Multi-dimensional nature of service innovation – Operationalisation of the Elevated Service Offerings construct in collaborative service organisations

Structured Abstract (250 words maximum)

Purpose – Innovation in services is thought to be multi-dimensional in nature, and in this context this paper presents and operationalises the concept of "Elevated Service Offerings" (ESO) in collaborating service organisations. ESO stands for new or enhanced service offerings which can only be eventuated as a result of partnering, and which could not be delivered on individual organisational merit. ESO helps us expand our understanding of service innovation to include a service network or service system's dimension.

Methodology/approach – A Structural Equation Model is specified and estimated based on constructs and relationships grounded in the literature, as well as self-developed constructs, using empirical data from 449 respondents in an Australian telecommunications service provider and its partnering organisations.

Findings –Results show that ESO is a multi-dimensional construct which was operationalised and validated through an extensive literature review, Exploratory Factor Analysis, Confirmatory Factor Analysis, and Structural Equation Modelling using a holdout sample.

Research limitations/implications – Qualitative and empirical data analysis was undertaken with data collected from a single large telecommunications service provider organisation, and its partnering organisations. Future research may seek to collect data from the entire telecommunications industry sector and their partnering organisations, across other service sectors, or even any other organisation where collaboration is pivotal to their success.

Practical implications – Service organisations today need to understand that innovation in services is not just about process or product innovation, or even performance and productivity improvements, but in fact includes organisational forms of innovation. Indeed, the interactions and complementarities between the three different aspects of ESO – strategic, productivity, and performance, highlight the increasing complex and multidimensional character of innovation and the ongoing iterative process.

Originality/value – This research provides empirical evidence for the existence of a multi-dimensional innovation in services construct – known as elevated service offerings in a collaborative service network, along with an adapted definition of service and a service innovation model.

Keywords: service definition; service innovation; service value networks; elevated service offering; construct development, structural equation modelling.

Paper type: Research paper/ theoretical paper.

Introduction

Many recent studies highlight the need to rethink the way we manage innovation in services and regard them as an interplay of service concepts, service delivery practices, client interfaces and service delivery technologies (den Hertog, 2000; Miles, 2005). Furthermore, innovations in services are increasingly brought to the market by networks of firms, selected for their unique capabilities, and operated in a coordinated manner (Agarwal and Selen, 2011). Examples include real estate portals, online universities, IKEA's furniture assembly experiences, entertainment media tourism, streaming services via Amazon/Quicken websites, Telnor's twitter-integration in its customer support system, DnB NOR's online self-scaling banking services, Storebrand in the employment pension area, SMS and MMS communication genres, interactive advertising, among others. Furthermore, the context of services is changing with the creation of new services – commonly referred to as 'credence services' in the end-user segment and 'knowledge-intensive services' in the business segment, promoted by internal collaboration and external information sourcing (Leiponen, 2005).

To-date research on the impact of networks on service innovation has been very sparse. While earlier research has shown that entities (firms) within a network learn new knowledge to advance its competencies through interacting with each other (Gupta and Govindarajan, 2000; Ibarra, 1993), as well as enhance service innovativeness (Goes and Park, 1997); recent research by Lee et.al. (2009) suggests that large networks may, in fact, diminish service innovativeness. Furthermore, this latter study uses a calculated variable to measure the construct of service innovativeness, rather than a direct measure through survey data. This means that previous literature shows potentially contradictory views on the effect of networks on service innovativeness, while the construct of service innovativeness in a service network context has not yet been operationalised using direct survey data.

As such, the need arises to establish a well-defined and validated measure of service innovation or innovativeness in the context of such networks that can be used to gather further insight into the direction and significance of the impact of networks on service innovation. This study attempts to address this issue, and has three major objectives. First, it examines various perspectives in defining services as evident from

extant literature, and subsequently aims at presenting an integrated definition of services in the context of networks. A second objective is to achieve a better understanding of innovation in services that results out of working and collaborating in such networks, also referred to in the literature as 'service systems' (University of Cambridge Report 2008, p. 6) or service value networks (SVN) (Basole & Rouse, 2008; Agarwal & Selen 2005; 2009). Lastly, this study aims at empirically operationalising such service innovation construct in networks, denoted as elevated service offerings (ESO), to understand its underlying dimensions.

We make several contributions to the literature. First, we synthesize earlier service definitions and extend the work of Sampson and Froehle (2006) in presenting a co-produced dynamic capability and process-based view of service, applicable to today's service system organisational environment in the context of a service- and knowledge-based dominant economy. Second, we amend the model of service innovation of den Hertog (2000) as it applies to a SVN, based on technological and non-technological innovations in services, 'organisational innovation' and 'marketing innovation', as well as collaboration leading to frontier innovations in products and processes that are new to the market or the world. Third, we address the weakness of the earlier measurement of the service innovativeness construct as a calculated variable (Lee et.al., 2009) by operationalising the construct of services innovation (ESO) in a service value network context, using survey data. Fourth, while this latter work provided empirical evidence of the effect of networks on service innovativeness in a non-profit health care (hospital) network, demonstrating the diminishing effect of building large networks on service innovativeness; our research addresses service innovation in a large for profit service network (telecom), with contradicting findings as clear service innovations emerged while operating in a large telecommunications service network.

Hence, our research widens the ongoing discussion of the effects of operating in a network environment on service innovation through our notion of ESO.

The remainder of the paper is structured as follows: first, we present a review of relevant literature on networks in services and service innovation. These service networks are also referred to as service systems or service value networks. Next, we establish an integrated definition of services that applies in such networks. This in turn forms the basis

for a theoretical grounding for the construct of Elevated Service Offerings (ESO), which conceptualizes such service innovation. Subsequently, the justification of the research hypothesis is followed by an overview of the research design and methodology, research analysis, and results. Finally, conclusions are drawn, together with limitations of the study and suggestions for future research.

Literature review and theoretical background

Networks and Service Innovation

The study of networks and service innovation is far from new. It has been a topic of interest in many scientific fields. Previous research has demonstrated that "*innovation in service firms goes across firm and industry boundaries"* and is not limited to an individual firm. Along the value chain the borders between firms get blurred through outsourcing of service functions, through the use of networks of service professionals, and through mixed project teams in which client and contracting service firm co-produce solutions to problems. Technical engineering firms and ICT service firms mostly work jointly with clients to co-produce and sometimes co-innovate. Some service firms even have a reputation for a particular service function that is not directly seen as their core activity. For example, some competitive retailers are especially good at organising the logistics in the value chain, some banks are known for their ICT capabilities and some IT service companies are known for their innovative approach towards human resources management." (den Hertog et.al, 2003, pp. 444-445). Furthermore, "*In many service industries innovations originate from the firms themselves. In many industries, service firms are the main source of innovation. This is especially so for those cases where non-technological innovations are dominant -for example in the finance sector. But even then some of the technological innovations are still brought about by other service firms, such as technical engineering firms, IT services, and private research firms*." (den Hertog et.al, 2003, p.445).

"Service networks", "service systems" and "service value networks" have all been used interchangeably in the literature to denote networks of service partners and customers, whereby *Service Systems* are more specifically defined as "*dynamic configurations of people, technologies, organisations and shared information that create and deliver value*

to customers, providers and other stakeholders." (University of Cambridge Report, 2008, p 1). Agarwal and Selen (2005) provide a more detailed definition of a service network or service system, referred to as a *Service Value Network* or SVN, as follows: "A SVN is *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*." Conceptually, a SVN influenced by organisational and environmental drivers is all about building and fostering dynamic capabilities to yield a service innovation or "elevated service offering", one that can only result because of collaborative efforts of the service network partners, as illustrated in Figure 1. This study will use the latter SVN definition when referring to (service) networks.

