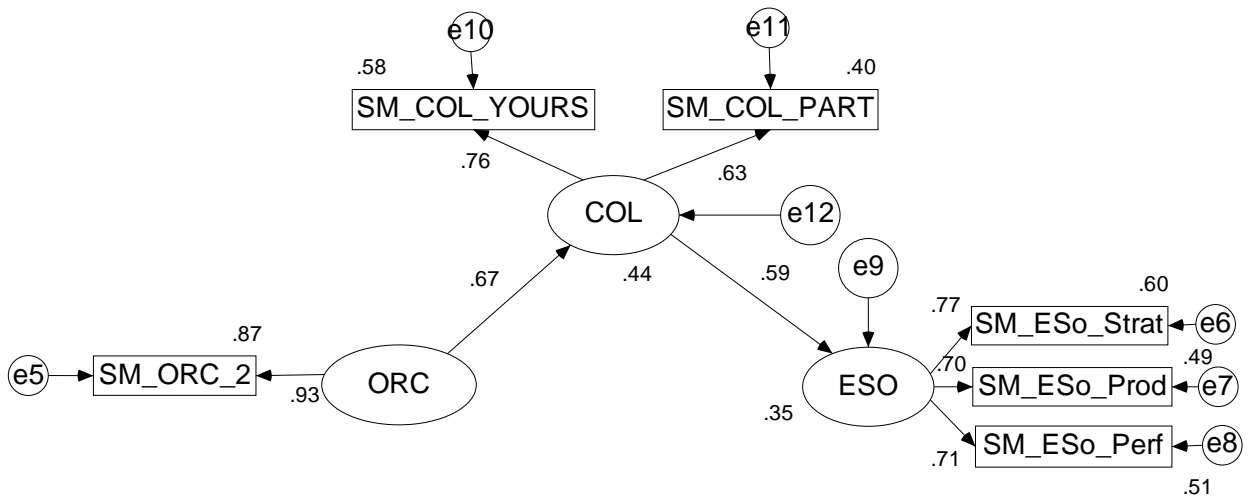


FIGURE 4
RESEARCH MODEL 2 - VALIDATION STUDY

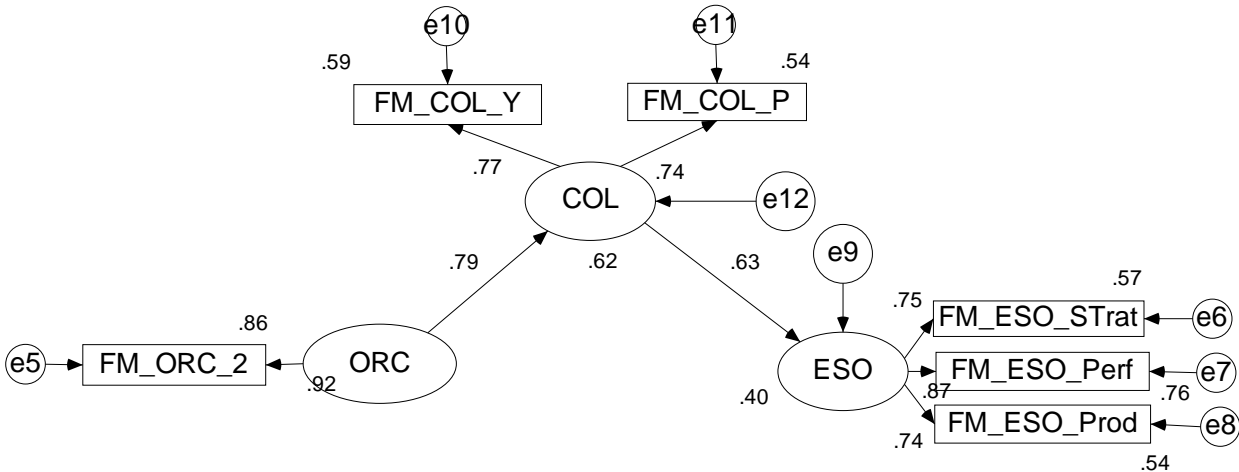


FIGURE 5
RESEARCH MODEL 3 - INITIAL STUDY

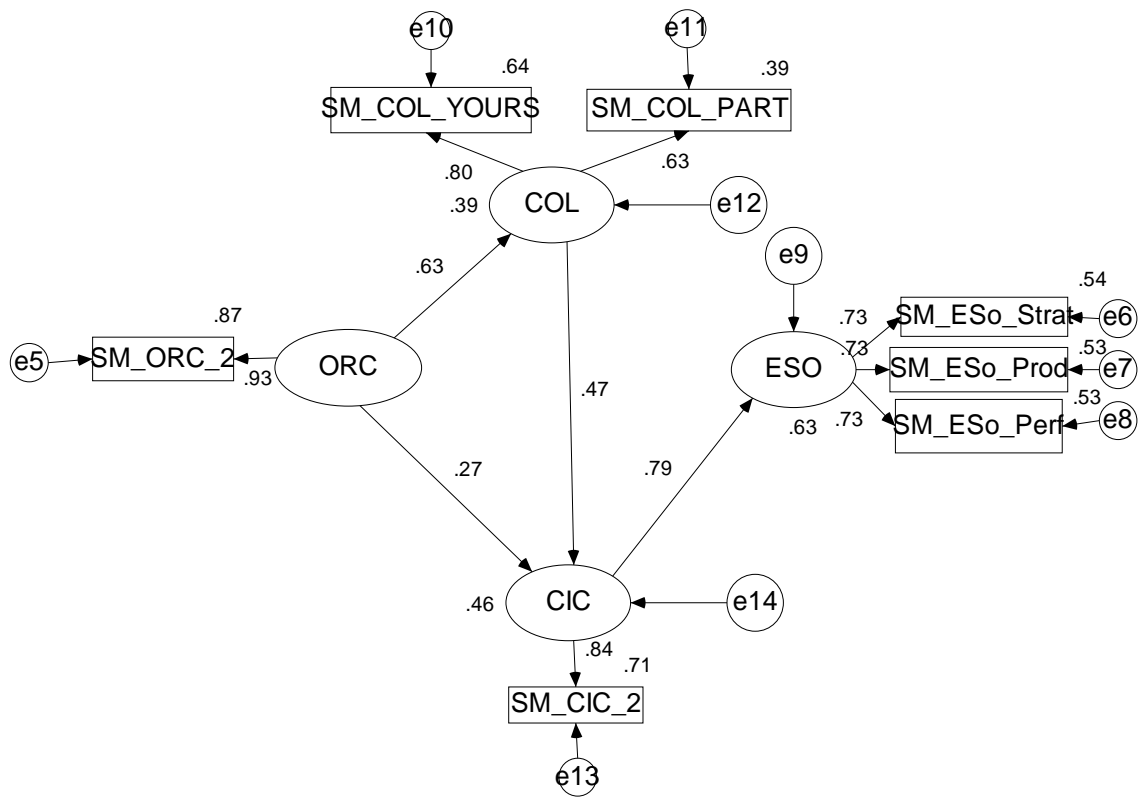


FIGURE 6
