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CONNECTIVITY IN SERVICE SYSTEMS

AN ANALYSIS OF TECHNOLOGY-ENABLED VALUE CO-CREATION PROCESSES IN THE CONSULTING INDUSTRY

by

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ABSTRACT

Interactions between service providers and customers were traditionally understood to occur through a physical interface. However, the advancement of Information and Communication Technology (ICT) has changed, and continues to change, the characteristics of these interactions. Today, service providers and customers increasingly interact through a virtual, rather than a physical, interface resulting in technology-enabled value co-creation processes, the central phenomenon investigated in this study.

Technology-enablement in service is an emerging reality around the world that academic research has not fully caught-up with. Early studies in service have predominantly focussed on face-to-face settings, and omitted technology-enabled value co-creation processes. Subsequent studies expand into technology-enabled contexts, yet these contributions tend to focus on the ICT alone and, just like their face-to-face counterparts, provide empirical insights from the perspective of either the service provider or customer. Consequently, this results in an incomplete account of technology-enabled value co-creation processes. Especially since scholars have called for prospective studies that focus on the human or relational dimension *and* the impact of ICT, all while including *both* service provider and customer in the inquiry.

This thesis presents the results of a qualitative multiple case study that empirically investigates technology-enabled value co-creation processes in the consulting industry. Each case consists of one, or a combination of consulting firms that engage by means of ICT with one, or a combination of customer firms, thereby providing the holistic outlook required. Furthermore, this study extends previous inquiries by providing a novel perspective through the connectivity metaphor as a socio-technical lens to analyse technology-enabled value co-creation processes. Connectivity is a multidimensional construct that allows assessing and comparing the relative importance of both ICT and the relational dimension for a service system's ability to co-create value.

This study develops two distinct models with sets of propositions that provide insight into the previously un-investigated socio-technical context of value co-creation. It argues that value co-creation is mainly a human interaction and the availability of ICTs in a service system do not influence human behaviour, goals or motivation regarding the value co-creation process. Consequently, this study concludes that the ability of a service system to co-create value is contingent on its human entities rather than ICTs that enable the interaction between them.

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LIST OF ABBREVIATIONS

AMWG	Asset Management Working Group
AUS	Australia
CAQDAS	Computer Assisted Qualitative Data AnalysiS
CAN	Canada
CLCS	Commission on the Limits of the Continental Shelf
CSP	Continental Shelf Project
DA	DeltaTech Associates
DF	DeltaFinance
F2F	Face-to-face
FIN	Finland
FP	Foundational Premise
GCT	Group Collaboration Technologies
GDL	Goods Dominant Logic
GDP	Gross Domestic Product
GER	Germany
GM	GammaMinistry
GSC	GammaScience Consult
IAMF	Infrastructure Asset Management Framework
IAS	International Accounting Standard
IHIP	Intangibility, Heterogeneity, Inseparability, Perishability
IM	Instant Message
ISPAR	Interact-Serve-Propose-Agree-Realize Model
ICT	Information Communication Technologies
IS	Information Systems
IT	Information Technology
JP	Japan
KPI	Key Performance Indicator
MB	Mega Bytes
NAICS	North American Industry Classification System
NZ	New Zealand
RQ	Research Questions
SC	Service Customer
SDL	Service Dominant Logic
SIC	Standard Industrial Classifications
SP	Service Provider

STP	Short Term Planning
TWI	Transparency Wrap-Up
UK	United Kingdom
UNCLOS	United Nations Convention on the Laws of the Sea
USA	United States of America
VC	Video Conferencing

1. INTRODUCTION

1.1 Background and Motivation of the Study

> *At one time, the belief was that services […] required direct interaction with customers [and that] service providers needed to be located where their customers were. This […] is no longer true because information technology has fundamentally changed the way many services are now designed and delivered.* (Davis, Spohrer, & Maglio, 2011, p. 1)

The 2009 Hollywood movie ‘Up in the Air’ portrays the life of Ryan Bingham, a management consultant who travels over 300 days each year in order to work with his corporate customers. The introduction of videoconferencing technologies in his firm is about to change his work-life from being based in airports and hotels to staying in one office and virtually communicating with his customers. The scenario displayed in this movie however, is not fictional but an emerging reality. Traditionally, interactions between service providers and their customers were understood to follow the notion of “high touch, low tech” (Bitner, Brown, & Meuter, 2000, p. 138), which implied the existence of a physical interface or customer touch-point (Bitner, 1990; Gadrey & Gallouj, 2002). Now, the advancement of Information and Communication Technology (ICT) has changed, and continues to change, the characteristics of these exchanges (Baym, Zhang, & Lin, 2004; Davis, et al., 2011; Edvardsson, Gustafsson, Kristensson, & Witell, 2010; Makarem, Mudambi, & Podoshen, 2009; Ostrom et al., 2010; Wünderlich, 2009).

Technology-enabled value co-creation, the central phenomenon investigated in this study, refers to interactions between service providers and customers where ICTs like video conferencing, teleconferencing, instant messaging or email enable interpersonal communication and exchange of resources that may resemble, and function as a substitute for, face-to-face (F2F) contact (Davis, et al., 2011, p. 4; Froehle & Roth, 2004). It is understood that a “traditional face-to-face service interaction” is increasingly “replaced by technology-based service encounters” (Edvardsson, et al., 2010, p. 566), meaning that customers and physically dispersed human service providers in service systems increasingly interact through a virtual, rather than a physical, interface (Froehle & Roth, 2004; Makarem, et al., 2009).

The consulting industry is, as portrayed in “Up in the Air”, an illustrative example for a knowledge-intensive service which requires close interaction with customers but experiences technology-driven changes. Researchers have argued that the need for physical contact as a mediator for customer input has, due to the unprecedented developments in ICT, become less relevant in this industry, and resulted in these service provisions beginning to shift into virtual realms (Lee & Park, 2009; Maglio & Spohrer, 2008; Sampson & Froehle, 2006). The strategy consulting firm Monitor Group demonstrates this phenomenon exceptionally well, and presents itself in reality as a vivid advocate for technology-enabled interactions with customers, while linking this practice to an improved work-life balance for prospective employees:

> Supported by information technology, we have adapted the manner in which we run our project teams [....]. Web conferencing and collaboration tools allow us to meet with clients around the world without leaving the office [....]. All this means that your work here can often fit around your life, versus the other way around. (Monitor, 2010)

While technology-enabled value co-creation and technology-enablement in service systems are emerging realities around the world, academic research has not fully caught-up with this development. Scholars have, for the past decade, criticised that service research has focussed predominantly on face-to-face settings and omitted technology-enabled exchanges between service providers and customers, thereby resulting in a gap in knowledge (Bitner, et al., 2000; Bowen, 2000; Brown, 2000; Chase & Apte, 2007; Lovelock & Gummesson, 2004). Consequently, “studies on the effects of customer-provider interaction […] are currently limited to services delivered via face-to-face encounters” (Wünderlich, 2009, p. 2). This implies a challenge for researchers and practitioners alike, since scholars argue that “guidelines for face-to-face services […] are only partially applicable to email” (Chase & Apte, 2007, p. 384) or other types of technology-enabled interactions (Froehle, 2006; Wünderlich, 2009). However, scholars, government institutions, and corporations are beginning to recognise the necessity to advance our understanding of the impact of technology-enablement on service (Bitner, Zeithaml, & Gremler, 2010; Blomberg, 2010; Chesbrough & Spohrer, 2006; Mott, 2010; Rust & Miu, 2006; Sheehan, 2006). A recent empirical study identified the role of ICT in service as a “pervasive force,” currently representing the key research priority within the service science research agenda (Ostrom, et al., 2010, p. 3).

1.2 Positioning the Study

Technology-enablement in service systems clearly changes the means by which service customers and providers interact and can therefore be perceived as a type of service innovation (Maglio & Spohrer, 2008). This conceptualisation is central to the debate amongst scholars who argued how the evident gaps in knowledge regarding the role of ICT in service can ideally be addressed. Central to the debate is the perception that previous studies, especially the ones conceptualising service and investigating service innovation, are conceptually and empirically insufficient (Michel, Brown, & Gallan, 2008; Ordanini & Parasuraman, 2011; Sebastiani & Paiola, 2010). Consequently, new means to investigate service innovation processes have been called for (Gallouj & Windrum, 2009) with the Service-Dominant Logic (SDL) (Vargo & Lusch, 2004, 2008a) believed to be able to significantly contribute to the advancement of the field (Chen, Tsou, & Huang, 2009; Michel, et al., 2008; Nam & Lee, 2010; Ordanini & Parasuraman, 2011).

The SDL represents a "novel and valuable theoretical perspective that unifies the conventional literature on innovation" (Nam & Lee, 2010, p. 1761). Service innovation is perceived as change to value co-creation processes, which are conceptualised as mutually beneficial interactions and exchanges of resources between entities of a service system (Chen, et al., 2009; Michel, et al., 2008; Nam & Lee, 2010; Ordanini & Parasuraman, 2011). While empirical studies linking the SDL and service innovation are rare, the design of such prospective studies is widely discussed. Central to this discussion is the call for more empirical qualitative work, especially in contexts where ICT drives such change in value co-creation processes (Chen, et al., 2009; Ordanini & Parasuraman, 2011; Sebastiani & Paiola, 2010). This is, evidently, believed to be the case "within professional service markets, such as consulting" (Payne, Storbacka, & Frow, 2008, p. 94), and researchers have argued that customers should be included in prospective studies (Chen, et al., 2009; Heinonen et al., 2010; Ordanini & Parasuraman, 2011). This study seeks to address the call for empirical work at the intersection of the SDL, service innovation and ICT by investigating technology-enabled value co-creation processes in the context of the consulting industry.

Most importantly though, scholars have argued that understanding technology-enabled value co-creation processes requires one to not only investigate the impact that ICT might have on service systems, but to equally explore the social or relational dimension underlying the exchange between entities (Edvardsson, Tronvoll, & Gruber, 2011; Makarem, et al., 2009;

Vargo, Maglio, & Akaka, 2008). Some researchers argue that the social underpinnings of human communication are potentially more important for successful value co-creation than technology enabling the interaction (Maglio, 2010; Ostrom, et al., 2010). Nevertheless, a significant empirical gap exists in regards to this specific approach when investigating technology-enabled value co-creation processes, because, as outlined previously, empirical insights predominantly exist in "face-to-face service encounters […] but not of service encounters involving *both* technology and the human touch" (Makarem, et al., 2009, p. 144).

In order to understand the socio-technical context of value co-creation, as well as the impact that technology-enablement may have on the ability of a service system to co-create value, this study extends the scope of previous inquiries by providing a novel perspective through the connectivity metaphor as an analytical lens on technology-enabled value co-creation processes (Angwin & Vaara, 2005; Kolb, 2008; Kolb, Collins, & Lind, 2008). Utilising connectivity is appropriate because it is a "useful lens through which to view and understand intra-and inter-organizational interactions" (Kolb, 2008, p. 138), and explicitly attempts to investigate the performance of a distributed workforce on social *and* technical levels (Kolb, et al., 2008). It therefore provides the socio-technical lens called for by Makarem, et al., (2009), Edvardsson, et al., (2011) and Vargo, et al., (2008).

Connectivity varies in its levels of intensity through various connective states that are contingent on the quality of the technical and social links between entities of a system (Janssen et al., 2006; Kolb, et al., 2008; Quan-Haase & Wellman, 2005a). Connective states are linked to a system's performance, and thereby allow us to assess the impact of technology enablement on a service system's performance from a socio-technical angle. Redman and Kinzig (2003) describe a state of super-connectivity, while Quan-Haase and Wellman (2005a) and Wajcman and Rose (2011) investigate the state of hyper-connectivity or constant-connectivity, respectively. Kolb, et al. (2008) provide a more comprehensive model and suggest that the connective states of *hypo* (insufficient) and *hyper* (excessive) connectivity represent conditions that can negatively influence the performance of a system. R*equisite connectivity* implies a threshold condition of just enough connectivity, while *connective flow* embodies an optimum state that may be achieved if hypo and hyper-connectivity are avoided (Kolb, 2008; Kolb, et al., 2008).

In order to assess the impact of too much or too little connectivity on performance, it is considered "critical" (Kolb, Caza, & Collins, 2012, p. 1) to understand how hypo and hyper-connectivity emerge. By expanding on the notion of *connective gaps,* introduced by Kolb, et al., this study perceives the states of hypo and hyper-connectivity as connective gaps that include "all connective absences (i.e., not available, affordable), interruptions, and disconnects between two parties" (2008, p. 183). Researchers argue that connectivity and its constructs should be utilised in advanced contexts of technology-mediated work-environments that underwent drastic technological change (Kolb, et al., 2008). This study attempts to address this challenge, and will apply the connectivity-lens for the analysis of technology-enabled value co-creation processes, a technology-mediated environment that is characterised by technological change.

1.3 Research Objective and Questions

This study empirically investigates and analyses technology-enabled value co-creation processes in the context of the consulting industry through a connectivity lens. It thereby attempts to explore and describe the socio-technical context in which resources can be exchanged and value be co-created by means of ICT and, by focussing on the emergence and consequences of connective gaps on service systems, to understand the impact that technology-enablement may have on a service system's ability to co-create value. Furthermore, this study must be seen as a foundation for future research which addresses Nam and Lee's (2010) call for the development of managerial guidelines regarding the effective and efficient use of ICT in service systems. The central objective of this study is:

> **To investigate technology-enabled value co-creation processes in the context of the consulting industry through a socio-technical connectivity lens and, by doing so, to understand how technology-enablement in a service system impacts its ability to co-create value.**

As recommended by Eisenhardt (1989) and Perry (1998), this study is guided by research questions (RQ) which directly address the research objective:

1) **How do service systems exchange resources and co-create value by means of ICT?**
2) **How do connective gaps emerge in a service system?**
3) **How does the emergence of connective gaps impact the ability of a service system to co-create value?**

1.4 Research Methodology

Researching technology-enabled value co-creation processes through a connectivity lens evidently represents an emerging and relevant research area with very limited empirical contributions. Whenever "little is known about a phenomenon" (Eisenhardt 1989, p. 548), theory building using case studies is considered to be an appropriate research strategy and consequently applied in this study.

Miles and Huberman explain that "the case is, in effect, your unit of analysis" (1994b, p. 25). With the service system considered the basic unit of analysis in service research (Maglio & Spohrer, 2008), an individual case in this multiple case study is consequently represented through an entire service system consisting of service provider, service customer, and service target, i.e. the reality to be transformed in the value co-creation process. By focussing on the entire service system, this study also addresses a methodological shortcoming in service research identified by Heinonen, et al. (2010, p. 532), who argue that existing studies simply "focused on analysing an individual service system from the company's point of view," which led to an "incomplete understanding" of service systems (Heinonen, et al., 2010, p. 532). Instead, service systems should be investigated using a "dyadic approach" (Grönross, 2010, p. 29) that simultaneously includes "the roles and input of both the customers and company" (Heinonen, et al., 2010, p. 543), an understanding that corresponds with the view of researchers advocating the inclusion of customers in empirical SDL-driven service innovation studies (Chen, et al., 2009; Ordanini & Parasuraman, 2011). By using the empirical research setting of the consulting industry as recommended by Payne, et al. (2008) and Gadrey and Gallouj (2002), each case in this study consists of one, or a combination of consulting firms, here referred to as service provider (SP), that engage by means of ICT with one, or a combination of customer firms, here referred to as service customer (SC), in technology-enabled value co-creation processes of a service target.

A criterion-based theoretical sampling approach was used to identify suitable cases and ensured that all cases were comparable (Yin, 1984). The selection and screening of cases in this study was supported through a case protocol, an approach recommended by Yin (2003, 2011), which helped the researcher to execute the study in a structured manner and assures the validity of the findings (Healy & Perry, 2000). As a result of this approach, four cases are incorporated in this study that represent a total of 11 organisations (six consulting firms and five customer firms), located in several locations across Australasia, North America and

Europe. The consulting firms that participated in this study include two “Big 4” firms, as well as four boutique consulting firms with expertise in areas such as energy exploration, IT consulting or asset management. The respective customer organisations are government institutions, telecommunication providers and financial service firms that interacted, on average, for approximately 17 months with their consultants.

The empirical data collected in these four cases includes qualitative interview data obtained through semi-structured interviews of 37 participants, who are senior managers, project managers and line employees from both the consulting and customer firms. Additional data collected include field-notes based on observations and case-documentation provided by the participants. Utilising multiple data collection methods was appropriate, given the theory building nature of this study (Eisenhardt 1989), realism as the underlying scientific paradigm (Healy & Perry 2000), as well as the use of the multiple case study method, which relies on multiple sources of evidence (Yin 2003).

The analysis of the data was based on recommendations and processes outlined by Yin (2011), Miles and Huberman (1994) and Eisenhardt (1989), and separated in within-case and cross-case stages. Especially the cross-case analysis was motivated by the desire to increase the generalizability of the within-case findings (Eisenhardt, 1989; Miles & Huberman, 1994b). Here, the researchers followed a variable-oriented strategy (Miles & Huberman, 1994, p. 175) and compared processes, events, and outcomes across cases.

1.5 Chapter Summary and Thesis Structure

This chapter introduced and motivated this study which is positioned at the intersection of research addressing the SDL, service innovation and ICT, as well as connectivity. It therefore contributes to the extant literature in these fields. The primary goal here is theory building which can contribute to further research in an important yet under-investigated area. This thesis consists of six chapters which follow the structure outlined in Figure 1.1.

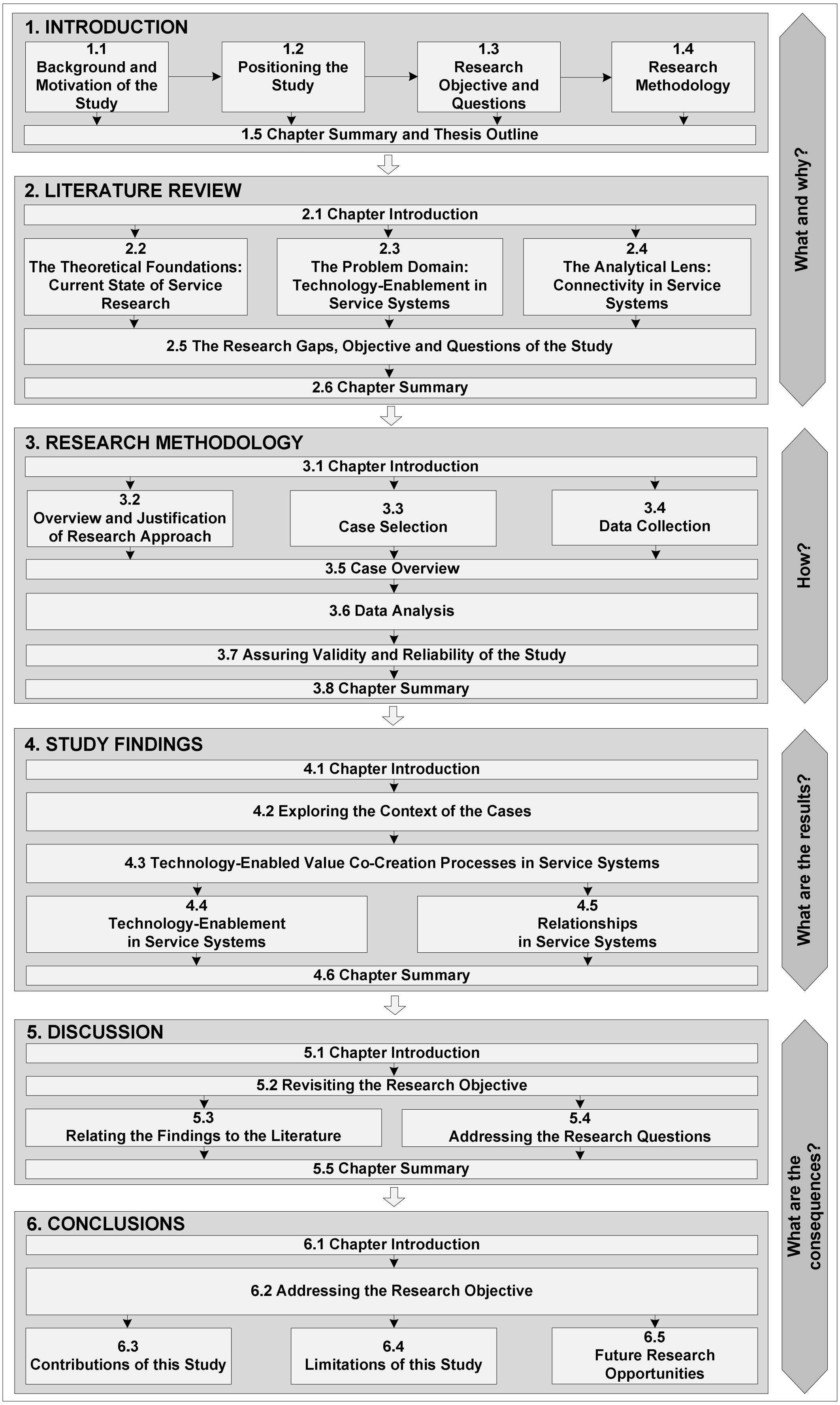

Figure 1.1: Structure of Thesis

2. LITERATURE REVIEW

2.1 Chapter Introduction

Chapter 2 introduces the relevant conceptual and empirical literature underlying this study, in order to clarify the theoretical foundations and highlight the empirical and conceptual gaps.

The chapter is divided into four main sections. Section 2.2 introduces, defines and discusses theoretical constructs that are relevant for the understanding of the subsequent sections and the overall study. The problem-domain in Section 2.3 structures and analyses established approaches in service innovation research, identifies their shortcomings, and introduces the SDL as a novel perspective that will be applied in this study. Technology-enablement is furthermore linked to service innovation, and the core research problem of this study, technology-enabled value co-creation, is delineated. Section 2.4 introduces connectivity as the analytical lens of this study, while Section 2.5 summarises the identified research gaps, and derives the research objectives and questions of the study. This structure, together with the detailed overview of the subsequent sub-sections is presented in Figure 2.1.

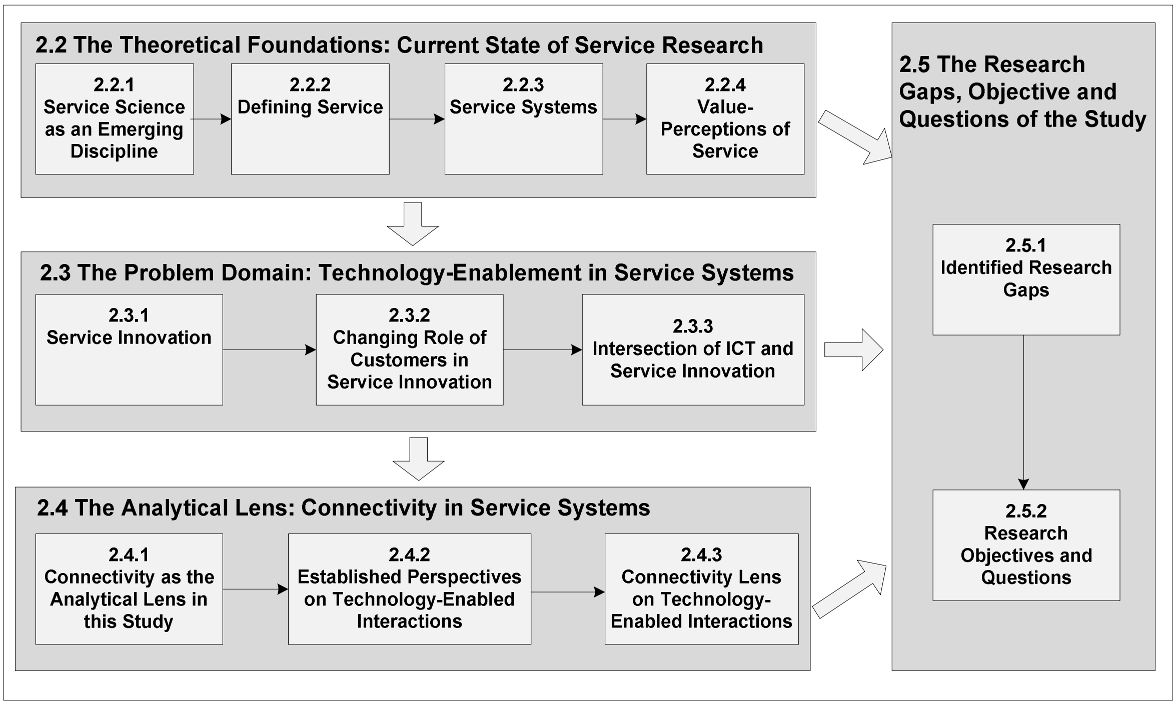

Figure 2.1: Structure of the Literature Review

2.2 The Theoretical Foundations: The Current State of Service Research

2.2.1 Service Science as an Emerging Discipline

The notion of service is not new, yet its current scale, complexity and relevance are unprecedented in history and driven by issues like globalisation, demographic changes and technological advances (BMBF, 2009; Chesbrough & Spohrer, 2006; IfM & IBM, 2008; Palmisano, 2006; Sheehan, 2006; Royal Society, 2009). Governments (BMBF, 2009; National Academy of Engineering, 2003) private corporations like IBM, or Fujitsu (Abe, 2005; IBM, 2010; IfM & IBM, 2008) as well as non-government institutions (IfM & IBM, 2008; OECD, 2005; Royal Society, 2009) have all recognised the importance of service for the prosperity, growth and socio-economic wellbeing of individuals, corporations and nation-states in the 21st century.