Insert Figure 1

Networks have been documented as a major source of competitive advantage (Achrol and Kotler, 1999; Kogut, 2000). Strong ties to other organizations mitigate uncertainty and promote adaptation by increasing communication and information sharing (Kraatz, 1998). Through interacting with each other within a network, entities learn new knowledge to advance its competencies (Gupta and Govindarajan, 2000; Ibarra, 1993). Extant research has indicated that when entities are closely connected, they are motivated to share ideas and resources (Tsai, 2001; Uzzi, 1999). Synergistic benefits such as complementary knowledge can be developed through a connected set of entities (e.g.Gemunden et al., 1996; Rindfleisch and Moorman, 2001; Sparrowe et al., 2001). Through inter-organisational ties to pool knowledge, innovative outcomes can be improved. Furthermore, communication and cooperation can lead to significant reductions in total costs (Gavirneni, 2002), and also enhance service innovativeness (Goes and Park, 1997) (adapted from Lee et.al., 2009). Other research propagates innovation through

collaboration, where several enterprises work together in order to achieve mutual aims, and encourage close relationships among partners, who combine their core competencies efficiently and effectively to achieve mutual goals (stakeholders and end customer voice), – particularly in the ever-changing context of services (Bititci et.al., 2004). Further, according to Chesbrough (2003) and Enkel at al. (2009), innovation resided within the boundaries of a company, to become known as the closed innovation model. On the other hand, the open innovation model propagates that organisations should foster collaboration between internal employees and external stakeholders, and that they should also bring their in-house innovation activities to market. As such, involvement in customer, employee and customer/employee co-creation enriches the brand experience (Brodie et al., 2009), frontline employees become a source for both incoming ideas and innovation implementation (Cadwallader et. al., 2010), and co-creation (Vargo et al., 2008) typically focuses consumers co-creation of value in virtual environments (Fuller, 2010). As such, collaboration with different stakeholders is key for delivering new kinds of services in complex service networks.

In contrast, other prior research has suggested that strong ties may not necessarily produce positive outcomes (e.g. Krackhardt, 1999). When entities are so closely tied with each other, shared information and knowledge can create redundancy while not providing new insights (Granovetter, 1973; Rowley, 1997). In other words, strongly interconnected network members with shared beliefs often reach consensus, restricting the adoption of new services. Tied entities may also avoid conflict, to maintain their relationships, by not challenging each other (Fombrun, 1986). When ties are too strong, they limit networked entity's development of new ideas. This indeed hinders service innovativeness (Krackhardt, 1999). A recent study by Lee et. al. (2009) reported that, while small networks engaged in increased service innovativeness, it appeared that when networks got too large, service innovativeness diminished.

As such, the literature states contradictory views of the possible effects of service networks on service innovation. One reason could be how service innovativeness or service innovation is measured. A study conducted by Lee et.al. (2009) measured the service innovativeness construct as a calculated variable, and identified this as a weakness of their study: "*A final potential limitation was our use of calculated variables to measure*

the constructs of interest. Although using secondary data for unobserved variables can eliminate subjective biases from surveying informants, calculated variables are not free from measurement error. Future research could collect survey data from service providers to directly measure service innovativeness" (Lee et. al., 2009, p.403). Our research will address this issue by operationalising the construct of services innovation (ESO) in a service network context, using survey data.

Defining Services

Our study also contributes to our understanding of services in a service network setting by defining services in the context of a service- and knowledge-based dominant economy, as follows. Adapting from earlier definitions quoted by Sampson and Froehle (2006), Teboul (2006) and Vargo and Lusch (2006), and concurring with Crespi et al. (2006), "The Service System" combines the co-produced resource-based and process-based definition of service. The process-based definition of service by (Sampson and Froehle, 2006) defines the important role customers play in the service production process, with the key distinction being the customer providing the inputs, versus the customer themselves being the input to the service delivery process, as cited in (Teboul, 2006). In the resource-based definition, services are treated as an application of competencies, making use of knowledge, skills and experience of all stakeholders (employees and customer co-production), taking into consideration the notion of the supply chain and collaborators across both goods and services; (as adapted from Vargo and Lusch, 2006). Finally, co-produced services view customers as an integral part of service delivery as they are "transformed" or simply interact during the transaction, allowing the split of a front-stage and back-stage approach of a service at any point in the continuum, as adapted from (Teboul, 2006). Subsequently, based on the above, we present a co-produced dynamic capability and process-based view of service, applicable to today's service network environment, using the concepts of Service Providers (SP), known as Service Suppliers (SS) or other Goods Suppliers (GS) as defined by Sampson and Froehle (2006), and present this co-produced dynamic capability and process-based view of service in Figure 2.

Insert Figure 2

Service Providers (SP) are the prime providers facing the customer, with the customer as the supplier of inputs into the service provider processes, making the service process bi-directional. The SP can also engage with other service providers, known as Service Suppliers (SS) or other Goods Suppliers (GS), representing the bi-directional flow of inputs. In our context of service networks, service is defined as "*the application of competencies (knowledge, skills and experience) of the 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.*" This definition integrates key service characteristics and symptoms of services, along with partnerships, knowledge, skills and experience in an overarching framework.

Now that we have defined service in the context of a service network, and have adopted a clear definition of a service value network as our operating description of a service network, we turn to grounding the concept of service innovation in service networks.

Service innovation and elevated service offering (ESO)

Research on service innovation has expanded over the last decade, yet our understanding of service innovation is still limited, and as argued by Vang and Zellner (2005, p.148) "*needs to be broadened to adequately capture innovation in services*" through empirical studies that describe innovation in service networks. Indeed, the literature reveals several definitions of service innovation in the context of atomised organisations, but not in the context of collaborative networks.

Recently, Menor and Roth (2007) defined new service: "*as an offering not previously available to the firm's customers that results from either an addition to the current mix of services or from changes made to the service delivery process.*" Hence, their definition reflects dimensions of both service concept and service delivery innovations. This is consistent with earlier research by Edvardsson and Olsson (1996), who argue that service development can be broken down into three activities: service

concept development, service system development, and service process development. The service concept is the description of customers' needs and how these are to be satisfied. The service system represents the static resources required for the service. These consist of the service company's staff; the physical/technical environment; the organisation in terms of its structure and administrative support systems, and also customers themselves as these can be considered "co-producers". The service process is the chain of activities which must occur for the service to function.

Johne and Storey (1998) stated that enlightened companies now use networks of appropriate shapes and forms for achieving specific types of product developments. Networking was defined in the context of supplementing bureaucracy so that individuals can work together informally in teams often at a great distance. Kandampully (2002) extended the use of networks in service innovation to a network with customers and partners inside and outside the firm. He goes on to say that "the network of relationships renders the firm's capabilities "amorphous" in nature, and that this amorphous knowledge represents the true "resource" in a service firm, and ultimately provides the creative potential for "innovation", the so-called "core competency" (Kandampully, 2002, p. 18). The importance of such networks was stated earlier as: "*if customers require products or services that are not within the realm of a firm's core competency, the firm should find ways to procure those competencies – for the benefit of the customer- by creating strategic alliances both horizontally and vertically (internal and external relationships) with individuals and firms*" (Peppers and Rogers, 1997 in Johne and Storey, 1998, p. 22).

"Service innovation results when a firm is able to focus its entire energies to think on behalf of the customer- for an outcome that surpasses customers' present expectation of superior value." (Kandampully, 2002, p. 24). We denote such service innovation as "elevated service offerings", or ESO. In our context of partnering organisations**,** previous alliance literature and innovation literature has demonstrated that innovation in services is possible in several dimensions through increased productivity, improvement in performance, and new service offerings (Johne and Storey, 1998; Menor et al., 2002; Van der Aa and Elfring, 2002; Tidd et al., 2005; den Hertog, 2000; DTI, 2007, Kandampully, 2002).

In particular, focusing on dimensions of service innovation, den Hertog (2000) developed a service innovation model centered on four key elements of any service innovation, including Service Concept, Client Interface, Service Delivery System and Technological options. This four-dimensional service innovation model is adapted to serve as our framework for detailing the various dimensions of a service innovation or ESO as it may apply within a service network, and is shown in Figure 3.

Insert Figure 3

In particular, a completely new service will mean new features and attributes for a service offering. This changes the way employees work (delivery system), relate and interact with customers (client interface), and the way technology is used in business processes (technological options). Further, business services rely on knowledge, form key inputs in products or processes of other businesses, and often apply information and communications technology (ICT) to support the delivery process (den Hertog, 2000; Von Nordenflycht, 2010; Windrum and Tomlinson, 1999). In addition to ICT's impact on innovation, there are also non-technological service innovations to take into account (Kandampully, 2002), including new business models/concepts, new customer/delivery interfaces and new service-product offerings (Forfas, 2006; DTI, 2007; Voss and Zomerdijk, 2007). As such, the concept of service innovation should include organisational forms of innovation as well.