RESEARCH MODEL 3 - VALIDATION STUDY

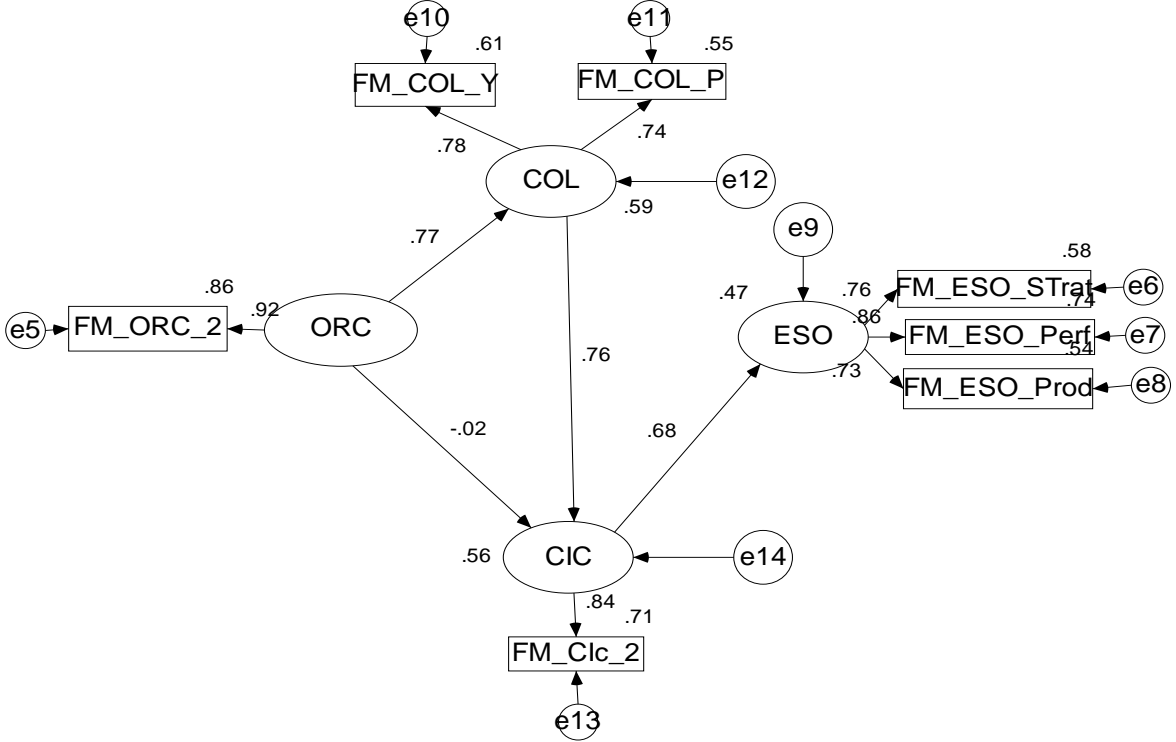
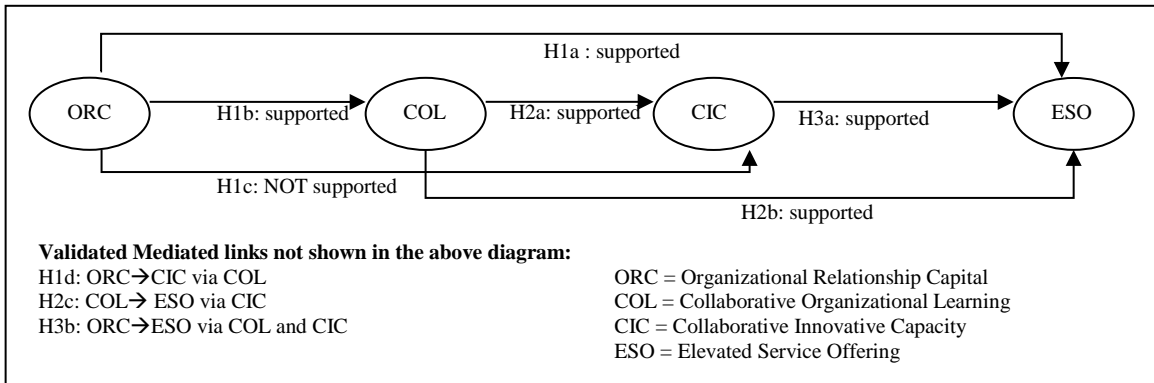


FIGURE 7

RESEARCH HYPOTHESES RESULTS



APPENDIX A

CONSTRUCT MEASUREMENT AND CFA RESULTS

(Note: Scales comprising of final items only are reported here. Scales were initially developed using EFA, and confirmed using one factor congeneric modeling using CFA. Items dropped during EFA and CFA are not reported here.) Taken from Agarwal & Selen (2009).