Industrialised countries like the United Kingdom (UK) today generate the vast share of their gross-domestic product (GDP) through service (BMBF, 2009; Maglio, Kieliszewski, & Spohrer, 2010; OECD, 2005; Royal Society, 2009). For example, the UK Office for National Statistics (2007) stated that three-quarters of the UK's GDP in 2007 originated from service and generated by 81% of the workforce. Governments even altered the ways of measuring economic activities in order to reflect the growing importance of service, a trend driven by developments in ICT (UK Office for National Statistics, 2007). Standard Industrial Classification (SIC) codes in the UK, and the North American Industry Classification System (NAICS) in the USA were altered, with the latter now listing 15 out of a total of 20 industry sectors as "entirely-services producing sectors" (Bureau of Labour and Statistics, 2009). Even emerging economies such as China are shifting into a service-dominated environment and away from agriculture or manufacturing (Ostrom, et al., 2010). Moving from country to corporate statistics, the IBM Corporation reported in 2009 that its service business continued to grow into the dominating force behind revenue growth and income, accounting for 58% of the company's revenue, which outperformed all other business areas combined (IBM, 2009).

In the early 1990s, Drucker (1991) foresaw the rising significance of service. He argued for the need to "raise the productivity of knowledge and service workers" (Drucker, 1991, p. 69) in order to maintain the competitive advantage of companies, peace and prosperity of nations, and consequently the "quality of life in every industrialized nation" (Drucker, 1991, p. 70).

Failing to do so could impose the threat of economic downturn and “possibly even class war” (Drucker, 1991, p. 70). Despite Drucker’s call for action, in 2003 the US National Academy of Engineering argued that “academic research has not focused on, or been organised to meet the needs of service businesses” (2003, p. 8). Other authors (Chesbrough & Spohrer, 2006; Spohrer & Maglio, 2010; Triplett & Bosworth, 2004) support this argument, and argue that despite its importance for society, service is the “least studied and least understood part of the economy” (Spohrer & Maglio, 2010, p. 158), with innovation around service being approached less systematically than innovation in areas such as agriculture or manufacturing (Chesbrough & Spohrer, 2006).

Researchers have since called for a “science of service” that integrates and expands existing research on service (Chesbrough & Spohrer, 2006; Donofrio, Sanchez, & Spohrer, 2010; Glushko, 2008; Karmarkar, 2004; Maglio, Srinivasan, Kreulen, & Spohrer, 2006; Ostrom, et al., 2010; Paulson, 2006; Rust & Miu, 2006; Spohrer, Anderson, Pass, Ager, & Gruhl, 2007). Service science, as an emerging “interdisciplinary approach to study, improve, create, and innovate in service” (Maglio, et al., 2010, p. 1), uses “fundamental science, models, theories, and applications to drive service innovation” (Ostrom, et al., 2010, p. 2). It is understood as “the study of value co-creation interactions amongst entities, known as service systems” (Spohrer, Anderson, et al., 2007, p. 315), or the “study of the application of the resources of one or more systems for the benefit of another system in economic exchange” (Spohrer, Vargo, Caswell, & Maglio, 2008, p. 3).

By using a modified Delphi approach, and drawing on responses from over 300 respondents from academia and industry, Ostrom, et al. (2010) identified 10 emerging research priorities for service science. Particularly important for this study is the fact that the role of technology-enablement or ICT in the context of service innovation was considered *the* key research priority for service science (Ostrom, et al., 2010, p. 26). ICT emerged in the study of Ostrom, Bitner et al. (2010) as a “pervasive force”, significantly affecting all other areas (Ostrom, et al., 2010, p. 3). This corresponds with other scholars (Bitner, et al., 2010; Blomberg, 2010; Chesbrough & Spohrer, 2006; Mott, 2010; Rust & Miu, 2006; Sheehan, 2006), as well as government-institutions (BMBF, 2009; IfM & IBM, 2008), that recognise the relevance of ICT for service research. While this study addresses that call for research, it is necessary to initially explore and define the key constructs of the research, beginning with the most relevant one of all: service.

2.2.2 Defining Service

2.2.2.1 Overview and Early Phase

Scholars from a variety of disciplines have debated "over the last two-hundred years" (Spohrer & Maglio, 2010, p. 159) what constitutes and defines service. Their disciplines include marketing (Brown, Fisk, & Bitner, 1994; Converse, 1936; Grönross, 2006; Gummesson, 2008; Shostack, 1977), computer science (Endre et al., 2004; Sheth, Verma, & Gomadam, 2006; Zhang, 2007), economics (Hill, 1977; Triplett & Bosworth, 2004), operations research (Dietrich & Harrison, 2006; Sampson, 2001; Sampson & Froehle, 2006; Thomas & Griffin, 1996) and the social and behavioural sciences (Chase & Dasu, 2001; Maister, 1985; Rouse & Baba, 2006). Service has been defined throughout four distinctly different, yet overlapping main phases. Table 2.1 presents the key contributions of the four phases:[1]

Phases	Understanding of 'service'	Key Authors
Early Phase (2.2.2.1)	"non-productive labour" "immaterial products"	(Smith, 1776/1904) (Say, 1821)
Advanced Phase (2.2.2.2)	"non-physical things for which we spend money" "definition by exclusion" "everything else" "process of performance, rather than a thing" "intangibility, heterogeneity, inseparability, perishability (IHIP-criteria)"	(Converse, 1936) (Judd, 1964) (Rathmell, 1966) (Lovelock, 1983) (Zeithaml, Parasuraman, & Berry, 1985)
Classification Phase (2.2.2.3)	"high vs. low customer-contact intensity" "maintenance interactive; task interactive; personal interactive" "mass service; service shop; professional service" "metaviews of services" "demand orientation; knowledge and technology-intensity"	(Chase, 1978) (Mills & Marguiles, 1980) (Silvestro, Fitzgerald, Johnston, & Voss, 1992) (Cook, Goh, & Chung, 1999) (Glückler & Hammer, 2011)
Service Logic Phase (2.2.2.4)	"services are exchanged for services" "everybody is in service" "service is common denominator in exchange" "production processes wherein customers supply input for that customer's unit of production" "value co-creation phenomena that arise among interacting service system entities"	(Bastiat, 1850/1979) (Levitt, 1972) (Vargo & Lusch, 2004) (Sampson, 2010) (Spohrer & Maglio, 2010)

Table 2.1: Evolution of the Scholastic Understanding of Service Definitions

[1] Vargo and Morgan (2005) provide an excellent analysis and review of the history of literature investigating and defining service.

Researchers in the *early phase* created "stand-alone" definitions of service for a specific context (Converse, 1936; Judd, 1964; Lovelock, 1983; Rathmell, 1966; Say, 1821). Others tried to define service by establishing and exploring perceived differences between service and goods, marking the *advanced phase* (Hill, 1977; Regan, 1963; Sasser, Olson, & Wyckoff, 1978; Zeithaml, et al., 1985). Researchers of the *classification phase* defined service by generating distinctive classification criteria within typologies and taxonomies that differentiated one type of service from another (Bitner, 1992; Chase, 1978; Cook, et al., 1999; Fähnrich & Meiren, 2007; Mills & Marguiles, 1980; Silvestro, et al., 1992). Finally, researchers of the *service-logic phase* perceive service as the basic foundation for economic exchange and define service, together with value, as a relational construct (Bastiat, 1850/1979; Grönross, 2006; Gummesson, 2007b, 2008; Lusch & Vargo, 2006; Shostack, 1977; Spohrer & Maglio, 2010; Vargo & Lusch, 2004, 2006).

The initial understanding of service in the early phase was largely influenced by political economists (Vargo & Morgan, 2005), and by the means in which economic activity was measured. Adam Smith's analysis in the *Wealth of Nations* examines service in the context of the economic success of nation states (Smith, 1776/1904). He distinguished between "productive" labour, which contributed to the monetary wealth of a nation, and "unproductive" labour which did not. Productive labour resulted in a surplus of tangible entities that were suitable for export, and provided the nation with monetary wealth (Smith, 1776/1904), while "unproductive" labour included all economic activities that did not result in tangible surplus entities suitable for export. Smith included "churchman, lawyers, musicians, and opera singers" (1776/1904, p. 314) in that "unproductive" group of labour (Vargo & Morgan, 2005), all of which may nowadays be considered "service-jobs". A nation's wealth could consequently be increased by maximising productive labour and minimising unproductive labour (Spohrer & Maglio, 2010). However, Lovelock and Gummesson (2004) argue that Smith considered only those service provisions unproductive which, despite being "honourable", or "necessary", would "perish in the very instant of [their] production" (Lovelock & Gummesson, 2004, p. 24; Smith, 1776/1904; Vargo & Morgan, 2005, p. 44). However, "those who undertake the improvement or cultivation of lands, mines, and fisheries" (Smith, 1776/1904, p. 314) were considered productive, since they contributed to the creation of tangible entities suitable for export (Vargo & Morgan, 2005).

A different perspective on production or productive labour was provided by French scholar Jean Baptist Say. He disagreed with Smith (1776/1904) and is considered the first scholar to associate the characteristic of intangibility, or immateriality, with service (Hill, 1999; Lovelock & Gummesson, 2004; Say, 1821). Immateriality was later perceived as the key characteristic in understanding service (Brown, et al., 1994; Lovelock & Gummesson, 2004; Zeithaml, et al., 1985), and ultimately led to the development of the IHIP-criteria outlined in Section 2.2.2.2.

Spohrer and Maglio (2010) claimed that Smith's initial work had a misleading impact on many researchers in the field of economics, who misconceived service as an unproductive activity which should be minimised. This explains why unambiguous service research was largely neglected in the early 20th century, and the research landscape focussed on goods-driven interactions between consumers and producers (Rathmell, 1966; Vargo & Morgan, 2005). Marketing researchers were amongst the first to focus their attention back on service, motivated by the belief that this would aid to goods production and marketing (Converse, 1930). The definition of service however, remained ambiguous as "all those non-physical things for which we spend money" (Converse, 1936, p. 492).

2.2.2.2 Advanced Phase

Researchers in the 1960s defined service once again (Brown, et al., 1994). Judd proposed a "definition by exclusion" (1964, p. 59), providing insight into "what services are not," while Rathmell (1966) further extended this notion by stating that "services seem to be everything else" other than "tangible economic products which are capable of being seen and touched and may or may not be tasted, heard, or smelled" (Rathmell, 1966, p. 32). The interest in service research sparked once more in the 1970s and 1980s, when the public in the United States of America (USA) initially realised that they had evolved into a service-driven economy (Berry & Parasuraman, 1993). Research in that period was driven by the perceived differences between service and goods (Brown, et al., 1994; Lovelock & Gummesson, 2004; Schneider, 2000). One of the most prominent and widely-cited works attempting to define service goes back to Zeithaml, Parasuraman and Berry (1985). The authors ratified the IHIP-criteria, based on an extensive literature review of the previous decades (Lovelock & Gummesson, 2004), with a similar work by Edgett and Parkinson (1993) producing comparable results almost a decade later. The IHIP-criteria are based on what were, at the time, considered the four distinctive characteristics of services (Lovelock & Gummesson, 2004): *intangibility*, *heterogeneity*, *inseparability* and *perishability*. While these criteria were already discussed previously[2], Regan (1963), Parker (1960), as well as Sasser, et al. (1978), are considered the first to introduce and explore these perceived characteristics of service to various degrees, after Say's (1821) early argument of intangibility. A range of other characteristics, such as the "absence of ownership in service purchases" (Edvardsson, Gustafsson, & Roos, 2005, p. 113) have been suggested (see for example Lovelock, 1983). However, none were ever widely accepted (Edvardsson, et al., 2005).

Intangibility as the most fundamental characteristic between a good and a service, was rooted in the perceived lack of physical units of output inherent in service (Bateson, 1977; Berry, 1980; Lovelock, 1981; Rathmell, 1966). The alleged nature of service as "performances, rather than objects," meant that they could not be "seen, felt, tasted, or touched in the same manner in which goods can be sensed" (Zeithaml, et al., 1985, p. 33).

Heterogeneity, as a defining characteristic of service, was derived from the understanding that, in comparison to physical units of output, service resists standardisation. This was understood to be especially true in regard to the performance and quality of a service. For example, "different employees may be in contact with an individual customer, raising a problem of consistency of behaviour" (Langeard, Bateson, & Lovelock, 1981, p. 16). Kniseley (1979) further argued that an employee's performance fluctuates on a daily basis, making it difficult to provide an identical service to each customer, thereby resulting in heterogeneous service provisions (Bessom & Jackson, 1975; Davidson, 1978; Langeard, et al., 1981; Zeithaml, et al., 1985).

Inseparability of production and consumption refers to the understanding of services being simultaneously produced and consumed, while goods were believed to be produced, sold, and consumed in a somewhat sequential order. Scholars at the time (Grönross, 1978; Rathmell, 1966; Schlissel, 1977; Upah, 1980; Zeithaml, 1981) believed that a service is first sold, and then *simultaneously* produced and consumed. Customers are required to be physically present during the production of service provisions, such as a haircut or taxi-ride, which "forces the buyer into intimate contact with the production process" (Carmen & Langeard, 1980, p. 8).

[2] For an extended literature-review in regard to the IHIP-criteria, see Zeithaml, Parasuraman and Berry (1985).

Perishability refers to the idea that a service, compared to a physical good, possesses a relative inability to be stored (Bateson, 1977; Bessom & Jackson, 1975; Kniseley, 1979; Rathmell, 1966). However, perishability was the most controversial characteristic and received the least support in the literature at the time. Yet, Zeithaml, et al. (1985) argued that the inability of a service to be stored implied challenges for service provider to synchronise their supply and demand processes.

A variety of scholars have since explicitly criticised the IHIP-criteria for representing perceptions that represent service as disadvantaged in relation to goods (Beaven & Scotti, 1990; Gummesson, 1993; Lovelock & Gummesson, 2004; Lusch & Vargo, 2006; Vargo & Morgan, 2005). The validity of the IHIP-criteria is challenged by the questions of whether service should really be defined by its perceived disadvantages, or if these are instead driven by a fundamentally different understanding of economic exchange, now referred to as the Goods-Dominant Logic (GDL) (Vargo & Lusch, 2004; Vargo & Morgan, 2005). Further problems associated with the GDL in relation to defining service include that a "fairly unambiguous definition of goods" (Gummesson, 1993, p. 32) exists, and also that the existence of service is forced on "goods conditions instead of […] their own [service] conditions" (Gummesson, 1993, p. 32). While "intangibility emerges as an ambiguous and surprisingly limited concept […] equally valid for some goods" (Lovelock & Gummesson, 2004, p. 27), many service provisions actually involve physical entities as well, implying that "the traditional division between goods and services is long out-dated" (Gummesson, 1993, p. 250). Lovelock and Gummesson summarise the debate:

> As a paradigm, the notion that the four IHIP characteristics make services uniquely different from goods is deeply flawed [and] the claim that services are uniquely different from goods on the four specific IHIP characteristics is not supported by the evidence. (2004, p. 32).

2.2.2.3 Classification Phase

Driven by the challenges associated with the traditional approaches of defining service (Lovelock & Gummesson, 2004), service researchers have turned to yet another approach and begun to create typologies, taxonomies, or classification criteria deemed suitable to define and address the complexities of service. Mills and Marguiles (1980) argue that typologies characterising different types of service provisions are a suitable way to reduce complexity and have the ability to stimulate thinking. Service typologies are also seen as a useful tool for the provision of teaching and research frameworks (Haynes, 1989), the practical support of managers wanting to relate their business to other organisations using a set of common criteria (Bowen, 1990; Chase, 1978), or to group service provisions by something other than their industry (Lovelock, 1983). Newer approaches tend to be more context-specific. For example, Lee and Park (2009) developed a taxonomy for the strategic management of service provisions in the e-commerce space, while Fähnrich and Meiren (2007) developed a typology with the intention to support service engineering approaches, and Glückler and Hammer (2011) used empirical data to classify service businesses with the purpose of identifying "differences in growth, innovation and policy gains" within Germany (Glückler & Hammer, 2011, p. 3). A literature review by Cook, et al. (1999) highlights further motivational factors leading to the development of service typologies, including corporate strategy, marketing, managerial issues, as well as the prediction of consumer behaviour.

Most typologies use conceptually rather than empirically derived criteria to distinguish and define service. Viitamo (2007) used capital intensity, degree of standardisation, as well as degree of tangibility, while Haynes' (1989) work is based on the customer interface (nature of interaction between customer and provider) and technology intensity as key characteristics. Others defined service based on its degree of customer contact intensity (Chase, 1978), distinguished between professional service, service shop and mass service (Silvestro, et al., 1992), or maintenance interactive, task interactive, as well as personal interactive service providers (Mills & Marguiles, 1980).

The lack of empirical grounding inherent in most service typologies has been criticised, especially when evaluating the validity and ability of these means to distinguish and define service (Bowen, 1990; Cook, et al., 1999; Fähnrich & Meiren, 2007; Glückler & Hammer, 2011). The fact that service typologies are usually based on a small number of dimensions that are believed to be relevant for the problems associated with the typology's context (Cook, et al., 1999), does not permit the analysis of all characteristics distinguishing service provisions (Bowen, 1990). Most importantly though, servce typologies are equally gounded in the belief that service provisions are distinctly different from physical goods. For example, Glückler and Hammer (2011, p. 2) stated that "the first step towards a service typology is to define the boundary between service activities and non-service." Ultimately, it is evident that service typologies are dominated by the IHIP-criteria, an understanding which contradicts the perception of service advocated by the supporters of the service-logic phase.

2.2.2.4 Service-Logic Phase

Considered by some to be the "first services scholar" (Spohrer & Maglio, 2010; Vargo & Morgan, 2005, p. 45), Frederic Bastiat did not support Adam Smith's idea that value must be associated with tangible objects, but rather argued that the foundation of economics was based on individuals who experience "wants" and strive for their "satisfaction" (Bastiat, 1850/1979, p. 40; Vargo & Morgan, 2005). Value was found in the "comparative appreciation of reciprocal services" (Bastiat, 1850/1979, p. 43). Others further argued that Bastiat's (1850/1979) understanding of value and service was based on the idea of humans transforming tangible objects through their capabilities or, according to Bastiat, through service (Spohrer & Maglio, 2010; Vargo & Morgan, 2005). Any human's goal is to apply a service, in order to alter the state of an object, which fulfils somebody's need for satisfaction. The value derived from the transformation of that object is consequently not affiliated with the tangible object, as was the case for Smith (1776/1904), but in the service associated with its transformation.

Over one hundred years later did Shostack (1977) call for services marketing to break free from product marketing. She argued that while the automobile is a tangible entity, the service of transportation, an element independent from the physical entity, is equally important and marketed to the customer; yet, the automobile is only *one* of *many* different alternatives for transportation. Shostack (1977) then hypothesised that car-manufacturers are instead "marketing a *service*, a service that happens to include a *by*-product called a car", resulting in "tangible services" (Shostack, 1977, p. 74). This argument is in line with Bastiat (1850/1979) who also perceived the value of human interactions (i.e. service) not to be rooted in a physical entity but rather in the service that an entity can embody. Neither of these ideas were fully recognised until the 21st century with the emergence of various "service-logics".

The SDL by Vargo and Lusch (2006; 2004, 2006, 2008a), the service logic (Grönross, 2006; Normann, 2001), the service perspective (Edvardsson, Gustafsson, & Equist, 2007), or the unified service theory (Sampson, 2010; Sampson & Froehle, 2006) are also all based on the premise that service is the fundamental basis of exchange. Perceived as the "philosophical foundation of service science" (Maglio & Spohrer, 2008, p. 18), a service-centred view on economic exchange is understood as the "right perspective, vocabulary, and assumptions on which to build a theory of service systems, their configurations, and their modes of interaction" (Maglio & Spohrer, 2008, p. 19). The development of a common language for service science, grounded in a service-centred view, is considered a key benefit that may help overcome the "paradigmatic power of the goods-dominant logic" (Vargo, Lusch, & Akaka, 2010, p. 134). The GDL established a lexicon that led to previous misconceptions and misinterpretations such as the IHIP-criteria. Therefore, and most notably, the SDL is seen as a way to provide theoretical understanding about service, value, and their roles in economic exchange. While the field lacks clarity on how to apply the SDL in an operational real-world context (Karpen, Bove, & Lukas, 2009), ten foundational premises (FPs) were established that structure the underlying concepts in a succinct framework. Table 2.2 presents an overview of these premises:

	Foundational Premise	Explanation/Justification
FP 1	Service is the fundamental basis for exchange.	Service is the basis for all economic exchange. Service is exchanged for service.
FP 2	Indirect exchange masks the fundamental basis of exchange.	Goods, money, and institutions mask the service-for-service nature of exchange.
FP 3	Goods are distribution mechanisms for service provisions.	Goods (both durable and non-durable) derive their value through use - the service they provide.
FP 4	Operant resources are the fundamental source of competitive advantage.	The comparative ability to cause desired change drives competition.
FP 5	All economies are service economies.	Service (singular) is only now becoming more apparent with increased specialisation and outsourcing.
FP 6	The customer is always a co-creator of value.	Implies value creation is interactional.
FP 7	The enterprise cannot deliver value, but only offer value propositions.	The firm can offer its applied resources and collaboratively (interactively) create value following acceptance, but cannot create or deliver value alone.
FP 8	A service-centred view is inherently customer oriented and relational.	Service is customer-determined and co-created; thus, it is inherently customer oriented and relational
FP 9	All economic and social actors are resource integrators.	Implies the context of value creation is in networks of networks (resource integrators).
FP 10	Value is always uniquely and phenomenologically determined by the beneficiary.	Value is idiosyncratic, experiential, contextual, and meaning laden.

Table 2.2: Foundational Premises of the SDL, adapted from Vargo and Lusch (2008a)

With service considered the basis of all economic exchange (*FP1*), the SDL challenges the notion of a "service economy" or the rise thereof (*FP 5*), as an illusion based on the prevalence of goods-dominant thinking. The SDL further argues that service and service-logic are superordinate to the GDL, both in terms of classification and function (Gummesson, 2007b; Vargo & Akaka, 2009; Vargo, et al., 2010).

The SDL defines service as the "application of competences (knowledge and skills) for the benefit of another" (Vargo & Lusch, 2008a, p. 256). Exchange on markets is driven by the process of individuals applying specialised competencies (knowledge and skills), or operant resources (*FP 4*), for their and other's benefit (Vargo, et al., 2010). Or, as Bastiat stated in the 19th century: "services are exchanged for services" (Bastiat, 1850/1979, p. 162). The SDL perceives service as a process centred around value co-creation between entities, while goods merely present a transportation mechanism for service provisions (*FP 3*) (Vargo & Lusch, 2004, 2006). Goods are, in this context, "tangibilized services", or "intermediate artefacts of specialization" (Vargo & Morgan, 2005, p. 51) that allow for the transfer of competences, or service. However, goods, money or institutions also present a web of intermediaries in which the direct exchange of service for service is embedded (*FP 2*) (Vargo, et al., 2010).

The perception of service as a process has been utilised by several authors (Grönross, 2000; Gummesson, 1995; Sampson, 2010). For example, Sampson (2010) defines service as "processes wherein each customer supplies one or more input components for that customer's unit of production" (Sampson, 2010, p. 35). The explicit involvement of the customer is also crucial in the SDL because here the focus of exchange shifts away from a goods-dominant understanding of a transaction involving a good, created by a producer for a consumer, towards an interactional relationship (Vargo & Akaka, 2009; Vargo, et al., 2010). Scholars have mutually agreed that this interaction or value co-creation (*FP 6*) takes place between service systems (Maglio, et al., 2010; Spohrer, Anderson, et al., 2007; Spohrer & Maglio, 2010; Vargo & Lusch, 2006; Vargo, et al., 2010), however its significance is found in the process itself. Ultimately, the purpose of this process is to fulfil the needs of one or several service systems (e.g. customers) (Lusch, Vargo, & Tanniru, 2010).[3]

The "process of serving" (Vargo, et al., 2010, p. 145) is inherently collaborative and involves the beneficiary or customer of the service (*FP 8*) who experiences and also determines its value (*FP 10*). The service provider in that interaction, however, only offers value "propositions", which need to be accepted and realised by the beneficiary (*FP 7*). These value

[3] See Section 2.2.3 for an in-depth discussion on "service systems".

propositions incorporate the service provider's resources that are part of the service system, but need to be integrated along with the beneficiary's resources, or resources from other entities within the service system, so that value can be co-created (*FP 9*) (Vargo & Lusch, 2004, 2006; Vargo, et al., 2010).