As such, we adapted the original service innovation model of den Hertog (2000) by modifying the fourth dimension from 'technological options' to 'organisational options' to reflect the wider setting of a service network. In our definition of organisational options, we allow for the ability to integrate and co-ordinate inter- and intra- organisational ICT systems, which enable flow of information, reach, and richness across partnering organisations.

Based on the above theoretical underpinnings within the context of a service network, we define ESO as:

a new or enhanced service offering which can only be eventuated as a result of a collaborative arrangement, one that could not otherwise be delivered on individual

organisational merits, and comprises of a new or modified service offering; new client interface/customer encounter; new service delivery system; new organisational architecture or marketing proposition; and/or improvements in productivity and performance through human resource management capabilities management.

The service offering is "elevated" beyond what is possible by the individual firm through collaborative efforts and/or expertise of the network partners. An example of ESO refers to a virtual critical-care (ViCCU) tele-health case study (Li et al., 2006) that helped ease emergency specialist shortages in regional Australia, and which operated in a service network setting. This business setting involved Commonwealth Scientific and Industrial Research Organisation (CSIRO), CentiE, and Sydney West Area Health Services as network partners, and deals with the support of critical-care services between a referral hospital and a rural hospital by transmitting very high-quality, real-time multimedia information, including images, audio, and real-time video, over an IP-based network. In the ViCCU case, the radical approach of treating emergency patients located remotely, especially in areas where the reach of appropriate emergency services was difficult to deliver in time, is an example of an ESO. Through the use of relationship management (patient, nurses, doctors, telecommunications company, CSIRO), knowledge management (the use of tacit and explicit knowledge of partners in coming up with the practical solution of this need), technology management (appropriate use of technology—Internet protocol (IP)–based network with excellent video quality), and process management (design of new resources, routines, and tasks and the integration with old practices through ICT systems and processes integration across partners), a new system was developed to deliver customised emergency hospital care.

In the above adapted framework, we can recognise strategic decision based elements, such as new or modified service offerings, new or modified customer interfaces, new service delivery processes and an expansion into new market segments and/or other industry sectors, arising as a result of collaboration with partners, something which was not possible on individual organisational merits. We believe that as organisations collaborate and form partnerships, it is the co-ordination and integration of the end-to-end processes, activities and routines that require inter- and intra- organisational alignment, as a result of which new operating structures and/or new delivery methods may emerge.

Decisions relating to new service offerings and service delivery methods, along with the simultaneous target reduction in transaction unit costs, are indeed interrelated, and are dimensions of the service strategy. These attributes are included as part of the strategic dimension of the service innovation, or *ESO-Strategic.* Performance related dimensions of service innovation include facets related to service customisation, utilisation of assets, demand capacity, customer satisfaction and service reliability, whilst productivity related dimensions, on the other hand, include characteristics pertinent to lead time associated with commercialising of service offerings, service delivery lead times, on-time delivery of services and customer waiting time. Both performance and productivity related dimensions will be denoted as the operational dimension of the service innovation, or *ESO-Operational.*

The Elevated Service Offering (ESO)-construct measures and service innovation dimensions have been taken from extant literature in designing the actual measurement items for operationalising ESO (Roth, 1993; Sharifi & Zhang, 1999; Goldman et al., 1999; Van Hoek, Harrison & Christopher, 2001; Swafford, Ghosh & Murthy, 2006; Heskett, Sasser & Hart, 1990; Verma & Young, 2000; Prajogo, 2006). Having grounded the ESO in the literature, our research question is discussed next.

Research question and research hypothesis

We postulate our research question as follows – *How can we operationalise an elevated service offering in a collaborative setting?*, and in this context we explore the concept of Elevated Service Offerings (ESO) at the strategic and operational levels.

In line with our definition of Elevated Service Offerings (ESO)**,** implying a new or enhanced service offering which can only be eventuated as a result of a collaborative arrangement, one that could not otherwise be delivered on individual organisational merits (Agarwal & Selen, 2009); we envisage ESO as a higher-order construct comprising of multiple dimensions (Goldstein et. al. 2002; Forfas 2006; Voss and Zomerdijk, 2007), including a new service offering, new organisational structure and service delivery mechanism, and productivity and performance improvements emerging as a result of collaboration. Accordingly, in line with den Hertog (2000) different aspects of ESO are likely to be interdependent and interrelated to each other. Not only that, these outcomes

may fundamentally engage some form of technological and/or non-technological innovations in services, which are emerging as a result of collaboration between partners and its effective management. Due to the inter-dependency and interrelations between constructs, (Agarwal and Selen, 2007) have envisaged two components, namely *ESO-Strategic* and *ESO-Operational.*

The *ESO-Strategic* component comprises of strategic decision based elements, such as new or modified service offerings, new or modified customer interfaces, new service delivery processes and an expansion into new market segments and/or other industry sectors, arising as a result of collaboration with partners, something which was not possible on individual organisational merits. We believe that as organisations collaborate, it is the co-ordination and integration of the end-to-end processes, activities and routines that require inter- and intra- organisational alignment, as a result of which new operating structures and/or new delivery methods may emerge. Decisions relating to new service offerings and service delivery methods, along with the target reduction in transaction unit costs, are interrelated, which are dimensions of the service strategy. These attributes are included as part of the ESO-Strategic construct, and are in line with the recent definition of services in the context of innovation in services (Menor and Roth, 2007).

We further defined the dimensions of ESO-Operational, as made up of *ESO-Performance* which includes facets related to service customisation, utilisation of assets, demand capacity, customer satisfaction and service reliability; and *ESO-Productivity* which includes characteristics pertinent to lead time associated with commercialising of service offerings, service delivery lead times, on-time delivery of services and customer waiting time. As such, ESO is postulated as a single higher order construct measured directly by three indicator variables: *ESO-Strategic, ESO-Productivity* and *ESO-Performance*. Therefore, our research hypothesis is stated as:

> ***H1:*** *ESO is a higher-order construct made up of three sub-constructs, namely ESO-Strategic, ESO-Performance and ESO-Productivity.*

In particular, based on prior research we are expecting to find empirical evidence for service innovations defined within the ESO framework that comes about as a result of

working in a service network. It is important to note that no actual measurement items for operationalising service innovation or ESO in a network setting have been reported in the literature, and accordingly will be newly developed. As such, our research will involve an exploratory phase to explore the items to be used, followed by a confirmatory phase to validate these items for operationalising ESO.

Research design and methodology

The research methodology and research design are depicted in Figure 4:

Insert Figure 4

Questionnaire design

Based on relevant management literature described earlier, the theoretical framework of an ESO was proposed and the questionnaire was designed. The questionnaire was pilot tested via email to 79 employees belonging to a particular case study within a telecommunications service provider and its partnering organisations. The initial phase of this research employed qualitative methods to explore and demonstrate the existence of collaborative structures across partnering organizations through four case studies and convergent interviewing (Rao and Perry, 2003) to help address and identify issues in less researched areas, like the emerging phenomenon of ESO in collaborative environments. On average, 8-9 interviews per case-study were conducted with executives across all partnering organizations. Convergent interviewing showed that the intention to achieve outcomes which were innovative, better and faster, were the prime objectives behind the collaboration. The need for development of new constructs emerged as a result of the insights and findings from the case studies and convergent interviews. When there was any confusion, the wording of the question was modified. All measurement items of the ESO construct were measured using a 5-point Likert scale with “1” for “strongly disagree” and “5” for “strongly agree”. ESO was divided into strategic ESO, comprising of seven items, and ESO performance and ESO productivity, together measured by thirteen items as shown in Table 1.