DYNAMIC CAPABILITIES	Factor Loading
Organizational Relationship Capital	
There is close, personal interaction between the partners at multiple levels	0.67
The collaboration is characterized by mutual respect between the partners at multiple levels	0.82
The collaboration is characterized by mutual trust between the partners at multiple levels	0.87
The collaboration is characterized by high reciprocity among partners	0.81
Once we establish collaborative arrangements we develop long term relationships	0.50
Fit Measures: $\chi^2=13.933$, $n=224$, $df=5$, $CMIN/DF=2.386$, $p=0.016$, $BSP=0.121$, $GFI=0.976$, $AGFI=0.928$, $TLI=0.965$, $CFI=0.982$, $RMR=0.0326$, and $RMSEA = 0.090$	
Note: ORC was a single factor construct in final configuration	
Collaborative Organizational Learning	
Collaborative Organizational Learning - Yours	
Your organization has learned or acquired new or important information/knowledge from the partner including weakness, strength, gaps and discontinuities	0.63
Your organization has learned or acquired new critical capability or skill from the partner	0.85
Your organization has enhanced its existing capabilities/skills as a result of the partnership	0.82
Working with partners increases our contextual capability and knowledge	0.58
Fit Measures: $\chi^2=6.224$, $n=224$, $df=2$, $CMIN/DF=3.112$, $p=0.045$, $BSP=0.101$, $GFI=0.986$, $AGFI=0.932$, $TLI=0.959$, $CFI=0.986$, $RMR=0.0296$, and $RMSEA = 0.097$	
Collaborative Organizational Learning - Partners	
The collaborative arrangement has helped the partner learn or acquire new critical capability or skill	0.82
The collaborative arrangement with the partners has helped the partner acquire new or important information/knowledge including weakness, strength, gaps and discontinuities	0.89
The collaborative arrangement has helped the partner enhance their existing capabilities/skills	0.84
Fit Measures: $\chi^2=2.009$, $n=224$, $df=2$, $CMIN/DF=1.004$, $p=0.366$, $GFI=0.994$, $AGFI=0.982$, $TLI=1.000$, $CFI=1.000$, $RMR=0.0115$, and $RMSEA = 0.004$	
Collaborative Innovative Capacity	
There is always a continuous and plentiful supply of good ideas from partners and customers	0.56
We collaboratively come up with novel and interesting ideas when solving problems	0.78
Working in collaboration breaks perceptual and cognitive sets of information promoting lateral and fresh thinking	0.72
Fit Measures: $\chi^2=0.217$, $n=224$, $df=1$, $CMIN/DF=0.217$, $p=0.641$, $GFI=0.999$, $AGFI=0.996$, $TLI=1.017$, $CFI=1.000$, $RMR=0.0072$, and $RMSEA = 0.000$	
SERVICE INNOVATION-ESO	
The elevated service offering through partnership results in	
Strategic ESO	
• A new service offering	0.55
• A new customer encounter interface	0.77
• A new operating structure	0.79
• A new service delivery process	0.74
• An increase in the service attributes of an existing service offering	0.66
Fit Measures: $\chi^2=16.987$, $N=224$, $DF=5$, $CMIN/DF=3.394$, $P=0.005$, $BSP=0.121$, $GFI=0.970$, $AGFI=0.911$, $TLI=0.938$, $CFI=0.969$, $RMR=0.0366$, AND $RMSEA = 0.104$	

Operational ESO – Performance

- | | |
|--|------|
| • an increase in the level of service customization | 0.66 |
| • an improvement in level of customer satisfaction | 0.84 |
| • an increase in level of customer retention | 0.89 |
| • an increase in memorable service experience of customers | 0.81 |

Fit Measures: $\chi^2=2.507$, $n=224$, $df=2$, $CMIN/DF=1.253$, $p=0.285$, $GFI=0.994$, $AGFI=0.972$, $TLI=0.997$, $CFI=0.999$, $RMR=0.0133$, and $RMSEA=0.034$

Operational ESO – Productivity

- | | |
|---|------|
| • a reduction in service delivery lead times | 0.83 |
| • an increase in on-time delivery of services | 0.86 |
| • a reduction in customer waiting time | 0.83 |

Fit Measures: $\chi^2=0.003$, $n=224$, $df=1$, $CMIN/DF=0.003$, $p=0.957$, $GFI=1.000$, $AGFI=1.000$, $TLI=1.009$, $CFI=1.000$, $RMR=0.0004$, and $RMSEA=0.000$