2.2.2.5 Service in the Context of this Study

Notwithstanding the rise of the SDL, the goods-dominant paradigm still has an impact on service research today, with service being perceived as different and inferior from goods (Spohrer & Maglio, 2010; Vargo, et al., 2010). On the contrary, the various service-logics in general, and the SDL in particular (Grönross, 2006; Gummesson, 2008; Lusch & Vargo, 2006; Normann, 2001; Shostack, 1977; Vargo & Lusch, 2004, 2006, 2008a), present a holistic perspective on economic exchange that is centred around service. The SDL is considered beneficial for the development of service science and the advancement of service research (Maglio, et al., 2010; Maglio & Spohrer, 2008; Ostrom, et al., 2010; Spohrer, et al., 2008; Vargo & Akaka, 2009; Vargo, et al., 2010), and consequently adopted as a underlying perspective on service and economic exchange in the context of this study. At this stage however, a more thorough understanding of the theoretical foundations and constructs underlying the SDL is necessary to develop the research questions and identify the subsequent research gaps related to technology-enabled value co-creation. Most notably the concepts of value, value co-creation and service systems are relevant and introduced in the following sections.

2.2.3 Service Systems

2.2.3.1 Defining Service Systems

The service system is considered the "basic theoretical construct" or "basic unit of analysis" in service science, and presents an abstraction on value co-creation (Maglio & Spohrer, 2008, p. 19). Systems can be understood as "a way of looking at the world" (Weinberg, 2001, p.22), or as a "configuration of parts connected and joined together by a web of relationships" (Bánáthy, 1997). Spohrer and Maglio link these broad ideas to define service systems as "value co-creation configurations of people, technology, value propositions connecting internal and external service systems, and shared information" (2007, p. 72).

People, technology, organisations and shared information represent resources that are exchanged and applied through service within a service system (Maglio & Spohrer, 2008; Spohrer & Maglio, 2010; Vargo, et al., 2010).[4] Service systems consist of *entities,* which represent "dynamic configurations of resources" (Spohrer & Maglio, 2010, p. 174). These resources are capable of intentionally applying and exchanging other resources in order to co-create value, which ultimately creates an environment where a service system is a resource itself (Spohrer, et al., 2008). The combination of technical and human resources within a service system results in service systems perceived as a type of socio-technical (Spohrer & Maglio, 2008) system. For example, this study investigates service systems where consulting and customer firms represent entities that exchange resources by means of technology.

Service systems vary in size and complexity: from the smallest service system which consists of a single individual interaction with other service systems, to the largest service system apparent today in the global economy (Maglio & Spohrer, 2008). By assuming the premise of service exchanged for service (Bastiat, 1850/1979; Vargo & Lusch, 2004), every service system represents both a provider and customer of service that is connected to other service systems through value propositions (Normann, 2001; Vargo & Akaka, 2009). Since service systems change their composition of resources over time, they are not static but rather open and dynamic and not constrained for a particular purpose (Spohrer, Maglio, et al., 2007).

2.2.3.2 Interaction in Service Systems

The *interaction* of service system entities occurs across four distinct dimensions: information-sharing, work-sharing, risk-sharing, and goods-sharing (Maglio & Spohrer, 2008). Consulting is typically dominated by information sharing (Mills & Marguiles, 1980), while risk-sharing is likely to dominate an insurance company (Maglio & Spohrer, 2008). Service systems can be classified by the type of interactions and exchanges that dominate within the system. However, a combination of types of exchanges is typically prevalent and, in certain instances, all four types of exchange are present within a single service system. (Maglio & Spohrer, 2008).

Interactions between entities in a service system do not guarantee the co-creation of value in every instance. Spohrer, Vargo et al. (2008) explained this through the ISPAR model

[4] See Section 2.2.4.2 for an in-depth overview of the role of resources in the value co-creation process.

(Interact-Serve-Propose-Agree-Realize) which outlines potential paths for interactions within and across service systems and their outcomes. The model describes ten possible outcomes, yet less than fifty per cent of the possible outcomes lead to value co-created as the result of an interaction (Spohrer, et al., 2008). While the alternative outcomes may lead to other benefits for the service system, they will not necessarily lead to the originally intended realisation of value (Spohrer & Maglio, 2010). Grönroos (2008) as well as Heinonen, et al. (2010) support this argument, and state that the process of co-creation of a service and value as a potential outcome are separate end results of an interaction. Here, "co-creation does not necessarily result in value emergence" (Heinonen, et al., 2010, p. 538). Value as another central construct in service research is explored in the next section.

2.2.4 Value-Perceptions of Service

2.2.4.1 Value Dimensions and Value Co-Creation

Value, the process of its creation, its perception and determination by a beneficiary, are the central elements, and the core purpose of economic exchange (Spohrer & Maglio, 2010; Vargo, et al., 2008). Value itself is considered to be an elusive term, and has been studied and discussed in a variety of disciplines[5] (Dixon, 1990; Vargo, et al., 2008). For example, von Mises (1998) suggests that value can ultimately be considered a type of human judgement in regard to the existence or non-existence of change in the world. This change can be physical, mental or social, with its existence or prevention considered a prerequisite for the occurrence of value. However, the type of change, its perception, and consequently value, can alter over time and is dependent on individual judgement (Spohrer, Anderson, et al., 2007; von Mises, 1998). Other attempts to define value did not provide a unanimous understanding of value either. Researchers often attempted to quantify the value of a service as perceived by a customer, yet without exploring its nature. Stephens, et al. (1987) argued that the value perception of a service is determined by its overall quality and price, as well as the customer's needs and expectations. Holbrook and Corfman (1985) had a slightly different viewpoint, namely that value is a personal experience that depends on the customer's personal taste and experience. Houston (1986) established a link between a customer's participation in the service process and its perceived value, while Brandt and Reffett (1989) argued that cost constraints experienced by the customer influenced his or her view on the

[5] For a review on the historical connotations of "value", see Dixon (1990).

value of a service. Alternative attempts by Zeithaml (1988) or Monroe (1991) understood the value of a service as a ratio of perceived benefits to sacrifice (i.e. cost).

Vargo and Morgan (2005) argue that these traditional models of value are inspired by the GDL, and hence centred around a firm's output and price thereof. For example, Cronin, Brady et al. (2000) established a model with attributes, presumably affecting service value when altered. These attributes either increased service value, or were perceived outcomes thereof and included service quality, buying intention, sacrifices and customer satisfaction (Cronin, et al., 2000). The understanding of value in the SDL, service science literature, and in the context of this study, is considerably different and detached from a firm's output and price. Table 2.3 compares the perception of value from a GDL and SDL viewpoint:

	GDL	SDL
Value driver	Value-in-exchange	Value-in-use or value-in-context
Creator of value	Firm, often with input from firms in a supply chain	Firm, network partners, and customers
Process of value creation	Firms embed value in 'goods' or 'services', value is 'added' by enhancing or increasing attributes	Firms propose value through market offerings, customers co-create value through use
Purpose of value	Increase wealth for the firm	Increase system wellbeing through service (applied knowledge and skills of others)
Measurement of value	The amount of nominal value, price received in exchange	The adaptability and survivability of the beneficiary system
Role of firm	Produce and distribute value	Propose and co-create value, provide service
Role of customer	To 'use up' or 'destroy' value created by the firm	Co-create value through the integration of firm-provided resources with other resources
Role of goods	Units of output, operand resources that are embedded with value	Vehicles for operant resources, enables access to benefits of firm competencies
Resources used	Primarily operand resources	Primarily operant resources, sometimes transferred through operand resources

Table 2.3: Value in the GDL and SDL, adapted from Vargo, Maglio et al.,(2008)

The service science literature defines value as an "improvement in a system, as judged by the system or the system's ability to fit an environment" (Spohrer, et al., 2008, p. 5). Yet, the concept of value is in the service science literature further differentiated into *value-in-exchange* and *value-in-use* (Spohrer & Maglio, 2010; Vargo & Lusch, 2004; Vargo, et al., 2008; Vargo & Morgan, 2005). This idea goes back to Aristotle, who differentiated between use-value and exchange-value (Dixon, 1990), Smith, (1776/1904) who argued for value-in-use and value-in-exchange, or Karl Marx, who introduced use-value and exchange-value in his work on economic exchange (Marx, 1876/2010).

Value-in-exchange, which has its roots in the GDL, accepts that value is manufactured by a firm, embodied within a physical good, and then exchanged for money.[6] The nominal value of the good is measured using the price that the firm receives in exchange for the product. For example, a firm transforms raw materials like wood, stone, metal and cement, which in their initial state do not contain any value for a customer, into a house. This transformation process embeds value into the raw materials that constitute a house that the customer desires and purchases by exchanging money. Value is consequently measured by this exchange transaction, using the price of the house as an indicator for the value generated by the firm (Vargo, et al., 2008; Vargo & Morgan, 2005). Marx's (1876/2010) view on exchange value was similar, since the exchange value of a good, or *commodity* as Marx called it, represented its owner's purchasing power and ability to command labour. Consequently, purchasing a good meant one consumed the results of the labour required for its production (Marx, 1876/2010). Interestingly, the term consume has also been associated with destroy or use up (Normann, 2001), indicating that, within the GDL, the customer is seen as a destructor of value (Vargo, et al., 2008; Vargo & Morgan, 2005).

The *value-in-use* perspective dominant in the SDL, is embedded in the conceptualisation of value being co-created with the customer, and also determined by him or her[7] (Vargo & Lusch, 2004; Vargo, et al., 2010). The idea of value co-creation in a mutually beneficial, collaborative process between a firm and customer goes back to Normann and Ramirez (1993), as well Prahalad and Ramaswamy (2000), and was re-introduced as part of the SDL (Vargo & Lusch, 2004). Value-in-use (Smith, 1776/1904; Vargo & Lusch, 2004), or "use value" (Marx, 1876/2010), essentially refers to value, or the perception of the "improvement of a service system" (Spohrer, et al., 2008), as the ultimate result of the utilisation or *use* of a resource (i.e. a service). Whenever a service system integrates and applies resources within a specific context, *and* considers the improvements derived from the integration and application of resources beneficial for itself, value (in-use) is co-created (Spohrer & Maglio, 2010; Vargo, et al., 2010). Hence, "there is no value until an offering is used. Experience and perception are essential to value determination" (Vargo & Lusch, 2006, p. 44). While a firm can initiate a value proposition, "the actualization of value is in the hands of the consumer" (Gummesson, 2008, p. 115).

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[6] This understanding of value is heavily influenced by Adam Smith and was introduced in Section 2.2.2.1.

[7] See foundational premise number 10 in Section 2.2.2.3.

A firm applies its knowledge and skills (i.e. service) to transform, once again, raw materials such as wood, stone, metal and cement into a house[8]. The SDL argues that the house or "good", is the transportation mechanism for the firm's service, and also its input in the value co-creation process with the customer (Vargo & Akaka, 2009). Value is only co-created once the customer applies his or her own resources by *using* the house for living, entertaining or other purposes. The house, and hence the firm's service of building it, has only value when the house is used in the context of the customer's own life, and when that customer perceives using the house as beneficial. The reciprocity of the value co-creation process through the customer is usually indicated through monetary payments. These can basically be understood as value-in-exchange, or a "negotiated measurement offered and received among exchange partners" (Vargo, et al., 2010, p. 150). Value-in-use is seen as the driver of the value co-creation process, while value-in-exchange can be considered to be a mediator (Vargo, et al., 2010) that provides a way of measuring *relative* value within the context of interacting service systems (i.e. the firm and its customer). Furthermore, while value-in-use can exist without value-in-exchange, the perception of the actual value-in-use by the beneficiary also depends on its value-in-context (Vargo, 2008; Vargo & Lusch, 2008b).

Value-in-context refers to the idea that the perception of value through an entity is also subject to the contextual background of service systems that the beneficiary is embedded in at a particular time and location (Vargo, et al., 2010). The focal firm (i.e. service provider) issuing a value proposition is only one entity within that network, while other environmental resources (i.e. service systems) can include private, market-facing or public sources (Vargo, et al., 2010). Consequently, if value is co-created, it occurs within the context of a larger "value configuration space" or "service ecosystem" (Vargo, 2008, p. 214; Vargo & Lusch, 2008b; Vargo, et al., 2010). An alternative viewpoint, brought forward by Edvardsson, et al. (2011) adds that the context of value co-creation, operant and operand resources, as well as value, are socially constructed and should be understood as value-in-*social*-context. Figure 2.2 conceptualises value co-creation among two service systems, focussing on the core relationships of value-in-use, context and exchange.

[8] However, this process alone is considered a value proposition. See Section 2.2.2.3.

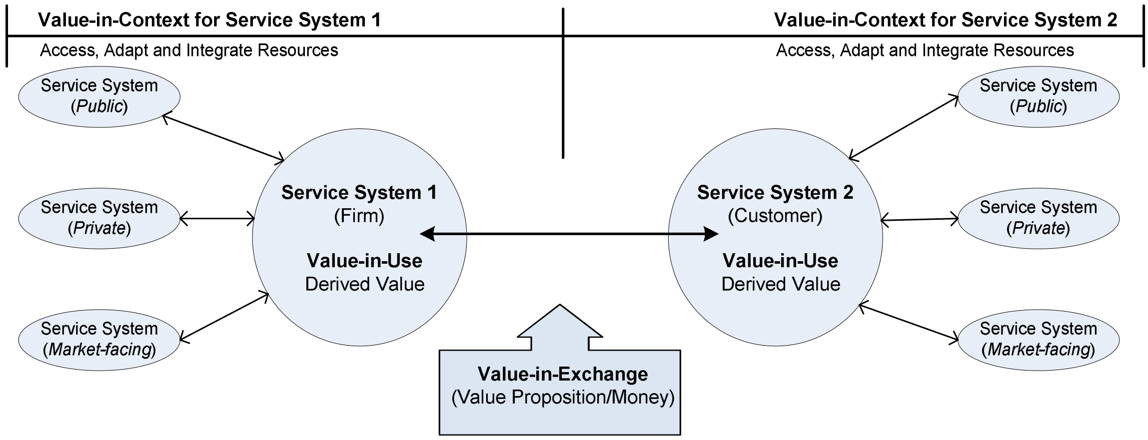


Figure 2.2: Value Co-Creation in Service Systems (Vargo, et al., 2008, p. 149)

2.2.4.2 Resources and Value Co-Creation

Value co-creation in service systems depends not only on the context, but also on the availability of resources, and the system's ability to exchange them (Prahalad & Ramaswamy, 2004; Vargo, et al., 2010). Resources can be differentiated into *operand* and *operant* resources (Vargo & Lusch, 2004, 2006).

Operand resources are physical resources "on which an operation or act is performed" (Constantin & Lusch, 1994; Vargo & Lusch, 2004, p. 2), and are central to the GDL perspective of value creation where they are understood to contain value (Vargo & Morgan, 2005). *Operant* resources however, are "employed to act on operand resources and other operant resources" (Constantin & Lusch, 1994; Vargo & Lusch, 2004, p. 2), thus representing knowledge, skills or information, or entities of a service system. Operant resources are intangible and invisible, as well as dynamic and infinite (Vargo, et al., 2010). They generate outcomes which enable individuals to generate new operant resources, such as new ideas or knowledge, but can also be applied to physical or operand resources in order to initiate a value co-creation process with another service system. Lusch, et al., (2008) refer to this transformation using a specific (operant) resource, while generating a benefit, as *resourcing*.

The actual interaction and utilisation of resources across the value network is understood to occur without any constraints, since "all actors involved in an exchange are relational, and thus openly share relevant information" (Vargo, et al., 2010, p. 150). Open information sharing helps to eliminate untrustworthiness, and consequently "service systems promote the symmetric flow of information and communication both externally and internally" (Vargo, et al., 2010, p. 150), leading to an environment of collaborative communication. However, contrary to this perspective of open information sharing, Möller (2008, p. 206) argues that customers “might lack the willingness and ability to integrate themselves” in this process. While the willingness and ability of customers are considered important prerequisites for the exchange of resources (Meuter, Bitner, Ostrom, & Brown, 2005; Sheth & Parvatlyar, 1995), “companies need to provide circumstances that enable different customer […] to perform as co-creators” (Möller, 2008, p. 206). This could include educating or socialising with customers, which Möller believes can aid “to enhance their ability or willingness to co-create” (2008, p. 206).

2.3 The Problem Domain: Technology-Enablement in Service Systems

2.3.1 Service Innovation

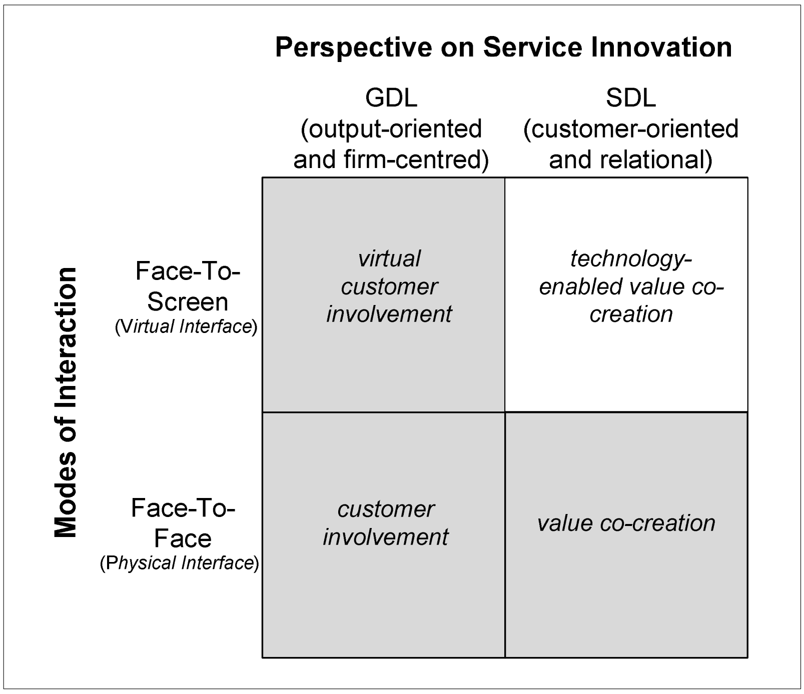
2.3.1.1 Defining Service Innovation

This study addresses the key research priority in service science at the intersection of service innovation research and ICT (Bitner, et al., 2010; Blomberg, 2010; BMBF, 2009; Chesbrough & Spohrer, 2006; Mott, 2010; Ostrom, et al., 2010; Rust & Miu, 2006; Sheehan, 2006). Section 2.3.1 initially analyses existing streams of service innovation research, outlines the role of ICT therein, and argues why, and how, the SDL is utilised in this study.

Innovation in service has been linked to fundamental social change (Zaltman, Duncan, & Holbeck, 1973), economic growth (Biemans, 1992), a firm’s competitive advantage (Alam, 2006b; Paswan, D'Souza, & Zolfagharian, 2009), corporate profitability (Shaw & Ivins, 2002), or the improvement of interactions within a service system (Butler et al., 1997; McAfee, 2005; Spohrer & Maglio, 2008). Zaltman, et al. (1973) defined innovation as a creative development process, a process of adoption, or the outcome of a process. As a creative development process, innovation was perceived as an act (Steiner, 1965), activity (Myers & Marquis, 1969), or “the setting up of a new production function” (Schumpeter, 1939, p. 87), while innovation in the context of a process of adoption required “the adoption of a change which is new to an organisation,” and occurred only when change was adopted (Knight, 1967, p. 479). Finally, innovation was defined as the outcome of a process that “occurs only when something is entirely new” (Levitt, 1966, p. 63), including “improvements in technology and better methods or ways of doing things” (Porter, 1990, p. 45), or “an idea, practice, or object that is perceived as new by an individual” (Rogers, 1983, p. 11).

Within the context of this study however, a definition for service innovation originating out of the service science literature is adopted. Service innovation is consequently defined as “changes to a service system, which has a direct impact on the evolution of the system” (Spohrer & Maglio, 2008, p. 15). With value being defined in the service science literature as an “improvement in a system, as judged by the system” (Spohrer, et al., 2008, p. 7), service innovation consequently attempts to initiate positive changes or improvements to a service system which can ultimately increase the perceived value that a customer experiences when interacting with that service system (Spohrer & Maglio, 2010).

The alleged differences of goods and services, and the related challenges of conceptualising service and value that resulted in the GDL vs. the SDL (see Section 2.2), also influenced research on innovation in service (Flint, 2006; Gallouj & Savona, 2009; Michel, et al., 2008). This divide in the literature between researchers investigating service innovation from the GDL, as opposed to the SDL, impacts how service innovation is understood and research is conducted. Figure 2.3 conceptualises existing approaches to investigate service innovation processes by focussing on the modes of customer interaction (physical vs. virtual customer interface), thereby addressing the role of ICT in these studies, as well as by focussing on the underlying perspective on service innovation (GDL vs. SDL).



(Clear field indicates empirical gap and represents the focus of this study)

Figure 2.3: Approaches to Investigate Service Innovation Processes

By using Figure 2.3 as a guideline, the subsequent sections discuss the various conceptual and empirical approaches to service innovation research. Section 2.3.1.2 outlines the SDL perspective on service innovation research, while Section 2.3.1.3 discusses the established GDL-driven stream of service innovation research. Subsequently, Section 2.3.2 presents customer involvement as well as virtual customer involvement as research fields that attempt to advance service innovation from the GDL perspective, while Section 2.3.3 focuses on technology-enabled value co-creation as the SDL-driven focus of this study.

2.3.1.2 Service-dominant Perspective on Service Innovation Research

The SDL (Lusch & Vargo, 2006; Vargo & Lusch, 2004; Vargo, et al., 2010) is increasingly gaining recognition as the leading perspective for the investigation of innovation in service (Chen, et al., 2009; Michel, et al., 2008; Nam & Lee, 2010; Ordanini & Parasuraman, 2011; Sebastiani & Paiola, 2010). This is because the SDL represents a "novel and valuable theoretical perspective that unifies the conventional literature on innovation" (Nam & Lee, 2010, p. 1761), thereby resulting in a "broad nomological network for investigating service innovation" (Ordanini & Parasuraman, 2011, p. 2). However, examining service innovation using the SDL "necessitates a rethinking and re-evaluation of the conventional literature on innovation," (Michel, et al., 2008, p. 54), including "a shift in thinking from attributes to value in use, from produced operand to embedded operant, and from a firm perspective to a genuine consumer-centric view" (Michel, et al., 2008, p. 65). Compared to the traditional GDL driven service innovation research, the SDL offers a "broader scope that enables scholars to better study and grasp innovation in a more enlightened manner" (Michel, et al., 2008, p. 65). Consequently, utilising the SDL perspective is likely to provide the desired advances in understanding service innovation as called for in the service science agenda (Chesbrough & Spohrer, 2006; Glushko, 2008; Ostrom, et al., 2010).

Service innovation research, as perceived by the SDL, focusses on change in the value co-creation process, and focusses on customers in the process (Edvardsson, et al., 2010). Flint (2006, p. 350) adds that innovation in service involves understanding and respectively altering the ways customers co-create value (Edvardsson, et al., 2010; Michel, et al., 2008). By utilising the SDL lens on innovation, firms can overcome the GDL driven understanding of innovation as a firm centred output, defined by a set of technical product attributes (Edvardsson, et al., 2005; Ordanini & Parasuraman, 2011; Sood & Tellis, 2005), and shift their attention to the various means on how to better co-create value with their customers

(Sebastiani & Paiola, 2010). Service innovation can be based on understanding the new roles that customers as co-creators of value can take (Michel, et al., 2008), or to initiate new ways to facilitate the exchange of resources (see Section 2.2.4.2) (Edvardsson, et al., 2010). Ultimately, the SDL-driven approach to service innovation research is based on an understanding of "how the customer co-created value, and not from the manufacturers' value proposition" point-of-view (Edvardsson, et al., 2010, p. 574). However, some researchers have recognised that even though the current literature provides a variety of examples of organisations that adopted a value co-creation approach, "relatively little is known about how customers engage in the co-creation of value" (Payne, et al., 2008, p. 83). This means "there is relatively little direction on how [the process of value co-creation] should be undertaken" (Payne, et al., 2008, p. 85). This argument is supported by Grönroos, who states that

> the roles of the firm and customer […] in the total process leading to value for customers cannot be established. Furthermore, it is unclear which of the firm's total activities and processes are part of the process labelled value creation, and which are outside it. The same goes for the customer's activities" (2011, p. 287).

He subsequently outlines that service provider and customer are not involved in an "unspecified, all-encompassing process of value creation" (Grönross, 2011, p. 287) as argued by the SDL, but proposes a differentiation between joint and individual activities performed by both parties over time.

The shortcomings and gaps in the service innovation literature are partly based on the fact that "empirical findings […] are limited and inconclusive" (Ordanini & Parasuraman, 2011, p. 1), which initiated the current debate over how service innovation should be investigated using the SDL. Central to this discussion is the call for more empirical qualitative work exploring service innovation (Chen, et al., 2009; Ordanini & Parasuraman, 2011; Sebastiani & Paiola, 2010) "especially in contexts, where […] the locus of service innovation is changing" (Chen, et al., 2009, p. 15), which is considered particularly prevalent whenever "the role of IT [information technology] is dominant" (Chen, et al., 2009; Ordanini & Parasuraman, 2011, p. 17). The debate corresponds with the notion of *technology-enabled value co-creation*, the focus of this study (see Section 2.3.3.4), as well as the attention that IT has recently received by service researchers[9]. Edvardsson, Gustafsson, et al. (2010) further highlighted in this context that the role of customers as value co-creators, and the ways that firms interact and communicate with their customers is changing. The key-factor here is that the "traditional face-to-face service interaction has been replaced by technology-based service encounters" (Edvardsson, et al., 2010, p. 566), with fewer face-to-face interactions meaning "less opportunity to learn from the customer and possibly weaker customer relationships" (Edvardsson, et al., 2010, p. 572). Consequently, these new technology-driven developments need to be taken into account when investigating how customers engage in value co-creation processes. This appears to be a major research gap, especially when considering that "studies on the effects of customer provider interaction and co-production […] are currently limited to services delivered via face-to-face encounters" (Wünderlich, 2009, p. 2).