Table 1: ESO Construct measures and questions used in analyses and their assigned codes

Construct Measure	*Variable/ Construct Reference Code*
Elevated Service Offering	***ESO***
The elevated service offering through partnership results in:	
Strategic ESO	
• a new service offering	ESOa
• a new customer encounter interface	ESOb
• a new operating structure	ESOc
• a new service delivery process	ESOd
• an increase in the service attributes of an existing service offering	ESOe
• an increase in the rate of new service offerings to the market	ESOf
• an expansion to new market segment and/or other industry sector	ESOt
Operational ESO –Productivity	
• a reduction in service delivery lead times	ESOh
• an increase in on-time delivery of services	ESOi
• a reduction in the time to commercialise new services	ESOg
• a reduction in service transaction costs	ESOq
• a reduction in customer waiting time	ESOj
Operational ESO – Performance	
• an increase in the level of service customisation	ESOk
• an increase in utilisation of facilities and assets	ESOl
• an improvement in service reliability	ESOm
• an increase in ability to meet demand capacity	ESOn
• an improvement in level of customer satisfaction	ESOo
• an increase in level of customer retention	ESOp
• an increase in brand image of your organisation	ESOs
• an increase in memorable service experience of customers	ESOr

Sampling and data collection

The survey instrument was pilot tested on 79 employees belonging to a major telecommunications service provider in Australia, and its partnering organisations. The main round online survey was circulated to an additional 1,717 individuals across the telecommunications service provider and its partnering organisations. The selection of participants was based on four case studies chosen during the qualitative stage, in addition to other identified major projects that also met the criteria as set out in the definition of ESO. This resulted in 380 valid and completed responses received, with a response rate of 22.13%. Out of these, approximately 31% responses were submitted by the partnering organisation, 22% by the customer organisations, and the remaining 47% by the parent telecommunications organisation. 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 Maximisation treatment (Little & Rubin, 1987; Graham, et.al., 1996) of missing data was used, resulting in a fully populated combined data set with 449 sample observations. The sample demographics are listed in Table 2.

Table 2: Sample demographics

Characteristics	***Data Set 1 (n=225)***		***Data set 2 (n=224)***	
	Count	Percentage (%)	Count	Percentage (%)
Employee Organisation				
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 Organisation				
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

Non-response and common method bias

Non-response bias is the difference between the answers given by non-respondents and respondents (Lambert and Harrington, 1990). The final round sample was split into two groups, one set comprising of responses received prior to sending the reminder, and the second set after the reminder email was sent. The early wave group comprised of 281 responses, while the late wave group comprised of 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. These results indicate 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. A triangulation research methodology was used, initially with a qualitative case-study method, which was underpinned by convergent interviewing; followed by quantitative analysis data preparation, measurement analysis, research involving EFA, and one-factor congeneric modeling for construct validation.

Data preparation

This research involves the development of several new constructs, and as such the research methodology required an exploratory phase. Gerbing and Hamilton (1996) and Anderson and Gerbing (1988) recommended a two-stage process in the exploration and validation of the factorial structure of questionnaire items. To enable this two-stage process, data set 1 (DS1) and data set 2 (DS2) were created in the ratio of 1:1, respectively. Data was collected across two stages – pilot and main round, which was then pooled in accordance to Joreskog (1971) findings - data can be pooled only if the underlying factor structures are similar, which is exhibited via a lack of significant differences between the covariance matrices for the two data sample sets. The variance-covariance matrices were seen as equivalent across the trial and final data sets. As such, the two samples were pooled resulting in a total of 449 sample observations. DS1 (n=225) was used for construct extraction during the EFA stage, whereas DS2 (n=224) was used for validation during the CFA stage using one-factor congeneric modeling.

In an attempt to get clean data for the purpose of quantitative analysis, and to overcome and minimise any statistical discrepancies, tests were conducted to view outliers, level of skewness, and kurtosis existing for each item and scale. “Bollen-Stine bootstrap p” (Bollen & Stine, 1992), a post-hoc adjustment to account for non-normality as advocated by (Holmes-Smith, Coote & Cunningham, E. 2005) when using non-normal data in SEM, was used to conduct a bootstrap modification of the model χ^2. Accordingly, an adjusted p-value is to be computed and the model is rejected if $p<0.05$. The number of bootstrap samples in this research study was set at 1000. Further, the item parceling technique was used to reduce the degree of non-normality in the data (Bagozzi & Heatherton, 1994; Bagozzi & Edwards, 1998). Hence, the parceled solutions are expected to provide better models of fit, and data are more likely to meet the underlying assumptions of SEM (Little, Cunningham, Shahar & Widaman, 2002). The data was randomly split in equal proportion (data set 1 (DS1); n=225 and data set 2 (DS2); n=224) to fulfill data requirements for subsequent EFA-, and CFA one-factor congeneric model and validation phases.

Reliability and validity

Prior to data collection, content validity was supported by previous literature, executive interviews, and pilot tests. After the data collection, a series of scale checks and analyses was performed to test the reliability, validity and unidimensionality of the constructs. The parameters for these constructs were tested at the original scale level (not reported) and the item parceled level (See Table 3 & 4) for DS1 and DS2 datasets, respectively.

Table 3: Means, Standard Deviations, and Inter-correlations for item parcels, DS1, n=225

Elevated Service Offering		ESO_strat	ESO_prod	ESO_perf
Elevated Service Offering - Strategic	P	(0.740)		
	Sig			
Elevated Service Offering - Productivity	P	**.526(**)**	(0.789)	
	Sig	0.000		
Elevated Service Offering - Performance	P	**.548(**)**	**.526(**)**	(0.876)
	Sig	0.000	0.000	
Notes: N=225, Value in parentheses on the diagonal are coefficient alphas for the respective parcels				
**Correlation is significant at the 0.01 level (2-tailed); *Correlation is significant at the 0.05 level (2-tailed).				
Mean		3.784	3.539	3.618
Standard Deviation		0.493	0.671	0.687
Skewness		0.458	-0.728	-0.483
Kurtosis		0.552	0.457	0.122
Scree test		1	1	1

Table 4: Means, Standard Deviations, and Inter-correlations for item parcels, DS2, n= 224

Elevated Service Offering		ESO_strat	ESO_prod	ESO_perf
Elevated Service Offering - Strategic	P	(0.828)		
	Sig			
Elevated Service Offering - Productivity	P	**.505(**)**	(0.879)	
	Sig	0.000		
Elevated Service Offering - Performance	P	**.654(**)**	**.668(**)**	(0.876)
	Sig	0.000	0.000	
Notes: N=224 Value in parentheses on the diagonal are coefficient alphas for the respective parcels				
**Correlation is significant at the 0.01 level (2-tailed); *Correlation is significant at the 0.05 level (2-tailed).				
Mean		3.790	3.545	3.633
Standard Deviation		0.549	0.731	0.675
Skewness		-0.051	-0.568	-0.378
Kurtosis		0.372	1.083	0.524
Scree test		1	1	1

The mean, standard deviation, kurtosis, skewness, and correlations for the item parceled scales for data set 1 and 2, are shown in Table 3 and 4, respectively. From the tables above, the inter-correlations between the item parceled scales provided discriminant validity evidence for the constructs under review as the correlation between variables was less than 0.75, as such items were parceled using domain-representative parcels as

indicators of higher-order constructs comprising of 2 or 3 parceled variables (Kishton and Widaman, 1994).

Table 5 lists the calculated Cronbach alpha value for the scales at various stages of the analysis: Cronbach's alpha value after the completion of internal consistency tests and Exploratory Factor Analysis (EFA), followed by Cronbach alpha values after the measurement instrument purification process in Confirmatory Factor Analysis (CFA). Table 4 above showed the Cronbach alpha values of the item parceled indicator variables shown on the diagonal axis of the inter-correlations of item parcels. The Cronbach alpha coefficient should be greater than 0.7 for the scale to be acceptable (Nunnally and Bernstein, 1967), and greater than 0.6 in the case of new constructs. Cronbach Alpha values for the ESO higher-level construct for both data sets in Table 5 indicate that all sub-constructs are reliable for this research (Nunnally, 1978).