In addition to more empirical work on the intersection of service innovation and ICT, other researchers outline that empirical SDL-driven service innovation studies should predominantly focus on operant resources (Chen, et al., 2009; Michel, et al., 2008; Ordanini & Parasuraman, 2011). From a methodological standpoint, the "point of views of external partners" (Chen, et al., 2009, p. 15), such as customers, are considered crucial for empirically understanding value co-creation, and "future researchers might consider obtaining […] this construct from customers themselves" (Ordanini & Parasuraman, 2011, p. 17). Furthermore, Payne, et al. (2008, p. 94) argue for a SDL-driven investigation of innovation "within professional services markets, such as consulting, legal and technical services," in order to "generate useful insights into this knowledge-intensive sector" (Payne, et al., 2008, p. 94).

While the improvements that the SDL can contribute to service innovation research are clearly understood, studies that explicitly apply the SDL perspective on service innovation are, to date, rare but growing in numbers. While none of these empirical studies have explicitly addressed the research implications for SDL-driven innovation studies outlined in the literature, some advancement has been made. Michel, et al. (2008, p. 55) demonstrated that radical innovations "can be better understood when applying a SDL perspective." Paswan, et al. (2009) as well as Nam and Lee (2010) developed conceptual service innovation typologies, while Ordanini and Parasuraman (2011) developed a SDL driven

[9] See Section 2.2.1 for a detailed description of the recent research priorities identified in service science in general, and the prevalent role of IT in this context, in particular.

conceptual framework for investigating the antecedents and consequences of service innovation. Ultimately, in order to better understand the advantages that the SDL can provide for service innovation research, the following section investigates existing GDL-centric service innovation studies by using a SDL lens which helps to identify several previously unknown shortcomings and disadvantages of these studies.

2.3.1.3 Goods-dominant Perspective on Service Innovation Research

The GDL-driven research canon on service innovation can be distinguished into a *technologist* or assimilation approach which reduces service innovation to the adoption of new technologies, and especially ICT, the service-oriented or *demarcation* approach, which seeks to identify specific differences in goods and 'services' innovation, and the integrative or *synthesizing* approach, which attempts to develop a common innovation framework for goods and services (de Vries, 2004; Drejer, 2004; Dröge, Hildebrandt, & Forcada, 2009; Gadrey & Gallouj, 2002; Gallouj & Savona, 2009; Tether & Hipp, 2002).

The *technologist* approach associates, or more precisely reduces, service innovation to the adoption and utilisation of new technology in a perceived service-context (Drejer, 2004; Dröge, et al., 2009). This school of thought represents the oldest stream of research on service innovation, and neglects other (non-technological) dimensions of innovation (Den Hertog, 2000; Dröge, et al., 2009; Gallouj & Savona, 2009). Technologists argue that the 'service-economy' becomes increasingly dependent on technology, which consequently represents the key driver for innovation, and that theories and concepts of (technology-based) innovation developed in manufacturing contexts can be transferred to innovation in services (de Vries, 2004; Dröge, et al., 2009; Gadrey & Gallouj, 2002; Gallouj & Savona, 2009). Central to this approach is the work of Barras (1986, 1990), who argued that ICTs represented the "enabling technology" (Barras, 1990, p. 215), to what he believed were the specific 'production processes' in service firms, and his work has since become the foundation for most technologist studies (Dröge, et al., 2009; Gadrey & Gallouj, 2002; Gallouj & Savona, 2009; Gallouj & Weinstein, 1997). Here, innovation in services is linked to gains in ICT-related competencies of an organisation, as well as overall progress in ICT developments.

The *demarcation* approach represents the second mainstream research approach in service innovation. It attempts to develop a unique framework for the investigation of service innovation by explicitly identifying perceived differences between services and goods innovation (Drejer, 2004; Dröge, et al., 2009; Gallouj & Savona, 2009; Nijssen, Hillebrand, Vermeulen, & Kemp, 2006). This approach argues that service-specific theories of innovation are necessary since some forms of innovation are service-specific. Consequently, concepts derived from goods-innovation cannot be translated to services, a belief rooted in the IHIP-criteria (see Section 2.2.2.2) (Den Hertog, 2000; Gadrey, Gallouj, & Weinstein, 1995; Gallouj & Windrum, 2009; Preissl, 2000). For example, Nijssen, et al. (2006, p. 242) argue that "the specific characteristics of services, i.e. their intangibility, co-production with customers, simultaneity, heterogeneity and perishability […] affect the development process of services and make them to a certain degree unique". Fähnrich and Meiren (2007, p. 10) add that "service types where so-called *soft factors* play a vital role, traditional product development methods are no longer transferable". Consequently, demarcation researchers created a set of "specific, non-traditional types of innovation," (Gallouj & Savona, 2009, p. 160), with the goal to "highlight the existence of particular forms of innovation in services" (Gadrey & Gallouj, 2002, p. 19).

Ordanini and Parasuraman (2011, p. 2) summarise that "while seemingly opposite approaches, assimilation [i.e. technologist] and demarcation are both inspired by a goods-dominant logic," which lead to "incomplete knowledge about the true nature and impact of service innovations". The technologist's view on service innovation is firm-centred and perceives ICT, an operand resource, as the key driver of innovation where value is embedded. Here, the purpose of innovation is the utilisation of new operand resources which embody value in exchange and result, at best, in a novel value proposition by the firm. The customer is not involved in any of these processes and is viewed as the recipient of the innovative output, which can be realised if the firm's operand resources are sufficiently utilised.

The demarcation and technologist approach are, from the SDL perspective, to a large extent structurally similar, yet some differences exist. The technologist approach perceives service and manufacturing activities as identical, while the demarcation approach is conceptually grounded in the IHIP-characteristics, and therefore subject to the shortcomings identified therein (Beaven & Scotti, 1990; Gummesson, 1993; Lovelock & Gummesson, 2004; Lusch & Vargo, 2006; Vargo & Morgan, 2005). While demarcation researchers recognise that service requires interaction with the customer (Gallouj & Windrum, 2009), this interaction is considered to obfuscate service innovation research, and resulted in a focus on certain types of innovation only, thus limiting their overall scope (Gallouj & Savona, 2009). For example, scholars here argue that the customer is a source of information that needs to be observed by the firm, which aims to collect and transform this information into an “innovation output” (Gallouj & Savona, 2009, p. 159). This is achieved by applying a firm’s “suitable […] technical equipment” (Gallouj & Savona, 2009, p. 159) or operand resources. The firm-driven focus on the customer and attempt to learn *from*, instead of *with* the customer, are elements of market orientation (Michel, et al., 2008). However, market orientation is “compatible if not implied by a service centred model” (Vargo & Lusch, 2004, p. 6), and consequently an “incomplete substitute for a SD logic [SDL] perspective for the evaluation of innovation” (Michel, et al., 2008, p. 57) by itself. The difference between a firm’s market orientation and the SDL perspective on innovation is the separation between value-in-use and value-in-exchange (Michel, et al., 2008). The creation of an output by a firm with attributes specified by a customer who was observed in one way or another, differs from a value co-creation process leading to value-in-use, and does not classify as an approach to understand innovation when viewed through the SDL (Michel, et al., 2008).

While some demarcation researchers recognise the importance of operant resources in service innovation, and refer to them as “non-technical” (Gadrey & Gallouj, 2002, p. 20), the majority of demarcation and technologist studies however, are centred around the utilisation of operand resources (Desai & Low, 1987; Hjalagar, 1997; Niehans, 1983; Sirilli & Evangelista, 1998; van der Aa & Elfring, 2002). For example, demarcation scholars argue that “new solutions are produced and innovations brought […] in the client firm” (Gadrey & Gallouj, 2002, p. 20) resulting in “marketable products” (Drejer, 2004, p. 559). Ultimately, both the demarcation and the technologist approach emphasise a firm centred view of value added operand resources such as ICTs, while the SDL focuses on the application of operant resources in value co-creation, with value perceived in-use by the beneficiary rather than value-in-exchange (Michel, et al., 2008; Vargo & Lusch, 2004; Vargo, et al., 2010). Furthermore, while technologies “may influence a firm’s ability to craft a value proposition” (Michel, et al., 2008, p. 58), “technology is only a medium” (Sundbo, 1997, p. 436), which can function as a repository or tool that facilitates the actual value co-creation between a service provider and customer (Bitner, et al., 2000), but is “not an innovative element *per se*” (Sebastiani & Paiola, 2010, p. 85).

Most researchers claim that demarcation studies are an intermediary to the more integrative *synthesizing* approach of service innovation research which focuses on aligning research on innovation in service and manufacturing, rather than investigating both fields separately (de Vries, 2004; Dröge, et al., 2009; Gadrey & Gallouj, 2002; Gallouj & Savona, 2009; Gallouj & Weinstein, 1997; Gallouj & Windrum, 2009). Here, the goal is to develop a theory in innovation where no distinction between innovation in services or goods is made a-priori, and where technical and non-technical forms of innovation are equally taken into account (de Vries, 2004). This development is understood to be driven by the argument of the increasing interdependence between manufacturing and services (Gadrey & Gallouj, 2002; Miozzo & Soete, 2001). Especially the fact that goods are often sold including services, and vice-versa, are key arguments that researchers supporting the synthesis approach have brought forward (Baines, Lightfood, Benedettini, & Kay, 2008; de Vries, 2004; Dolfsma, 2004; Gadrey, et al., 1995; Gebauer & Friedli, 2005; Sundbo, 2001).

Servitization, a research field part of the synthesis approach, investigates the perceived interrelationship between goods and added service provisions (Baines, et al., 2008; Ren & Gregory, 2007; Vandermerwe & Rada, 1988) through so-called “product-service-systems” (Goedkoop, van Halen, te Riele, & Rommens, 1999; Neely, 2008, p. 103), that “create additional value adding capabilities for traditional manufacturers” (Baines, et al., 2008, p. 547). Initially introduced by Vandermerwe and Rada (1988), servitization is understood as the “innovation of an organisation’s capabilities and processes to shift from selling products to selling integrated products and services that deliver value” (Baines, et al., 2008, p. 547). It widely acknowledges that manufacturing firms are “adding extra service components to core products” (Verstrepen, Deschoolmeester, & van den Berg, 1999, p. 539), with the result being an “integrated bundle of goods and services” (Robinson, Clarke-Hill, & Clarkson, 2002, p. 150), that is offered to gain competitive advantages by satisfying customer needs and thus increasing the firm’s financial performance (Ren & Gregory, 2007).

The conceptual and linguistic roots of the synthesis approach are still embedded in the GDL. While researchers here inadvertently extend their understanding towards operand (i.e. ‘the good’) and operant resources (i.e. ‘the service’), the perception of value is rooted in the GDL notion of value-in-exchange, rather than in value-in-use. Likewise, the servitization studies which are central to the synthesis approach, perceive service as a value generating ‘add-on’ (Verstrepen, et al., 1999) to a ‘good’ which “deliver value” (Baines, et al., 2008, p. 547).

Once again, value is affiliated with operand resources, and delivered in-exchange. The SDL perspective would argue that a manufactured good is not the output of an innovative process, but rather represents a distribution mechanism for a service, with its value determined in-use by the beneficiary (Michel, et al., 2008; Vargo & Lusch, 2004; Vargo, et al., 2010). The synthesis approach, when compared to the demarcation and technologist approaches, attempts to recognise the contribution of the customer, and even acknowledges that both operant ('competences of the customer') and operand resources ('technical characteristics') can be part of an innovation process (de Vries, 2004; Gadrey & Gallouj, 2002; Gallouj & Savona, 2009). While the synthesis approach views service innovation as a process resulting in change to the operand and operant resources of both firm and provider, it is nevertheless firm-centric and "delivered" to the customer (Gallouj & Savona, 2009, p. 163), which omits the value in-use perspective. The interaction between firm and customer, or the innovation-process, ends according to Gallouj and Savona (2009) after the firm's value proposal and the customer's acceptance of the proposal. The actual realisations of the value in-use, as well as the evaluation of value are not part of this innovation conceptualisation. According to Spohrer et al. (2008), value can consequently not be co-created (see Section 2.2.3), and the synthesis approach incomplete in its insight on service innovation, when investigated through the SDL lens.

While Michel, et al. (2008, p. 55) summarise that "virtually all discussion about innovation is from a GDL perspective," a growing number of researchers have criticised existing GDL-driven attempts of investigating service innovation due to their firm-centric perspective and focus on the output of value-added operand resources and value-in-exchange (Chen, et al., 2009; Michel, et al., 2008; Nam & Lee, 2010; Ordanini & Parasuraman, 2011; Sebastiani & Paiola, 2010). While the influence of the GDL on the technologist and demarcation approach is obvious and widely recognised (Chen, et al., 2009; Ordanini & Parasuraman, 2011), it equally influenced the synthesis approach.

In conclusion, Gallouj and Windrum (2009) argue that advancing service innovation research requires a "reassessment of established theories and models, and the development and testing of new theories and models […] it requires a thorough review of what (we think) we know about innovation" (Gallouj & Windrum, 2009, p. 141). This study supports their claim, however, it also acknowledges that only a SDL-driven investigation of service innovation can overcome the shortcomings of the existing GDL-driven approaches. It therefore responds to the recent discussion in the literature and applies the suggested research implications for SDL-driven innovation studies outlined in the literature. Finally, Table 2.4 compares the technologist, demarcation, and synthesis approaches with a SDL-driven perspective on service innovation.

	Technologist Approach	Demarcation Approach	Synthesis Approach	Service-Dominant Logic
Innovation Perspective	Firm centred output	Firm centred output	Holistic process	Customer centred process
Role of Customer	Passive	Passive	Contributes to satisfaction of 'need'	Active
Direction of Innovation	To market (firm to customer)	To market (firm to customer)	To market (firm to customer)	Market with (dialogue with customer)
Innovation Resources	Operand	Operand	Operand and Operant	Operant
Value of Innovation	Value in Exchange	Value in Exchange	Value in Exchange	Value in Use
Perspective on Service	Activity identical to manufacturing	IHIP	Services and Goods are 'products' fulfilling 'needs'	Service as basis of economic exchange

Table 2.4: Comparison of the Key Approaches in Service Innovation Research

2.3.2 Changing Role of Customers in Service Innovation

2.3.2.1 Accessing Customer Information

In order to build the necessary conceptual foundations for the development of the research questions, this section further discusses the changing role of customers in the context of service innovation research which is perceived as central to the advancement of SDL-driven service innovation research. Section 2.3.2.1 initially outlines the importance of obtaining relevant information from customers as the key incentive for their involvement in innovation processes. Section 2.3.2.2 reviews GDL-oriented empirical and conceptual studies in the field, while Section 2.3.2.3 incorporates the role of ICT in these processes by reviewing studies related to virtual customer involvement.

Information is understood as the "essence of service organisations," (Mills & Marguiles, 1980, p. 261), as well as the "basis of power" (Mills & Marguiles, 1980, p. 263), and it is the quantity and quality of the operant resource information exchanged in a service system, that influences the success of the value co-creation and is, subsequently, necessary for service innovation processes (Ballantyne & Varey, 2006; Bettencourt, Ostrom, Brown, & Roundtree, 2002; Edvardsson, et al., 2010; Mills & Marguiles, 1980; Xue & Field, 2008). Even GDL-oriented service innovation studies recognise that the "secure access to the critical resource of information on customer needs" (Carbonell, Rodriguez-Excudero, & Pujari, 2009, p. 538), and the dissemination of this information throughout a firm is crucial when developing a new service (Enkel, Kausch, & Gassmann, 2005). This "logic of information processing" (Lundkvist & Yakhlef, 2004, p. 249) is based on a perceived asymmetric relationship, where "the 'need' information (what the customer wants), resides with the customer, and the 'solution' information (how to satisfy those needs) lies with the manufacturer" (Thomke & Von Hippel, 2002, p. 76). However, this information has to be obtained from the customer in sufficient quantity and quality and transferred towards the firm (Lundkvist & Yakhlef, 2004), an approach similar to demarcation approaches discussed in Section 2.3.1.3.

While being inherently goods-centric, researchers have argued that the acquisition, transfer, and use of information from the customer are usually characterised through a degree of stickiness, meaning that this information is usually "costly to acquire, transfer, and use" (Szulanski, 2000; Von Hippel, 1994, p. 429; 1998). Sticky information is considered to be related to the social context in which it originates, hence the successful transfer of sticky information requires deeper interactions and processes of communication with customers, which studies related to customer involvement attempted to achieve (Gales & Mansour-Cole, 1995; Lundkvist & Yakhlef, 2004; Sanden, 2007; Von Hippel, 1994).

Researchers have argued that, in order to accomplish the transfer of sticky information, organisations need to ensure that customers are fully integrated and active participants in service innovation processes since "it is no longer sufficient simply to conduct interviews or surveys" when attempting to understand the customer (Edvardsson, et al., 2010, p. 566; Sanden, 2007). Selected customers, here referred to as "lead users," are now proactively involved in the initial development of a new service, for instance by being part of a project team, while being "fully aware of the fact that he explicitly reveals his valuation, needs, requirements and preferences" (Riordian, Blau, Neumann, & Weinhardt, 2008, p. 6). The following section outlines GDL-oriented empirical and conceptual studies that investigated the involvement of customers in the context of service innovation processes.

2.3.2.2 Customer Involvement

Conceptual and empirical studies broadly affiliated with the research fields of New Service Development (Bowers, 1989; Eastingwood, 1986; Edvardsson & Olsson, 1996; Johne & Storey, 1998) and Service Engineering (Fähnrich & Meiren, 2007; Luczak, Gill, & Sander, 2007; Spath, van Husen, Meyer, & Elze, 2007) investigated the interaction between customers and service providers in innovation processes. While these *customer involvement* studies are equally rooted in the GDL, they nevertheless represent an important advancement by discussing the customer's role during the initial creation of a new service. Table 2.5 presents an overview.

Concept	Exemplary Definition	Other Relevant Authors
Customer Involvement	"Those processes, deeds and interactions where a development team collaborates with current (or potential) customers at the program, project and/or stage level of the development process" (Sanden 2007, p. 16)	(Carbonell, et al., 2009; Kristensson, Matthing, & Johansson, 2007; Lundkvist & Yakhlef, 2004; Ritter & Walter, 2003; Sanden, 2007)
Customer Integration	"Customer integration is the incorporation of resources from customers into the processes of a company" (Moller 2008, p. 1)	(Edvardsson, Gustafsson, Kristensson, Magnusson, & Mathing, 2006; Enkel, et al., 2005; Frauendorf, 2006; Möller, 2008; Piller & Möslein, 2002)
Customer Co-Development	"Co-development is about co-opting customers' competence and bringing the customer into the innovation process" (Edvardsson, Gustafsson et al. 2010, p. 565)	(Anderson & Crocca, 1993; Edvardsson, et al., 2010; Neale & Corkingdale, 1998)
User involvement	"A set of behaviours or activities performed by potential users during the system development process" (Barki & Hartwick 1989, p. 55)	(Alam, 2002; Barki & Hartwick, 1989; Kaulio, 1998; Lettl, 2007; Magnusson, Matthing, & Kristensson, 2003)

Table 2.5: Concepts Investigating the Role of Customers in Service Innovation Research

Researchers investigating customer involvement[10] have long argued *when* to involve the customer in service innovation processes (Alam, 2006a; Gruner & Homburg, 2000; Sanden, 2007). However, the foundation of this debate is, once again, based on the GDL oriented understanding of innovation (Spohrer, et al., 2008; Vargo, et al., 2010). These GDL-oriented studies focus on what Vargo, et al., (2010) refer to as new *service co-production,* as opposed to the SDL-oriented service innovation studies, which attempt to understand how customers engage in *value co-creation* processes with *existing* value propositions. Co-production is, unlike value co-creation, optional (Spohrer, et al., 2008; Vargo, et al., 2010), and refers to a

[10] For the sake of simplicity, within the scope of this study, the term 'customer involvement' is used to describe the concept of a customer's interaction with a service provider during an GDL-driven innovation process.

customer's contribution to the *initial* creation of the firm's value proposition, the dominant perception of innovation inherent in these studies.

A plethora of literature investigates the various stages of service co-production, mainly by following conceptual process-models that are derived from a manufacturing context (de Jong & Vermeulen, 2003). Consequently, customer involvement in service co-production is limited to the extent of the phases inherent in these process-models, which usually have the intention of "applying the appropriately modified engineering know-how established in the field of conventional product development to the development of services" (Fähnrich & Meiren, 2007, p. 5). While no generally applicable model has been agreed upon to date (Agrawal & Berg, 2007), all models follow, with differences in their level of detail, the same underlying sequence of core-phases. These include *idea generation*, *design*, *analysis*, *implementation* and *launch*, and are represented through vertical arrows in Figure 2.4, where key process models that outline a structured innovation process are compared with studies that argue for the ideal timing of a customer's involvement during service co-production.

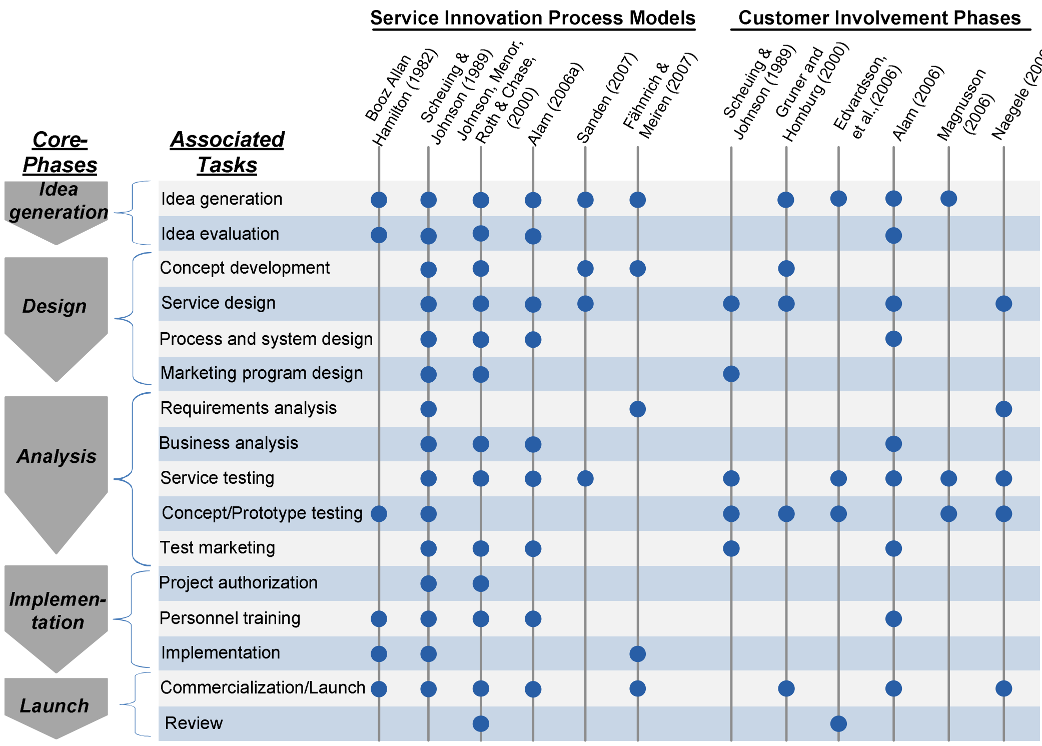


Figure 2.4: Customer Involvement in Established Service Innovation Phases

The major shortcoming of these studies is, when viewed through the SDL perspective on service innovation, their rooting in the GDL and limited scope on service co-production, rather than value co-creation. Consequently, and most importantly, they neglect to investigate the role of customers in value co-creation, which occurs, by definition, *after* the initial launch of a new service; here, the involvement of the customer is not examined anymore since the innovation-process is considered complete after the launch of the service. Möller (2008, p. 5) provides additional support for this argument, stating that "customer integration [i.e. involvement] assumes a narrower perspective than co-creation of value as defined by the SDL." Hence, utilising customer involvement as a construct in service innovation research implies a non-relational, firm-centric and output-oriented process in which customers can provide some sort of input, and is consequently unsuitable as a construct when attempting to advance service innovation research from a SDL-driven viewpoint as argued for by Michel, et al. (2008), Chen, et al. (2009), Ordanini and Parasuraman (2011) and others (Edvardsson, et al., 2010; Sebastiani & Paiola, 2010).

2.3.2.3 Virtual Customer Involvement

New technology-enabled approaches towards customer-centred service innovation such as co-innovation (Bughin, Chui, & Johnson, 2008; Bughin, Chui, & Manyika, 2010) and collaborative innovation (Donofrio, et al., 2010) introduce an alternative perspective on previous approaches to customer involvement. The key attribute distinguishing these "distributed innovation" (Prandelli, Verona, & Raccagni, 2006; Sawhney & Prandelli, 2000, p. 24) approaches from existing ones, is the novel recognition of the physical separation of service provider and customer and application of ICT, leading to virtual customer-firm interactions during service co-production (Nambisan, 2002, 2009; Nambisan & Baron, 2007, 2009; Verona, Prandelli, & Sawhney, 2006). This virtualisation of customer involvement consequently led to *virtual customer involvement* (Bartl, Füller, Ernst, & Mühlbacher, 2004; Dahan & Hauser, 2002; Rohrbeck, Steinhoff, & Perder, 2008).

Physical proximity, or interactions relying solely on a face-to-face interface, are considered to limit the quantity of customers a firm can include during co-production (Bartl, et al., 2004; Dahan & Hauser, 2002; Sawhney & Prandelli, 2000; Sawhney, Verona, & Prandelli, 2005). In a virtual environment however, firms can include a potentially unlimited number of customers simultaneously and in real-time for their innovation purposes (Rohrbeck, et al., 2008; Sawhney & Prandelli, 2000; Sawhney, et al., 2005). For virtual customer involvement, the "internet is used as the prime communication channel" between firms and customers contributing to the innovation process (Rohrbeck, et al., 2008, p. 471). The methods currently utilised in virtual environments however, "simply move paper-and-pencil or central-location interviewing methods to the web" (Dahan & Hauser, 2002, p. 333). Yet, unlike in a physical environment where customers are usually bound to participate in an interview or survey, virtual customer involvement techniques can be terminated by customers at any time (Dahan & Hauser, 2002). Consequently, researchers have argued that web-based tools should not be mere copies of their physical counterparts, but be "designed with the web in mind" (Dahan & Hauser, 2002, p. 334).[11] Nevertheless, these techniques usually attempt to gather information from customers in regard to a proposal that was initiated by the firm (Edvardsson, et al., 2006; Matthing, Sanden, & Edvardsson, 2004; Sanden, 2007). For example, existing empirical studies investigating virtual customer involvement are typically related to product innovation and focus on two broad areas: first, a group of qualitative studies investigating virtual customer involvement describe the dynamics and internal processes within a specific industry or scenario (Bartl, et al., 2004; Kosonen & Ellonen, 2007; Verona, et al., 2006), while the second group of studies concentrates on the technical elements and methodologies utilised here (Kohler, Füller, Stieger, & Matzlre, 2011; Piller & Walcher, 2006; Rohrbeck, et al., 2008).

Ultimately, engaging with customers in a technology-enabled environment is an important step towards a customer-centred approach to innovation in service. However, existing methods inhibit the same shortcomings inherent in traditional customer involvement: they are grounded in a firm-centred, output-oriented and non-relational GDL-dominated perspective on service innovation, merely shifted into virtual realms. Most notably, the virtual involvement of the customer is typically restricted to "the generation, design, refinement, and testing of ideas and new product concepts" (Füller, 2010, p. 98), which corresponds with the sequential innovation process for customer involvement introduced in Figure 2.4.

Virtual customer involvement is, just like previous customer involvement approaches, limited to service co-production. It therefore neglects to investigate how customers engage in value co-creation processes which is considered necessary by researchers advocating the SDL-driven perspective on service innovation. One of the key challenges omitted by virtual customer involvement approaches is that the co-creation of value process occurs *after* the launch of a new service. The innovation process however, is already considered completed at

[11] For an overview on actual ICT-based methodologies for customer involvement see Dahan and Hauser (2002). Empirical industry-examples can be found in Bartl, et al. (2004).

that stage by GDL-driven researchers, who consequently do not investigate the role and contributions of customers beyond the launch of the service.

While Sanden (2007, p. 131) argues that “virtual customer methods are still in their infancy” it is evident that the key challenge is not necessarily a perceived shortcoming rooted in the use of ICTs, but rather the underlying GDL-driven perspective on service and economic exchange. It is therefore necessary to investigate service innovation from the SDL-driven perspective, while taking the recent developments in ICT into consideration. This is exactly what Chen, Tsou et al. (2009) or Sebastiani and Paiola (2010) proposed (see Section 2.3.1.4). This present study adopts the standpoint of Chen, Tsou et al. (2009) and Sebastiani and Paiola (2010), because our understanding of “virtual co-creation projects is limited” (Füller, 2010, p. 98) and, to the best of the researchers knowledge, no empirical research exists to date that investigates technology-enabled value co-creation processes as advocated by the SDL perspective on service innovation. The following section addresses the intersection of ICT and service innovation, and explains technology-enabled value co-creation, the core construct of this study, in detail.

2.3.3 Technology-Enablement in Service Systems

2.3.3.1 Modes of Technology-Use in Service Systems

“Technology, in particular information technology, has influenced the nature of services […] and the practice of service innovation” (Bitner, et al., 2010, p. 200). ICTs are known to have implications for service firms on the strategic, developmental and executional level (Ostrom, et al., 2010), can increase the profitability for service businesses (Rust & Miu, 2006), be a source of innovation by itself (Sheehan, 2006), or enable new types of value co-creation processes and interactions between customers and service provider (Bitner, et al., 2010). In order to effectively and efficiently utilise ICT, service firms need to initially understand how technology can be incorporated into interactions with customers.

The interaction between a customer and firm takes place at an *interface*, defined as the “physical or virtual point of contact between customer and service provider” (Gadrey & Gallouj, 2002, p. 39). Virtual interfaces are especially prevalent in the context of service engagements in a “networked society” (Castells, 2000; Verhoef, Reinartz, & Krafft, 2010, p. 247). Especially new ICTs ranging from email, video-conferencing or social networking sites, are emerging as the dominant interface for the interaction between service firms and customers (Verhoef, et al., 2010, p. 247). Froehle and Roth (2004) developed five abstract conceptual modes that describe how service firms can interact with customers in relation to technology. Figure 2.5 presents these conceptual modes.

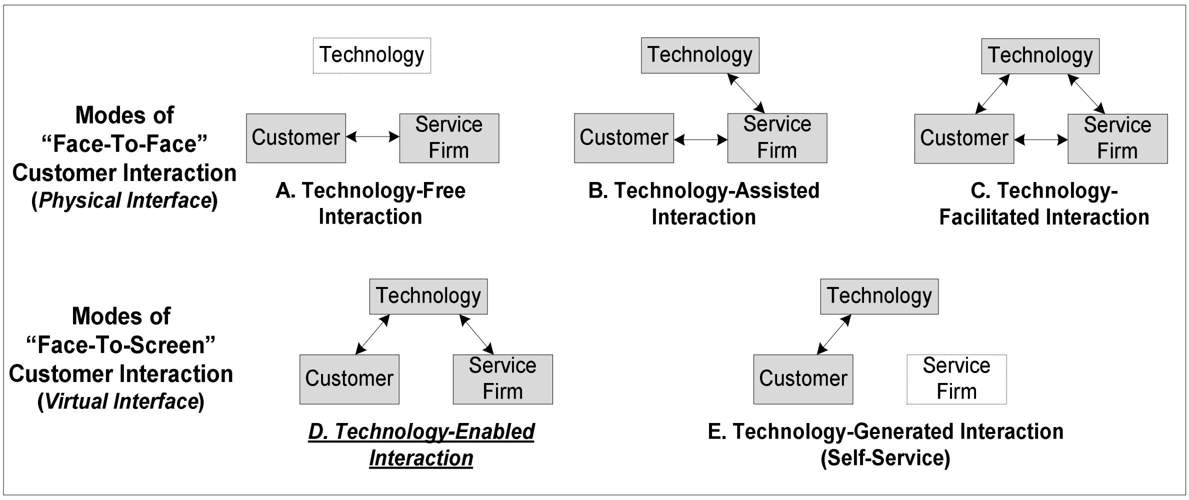


Figure 2.5: Modes of Technology-Use in Service Systems (Froehle & Roth, 2004, p. 3)

The interaction between a service firm and customer can, in relation to the use of technology, be conceptualised using the two categories of *face-to-face* (physical interface) and *face-to-screen* (virtual interface). The underlying assumption behind face-to-face interaction is that the interface by which customers and providers interact (Gadrey & Gallouj, 2002), is based on *physical* contact. Such a face-to-face interaction can either be technology-free (Graph A), technology-assisted (Graph B), or technology-facilitated (Graph C). A face-to-face interaction between service provider and customer is technology-free when technology is not required or used. A technology-assisted interaction utilises technology in order to improve the interaction with the customer, yet relies on physical contact. This could be the case in a retail-store where the sales assistant operates an electronic cash-register. Finally, in technology-facilitated interactions the customer and service provider use and access the same technology simultaneously, while experiencing physical proximity. For example, the joint use of a PowerPoint-presentation during a meeting between a consultant and client is considered a technology-facilitated interaction (Froehle & Roth, 2004).

The second category used to conceptualise customer-firm interactions assumes that the interface by which customer and provider interact is *virtual*. Consequently, technology-enabled interaction imply that the customer and service firm are "not physically co-located" (Froehle & Roth, 2004, p. 3). Instead, the interaction is enabled by utilising one or several types of technology, such as email, instant-messaging or video-conferencing that form a substitute for physical face-to-face interactions. These technology-enabled interactions (Graph D) between customer and service firm are the focus of this study, and its implications are discussed in more detail in the subsequent section. Finally, in technology-generated interactions (Graph E), technology entirely replaces the human touch-point on the side of the service provider. Here, the customer interacts only with some kind of technology (for example a website or online-store), in a self-service environment, while human-to-human contact is absent (Collier, 1983; Froehle & Roth, 2004).

2.3.3.2 Technology-Enabled Value Co-Creation

Interactions amongst service providers and customers traditionally follow the notion of "high touch, low-tech" (Bitner, et al., 2000, p. 138), implying the existence of a physical interface between the entities involved (Bitner, 1990). Technology played a minute role in these face-to-face service encounters, where technology-assisted or technology-facilitated interactions (see Section 2.3.3.2) represented slight deviations from an otherwise entirely technology-free environment. Nevertheless, researchers have, for the past decade, begun to understand that the advancement, ubiquity and sophistication of modern ICTs has changed, and is likely to continue to change, how service providers and customers interact (Parasuraman, 2000; Zeithaml, Parasuraman, & Malhotra, 2002). The shift toward online and technology-mediated interfaces is not just prevalent, but likely to be inevitable, and will continue to influence how customers and providers interact and exchange resources when attempting to co-create value (Froehle, 2006; Froehle & Roth, 2004).

While some service providers use ICT to "replace or substantially diminish personal interaction in service provision" (Walker & Johnson, 2004, p. 564), resulting in technology-generated interactions and self-service, ICT can also enable interpersonal communication and interaction that closely resembles face-to-face interactions (Baym, et al., 2004; Makarem, et al., 2009; O'Sullivan, 2000). Here, interactions with customers in "traditional face-to-face service interaction," can be "replaced by technology-based service encounters" (Edvardsson, et al., 2010, p. 566).[12] An example for this development is a service provision like consulting which, like most knowledge-based service provisions, typically requires close face-to-face interaction between a service provider and customer. Lee and Park (2009, p. 9618) noticed

[12] See also Section 2.3.1.3.

that "with the advancements of IT, many traditional service providers are starting to provide services online." Within consulting it is understood that the need for physical contact between a consultant and customer, as a mediator for customer input has, due to technological advancements, become less relevant (Lee & Park, 2009; Maglio & Spohrer, 2008; Sampson & Froehle, 2006). This type of service is consequently beginning to shift into virtual realms, with ICT-based interactions beginning to replace the physical contact between a consultant and customer (Donofrio, et al., 2010; Lee & Park, 2009; Maglio & Spohrer, 2008).

The resulting value propositions are described as technological knowledge-intensive business services (Glückler & Hammer, 2011), interactive remote service provisions (Wünderlich, 2009), or technology-enabled service encounters (Makarem, et al., 2009). The common element here is the high degree of technology-mediated interactions (see Section 2.3.3.3) between service provider and customer, with technology enabling the "interpersonal interaction between a customer and a company" (Makarem, et al., 2009, p. 135; Wünderlich, 2009). This element of interpersonal technology-enabled interaction is a differentiating factor here, compared to service provisions that rely on technology-generated interactions such as a self-service, but do not include human-to-human interactions in the process (Froehle & Roth, 2004; Glückler & Hammer, 2011; Makarem, et al., 2009; Wünderlich, 2009).

Technology-enabled interactions between a customer and service provider imply that the process of value co-creation is affected by this development as well, resulting in *technology-enabled value co-creation processes*, the central phenomenon investigated in this study. In this context, it is important to emphasise that ICTs only enable the change in the value co-creation process. Hence, researchers should not adopt a technologist approach and perceive ICTs as the main driver of innovation (see Section 2.3.1.2), but must rather understand that the ways firms interact and communicate with their customers are changing. With service innovation defined as "changes to a service system, which has a direct impact on the evolution of the system" (Spohrer and Maglio 2008, p. 15), it is these changing means by which entities in service systems interact rather than ICT alone that represents the innovation. Figure 2.6 demonstrates the aforementioned shift.

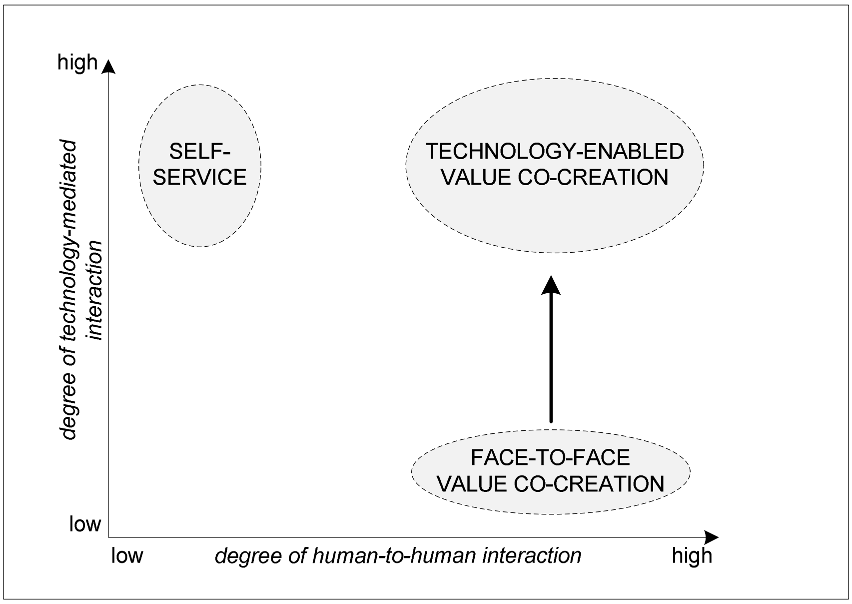


Figure 2.6: Shifting Interactions, adapted from Wünderlich (2009)

Donofrio, et al., (2010) identify three key drivers that attempt to explain the shift in value co-creation from a physical interface, towards a virtual one: the greater opportunities for customer and provider collaboration through commonly available ICT infrastructure (*network ubiquity*), *open standards* ensuring accessibility and usability of ICT, and *new business designs* providing economic incentives for 'online' collaboration between service providers and customers (Donofrio, et al., 2010). New information and communication technologies, most notably the internet, email and mobile communication applications, are now commonly available and standardised, so that the accessibility and usability of these technologies has become relatively simple. Network ubiquity, open standards and new business designs (Donofrio, et al., 2010), have changed the service-landscape dramatically (Gummesson, 2008; Lovelock & Gummesson, 2004). New business designs have emerged and influenced the ways organisations co-create value with their customers (Blomberg, 2010; Lovelock & Gummesson, 2004; Peterson, Balabubramanian, & Bronnenberg, 1997; Reichheld & Schefter, 2000; Rust & Kannan, 2002; Wünderlich, 2009). The physical location of the value co-creation process is beginning to become irrelevant, because "as the ability to communicate increases, the need for transport decreases" (Lusch, et al., 2010, p.23). This impacted the ways resources such as information are now exchanged and applied within the value network, with ICT becoming the "meta-force altering business and society" (Lusch, et al., 2010, p. 22).

While technology-enabled value co-creation is an emerging reality in economies around the world, service researchers have, for the past decade, criticised that service research has not caught-up with this development (Bowen, 2000; Brown, 2000; Chase & Apte, 2007; Lovelock & Gummesson, 2004). For example, Lee and Park (2009), as well as Chase and Apte (2007, p. 384) criticise that "there is little […] empirical research specifying how service interactions should be handled over the Internet". Especially the fact that service research has, in the past, predominantly focussed on face-to-face interactions, is now recognised as an issue resulting in a (technology-driven) gap in knowledge. While previous studies contributed enormously to our understanding of value co-creation in face-to-face contexts "considerably less work has been done to improve our understanding of […] technology-mediated settings (e.g., via telephone, instant messaging (IM), or email" (Froehle & Roth, 2004, p. 1). This is an important gap, because the types of ICT that service provider rely on to interact with their customers are not limited to standardised technologies such as telephone, fax or email anymore. Increasingly, Instant Messaging (IM), Video-Conferencing (VC) (Nguyen & Canny, 2007) are utilised as well. However, the extent to which these technologies are used remains unclear (Froehle, 2006). Chase and Apte (2007, p. 384) further assess the current state of service research and the role of ICT therein, stating that "guidelines for face-to-face services […] are only partially applicable to email" (Chase & Apte, 2007, p. 384), and consequently "need to be updated to include virtual" contexts as well (Froehle, 2006, p. 8).

Before taking a normative research approach to the intersection of service innovation research and ICT, which can provide actual recommendations on "how to manage" service systems effectively (Lee & Park, 2009, p. 9618), it is more important to explore how service systems operate and interact by means of ICT (Vargo, et al., 2008). Understanding value co-creation in a technology-enabled context requires us to explore how "information technology influences the ways in which value can be created effectively", but also asks: "what approaches do we need to understand the socio-technical context of value creation?" (Vargo, et al., 2008, p. 151). This is especially relevant when taking the significance of social environments of human communication for value co-creation into account, which are, especially in the case of a technology-enabled value co-creation process, potentially more important for successful value co-creation than the technology enabling the interaction within the service system itself. For example, differences in time-zones or privacy concerns are suspected to inhibit the service system's ability to co-create value (Maglio, 2010; Ostrom, et al., 2010). While Naisbitt (1982, p. 52) already foresaw in the 1980's that "the more high technology around us, the more the need for human touch," our understanding, especially from an empirical standpoint, on how service systems can ideally interact via ICT and overcome these challenges, is still very limited (Ostrom, et al., 2010). Just recently, Edvardsson, et al., (2011) suggested that future researchers should explicitly focus on the social reality in which a service is exchanged, while Makarem, et al., (2009, p. 144) concluded that researchers provided significant empirical insights into "face-to-face service encounters […] but not of service encounters involving *both* technology and the human touch."[13] This study attempts to address these empirical and conceptual research gaps, which correspond with the SDL-oriented research agenda for service innovation discussed in Section 2.3.1.2.

An evolution from interpersonal to virtual interactions has previously been observed in research on collaboration and interaction in teams, which led to the research area of virtual teams (Colquitt, Hollenbeck, Ilgen, LePine, & Sheppard, 2002; Martins, Gilson, & Maynard, 2004). Consequently, the argument has been brought forward that service research should widen its boundaries, and incorporate insights gained in virtual team research, in order to investigate technology-enablement in service systems (Froehle, 2006). *Connectivity* is, in the context of interactions within socio-technical systems and virtual teams, already seen as an appropriate approach to investigate and understand the performance of such a distributed workforce on social and technical levels (Kolb, 2008; Kolb, et al., 2012; Kolb, et al., 2008). Connectivity therefore represents the ideal socio-technical analytical lens for the investigation of technology-enabled value co-creation, as called for by Makarem, et al., (2009), Edvardsson, et al., (2011) or Vargo, et al., (2008). Section 2.4 discusses the conceptual and empirical foundations of the connectivity metaphor as brought forward by Kolb, et al., (2008). It furthermore describes the ideas underlying connectivity in detail, and outlines why and how connectivity will be utilised as the analytical lens for investigating technology-enabled value co-creation processes in this study.

[13] Italics added to quote.

2.4 The Analytical Lens: Connectivity in Service Systems

2.4.1 Connectivity as the Analytical Lens in this Study

The lack of empirical studies investigating technology-enabled value co-creation processes from a socio-technical perspective was outlined in the previous section. Froehle (2006) was amongst the first researchers who acknowledged the increasingly important role of ICTs in service systems, and the associated shift of value co-creation processes into virtual realms. He consequently argued that technology-enabled interactions between customers and service providers should be perceived as a "type of virtual team", and hence "opportunities arise for employing some of the findings from the virtual team literature to technology-mediated [service systems]" (Froehle, 2006, p. 12). However, the wider virtual team literature has typically focussed on the communication technology *or* the virtual team as their unit of analysis, thereby addressing *either* the technical *or* social dimension of that interaction (see Section 2.4.2). Therefore, the findings originating from this stream of literature appear unsuitable when investigating technology-enabled value co-creation processes, where understanding the social *and* technical dimension is considered crucial (Edvardsson, et al., 2011; Makarem, et al., 2009). Also, the somewhat incomplete understanding of technology-enabled interactions inherent in the existing virtual team literature has motivated researchers' to call for new analytical means, including "new theoretical bases that are uniquely relevant to virtual interaction, to develop a more theoretically grounded understanding of the functioning of VTs [i.e. Virtual Teams]" (Martins, et al., 2004, p. 823).

Connectivity is gaining attention as such a socio-technical lens "through which to view and understand intra- and inter-organizational interactions" (Kolb, 2008, p. 138), and is considered to possess the necessary qualities to advance our "thinking about how we connect and disconnect in an increasingly interconnected world" (Kolb, 2008, p. 141). Most importantly, since researchers have recognised that focussing on technical connections only (Castells, Fernandez-Ardevol, Qiu, & Sey, 2007; Waverman, Dasgupta, & Brooks, 2009) fails to provide sufficient insights, connectivity "can and should be applied to social interactions" (Kolb, 2008, p. 140) as well. It is this socio-technical multidimensionality of connectivity which represents its key advantage over the limited approaches originating from the virtual team literature, and hence provides a novel research-lens for this study.

Connectivity has the ability to address the shortcomings inherent in virtual team research and is, as an analytical lens, particularly suitable for investigating technology-enabled value co-creation processes and for advancing service science. By using four foundational pillars (see Section 2.4.3.1), this study argues that connectivity can be understood as a 1) holistic perspective on interactions within a system that 2) explicitly recognises entities at the core of that interaction, and is 3) understood as a multidimensional socio-technical construct, and can 4) vary its levels of intensity between entities, therefore impacting a system's performance.

Mason's argument that "the idea of connectivity is central to systems thinking" (2005, p. 69), together with the holistic perspective that connectivity provides on interactions in systems, makes it applicable in service science because here the service system is considered the basic unit of analysis (Maglio and Spohrer 2008). Fundamental to understanding interactions through a connectivity lens is the understanding of systems being comprised of individually connected entities (Jordan, 1969/2001; Mason, 2005). Service science also argues that service systems consist of entities (Maglio & Spohrer, 2008; Spohrer & Maglio, 2010; Vargo, et al., 2010), which exchange operand and operant resources in order to co-create value (Prahalad & Ramaswamy, 2004). This holistic perspective on interacting entities in systems exists in both service science and connectivity research.

The combination of technical and human resources within a service system has led to service systems being perceived as value co-creation configurations that resemble a type of socio-technical system (Spohrer & Maglio, 2008). Consequently, and as outlined previously, researchers have argued that it is crucial to understand the socio-technical context of value co-creation (Edvardsson, et al., 2011; Makarem, et al., 2009), which can, in the case of a technology-enabled value co-creation process, be potentially more important for successful value co-creation than the technology enabling the exchange within the service system itself (Maglio, 2010; Ostrom, et al., 2010). As a multidimensional socio-technical construct, connectivity addresses this issue and can provide insights into both the technical and social or human underpinnings of technology-enabled interactions. It is this dyadic lens that further supports the applicability of connectivity as an analytical lens in service science.

Finally, service science attempts to increase societies' abilities to plan, advance and scale service systems in terms of their efficiency and effectiveness (Maglio & Spohrer, 2008; Spohrer & Maglio, 2010). The efficiency of a service system is measured by its ability to co-create value, which depends on its ability to exchange operand and operant resources amongst all entities, internal or external to the system (Prahalad & Ramaswamy, 2004). In the context of technology-enabled value co-creation, these entities rely on ICT to exchange the operant resource of information. Consequently, effective and efficient value co-creation depends on the system's ability to exchange information in a technology-enabled environment, which relates to Cartwright's argument, that "value generation […] derives not necessarily from outright ownership of resources but from the *interconnectivity* […] of the participants" (2002, p. 63).[14] The fact that the levels of socio-technical connectivity between entities of a system can vary throughout connective states, is the reason why connectivity has been linked to the performance of a system (Janssen, et al., 2006; Kolb, et al., 2008). Utilising connectivity as the analytical lens for investigating technology-enabled value co-creation in this study represents a means to understand the socio-technical context of value co-creation in technology-enabled environments as called for by Makarem, et al., (2009), Edvardsson, et al., (2011) or Vargo, et al., (2008) in relation to the effectiveness and efficiency of the process.