Table 5: Scale Reliability and Descriptive Statistics

Scale	*Alpha Coefficient*	*Mean*	*Variance*	*Standard Variation*
Outcomes				
Elevated Service Offering as a three-factor construct – EFA				
Elevated Service Offering Strategic (7 items) – DS1	0.799	26.32	11.81	3.44
Elevated Service Offering-Performance (4 items) – DS1	0.876	14.47	7.56	2.75
Elevated Service Offering – Productivity (3 items) – DS1	0.789	10.62	4.05	2.01
Elevated Service Offering as a three-factor construct – CFA				
Elevated Service Offering Strategic (7 items) – DS2	0.844	26.31	13.60	3.69
Elevated Service Offering Strategic Revised (5 items) – DS2	0.828	18.95	7.54	2.75
Elevated Service Offering - Performance (4 items) – DS2	0.876	14.53	7.28	2.70
Elevated Service Offering - Productivity (3 items) – DS2	0.879	10.64	4.81	2.19

Construct Extraction and Validation

Recall that two data sets were used in the two stages of the construct development analysis. We followed the two-step method used in Narasimhan and Jayaram (1998) to test construct reliability, employing EFA to ensure unidimensionality of the scales, followed by Cronbach's alpha for assessing construct reliability. In the first stage, EFA using Maximum Likelihood extraction with oblique rotation with Kaiser normalisation was used to reduce the large set of items into a couple of bundled underlying variables using DS1; wherein items were deleted from consideration based on low communalities, low loadings on the construct, and or nuisance items (see Table 6). The loading factors were generally

in excess of 0.6 (Flynn, Schroeder & Sakakibara, 1994), however in the case of new factors values down to 0.3 may be acceptable (Hair, Anderson, Tatham, & Black, 1998; Cunningham, Holmes-Smith & Coote, 2006), which is why a number of factors which happen to be new in this context have been accepted at this stage of the analysis.

Table 6: Factor pattern coefficients for the three factors of Elevated Service Offering Scale

Items [a]	***Strategic (1)***	***Performance (2)***	***Productivity (3)***
The elevated service offering through partnership results in a new service offering	**0.440**	-0.167	-0.052
The elevated service offering through partnership results in a new customer encounter interface	**0.452**	-0.066	-0.022
The elevated service offering through partnership results in a new operating structure	**0.512**	0.053	-0.172
The elevated service offering through partnership results in a new delivery process	**0.572**	0.046	0.023
The elevated service offering through partnership results in an increase in the service attributes of an existing service offering	**0.727**	-0.108	0.157
The elevated service offering through partnership results in an increase in the rate of new service offerings to the market	**0.663**	-0.043	-0.084
The elevated service offering through partnership results in a reduction in the time to commercialise new services	**0.437**	0.064	-0.337
The elevated service offering through partnership results in an increase in the level of service customisation	0.320	**-0.502**	-0.024
The elevated service offering through partnership results in an improvement in level of customer satisfaction	-0.034	**-0.874**	0.015
The elevated service offering through partnership results in an improvement in level of customer retention	0.033	**-0.841**	0.010
The elevated service offering through partnership results in an increase in memorable service experience of customers	0.000	**-0.726**	-0.172
The elevated service offering through partnership results in a reduction in service delivery lead times	0.328	-0.099	**-0.468**
The elevated service offering through partnership results in an increase in on-time delivery of services	-0.017	-0.032	**-0.801**
The elevated service offering through partnership results in a reduction in customer waiting time	0.019	-0.136	**-0.657**
Factor intercorrelations			
Factor 2	-0.573		
Factor 3	-0.553	0.409	
Eigenvalue	**5.975**	**1.406**	**1.176**
Total Variance Explained		**61.117%**	

Note: [a] These item were measured using a 5-point Likert scale, with "1" for "Strongly Disagree", "5" for "Strongly Agree".

Subsequently, the responses from the second independent group of participants (DS2) were used in a series of 1-factor congeneric CFA analyses to empirically validate the three respective ESO constructs.

The final scale for ESO consists of three higher level constructs: Strategic ESO, Operational ESO – Performance, and Operational ESO – Productivity. These three

constructs so identified answer the question of what the elevated service offering through partnership results in, the items of each are respectively shown in Figures 5, 6 and 7.

Insert Figure 5

Insert Figure 6

Insert Figure 7

Each item of the scale is measured on a 5-point Likert scale, with "1" for "strongly disagree" and "5" for "strongly agree as identified earlier in Table 1.

As evident, discriminant validity and convergent validity were both tested, using CFA (O'Leary-Kelly and Vokurka, 1998). Data set 2 (n=224) was used to examine and validate the factor structure of the ESO construct, and showed both discriminant and convergent validity. Next, we report the model fit indices for the one-factor Congeneric models after CFA validation using DS2 dataset, which are listed in Table 7.

Table 7: Summary of the Fit Statistics for One-Factor ESO Congeneric Models – DS2

Scale	χ2	dF	Probability	CMIN/ DF	GFI	AGFI	TLI	CFI	RMSEA	RMR
Acceptable Level for Excellent Fit			p>0.05 BSP=>0.05	Upto 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
Elevated Service Offering										
Elevated Service Offering-Strategic (ESOa,b,c,d,e,f,g)	95.579	14	<0.001	6.821	0.893	0.787	0.790	0.860	0.162*	0.0722
Elevated Service Offering-Strategic Revised (ESO a,b,c,d,e,)	16.987	5	0.005 BSP=0.121	3.394	0.970	0.911	0.938	0.969	0.104*	0.0366
Elevated Service Offering-Performance (ESO-p,o,r,k)	2.507	2	0.285	1.253	0.994	0.972	0.997	0.999	0.034	0.0133
Elevated Service Offering-Productivity (ESOh,i,j)	0.003	1	0.957	0.003	1.000	1.000	1.009	1.000	0.000	0.0004

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

Table 8 summarises the statistical changes to the scale and the item code that make up the construct at each stage after EFA extraction and CFA validation. Further, it also shows changes to the original scales as they migrated from the EFA stage to the CFA one-factor congeneric stage.

Table 8: Summary of Changes to the Scales

Items	*EFA*	*CFA one-factor congeneric*
Elevated Service Offering-Strategic	ESO a,b,c,d,e,**f,g**	ESO a,b,c,d,e
Elevated Service Offering-Performance	ESO k,o,p,r	ESO k,o,p,r
Elevated Service Offering-Productivity	ESO h,i,j	ESO h,i,j

Note: Items shown in bold were deleted during the CFA stage.

After completing EFA and CFA, we carried out the task of item parceling. Based on the inter-correlations, items were parceled as indicators of higher-order constructs, each of which was used in the subsequent SEM analysis. Table 9 shows the respective latent variable names, whereas Table 10 and Table 11 shows that discriminant validity was maintained at the latent construct level.

Table 9: Map of Final set of Latent Constructs

Label	*Construct/Variable*	*Item Parceled/Latent Constructs (prefixed with SM /FM based on DS1/2)*
Elevated Service Offering (ESO)	Composite Scale of different categories of elevated service offering	- Elevated Service Offering (ESO_Strat) - Elevated Service Offering (ESO_Prod) - Elevated Service Offering (ESO_Perf)

Table 10: Discriminant Validity amongst Latent Constructs used for analyses for data set1

Constructs	*ESO*
SM_ESO_Perf	**0.687**
SM_ESO_Prod	**0.681**
SM_ESO_Strat	**0.756**

Table 11: Discriminant Validity amongst Latent Constructs used for analyses for data set1 and dataset2, respectively

Constructs	*ESO*
FM_ESO_Perf	**0.836**
FM_ESO_Prod	**0.709**
FM_ESO_Strat	**0.759**

At this stage we would like to note the following. Using higher order factor analysis, higher-order CFA's hypothesise that the moderate correlations amongst first-order latent factors (Operational ESO and Strategic ESO) might be better explained by a higher-order latent variable (ESO), wherein the Operational ESO first-order latent factor is measured by ESO_Performance and ESO_Productivity, respectively. The correlation between first-order latent constructs, Operational ESO and Strategic ESO, was found to be 0.8. However, this model was found to be under-identified, and as such this alternative model is not further reported on in this paper.

Next we present results and associated analysis.

Analysis and results

Based on the constructs defined in Tables 9 and 10 above, the ESO variable is measured by three indicator variables – ESO_Strat (Strategic ESO), ESO_Perf (ESO Performance), and ESO_Prod (ESO Productivity). Figure 8 shows the unstandardised parameter estimates for our research hypothesis H1. The arrows that link the latent variables of ESO to the observed variables are unstandardised factor loadings; for example, the factor loading for ESO_Strat is 0.36. Above each of the error terms (represented by circles) is the estimate of variance; for example, for ESO_Strat, the variance of error term (e10) is 0.11.

Insert Figure 8

Insert Figure 9

Further, Figure 9 above shows the standardised parameter estimates for hypothesis H1. The arrows that link the ESO latent variable to the observed variables are standardised factor loadings; for example, the factor loading for ESO_Strat is 0.74. Above each of the rectangles is the squared multiple correlations (SMCs) or the square of the variable's standardised loading; for example, it is estimated that the predictor for ESO_Strat explains 55% of its variance. Moreover, Table 12 shows that the regression coefficient is statistically significant at the 0.05 level for ESO_Strat, ESO_Prod, and ESO_Perf.

Table 12: Estimates of regression weights

		Estimate	***S.E.***	***C.R.***	***P***
SM_ESO_Perf	← ESO	.491	.035	13.920	***
SM_ESO_Prod	← ESO	.491	.035	13.920	***
SM_ESO_Strat	← ESO	.364	.034	10.869	***

The Model fit summary for data set 1 indicates an excellent fit ($\chi 2$=0.303, n=225, dF=1, CMIN/DF=0.303, p=0.582, GFI=0.999, AGFI=0.995, TLI=1.012, CFI=1.000, RMR=0.0074 and RMSEA =0.000). Next, we conducted a validation analysis using data set 2, which is summarised in Table 13. Further, Table 13 also summarises the results from both the initial and validation analyses.

Table 13: Summary statistics for initial and validation study

Scale	χ^2	*dF*	*Probability*	*CMIN/ DF*	*GFI*	*AGFI*	*TLI*	*CFI*	*RMSEA*	*RMR*	*CAIC*
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	
ESO Model Initial Study	0.303	1	p=0.582	0.303	0.999	0.995	1.002	1.000	0.000	0.0074	32.383
ESO Model Validation Study	3.523	1	0.061	3.523	0.990	0.938	0.970	0.990	0.106	0.0217	35.582

The results reveal a significant relationship between the variables and the latent construct, hence hypothesis H1 is supported. Furthermore, in both the initial and validated models, a strong relationship was found for the variable ESO, and the variables ESO_Strat, ESO_Perf and ESO_Prod that measured it, with standardised factor loadings that were reasonably high, and with significant relationships between the measured variables and ESO outcomes. This is shown in Figure 10 below. The regression coefficient is statistically significant at the 0.05 level for ESO_Strat, ESO_Prod, and ESO_Perf.

Insert Figure 10

Discussion and conclusions

ESO emerged as a three-dimensional construct comprising of multiple dimensions, which are interdependent and interrelated to each other, and demonstrated the managerial and organisational aspects of strategic and operational innovation in services. As such, managers of collaborative service organisation need to visualise innovations in services differently to traditional New Product Development and New Service Development processes, and the concept of innovation should be extended to include organisational forms of innovation. Indeed, the interactions and complementarities between the three different aspects of ESO – strategic, productivity, and performance, highlight the increasing complex and multidimensional character of innovation and the ongoing iterative process.

This study indicates that the notion of ESO is best described as a combination of productivity enhancements, performance improvements, service, process or organisational innovations, or even resulting in a simultaneous combination of all three ESO dimensions. By describing ESO as a three-dimensional construct comprising of multiple dimensions (Goldstein et al., 2002; Forfas, 2006), we encompass wider management and organisational aspects of strategic and operational innovation in services, which are interdependent and interrelated to each other, and are consistent with "*any service innovation involves some combination of the four dimensions of service innovation"* (den Hertog, 2000). This notion of ESO concurs with the dimensions of business model-, process/system-, and service product-innovations (Forfas, 2006; Voss and Zomerdijk, 2007), and as proposed by the iterative model of services innovation – product, process and business model innovation (DTI, 2007; Voss and Zomerdijk, 2007).

From a strategic perspective, this indicates that organisational or managerial innovation in services may relate to new operating structures, new service delivery methods including a new customer encounter interface, and incremental changes to existing service offerings or even a new service offering. The last two dimensions are consistent with the recent definition of new service development by Menor and Roth (2007), which includes the dimensions of service concept and service delivery system innovations.

From an operations perspective, both productivity and performance dimensions are integral to any existing or new service business operations. The dimensions of service customisation, and service experience, added with customer retention and customer satisfaction, are found to be very important. On the other hand, in an urge for operational efficiencies, SVN operating in tandem may result in a reduction in service delivery lead times, enhanced on-time delivery of services, and a reduction in customer waiting time.

Accordingly, service innovations align to a large extent with the theoretical models (Forfas, 2006; DTI, 2007; Voss and Zomerdijk, 2007), and are also in agreement with the value creation through collaboration in service supply chain and value networks (Pittaway et al., 2004). Our research has demonstrated that innovation in services in SVN, denoted as ESO, is now empirically validated as a multi-dimensional higher order construct.

As such, our research has contributed to theory as follows. First, we presented an integrated definition of service in the context of networks, second we modified the fourth dimension of the earlier service innovation model of den Hertog (2000) to include 'organisational options' to reflect the wider setting of a service network, and allow for the ability to integrate and co-ordinate inter- and intra- organisational ICT systems and processes, which enable flow of information, reach, and richness across partnering organisations. Thirdly, and most importantly, the construct of services innovation in a service network context, denoted as ESO, was empirically tested and was shown to be comprised of multiple dimensions related to a new service offering, new organisational structure and service delivery mechanism, and productivity and performance improvements that all emerged as a result of collaboration. Further, our research provides the first empirical evidence of measurement of service innovation in a service network through survey data from service providers and customers.

Limitations and future studies

Our research has its set of limitations. Firstly, a triangulation research methodology was used, initially with a qualitative case-study method, which was underpinned by convergent interviewing; followed by quantitative analysis data preparation, measurement analysis, research involving EFA, and one-factor congeneric modeling for construct validation. Additionally, the qualitative and empirical data analysis was undertaken with data collected from a single large telecommunications service provider organisation, and its partnering organisations. Future research may seek to collect data from the entire telecommunications industry sector and their partnering organisations, across other service sectors, or even any other organisation where collaboration is pivotal to their success. As such, future studies must strive to obtain responses from multiple sources, across industry sectors, different contexts and even span across-cultural boundaries.

Although the validity and reliability assessments showed strong support for the ESO construct as was developed, future studies may address the segregation of the multi-dimensional construct ESO, currently represented as one higher order construct divided into three discrete constructs: ESO_Strat, ESO_Perf and ESO_Prod. Such analyses may determine whether the three dimensions of ESO: strategic, productivity and performance

are mutually exclusive, and if they are, whether they manifest themselves in the same causal direction, or in different directions (trade-off amongst ESO dimensions).

Lastly, this research analysis was focused on collaborations related to operational and service delivery tasks in a telecommunications industry value network, whereas other collaborations in other private or public sectors may be just as important and of interest. Future research may consider the inclusion of separate assessments of collaborations across traditional supply chains. Of particular interest may be to examine a service organisation's operational innovation when organisations use different techniques of collaboration eg. outsourcing, subcontracting-in, and collaboration with other non-supply chain partners. In addition, the validity of the multi-dimensional nature of innovation in services can be tested and validated across different services.