2.4.2 Established Perspectives on Technology-Enabled Interactions

This section discusses the wider virtual team literature in order to justify why connectivity is the most appropriate lens when investigating technology-enabled value co-creation processes. Section 2.4.2.1 initially reviews the literature on communication media and technology studies, while Section 2.4.2.2 reviews the literature focusing on the virtual team studies, before Section 2.4.3 discusses the connectivity literature in detail.

2.4.2.1 Communication Media and Technology Studies

The literature on communication media and technology studies focusses on the characteristics of a communication medium used for an interaction, or the means by which communication media are chosen and used. Early studies on technology-enabled communication investigated the characteristics of the communication medium itself, typically by investigating media-richness (Carlson & Zmud, 1999; Daft & Lengel, 1986; Daft & Lengel, 1984; Daft & Wiginton, 1979; Dennis & Kinney, 1998; Kahai & Cooper, 2003; Markus, 1994; Newberry, 2001; Schmitz & Fulk, 1991). Daft and Lengel (1986; 1984) suggested that communication media can be distinguished by their richness or ability to convey meaning. A medium is

[14] Italics added.

considered rich if it can "overcome different frames of reference or clarify ambiguous issues [and] change understanding in a timely manner" (Daft & Lengel, 1986, p. 560). Whenever a medium requires "a long time to enable understanding or […] cannot overcome different perspectives" (Daft & Lengel, 1986, p. 560), it is considered leaner, or lower in its richness. Daft and Lengel (1986) argue that face-to-face interactions are richest, followed by telephone, personal letters and, finally, impersonal written documents. Face-to-face communication provides immediate feedback, and transmits multiple cues through the communicator's body language or tone of voice, while the message is expressed in natural, rather than written language. A leaner medium provides fewer cues, restricts immediate feedback and conveys the message, for example, through asynchronous communication and written, rather than spoken form, which reduces clarity (Dennis & Kinney, 1998). However, this standpoint was based on the state of technology in the 1980s, and has since been revised, for example by Markus (1994), Ngwenyama and Lee (1997) and Newberry (2001), who extended the notion of media-richness to modern media such as email or video-conferencing. Ultimately, media vary in their richness due to their capacity for immediate feedback, the number of channels utilised, personalisation, and language variety (Daft & Lengel, 1986; Daft & Wiginton, 1979).

Other fields spawned from media richness are social presence theory (Culnan & Markus, 1987; Schmidt, Montoya-Weiss, & Massey, 2001; Short, Williams, & Christie, 1979), which argues that richer media promote perceived closeness or immediate presence with others, and research investigating the interrelationship between task and media fit (Christie & de Alberdi, 1985). Despite its popularity, media richness has not been without its critics, with researchers questioning whether or not a medium can vary in richness (Froehle, 2006), or criticising the theoretical underpinnings of media richness or social presence theory (Carlson & Zmud, 1999; Culnan & Markus, 1987; Lea & Spears, 1991; Spears & Lea, 1992). By introducing their *channel expansion theory*, Carlson and Zmud (1999) argue that a seemingly lean medium can increase in richness, depending on its use by an actor. The authors state that emails, or any other text-based message, could include the use of emoticons which enable an actor to convey subtle emotions such as irony, and thereby enhance the richness of that medium. Earlier research by Lee (1994) or Markus (1994) has provided similar findings. Yet another stream of research argues that new communication media often provide distinct features which make them superior to seemingly richer media. Emails can, for example, be edited and re-read if necessary, which is impossible for a telephone call, yet, according to the media-richness theory, the telephone would be considered the superior medium (Culnan & Markus, 1987; Froehle, 2006; Griffith & Northcraft, 1994). The key challenge for researchers lies in "comparing two different features or channel while holding all other things constant […which] is nearly impossible to do outside of a laboratory experiment" (Froehle, 2006, p. 12). Consequently, due to the inherent weaknesses of this approach, investigating technology-enabled interactions by focusing on the characteristics of a medium *only* is considered insufficient.

An alternative method to understanding technology-enabled interactions is to focus on the means by which *actors choose and use* a particular communication medium. Here, *media choice* is understood as "an individual's decision to use a medium in a particular communication incident" (Trevino, Webster, & Stein, 2000, p. 163), while *media use* is defined as "an individual's general pattern of use over time" (Trevino, et al., 2000, p. 163). Studies following this approach attempt to support and operationalise media choices by explaining and predicting patterns of media use and choice, and can be distinguished into *rational* and *collective choice* models (Riemer & Filius, 2009). *Rational choice* models assume that actors choose communication media after a coherent evaluation of the medium and task at hand (Arnott & Tan, 2001). These studies are typically related to media richness (Daft & Lengel, 1986; Dennis & Kinney, 1998; Newberry, 2001; Schmitz & Fulk, 1991) and social presence research (Culnan & Markus, 1987; Schmidt, et al., 2001; Short, et al., 1979) and follow a "fit rationale" (Riemer & Filius, 2009, p. 166), usually in regard to a task-media fit (Christie & de Alberdi, 1985). Portraying and theorising communication media choice in a rational fashion has been criticised, and consequently led to the development of the alternative *collective choice model* (Fulk, 1993; Fulk, Schmitz, & Steinfield, 1990; Kinney & Dennis, 1994; Riemer & Filius, 2009; Schwabe, 2004). Here, media choice is understood to be influenced by social (Fulk, 1993; Fulk, et al., 1990; Kinney & Dennis, 1994; Riemer & Filius, 2009) and individual factors such as the experience or skill an actor possesses in regard to the use of a particular medium (King & Xia, 1997; Rice & Case, 1983; Trevino, et al., 2000). Following this perspective, the social factors influencing media use and choice are typically considered more relevant than the individual factors, and widely discussed in the literature. For example, *social influence theory* (Fulk, et al., 1990) argues that the social environment of a user, such as team norms or co-worker attitudes toward technology, influences an actor's media choice. In addition, the *adaptive structuration theory* (de Sanctis & Poole, 1994) proposes that successful media use is dependent on a set of factor relationships in the social context of an actor, and that communication media are often used in ways other than originally intended (Schwabe, 2001). Furthermore, *media symbolism theory* (McLuhan, 1964; Sitkin, Sutcliffe, & Barrios-Choplin, 1992), states that the medium itself can be considered part of the message (McLuhan, 1964; Sitkin, et al., 1992). For example, Trevino, et al. (2000) outline how a letter can be perceived as a formal way to convey a message, while meetings are related to teamwork.

Studies investigating media choice and use have, just like media richness and social presence studies, been widely criticised. Riemer and Filius (2009), Watson-Manheim and Belanger (2002), as well as Yoo and Alavi (2001), argue that these studies attempt to generalise communication behavior, and perceive all communication situations as "analytically dissectible" (Riemer & Filius, 2009, p. 164), which is not always the case. The authors further state that rational and consistent media choice can only rarely be observed in reality. Empirical studies have shown that, even in similar communication scenarios, actors behave differently in their media choice and use (Watson-Manheim & Belanger, 2002; Yoo & Alavi, 2001). Furthermore, individuals tend to use communication media not in isolation, but in combination (Chidambaram, Lim, & Chan, 1998). Consequently, investigating the choice and use of a single medium only, which is typically the case, is neither feasible nor realistic in today's technology dominated environment where "modern artifacts often resemble integrated systems that come with bundles of communication features" (Riemer & Filius, 2009, p. 166). Trevino, et al., (2000) summarise the critique voiced against studies focusing on either media richness, social presence or media use and choice, and argue that these studies "have often been pitted against each other rather than considered as complementary" (Trevino, et al., 2000, p. 163). Ultimately, this stream of research has failed to provide a holistic understanding of technology-enabled interactions, and is considered "incomplete for it fails to examine […] relationships between media and communication in organizations over time" (Yates & Orlikowski, 1992, p. 310). Approaches originating purely out of these streams of literature are consequently not suitable to investigate technology-enabled value co-creation processes within this study.

2.4.2.2 Virtual Team Studies

The virtual team literature focusses on individuals interacting in a technology-enabled environment as the unit of analysis, and thereby provides a broader perspective than communication media and technology studies.[15] Definitions of what constitutes a virtual team are widely discussed (Powell, Piccoli, & Ives, 2004). Virtual teams are different from virtual groups (Hertel, Geister, & Konradt, 2005), telework (Bailey & Kurland, 2002; Konradt, Schmook, & Maelecke, 2000), or virtual communities (Wellman, 1997), because, as Powell, et al., (2004) state, their defining features of unity of purpose, identity as a social structure and their members' shared responsibility for an outcome (Cohen & Bailey, 1997), distinguish virtual teams from these other somewhat related organisational forms. Virtual teams are primarily characterised through their extensive and often exclusive use of technology for team interaction (Hertel, et al., 2005; Powell, et al., 2004). However, since most virtual teams maintain some form of face-to-face contact throughout the duration of their interaction (Hertel, et al., 2005), the *extent* of virtualness of a team is now discussed as a defining characteristic (Bell & Kozlowski, 2002; Griffith & Neale, 2001; Kirkman, Rosen, Tesluk, & Gibson, 2004; Zigurs, 2003). Yet, Froehle (2006) and Martins, Gilson and Maynard (2004) state that no mutually agreed-upon understanding is available for determining the degree at which a team is considered truly virtual. The most-cited attributes describing virtual teams are *location*, *temporal*, and *relational independence*, as well as *technology-use* (Martins, et al., 2004).

Location-independence explains that virtual teams are not constrained to one physical location, but can be located throughout the world (i.e. global virtual teams) and include culturally diverse members (Kayworth & Leidner, 2000; Maznevski & Chudoba, 2001). However, as Martins, et al., (2004, p. 808) state, virtual teams can also be co-located at "different workplaces at the same geographic location" and still be considered a virtual team. *Temporal-independence* describes that team-members are located in different time-zones (Kayworth & Leidner, 2002), or use asynchronous communication media such as emails (Bell & Kozlowski, 2002). *Relational independence* is understood as an attribute, describing the often different organisational backgrounds and affiliations of members in virtual teams that are brought together in selected projects or joint ventures (Maznevski & Chudoba, 2001; Townsend, DeMarie, & Hendrickson, 1998; Zigurs, 2003). Ultimately, this study adopts the definition brought forward by Martins, et al., (2004, p. 808), who refer to virtual teams as

[15] For an extensive literature review on virtual team research, see Martins, et al. (2004), Powell, et al. (2004), or Hertel, et al. (2005).

"teams whose members use technology to varying degrees in working across locational, temporal, and relational boundaries to accomplish an interdependent task".

Research on virtual teams typically focusses on *team inputs*, *tasks and socio-emotional processes*, or the *outcomes and performance* of virtual teams (Martins, et al., 2004; Powell, et al., 2004). Team inputs include the initial design and management of the virtual team (Bordia, 1997; Kaiser, Tullar, & McKowen, 2000; Sarker, Lau, & Sahay, 2001; Saunders, 2000; Suchan & Hayzak, 2001), team culture (Johansson, Dittrich, & Juustila, 1999; Kayworth & Leidner, 2000; Maznevski & Chudoba, 2001; Robey, Khoo, & Powers, 2000), or team training (Kaiser, et al., 2000; Suchan & Hayzak, 2001; van Ryssen & Hayes, 2000).

Researchers investigating the initial design of a virtual team typically attempt to identify means that can structure the interactions within the team, especially in the earlier phases of the team's formation. Team-building exercises and a clear team-structure (Kaiser, et al., 2000), or the establishment of shared norms are known to contribute to the team's success. Face-to-face interactions are considered especially crucial at an early stage of team development (DeMeyer, 1991; Saunders, 2000), and are known to improve the team's future interactions (Krumpel, 2000; Majchrzak, Rice, Malhotra, King, & Ba, 2000), the team's ability to clearly define the project (Ramesh & Dennis, 2002), and trust among team members (Maznevski & Chudoba, 2001; Suchan & Hayzak, 2001). Furthermore, negative constraints on the effectiveness and efficiency of a virtual team are equally investigated. The challenges here are typically related to the team members' ability to utilise ICT, rather than the technology itself (Powell, et al., 2004). Lacking technical expertise or the inability to solve technical problems are known to negatively affect team members' performances and overall satisfaction with their work environment (Kayworth & Leidner, 2000; van Ryssen & Hayes, 2000). Finally, consistent training of team-members, for example through a mentoring program (Suchan & Hayzak, 2001), is known to positively influence team-performance (Kaiser, et al., 2000; van Ryssen & Hayes, 2000), especially in regard to commitments to goals, higher decision quality or trust within the team (Tan, Wei, Huang, & Ng, 2000; Warketin & Beranek, 1999).

The task and socio-emotional processes in virtual teams represent another area of importance in virtual team research. Task-processes mainly include communication and coordination among team members (Alexander, 2000; Chase, 1999; Johansson, et al., 1999; Lurey & Raisinghani, 2001; Solomon, 2001), while socio-emotional processes include relationship-building among team-members (Burke & Chidambaram, 1996; Walther, 1995; Warketin & Beranek, 1999), cohesion (Wong & Burton, 2000; Yoo & Alavi, 2001) and trust (Ariss, Nykodym, & Cole-Laramore, 2002; Coppola, Hiltz, & Rotter, 2004; Coutu, 1998; Meyerson, Weick, & Kramer, 1996).

Research on tasks and performance in virtual teams investigates processes of team members working together when accomplishing a certain goal (Powell, et al., 2004). Here, the importance of effective and efficient communication between virtual team members has been discussed extensively (Alexander, 2000; Chase, 1999; Solomon, 2001). For example, Crampton (2001) and Sarker and Sahay (2002) found that dispersed team-members often assume to be excluded from information-sharing amongst co-located colleagues. Ultimately, researchers acknowledge that information-sharing in virtual teams is crucial for their success (Krumpel, 2000; Powell, et al., 2004; Suchan & Hayzak, 2001) and have called for an "information sharing culture" (Powell, et al., 2004, p. 11). Another non-technical factor that is known to influence the effective and efficient exchange of information includes the lack of a shared terminology within team-members (Qureshi & Vogel, 2001).

Researchers investigating socio-emotional processes in virtual teams typically focus on relationship building within the team, known to result in cohesion and trust, which are furthermore linked to increased team performance (Ariss, et al., 2002; Coutu, 1998; Maznevski & Chudoba, 2001; Meyerson, et al., 1996; Sitkin, Rousseau, Burt, & Camerer, 1998; Wong & Burton, 2000; Yoo & Alavi, 2001). However, some authors have argued that virtual teams tend to focus on the task rather than social interactions (Burke & Chidambaram, 1996; Walther, 1995), which can result in weaker perceived relationships and trust within teams (Warketin & Beranek, 1999). Actively developing trust is difficult in virtual teams because members typically do not meet directly (McDonough, Kahn, & Barczak, 2001), and teams are often forced to engage rather quickly after their initial formation (Jarvenpaa & Leidner, 1999) due to their often limited life-span.

Virtual team research investigating outcomes and performance represents the last main research area that has received considerable attention, and is typically related to the quality of decisions made, or the effectiveness of the interaction itself. Researchers have found that the quality of decision-making in virtual teams is similar to face-to-face teams (Cappel & Windsor, 2000; Straus & McGrath, 1994), while others have argued that face-to-face teams make better decisions (Andres, 2002; McDonough, et al., 2001), with yet another group of researchers concluding that virtual teams are superior (Schmidt, et al., 2001; Valacich, George, Nunamaker, & Vogel, 1994). The findings in regard to the effectiveness of the decision-making process are mixed as well. Some researchers have found that virtual teams need longer than face-to-face teams to accomplish tasks (Cappel & Windsor, 2000; Straus & McGrath, 1994). The reasons for the generally slower decision-making process are seen in the use ICTs as a communication medium (Lebie, Rhoades, & McGrath, 1995), and especially the fact that most media foster asynchronous, rather than synchronous communication (Malhotra, Majchrzak, Carman, & Lott, 2001). On the contrary, an early study by Sharda et al. (1988) argued that virtual teams make faster decisions than face-to-face teams, and other studies could not establish any differences between virtual and non-virtual teams (Burke & Aytes, 1998; Lind, 1999).

Overall, a variety of authors have criticised the empirical findings in virtual teams research as limited in scope and depth (Hertel, et al., 2005; Martins, et al., 2004; Powell, et al., 2004).[16] First, most studies "relied on media richness and social presence theories" (Martins, et al., 2004, p. 821), whose shortcomings have already been discussed in the previous section. Second, several empirical studies compared virtual to face-to-face teams, which limits the generalizability of findings, since teams relying on face-to-face interaction only, are becoming increasingly rare, thus making a direct comparison of virtual and face-to-face teams problematic (Griffith, Sawyer, & Neale, 2003). Quan-Haase and Wellmann (2005b, p. 215) outline in this context, that even co-located individuals often interact almost exclusively by means of ICTs, a phenomenon known as *local virtuality*. Third, methodological shortcomings furthermore limit the generalizability of most empirical virtual team studies. The fact that "much of the empirical research has been conducted in laboratory settings, using student teams working on short-term tasks" (Martins, et al., 2004, p. 822) challenges the findings of these studies in regard to their applicability in a real-world context (Powell, et al., 2004) and ignores the role of time on group processes and outcomes (Martins, et al., 2004, p. 819). While researchers recognise that obtaining empirical data can be challenging, virtual team research needs to be conducted in the field and with real-life teams and organisations, in order to advance from its state of infancy (Martins, et al., 2004; Powell, et al., 2004).

[16] For a general overview on future research directions in virtual teams, see Martins, Gilson et al. (2004), Powell, Piccoli et al. (2004), and Hertel, Geister et al. (2005).

Ultimately, both communication media and technology, as well as virtual team studies have significant shortcomings. Essentially, these streams focus on the technical elements *or* relational elements, yet without providing a holistic understanding of the interrelationship of the two dimensions. This critique has been raised by Trevino, et al. (2000) (see Section 2.4.2.1), as well as Martins, et al. who extend the debate and further argue that "researchers need to draw on the theoretical foundations that have been utilised in prior research on teams, as well as on new theoretical bases that are uniquely relevant to virtual interaction, to develop a more theoretically grounded understanding of the functioning of VTs" (2004, p. 823). Kolb, et al. link the virtual team literature to connectivity research by stating that "we used to ask which media were best for certain tasks […] we must now ask the question: 'how much' connectivity do we need?" (2012, p. 5). The following section discusses connectivity as a construct that is suitable for the investigation of technology-enabled value co-creation processes.

2.4.3 Connectivity as a Lens on Technology-Enabled Interactions

2.4.3.1 Defining Connectivity

Connectivity is emerging as a metaphor deemed suitable for analysing intra and inter-organisational interactions on multiple socio-technical levels. This section explores the attributes, dimensions and states of connectivity, and argues why and how it can be utilised as the analytical lens in this study for the analysis of technology-enabled value co-creation processes.

The term connectivity has been used by both academics and practitioners in a variety of contexts, for example, to describe non-technical characteristics of human interaction (Cartwright, 2002; Kanter, 1999; Tomlinson, 1999), within research about mergers and acquisitions (Schweiger & Goulet, 2005), systems thinking and development (Mason, 2005), or socio-ecological systems (Janssen, et al., 2006). Most importantly though, connectivity is increasingly gaining recognition as a suitable socio-technical lens when investigating intra- and inter-organisational interactions (Angwin & Vaara, 2005; Boisot & McKelvey, 2011; Kolb, 2008; Kolb, et al., 2012; Quan-Haase & Wellman, 2005a; Wajcman & Rose, 2011).

Connectivity however, is not unanimously defined and often used without further clarification as to what it entails. Table 2.6 presents an overview of current definitions:

Author	Definition
Angwin & Vaara (2005, p. 1,445)	"highlights the complexities, interconnected processes and synchronized activities in organisations and their contexts"
Janssen, et al., (2006, p. 4)	"one characteristic represented by the level of connectivity is the density of the links within the network, i.e., the number of links divided by the maximum possible number of links. Another aspect of connectivity is reachability, or the extent to which all the nodes in the network are accessible to each other"
Kolb (2008, p. 128)	"the mechanisms, processes, systems and relationships that link individuals and collectives (e.g. groups, organizations, cultures, societies) by facilitating material, informational or social exchange. It includes geo-physical (e.g. space, time and location), technological (e.g. information technologies and their applications) as well as social interactions and artifacts, including shared histories, travel, trade, migration, culture, politics and other social activities"
Limnios (2008, p. 56)	"the density and reachability among actors (stakeholders) in the corporate network"
Waverman, et al., (2009, p. 6)	"the totality of interaction between a nation's telecommunications infrastructure, hardware, software, networks, and users of these networks, hardware and software"

Table 2.6: Overview of Connectivity Definitions

The definitions by Angwin and Vaara (2005), Kolb (2008) and Limnios (2008), all define connectivity within an organisational context, while Janssen, et al. (2006) perceive connectivity more abstract, and in relation to systems thinking and network theory. Waverman, et al. (2009) however, divert from the understanding of connectivity as a socio-technical construct, and follow a third approach by focussing on technical interactions on a nation-state level only, and delineating connectivity therein. Despite these seemingly unrelated contexts, several similarities are eminent in all definitions, resulting in the working definition of connectivity in this study as: 1) a holistic perspective on interactions within a system that 2) explicitly recognises entities at the core of these interactions and is 3) understood as a multidimensional socio-technical construct that can 4) vary in its levels of intensity between entities, and therefore impact the performance of the entire system. These pillars that form the working definition of connectivity are subsequently discussed:

- **Connectivity provides a holistic perspective on interactions within a system.**

All authors imply that connectivity provides a holistic perspective on interactions within a distinct system. Mason further emphasises this notion by arguing that "the idea of connectivity is central to systems thinking" (2005, p. 69). This system-notion is represented through a network (Janssen, et al., 2006), a "corporate network" (Limnios, 2008, p. 56), an organisation (Angwin & Vaara, 2005), "groups, organizations, cultures, societies" (Kolb, 2008, p. 128), "a nation's telecommunications infrastructure, hardware, software, networks, and users" (Waverman, et al., 2009, p. 6) or, in the context of this study, a service system (see Section 2.2.3). While the purpose, or element exchanged during the interaction is rarely defined, Kolb states that "material, informational or social exchange" (2008, p. 128) is central to these interactions in systems. This corresponds with the understanding of interactions and exchange in service systems (see Section 2.2.3.2), which is also based on the material, informational or social exchange amongst entities (Maglio & Spohrer, 2008).

- **Connected entities are central to a system-perspective of connectivity.**

The understanding of connectivity as a holistic perspective on interactions within a system implies that this system must consist of connected entities. Any definition of system "appears to include reference, directly or indirectly, to connected entities" which are "things in the world sustained by a network of connections" (Mason, 2005, p. 70). Jordan adds that "the only things […] common to all systems are identifiable entities and identifiable connections between them" (1969/2001, p. 64). All authors who defined connectivity refer to connected entities such as actors or stakeholders (Limnios, 2008), nodes (Janssen, et al., 2006), or distinguish between both human and technical entities (Kolb, 2008; Waverman, et al., 2009). The same rationale applies for service systems, which consist of entities, or "dynamic configurations of resources" (Spohrer and Maglio 2008, p. 147), embodied through people, technology, organisations and shared information. Connectivity, as a holistic perspective, describes the connections between entities of a system.

- **Connectivity includes multiple socio-technical dimensions**

Waverman, et al. argue that connectivity is often defined in technical terms only, where it can be regarded as "the key enabler of the flow of information" (2009, p. 6). However, this flow of information depends on elements other than technology, and authors have argued that understanding connectivity in regard to technical links between entities *alone* is consequently not sufficient. ICTs represent, in the context of connectivity, "only part of the connective equation" (Kolb, 2008, p. 140). Human skills relevant for the use of these technologies, or interpersonal links among employees, customers or other stakeholders are also crucial and need to be equally taken into consideration (Kolb, 2008; Kolb, et al., 2008; Waverman, et al., 2009). This dual perspective on the social and technical dimension inherent in connectivity is central to the definitions of both Kolb (2008) and Waverman, et al. (2009). As outlined in Section 2.4.1, it is this multidimensionality which makes connectivity particularly suitable as an analytical lens for investigating technology-enabled value co-creation processes from the dyadic socio-technical perspective called for in the service science literature.

- **The levels of connectivity within a system influence its performance**

Connectivity is not static, but rather a fluctuating variable represented through various connective states (see Section 2.4.2.4). The fact that levels of socio-technical connectivity between entities of a system can vary throughout these connective states, suggests a link between connectivity and the performance of a system (Janssen, et al., 2006; Kolb, et al., 2012; Kolb, et al., 2008). For example, performance can be measured through the motivation or productivity of individual entities or other measures such as innovation, creativity or collaboration within a system (Kolb, et al., 2012).

2.4.3.2 Connective Attributes and Dimensions

The key advantage of the connectivity construct over traditional approaches such as media richness is its multidimensional perspective on technical *and* social connections in a given system. While the four pillars of connectivity sufficiently describe and define connectivity, it is also important to understand the evolution from the origins of connectivity as a description of technical connections only, to its application to social phenomena. Kolb (2008) delineates the four attributes of *latent potentiality*, *actor agency*, *temporal intermittence* and *unknowable pervasiveness*, which, together with the dimensions of *social* and *technical* connectivity, provide further insight into the characteristics of connectivity as a socio-technical construct.