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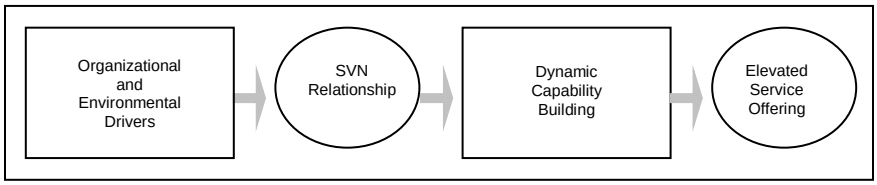

Figure 1: The Conceptual Service Value Network (SVN)

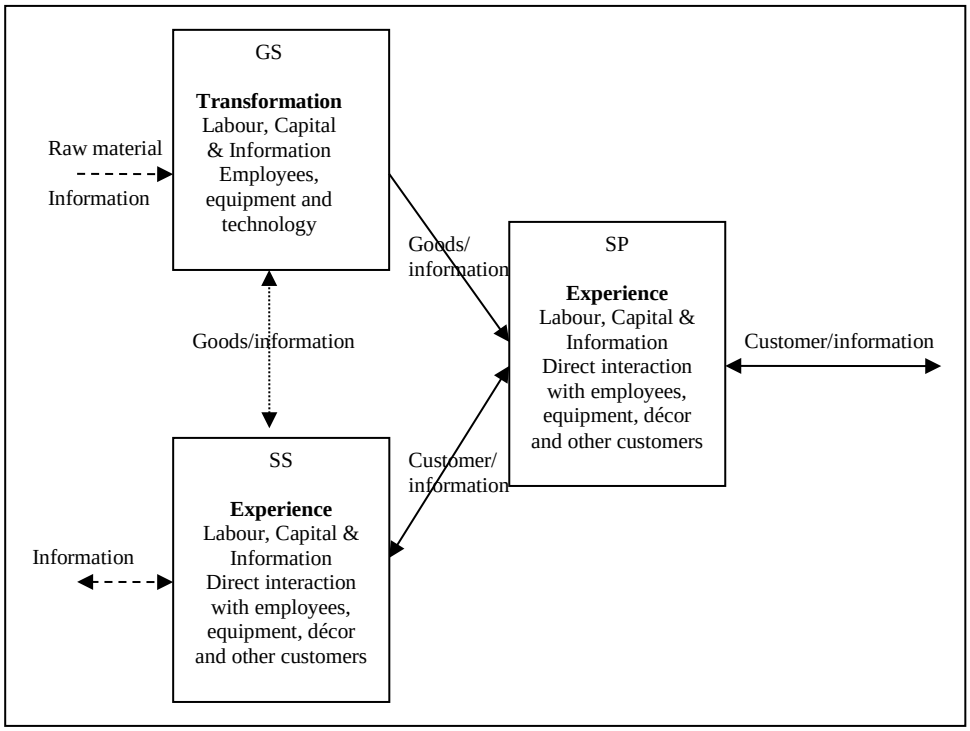

Figure 2: Co-produced resource-based and process-based definition of service as applicable in service networks – "The service system"

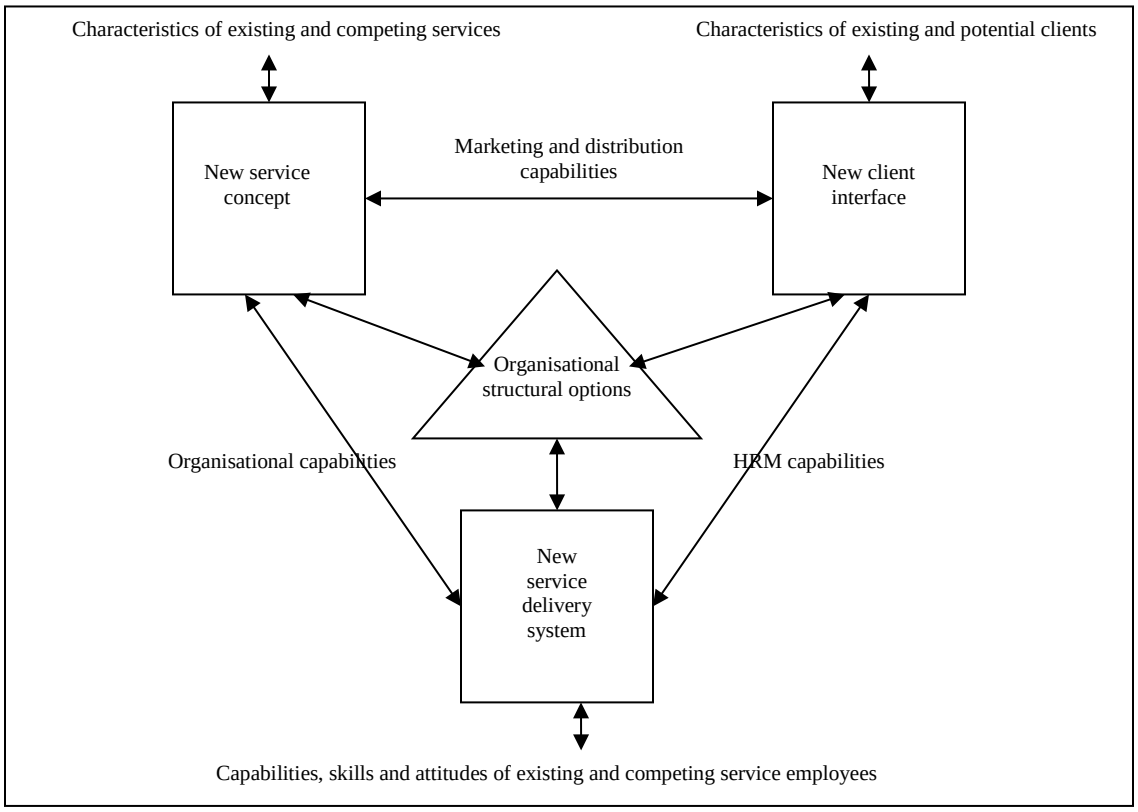

Figure 3: A four-dimensional model of service innovation in a collaborating environment (adapted from den Hertog, 2000)