Latent potentiality describes connectivity as a past quality, current condition, some latent future potential, or combination thereof. The term connectivity is based on the adjective connective, which Kolb relates to “connecting or serving to connect” (2008, p. 129). The related expression of connectedness however, implies *joined together* or *fastened* (past tense), suggesting an established connection or already completed action. Connectivity, in contrast, in present tense, implies future options and thus a latent potential to connect. Connectivity is consequently, as a condition, transferred metaphorically from the background to the foreground, depending on an actor’s needs. Connectedness however, refers to “states-of-being” (Kolb, 2008, p. 129) and not potential states.

Actor agency suggests that, despite the often abundant prevalence of technical connections in a system, entities in that system might not be highly connected. Using, or not-using a technical link is dependent on human agency (Cousins & Robey, 2005; Emirbayer & Mische, 1998) and implies that entities in any system can choose if, when, and how to use connective technologies. Consequently, a high level of connectivity might simply not be achieved because entities refuse to utilise a particular technological link (Kolb, 2008).

Temporal intermittency implies that connections between entities can always vanish through technical breakdowns, or simply because different time-zones keep entities from calling each other in the middle of the night. Connectivity can simply vanish at any time, is likely to be interrupted by external forces, and can therefore only to a certain extent be influenced and controlled by the connected entities (Kolb, 2008).

Unknowable pervasiveness refers to the fact that, despite any given level of technical connectivity and the attribute of latent potentiality, no entity can be aware of all of their real or potential connections. Since no connective link is ever totally continuous, neither can an entity be totally disconnected from others, either technically or socially. A world that is increasingly interconnected inherently bears the likelihood for connective uncertainties and accidents. Hence, Kolb (2008) argues that the implications of varied connections remain unclear for most entities.

The link between connectivity and technology *alone* that some authors advocated, led to a misinterpretation of increased technical connectivity being viewed as "synonymous with increased cultural and social connectivity" (Kolb, 2008, p. 130). This biased perception of connectivity might be rooted in the fact that "connectivity has not been fully explored from a socio-technical perspective" (Kolb, 2008, p. 131). An important initial step towards a better understanding of the socio-technical dimensions of connectivity has been undertaken by Kolb (2008), who, by extending the work of Espinosa, et al. (2003) and O'Leary and Cummings (2007), brought forward a set of ten distinctive, yet overlapping conceptual dimensions of connectivity.[17] These dimensions reflect an inherent *duality* (Giddens, 1984) of *connects* and *disconnects*. Essentially, duality describes the fact that every connection is simultaneously offset by a degree of disconnection. Duality exists since the two opposing categories of connects and disconnects are mutually exclusive of each other, and is also linked to the

[17] For an in-depth overview and further explanation of all dimensions, see Kolb (2008).

"double-edged nature of connectivity" (Janssen, et al., 2006, p. 5), where a "connection can be productive and satisfying. But it can also be unproductive and frustrating" (Murphy, 2007, p. 17). Consequently, maximising the connections within a system would not necessarily be an advantage for the system itself, but finding an optimal condition is desirable.

The dimensions of connectivity proposed by Kolb (2008) can be summarised into *social* and *technical* connectivity, which Murphy describes as "electronic connectivity" (2007, p. 18). Following the argumentation of Kolb, et al. (2008), this study proposes the following interim working-definitions of technical connectivity as:

- **the degree to which ICTs are readily available for all entities in the system and adequate for the successful exchange of resources,**

and social connectivity as:

- **the strength of social ties between entities that is necessary for the successful exchange of resources.**

Technical and social connectivity are ultimately seen as input-factors that rinfluence the level of connectivity between entities, as indicated through connective states (Kolb, et al., 2008). Figure 2.7 presents the relationship between the connective dimensions of technical and social connectivity, and the various states of connectivity which quantify the level of connectivity between entities and that are explained in the next section.

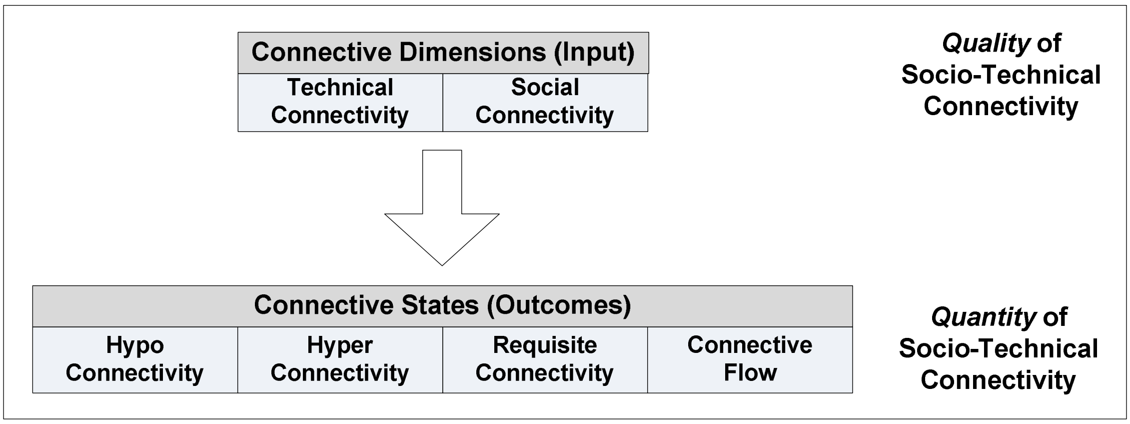


Figure 2.7: Connective Dimensions and States

2.4.3.3 Connective States and Performance

Kolb, et al. (2008) propose a model that conceptualises how varying levels of connectivity, or connective states, could affect the performance of a distributed work-team, a previously unexplored relationship. The model suggests that the connective states of *hypo* (insufficient connectivity) and *hyper* (excessive connectivity) negatively influence team-performance. On the contrary, *requisite connectivity* implies a threshold condition of just enough connectivity for the given task, while *connective flow* represents an optimum state. These four connective states are understood as outcomes, or quantitative measures of connectivity, influenced by the previously discussed social and technical input-factors (Kolb, 2008; Kolb, et al., 2008). Figure 2.8 illustrates the model.

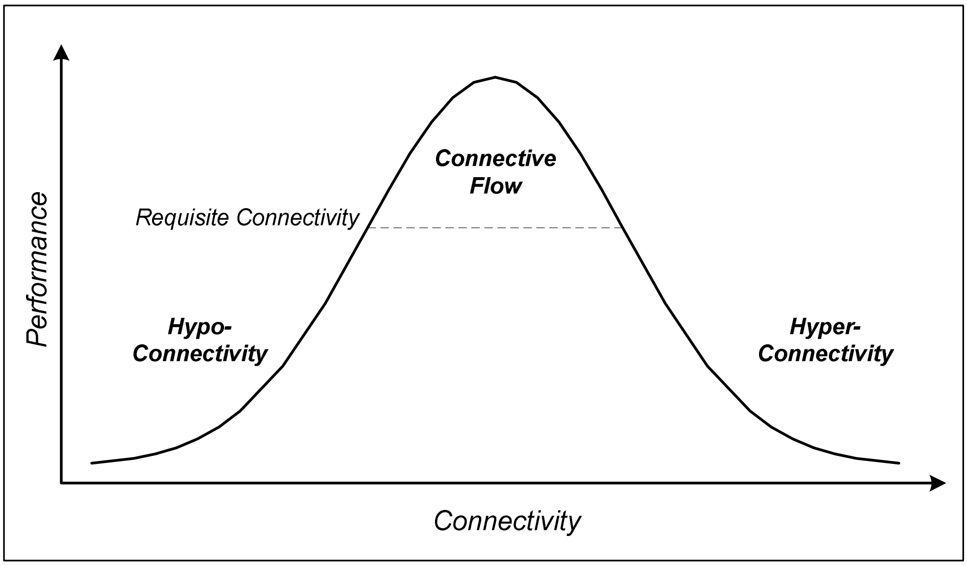


Figure 2.8: Connective States and Performance (Kolb, et al., 2008, p. 182)

Hyper-connectivity represents a connective state where individuals experience too much social and/or technical connectivity, they "have too much of a good thing [and are] *too* connected" (Murphy, 2007, p. 17). Hyper-connectivity is also referred to as super-connectivity (Redman & Kinzig, 2003), and related to an experiential state that involves "the instant availability of people for communication anywhere anytime" (Quan-Haase & Wellman, 2005a, p. 215). Quan-Haase and Wellman (2005a), and Wajcman and Rose (2011) relate hyper-connectivity to the ubiquitous availability of ICT in modern organisations and knowledge-work, or "the pervasive presence of information and communication technologies" (Wajcman & Rose, 2011, p. 941). A more extensive description of hyper-connectivity however, is provided by Kolb, et al. who link this connective state to "information overload, attention-taxing workflow and interruptions in collocated spaces, [...] including pervasive and ubiquitous computing applications such as wireless email and 24/7 telephone accessibility" (2008, p. 182).

Hyper-connectivity is well defined on a conceptual level, yet empirical evidence and further insights on the causes and consequences of this connective state are scarce. For example, Quan-Haase and Wellman (2005a) explored hyper-connectivity empirically while investigating media use in software development teams, and found that high level of task complexity and task interdependence are positively correlated with an individual being hyper-connected. While their study focuses on the *technical* dimension of connectivity only, their findings confirm that technologically hyper-connected individuals struggle to complete tasks, which is typically related to constant interruptions and the increasing necessity for coordination required between team-members (Quan-Haase & Wellman, 2005a).

Too little, or *hypo-connectivity*, on the contrary, is also suspected to have negative effects on the performance of systems (Kolb, et al., 2008). Hypo-connectivity is defined as "not having sufficient connections for the task or job at hand" (Kolb, et al., 2008, p. 181), and conceptually linked to technical issues such as weak internet connections, insufficient mobile phone reception, limited travel options between subsidiaries or members of distributed teams, or a lack in cross-cultural understanding (Kolb, et al., 2008).

This study suggests that both hypo and hyper-connectedness can be viewed as "connective gaps" (Kolb, et al., 2008, p. 184), or temporal instances of disruption that inhibit the interaction between a group of individuals and which occurs whenever hypo or hyper-cnnectivity occur. Support for this argument is provided by Kolb et al., who define connective gaps as "all connective absences (i.e., not available, affordable), interruptions, and disconnects between two parties" (2008, p. 183). As indicated by Quan-Haase and Wellman (2005a), hyper connectivity can cause interruptions, while hypo-connectivity is related to a lack of connectivity respectively.

The argument has been brought forward that "connective gaps ultimately matter more than location" (Kolb, et al., 2008, p. 184), which implies that exploring the emergence and means to overcome connective gaps is crucial when attempting to optimise the performance of a any system. One suggestion to overcome connective gaps is to control the degree of *density* between its entities (Janssen, et al., 2006). Janssen, et al. (2006) define density as a *relative* figure, or “the number of links [in a system] divided by the maximum possible number of links” (Janssen, et al., 2006, p. 4), while Kolb, et al. (2008, p. 184) define *connective density* as “the combined viable modes of social and technical connections between two or more persons or collectives,” an *absolute* number, quantified by the “number of links between actors” (Kolb, et al., 2008, p. 184). Ultimately, increasing connective density may be a way to “ensure continuity across connective gaps” (Kolb, et al., 2008, p. 184).

Requisite connectivity is the connective state in which organisations experience a sufficient level of socio-technical connectivity. This threshold condition is a condition of “robust and reliable communication and/or transportation media/modes, with operable alternative work around options, so that contact may be initiated or maintained at the rate, richness and intensity required for a given task” (Kolb, et al., 2008, p. 182). Requisite connectivity not only means “not having too much” (Kolb, et al., 2008, p. 184) or too little connectivity, but is, as a connective state, also suspected to be “contingent and relative to the situation, person and task” (Kolb, et al., 2008, p. 184). Other factors that may have an impact on what constitutes requisite connectivity in a given scenario, are the rank or seniority of an individual, group maturity and profession (Kolb, et al., 2008, p. 187).

Connective flow is an ideal theorised condition where “communication is highly effective and highly efficient, and balanced in accordance with our needs and the demands of the task or situation at hand” (Kolb, et al., 2008, p. 183). Kolb, et al. (2008) suggest that when one avoids hypo and hyper-connectivity, one may experience connective flow. Rooted in Csikszentmihalyi’s (1975, 1977) theory of flow which represents a state where individuals experience “the holistic sensations that people feel when they act with total involvement” (Csikszentmihalyi, 1975, p. 36), connective flow remains empirically un-investigated. Kolb, et al. (2008) argue that very little is known about which factors actually influence the emergence of requisite connectivity and connective flow. Individual rank and seniority or profession (Kolb, et al., 2008), or the means by which individuals utilise ICT (Froehle, 2006; Kahai & Cooper, 2003), are suspected to have an impact, yet no empirical studies exist to date that describe how or why this might be the case, or if any other contributing factors exist. This argument corresponds with arguments stated in the virtual team literature, where a lack of research on diversity such as the organizational tenure of team-members, or the “impact of dispersed organizational affiliations on team functioning” (Martins, et al., 2004, p. 820) has been criticised.

The related Information Systems (IS) literature began to investigate flow two decades ago when Hoffman and Novak (1996) applied it in the context of online-shopping. Flow has since been investigated in other technology-mediated environments, such as online-learning (Shin, 2006), online consumer behavior (Koufaris, 2002), online advertising (Sicilia & Ruiz, 2007), computer-games (Refiana, Mizerski, & Murphy, 2005), or emailing (Pilke, 2004). However, Hoffman and Novak (2009) argue that the current research on flow has not kept up with the dramatic technological changes that have occurred in the early 21st century. Web 2.0, social networks, or technology-enabled work, are areas in which flow is likely to occur; yet, its emergence remains un-investigated. Furthermore, the empirical studies in the IS literature that investigate flow typically focus on flow-experiences of single individuals rather than groups, and on interactions with some kind of rather simplistic ICT, rather than complex inter-organisational information systems. Therefore, scholars in the fields of connectivity and flow have both called for empirical investigations of connective states in advanced contexts that underwent drastic technological changes (Kolb, et al., 2008; Hoffmann and Novak 2009). This corresponds with the research implications of SDL-driven service innovation studies, which called for the investigation of changing value co-creation processes, believed to be the case in technology-enabled value co-creation.

Another link between connectivity and service research is the call for research investigating the interrelationship of the technical and social dimensions inherent, and potentially relevant, in both connectivity and technology-enabled value co-creation (Edvardsson, et al., 2011; Maglio, 2010; Makarem, et al., 2009; Ostrom, et al., 2010; Vargo, et al., 2008). Kolb, et al. consequently argue that “more empirical work is now needed in order to answer the crucial question of how certain [connective] states influence or determine productivity” (2012, p. 5) and “to better understand the social and technical contingencies of connectivity” (Kolb, 2008, p. 140). Being able to comprehend the factors that influence the emergence of connective gaps is “critical” (Kolb, et al., 2012, p. 1), because this understanding of connectivity can ultimately “help us to understand the impact of too much or too little connectivity on performance” (Kolb, et al., 2012, p. 4). However, to the best of this author’s knowledge, empirical studies that investigate connectivity, including the causes and consequences of connective gaps as outlined by Kolb, et al. (2008) and Kolb, et al. (2012) in an advanced technological and empirical service or value co-creation context, as called for in the relevant literature, do not exist to date.

2.5 The Research Gaps, Objective and Questions of the Study

Section 2.5 summarises the previously identified research gaps and implications, aligns these, and delineates the research objective and questions of this study.

2.5.1 Identified Research Gaps

Scholars argue that service innovation research can only progress if the GDL-oriented perspective is re-assessed, and if the development or introduction of a new perspective is based on this re-assessment (Baker & Sinkula, 2007; Gallouj & Windrum, 2009; Ostrom, et al., 2010). The SDL is increasingly gaining recognition as such a new perspective, deemed suitable to advance knowledge of innovation in service, and is consequently applied in this study (Chen, et al., 2009; Michel, et al., 2008; Nam & Lee, 2010; Ordanini & Parasuraman, 2011; Sebastiani & Paiola, 2010). However, advancing service innovation research through the SDL necessitates a shift in thinking away from traditional understandings of service innovation, resulting in a variety of research gaps and implications that embody the conceptual foundation of this study and are outlined in Table 2.7:

<table>
<tr><th colspan="2">Research Gap and Implication</th><th>Description</th><th>Authors</th></tr>
<tr><td rowspan="2">Research Gaps</td><td rowspan="2">Empirical</td><td>Lack of empirical work using the SDL-lens on service innovation</td><td>Ordanini & Parasuraman 2011; Sebastiani & Paiola 2010; Nam & Lee 2010</td></tr>
<tr><td>Lacking understanding of how customers and providers engage in value co-creation processes</td><td>Payne, et al., 2008; Michel, et al., 2008; Edvardsson, et al., 2010; Grönroos, 2011</td></tr>
<tr><td rowspan="4">Resulting Research Implications</td><td>Conceptual</td><td>Conduct research focusing on change in value co-creation processes.</td><td>Edvardsson, et al., 2010; Sebastiani & Paiola 2010</td></tr>
<tr><td>Methodological</td><td>Use qualitative empirical studies focussing on operant resources: explicitly include customers and collect data from them</td><td>Michel, et al., 2008; Chen, et al., 2009; Ordanini & Parasuraman 2011; Ostrom, et al., 2010</td></tr>
<tr><td rowspan="2">Contextual</td><td>Conduct empirical studies within professional service firms such as consulting</td><td>Michel, et al., 2008; Vargo, et al., 2008; Payne, et al., 2008</td></tr>
<tr><td>Conduct empirical studies in contexts where role of ICT is dominant</td><td>Chen, et al. 2009; Sebastiani & Paiola 2010; Ordanini & Parasuraman, 2011</td></tr>
</table>

Table 2.7: Research Gaps and Implications for SDL-driven Service Innovation Research

The lack of empirical service innovation studies that are grounded in the SDL represents a key research challenge (Nam & Lee, 2010; Ordanini & Parasuraman, 2011; Sebastiani &

Paiola, 2010). Consequently, scholars delineated conceptual, methodological and contextual research implications for prospective studies intending to advance knowledge in the field. Empirical studies should focus on changing value co-creation processes, investigate how customers co-create value (Edvardsson, et al., 2010; Michel, et al., 2008; Payne, et al., 2008; Sebastiani & Paiola, 2010), and utilise qualitative research methods to collect data from customers (Chen, et al., 2009; Michel, et al., 2008; Ordanini & Parasuraman, 2011; Ostrom, et al., 2010), especially in contexts where the role of ICT is dominant (Chen, et al., 2009; Ordanini & Parasuraman, 2011; Sebastiani & Paiola, 2010). This is, for example, understood to be the case in professional service firms (Michel, et al., 2008; Vargo, et al., 2008), an industry where value co-creation processes currently undergo ICT induced change, and thereby represet an innovation in service (Chen, et al., 2009; Ordanini & Parasuraman, 2011; Sebastiani & Paiola, 2010).

Understanding the *role of ICT* in service innovation equally results in a variety of research gaps and implications related to the ones concerning service innovation and the SDL:

Research Gap and Implication		**Description**	**Authors**
Research Gaps	*Empirical*	Lack of empirical work at intersection of ICT and service innovation	Chesbrough & Spohrer, 2006; Bitner, et al., 2010; Blomberg, 2010; Mott, 2010; Ostrom, et al., 2010
		Impact of ICT on service systems is unknown. Also unclear how service systems can ideally interact via ICT	Bogatin, 2006; Vargo, et al., 2008; Bowden, 2009; Ostrom, et al., 2010; Füller, 2010
		Empirical service research is limited to face-to-face encounters. Results are not applicable to ICT-enabled environment	Bitner, et al., 2000; Bowen, 2000; Froehle & Roth, 2004; Froehle, 2006; Chase & Apte, 2007; Wünderlich, 2009
		Limited knowledge of technology-enabled value co-creation processes	Bogatin, 2006; Bowden, 2009; Füller, 2010
Resulting Research Implications	*Conceptual*	Empirically investigate technology-enabled value co-creation processes	Froehle & Roth, 2004; Chase & Apte, 2007; Lee & Park, 2009
		Empirically investigate technical *and* social dimensions of technology-enabled value co-creation processes	Vargo, et al., 2008; Makarem, et al., 2009; Edvardsson, et al., 2010; Maglio, 2010; Ostrom, et al., 2010

Table 2.8: research Gaps and Implications Regarding ICT in Service Innovation

The lack of empirical work on the role of ICT in service innovation, especially through the SDL-lens, represents a key challenge (Bitner, et al., 2010; Blomberg, 2010; Chesbrough & Spohrer, 2006; Mott, 2010; Ostrom, et al., 2010). More specifically, it remains unclear how service systems can ideally interact by means of ICT (Ostrom, et al., 2010; Vargo, et al., 2008), and how ICT influences value co-creation processes in service systems (Bogatin, 2006; Bowden, 2009; Füller, 2010). Furthermore, existing studies on value co-creation are limited to face-to-face encounters, and findings here are considered inapplicable to technology-enabled environments (Bitner, et al., 2000; Bowen, 2000; Chase & Apte, 2007; Froehle, 2006; Froehle & Roth, 2004; Wünderlich, 2009).

Ultimately, a clear overlap exists between the research gaps and implications regarding the role of ICT in service innovation, as well as service innovation and SDL (see Figure 2.9). Both call for empirical work exploring technology enabled value co-creation processes. When attempting to investigate such processes, a particular emphasis on the technical *and* social dimensions underlying such interactions is considered necessary, yet remains equally un-investigated (Edvardsson, et al., 2011; Maglio, 2010; Makarem, et al., 2009; Ostrom, et al., 2010; Vargo, et al., 2008).

The *connectivity* metaphor was introduced in Section 2.4.1 as a suitable analytical lens for investigating technology-enabled value co-creation processes on social and technical levels. Table 2.9 summarises existing research gaps and implications regarding connectivity:

Research Gap and Implication		Description	Authors
Research Gaps	*Empirical*	Lack of empirical work on connectivity, esp. in contexts that underwent drastic technological change	Kolb, et al., 2008; Hoffmann & Novak, 2009 Kolb, et al., 2012
		Lack of empirical evidence on the causes and consequences of connective gaps or states	Kolb, et al., 2008; Hoffmann & Novak, 2009; Kolb, et al., 2012
Resulting Research Implications	*Methodological*	Employ findings from the virtual-team literature to service research	Froehle, 2006; Martins, et al., 2004
	Conceptual	Empirically explore the social and technical dimensions of connectivity. Focus on their interrelationship	Chen, et al., 1999; Pilke, 2004; Kolb, 2008; Kolb, et al., 2012

Table 2.9: Research Gaps and Implications Related to Connectivity

While a solid conceptual understanding exists, empirical studies investigating connectivity are rare (Kolb, et al., 2008; Hoffman & Novak, 2009; Kolb, et al., 2012). Consequently, researchers argued that connectivity should be applied to, and investigated in the context of technology-mediated work-environments where technological change is prevalent (Kolb, et al., 2008; Hoffman & Novak 2009). As outlined in Section 2.3.3.3, technology-enabled value co-creation processes represent such an environment. Since connectivity is, in the context of interaction within socio-technical systems and virtual teams, already seen as an appropriate approach for investigating such systems on socio-technical levels, it is applied in this study. Connectivity thereby addresses the call for investigations of technology-enabled value co-creation processes on multiple socio-technical levels by Makarem, et al. (2009), Edvardsson, et al. (2011), or Vargo, et al. (2008).

Figure 2.9 summarises all research gaps and research implications and explains their interrelationship.