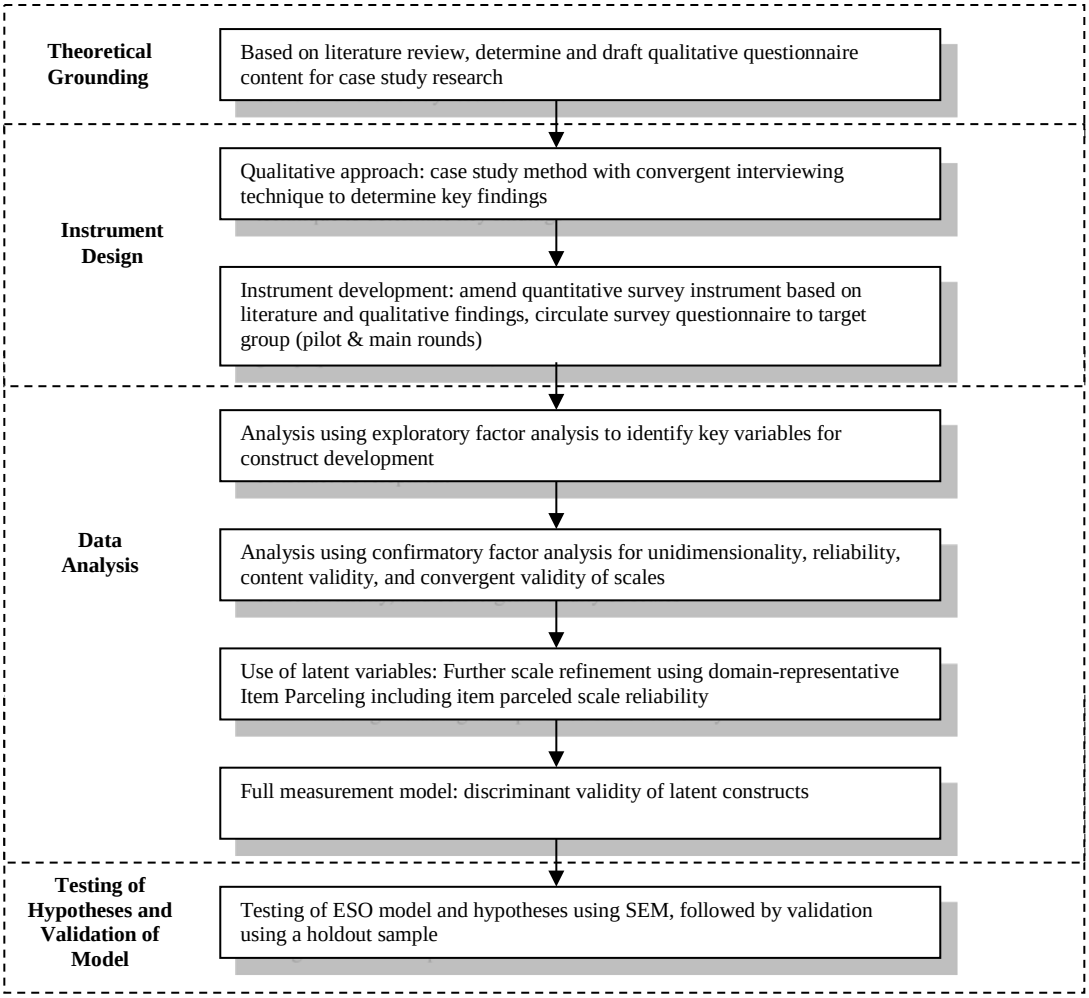

Figure 4: Research methodology and research design

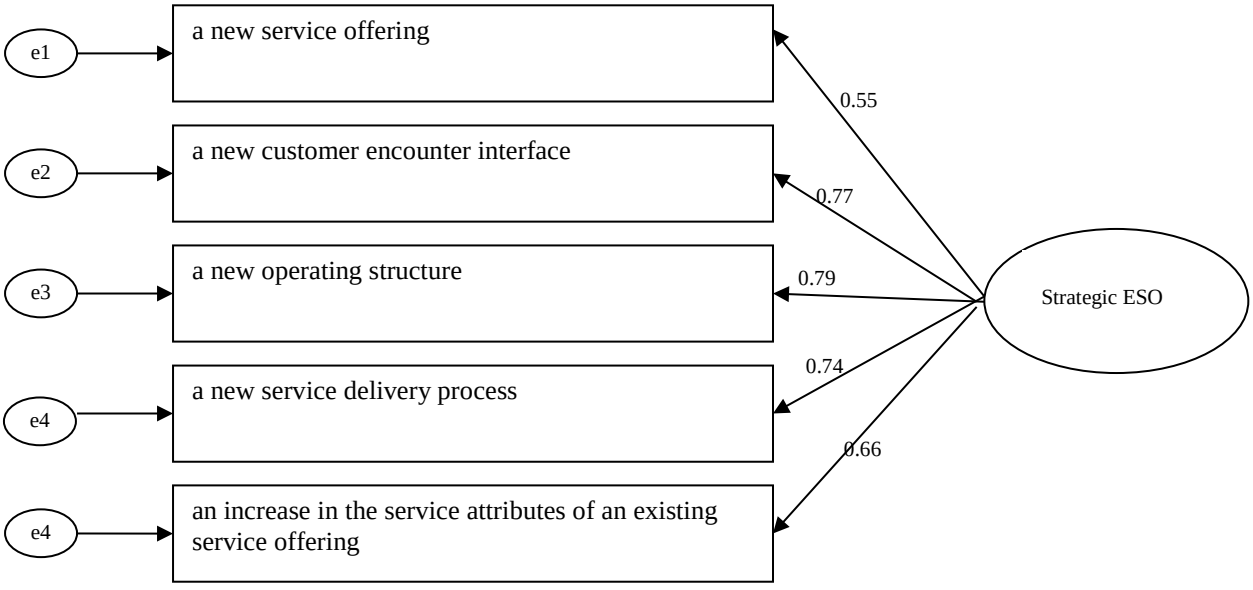

Figure 5: Final Scale Strategic ESO– One-Factor Congeneric Model

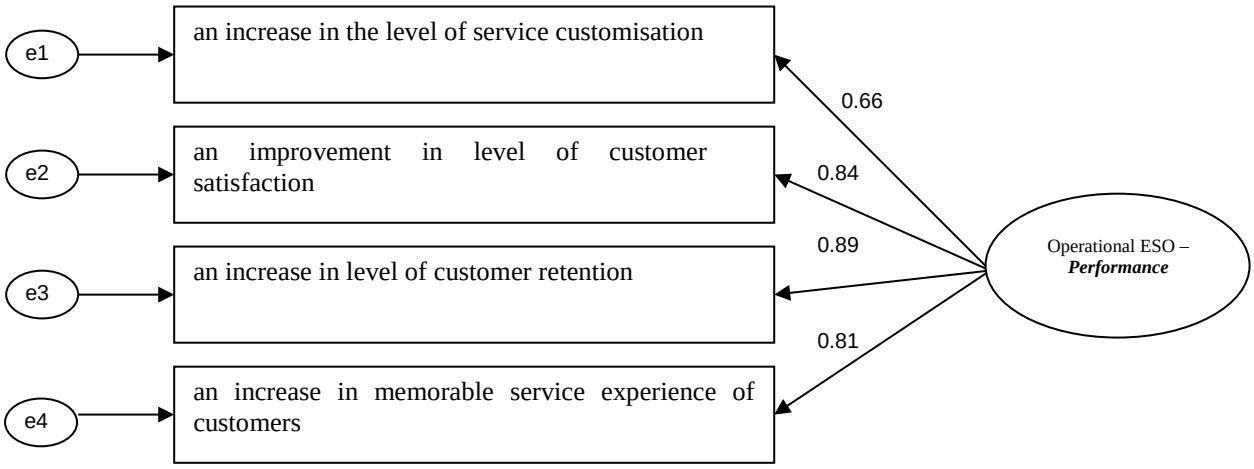

Figure 6: Final Scale Operational ESO_Performance– One-Factor Congeneric Model

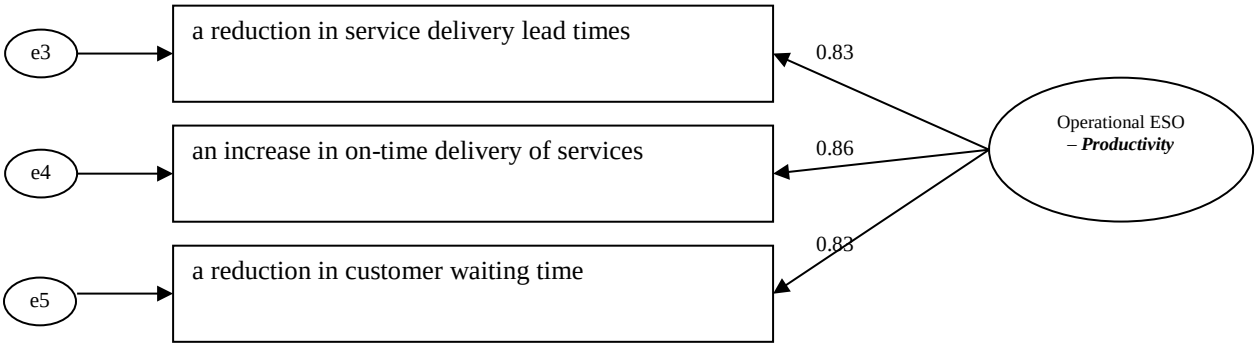

Figure 7: Final Scale Operational ESO_Productivity– One-Factor Congeneric Model

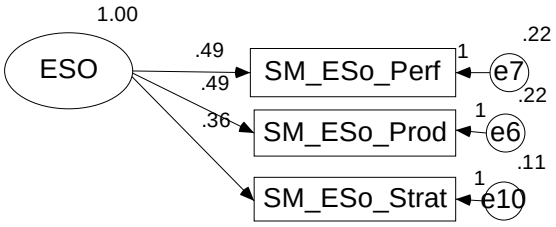

Figure 8: ESO Model – unstandardised

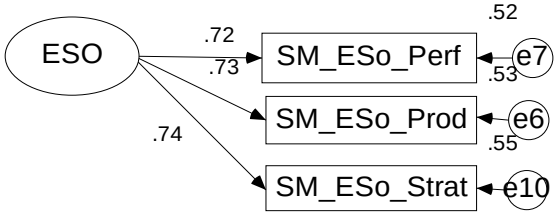

Figure 9: ESO Model – standardised

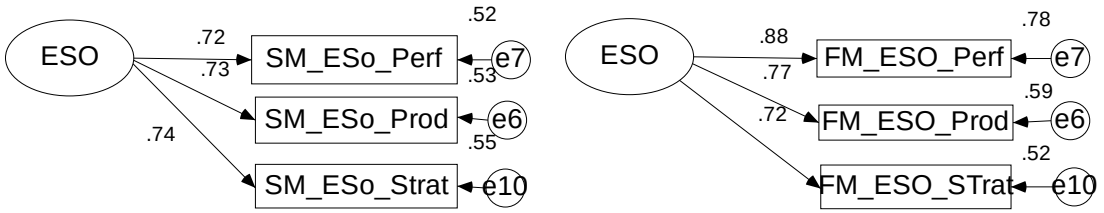

Figure 10: ESO Model: initial and validation study