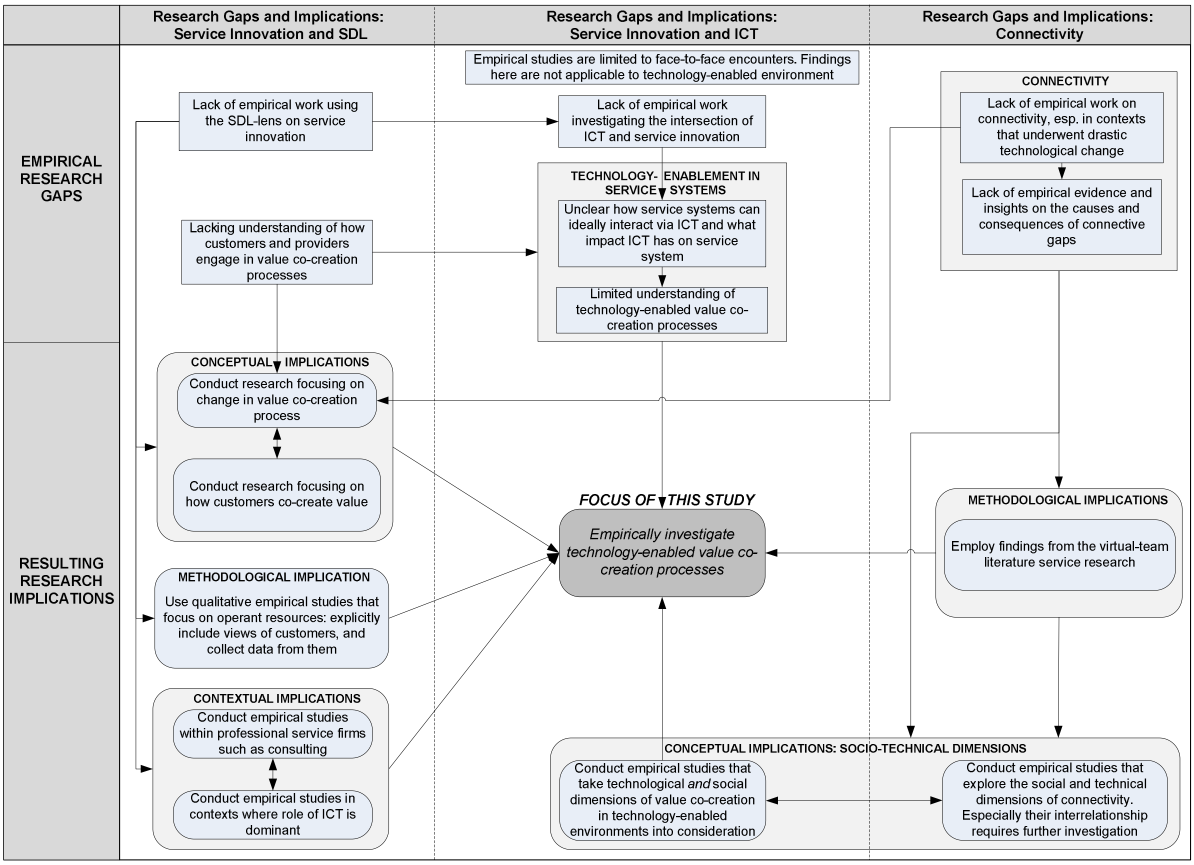


Figure 2.9: Synthesis of the Research Gaps and Implications in this Study

2.5.2 Research Objective and Questions

The research gaps and implications at the intersection of the SDL, service innovation and ICT, as well as connectivity that were identified throughout Sections 2.2 to 2.4, and subsequently summarised in Section 2.5.1, represent recognised and necessary opportunities for research that are addressed by this study. However, it is also important to acknowledge that this study can, due to the emerging nature of the research field, only represent a first step and foundation for future research which can aid to the development of managerial guidelines as called for in the literature (Lee & Park, 2009; Vargo, et al., 2008).

Initially defining a research objective and aligned research questions that help to guide the investigation is crucial for studies attempting to build theory from cases, the research strategy chosen here (Eisenhardt, 1989; Eisenhardt & Graebner, 2007; Perry, 1998). Consequently, the central objective of this study is formally defined as:

> **To investigate technology-enabled value co-creation processes in the context of the consulting industry through a socio-technical connectivity lens and, by doing so, to understand how technology-enablement in a service system can impact its ability to co-create value.**

By empirically investigating technology-enabled value co-creation processes in the context of the consulting industry, this study attempts to explore and describe the socio-technical context in which resources can be exchanged and value be co-created by means of ICT. By adopting a connectivity lens, this study furthermore attempts to provide insights into the emergence and consequences of connective gaps, which can help us understand what impact technology-enablement may have on the ability of a service system to co-create value. In order to address this research objective, a set of suitable research questions that guide the investigation must now be delineated:

First, Bonoma (1985) argues that theory building from cases requires the initial description and comparison of the unit of analysis, here represented through service systems whose entities predominantly interact and exchange resources by means of ICT. Vargo, et al. (2008) likewise argue that understanding value co-creation in a technology-enabled context requires the initial exploration and description of how service systems interact by means of ICT. Furthermore, Froehle (2006) explains in this context that the types of ICT that service provider rely on to interact with their customers, as well as the extent of their usage, remain un-investigated. In order to address the research objective and provide insights into the socio-technical context in which resources can be exchanged and value be co-created by means of ICT, this study follows the argumentation that value co-creation processes in service systems can be conceptualised as interactions (Grönross, 2011), and subsequently be described using three core constructs: "the content-*what* the individual wants to exchange; the process-*how* the individual wants to interact; and the people-*with whom* the individual wants to interact" (Anderson, Challagalla, & McFarland, 1999; Füller, 2010, p. 100). Consequently, the first research question guiding this study attempts to provide insights into the socio-technical context in which value co-creation processes occur, and is defined as:

How do service systems exchange resources and co-create value by means of ICT?

Second, understanding the socio-technical context of value co-creation in a technology-enabled setting requires investigating both the technical *and* social dimension underlying this exchange. As outlined previously, connectivity as the socio-technical analytical lens possesses this ability. However, in order to understand what impact technology-enablement may have on the ability of a service system to co-create value, it is important to initially recall that the performance of a service system is judged by its ability to co-create value which, in turn, depends on its capacity to access and exchange resources amongst all entities, internal or external to the system (Prahalad & Ramaswamy, 2004; Spohrer & Maglio, 2010; Spohrer, et al., 2008). With information understood as the "essence of service organisations," (Mills & Marguiles, 1980, p. 261), the argument has been brought forward that the performance of a service system in the consulting context would therefore depend on the ability of such a service system to effectively share the operant resource information between consultant and customer (Bettencourt, et al., 2002; Mills & Marguiles, 1980; Xue & Field, 2008).

When investigating the performance of a system through a connectivity lens, as suggested by this study, understanding connective states becomes pivotal (Janssen, et al., 2006; Kolb, et al., 2008; Murphy, 2007; Quan-Haase & Wellman, 2005a). Connective states provide a mean to quantify the levels of socio-technical connectivity experienced within a system, and thereby offer a proxy for investigating the impact of technology-enablement on the performance of that system. Specifically understanding which factors influence the connective states of hypo and hyper-connectivity to emerge is "critical" (Kolb, et al., 2012, p. 1), because it can eventually lead to an assessment of "the impact of too much or too little connectivity on performance" (Kolb, et al., 2012, p. 4) and allow us to compare the relative importance of both ICT and the social dimension for a service system's ability to exchange resources and therefore its ability to co-create value. As outlined previously, this study summarises hypo and hyper-connectivity under the umbrella term of connective gaps (see Section 2.4.3.3), and defines the third research question guiding this study is defined as:

How do connective gaps emerge in a service system?

Third, the consequences of connective gaps on the performance of service systems remain equally un-investigated. Understanding how these varying levels of connectivity may influence a service system's ability to co-create value addresses an important gap in the literature, and can help us understand the possible impact of technology-enablement on service systems. By expanding on question two, the last research question guiding this study is defined as:

How does the emergence of connective gaps impact the ability of a service system to co-create value?

Finally, Figure 2.10 provides an overview of the research framework underlying this study:

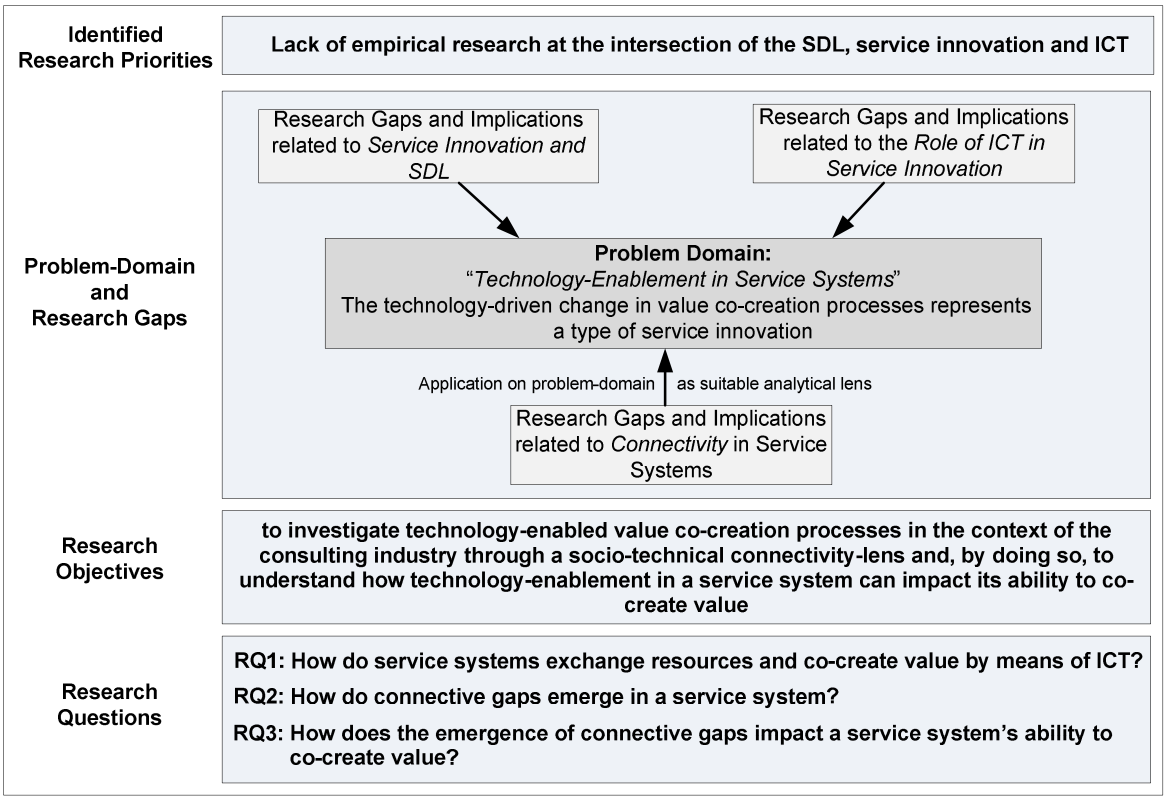


Figure 2.10: Research Framework

2.6 Chapter Summary

This chapter provided a review of the relevant literature and delineated research gaps and resulting research implications and questions. Specifically, this chapter established the theoretical foundations for this study by reviewing the wider service science literature, which provided insights into the current state of service research. It consequently identified the problem domain which addresses technology-enablement in service systems, and discussed connectivity as the appropriate socio-technical analytical lens. Based on this review of the extant literature, the chapter identified research gaps and implications at the intersection of the SDL, service innovation and ICT, as well as connectivity research; all of which evidently represent recognised and necessary opportunities for research that are addressed by this study. Subsequently, a research objective and guiding research questions were defined. Chapter 3 will explain how this study addresses the research objective and questions.

3. RESEARCH METHODOLOGY

3.1 Chapter Introduction

Chapter 3 introduces the research methodology and design of this study. The research design links the research objectives and questions to the process of collecting, analysing and interpreting data (Yin, 2003), and it is considered important to clarify and articulate it, so that a study's strengths and potential limitations are well understood (Maxwell, 2009).

The individual sections of this chapter represent the overall research process of this study. Section 3.2 justifies and outlines the research design which is grounded in realism as its underlying scientific paradigm, and theory building from cases as the research strategy. Multiple case studies represent the study's research method and the process of case selection is discussed in Section 3.3. The data-collection processes are described in Section 3.4, while Section 3.5 outlines the data preparation and analysis processes. The chapter concludes with a summary of quality criteria deemed suitable to evaluate case studies following the realism paradigm in Section 3.6, as well as a summary in Section 3.7. Figure 3.1 presents a detailed overview of the structure of the chapter.

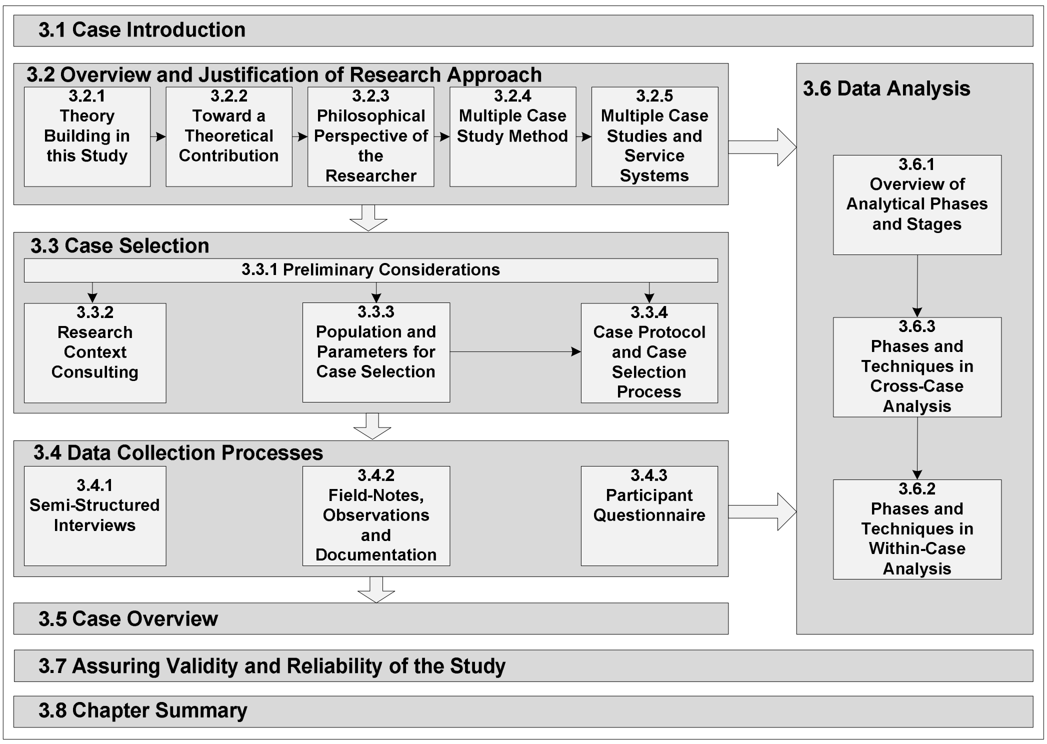


Figure 3.1: Structure of the Methodology Chapter

3.2 Overview and Justification of Research Approach

3.2.1 Theory Building in this Study

The literature review throughout Chapter 2 outlined that researching technology-enabled value co-creation processes through a connectivity lens represents an emerging and relevant research area with very limited empirical contributions available to date. Eisenhardt claims that "building theory from case study research [is] most appropriate in the early stages of research on a topic [when] little is known about a phenomenon" (1989, p. 548). Consequently, the research strategy of theory building from case studies is selected for this study. This inductive approach involves the creation of "theoretical constructs, propositions and/or midrange theory from case-based, empirical evidence" (Eisenhardt & Graebner, 2007, p. 25), and is according to Edmondson and McManus (2007) and Yin (1993), particularly suitable for studies like this present one, that are guided by *how* or *why* research questions.

Kerlinger defines theory as "a set of interrelated constructs (concepts), definitions and propositions that present a systematic view of phenomena" (1973, p. 9). Scholars agree that theories provide descriptions or explanations of observed processes or phenomena of interest through a series of constructs and associated interrelationships that explain how or why the observed processes or phenomena of interest occur (Bacharach, 1989; Engelen, Kiewiet, & Terouw, 2001; Gioia & Pitre, 1990; Lynham, 2002; Strauss, 1987). Therefore, theories allow "even if only probabilistically," the prediction of the variability of an outcome of interest associated with the observed process or phenomena (Colquitt & Zapata-Phelan, 2007, p. 1281).

Theory building involves "the process of modelling real-world phenomena" (Torraco, 1997, p. 123), as well as the testing and refinement of these phenomena (Gioia & Pitre, 1990). Most importantly, "theory building requires rich description" (Mintzberg, 1979, p. 587), which corresponds with Bonoma (1985), who outlined that theory building from cases requires the initial description, and comparison of the phenomenon or unit of analysis. While Christensen adds that description is only a "preliminary stage" (2006, p. 39) on the road towards developing normative theory, it is exactly this initial exploration and description of technology-enabled value co-creation processes in service systems that researchers called for, and that this study attempts to provide.

3.2.2 Towards a Theoretical Contribution

Providing a theoretical contribution, especially in empirical studies within the wider management discipline like this present study, is considered crucial (Bergh, 2003; Colquitt & Zapata-Phelan, 2007; Corley & Gioia, 2011; Hambrick, 2007; Kilduff, 2006; Whetten, 1989). Nevertheless, the argument has been brought forward that "what constitutes a theoretical contribution […] is a vexing question that cannot be answered definitively" and "can only be assessed in the context of each unique manuscript" (Corley & Gioia, 2011; Whetten, 1989, p. 26). While Corley and Gioia further define theoretical contributions as "a significant theoretical (as opposed to an empirical or a methodological) advancement in our understanding of a phenomenon" (2011, p. 12), Colquitt and Zapata-Phelan (2007) argue that researchers can make a theoretical contribution through inductive theory building, which is the approach adopted by this study.

Understanding the means to evaluate emerging theories is crucial when attempting to evaluate what constitutes a theoretical contribution. Scholars have discussed criteria deemed suitable here that, if fulfilled, are considered to confirm the existence of a sufficient theoretical contribution. One widely cited criterion is that of originality (Bergh, 2003; Corley & Gioia, 2011; Eisenhardt, 1989). A theory should provide new insights (Eisenhardt, 1989) that reveal "what we otherwise had not seen, known, or conceived" (Corley & Gioia, 2011, pp., p. 17). Additionally, Eisenhardt (1989) suggests theories can be evaluated by their fit to empirical data. Finally, Kilduff (2006) and Hambrick (2007) explain that a theory's ability to stimulate future research, for example by "alerting us to research opportunities hitherto unanticipated" (Kilduff, 2006, pp., p. 252), should be used to evaluate whether or not a theory makes a sufficient contribution. The contribution of this study in lieu of these criteria will be discussed in Section 6.3.

3.2.3 Philosophical Perspective of the Researcher

Case studies are the research methodology of this study, but are also linked to its philosophical perspective, or scientific paradigm (Creswell, 2003; Guba & Lincoln, 1994; Healy & Perry, 2000; Perry, 1998). Scientific paradigms are world views or "overall conceptual frameworks within which […] researchers work" (Healy & Perry, 2000, p. 118), and include the elements of ontology, epistemology and methodology (Deshpande, 1983; Healy & Perry, 2000). An ontology represents the "essence of phenomena under investigation" (Orlikowski & Baroudi, 1991, p. 7), or "the "reality" that researchers investigate" (Healy & Perry, 2000, p. 119). Epistemology describes the "relationship between that reality and the researchers [reality]" (Healy & Perry, 2000, p. 119), or according to Orlikowski and Baroudi (Orlikowski & Baroudi, 1991, p. 8), the "criteria by which valid knowledge about a phenomenon may be constructed and evaluated." Ultimately, the different assumptions in regard to ontology and epistemology influence the researcher's choice of methodology (Guba & Lincoln, 1994), which is "the technique used by the researcher to investigate that reality" (Healy & Perry, 2000, p. 119). Guba and Lincoln (1994) classified scientific paradigms into the categories of positivism, critical theory, constructivism and realism, which are, together with their individual elements, presented in Table 3.1:

Element	**Paradigm**			
	Positivism	*Critical theory*	*Constructivism*	*Realism*
Ontology	Reality is real and apprehensible	"Virtual" reality shaped by social, economic, ethnic, political, cultural, and gender values, crystallised over time	Multiple local and specific "constructed" realities	Reality is "real" but only imperfectly and probabilistically apprehensible
Epistemology	*Objectivist*: findings true	*Subjectivist*: value mediated findings	*Subjectivist*: created findings	*Modified objectivist*: findings probably true
Common methodology	*Experiments/ surveys*: verification of hypotheses through quantitative methods	*Dialogic/dialectical*: researchers is a "transformative intellectual" who changes the social world within which participants live	*Hermeneutical/ dialectical*: researcher is a "passionate participant"	*Case studies/ interviewing*: interpretation of research issues by qualitative and possibly quantitative methods

Table 3.1: Scientific Paradigms and their Elements (Healy & Perry, 2000, p. 119)

This study is based on the assumptions underlying the *realism* paradigm. However, in order to be able to understand this choice, the other three paradigms must initially be discussed. Researchers following *positivism* perceive reality as real and apprehensible, and assume that facts can be quantitatively measured in that reality (Guba & Lincoln, 1994). Consequently, observed data does not change through the observation, and researchers imply that findings are true (Healy & Perry, 2000). While case studies or qualitative data can adopt a positivist perspective (Crotty, 1998; Yin, 2003), Guba and Lincoln (1994) and others (Bonoma, 1985; Parkhe, 1993) argue that positivism is typically associated with quantitative data and deductive hypothesis testing, rather than inductive theory building. Perry (1998) outlines that the difference here "can be viewed in terms of scientific paradigms, with the deductive approach representing the positivist paradigm and the inductive approach representing the phenomenological paradigm" (Perry, 1998, p. 786). Ultimately, positivism is considered "inappropriate when approaching a social science phenomenon […] which involved humans and their real-life experiences" (Healy & Perry, 2000, p. 119). The research strategy of theory building from cases in this study involves inductive theory building involving humans and their real-life experiences rather than deductive theory testing. Following the recommendations by Perry (1998) and Healy and Perry (2000), this study is consequently rooted in a phenomenological scientific paradigm.

Critical theory is, as a phenomenological paradigm, strongly linked to the subjective individual values and assumptions that influence the researcher's perception of reality. Consequently, findings originating from studies based on the critical theory paradigm are not value free, but rather judgmental (Guba & Lincoln, 1994). Also, these studies typically attempt to "change the world in which the participants live" (Healy & Perry, 2000, p. 119) and often follow the research strategy of action research. The researcher of this study does not aspire to be a "transformative intellectual" (Guba & Lincoln, 1994, p. 112) who attempts to change the reality of individual entities in service systems, but is rather interested in understanding their behaviour. Hence, critical theory was not chosen as the underlying scientific paradigm for this study.

Constructivism, the second phenomenological paradigm, is based on an ontology which assumes that individuals always construct multiple realities (Healy & Perry, 2000). Guba and Lincoln (1994) argue that the only way for a researcher to uncover these multiple realities, is by becoming a "passionate participant" (Guba & Lincoln, 1994, p. 112) when engaging in fieldwork. Healy and Perry (2000) add that this scientific paradigm can be suitable for studies that investigate topics such as religion, beauty or prejudice, but not for studies related to management topics. The reason is that constructivism "excludes concerns about the important, and clearly 'real' economic and technological dimensions of business" (Healy & Perry, 2000, p. 120). Since technology, and the implications of its utilisation in service systems represent a core element of this study, the researcher decided against constructivism as the scientific paradigm for this study. However, it should be mentioned that some scholars like, for example, Yates and Orlikowski (1992) do, in fact, investigate the role of ICT in organisations from a constructivist standpoint.

Realism is the scientific paradigm chosen for this study. The fit between realism and case study research has already been acknowledged in the literature (Healy & Perry, 2000; Perry, 1998; Stake, 1995), with Perry affirming that "realism is the appropriate scientific paradigm for case study research" (1998, p. 787). Realism acknowledges that any reality examined is only imperfectly apprehensible, and understands that findings are only probably true (Godfrey & Hill, 1995; Guba & Lincoln, 1994; Merriam, 1988). Realism addresses the most widely cited criticism concerning positivism, specifically the assumption that reality is uniquely apprehensible, and that findings are undoubtedly true (Healy & Perry, 2000). Guba and Lincoln (1994) refer in this context to positivism as naïve reality, and realism as critical reality. Unlike positivism, which is considered to be value-free, or critical theory and constructivism which are value-laden, researchers applying realism are *value aware*. Being value aware means one accepts that a reality exists, however it is "only imperfectly apprehensible because of basically flawed human intellectual mechanisms and the fundamentally intractable nature of the phenomena" (Guba & Lincoln, 1994, p. 205). Consequently, realism is characterised by researcher objectivity, and recognises that limitations in regard to the researcher's abilities may lead to imperfect observations of the reality under investigation (Healy & Perry, 2000). Hence, realism is, due to its inherent researcher objectivity, considered particularly suitable for inductive theory building (Healy & Perry, 2000; Perry, 1998). As a theory-building study, objectivity is crucial in order to ensure that the contributions this study attempts to offer can be the foundation for future research. Realism is ultimately chosen by the researcher as the scientific paradigm for this study; however, realism also influences the subsequent research design of the study, specifically in regard to the initial use of theory and the application of data collection techniques. Both of which will be discussed in subsequent sections.

3.2.4 Multiple Case Study Method

Building theory from cases (Eisenhardt, 1989; Eisenhardt & Graebner, 2007) is the research strategy underlying in this study (see Section 3.2.1). This research strategy is based on the application of the case study method (Gerring, 2004; Yin, 1993, 2003), which is an "theory-generating methodology" (Gummesson, 2007a, p. 226), representing an "empirical enquiry that investigates a contemporary phenomenon within a real life context when boundaries between phenomena and context are not clearly evident and in which multiple sources of evidence are used" (Yin, 1984, p. 10). The data used for the inquiry can be qualitative and/or quantitative, and originate from a variety of sources, such as “archives, interviews, questionnaires, and observations” (Eisenhardt, 1989, p. 534).

Using multiple case studies is, besides its close affiliation with the research strategy underlying this study, the most suitable research method for the following reasons: first, the consulting industry, which provides the contextual background for this study (see Section 3.3.2) is considered a prime-example for an industry where the shift from face-to-face towards technology-enabled value co-creation as the phenomenon under investigation is particularly visible (see Section 2.3.3.4 and Section 3.3.1). However, the boundaries between the context consulting and phenomenon technology-enabled value co-creation are not clearly evident at this stage, which relates to Yin’s (1984) argument of indistinct boundaries.

Second, Edvardson, et al. (2011, p. 337) suggest that researchers attempting to empirically investigate value co-creation processes should do this by utilising multiple sources of evidence “including experiments, in-depth interviews, case studies, [and] observations,” in a given social context. Case studies provide the researcher with this opportunity to collect qualitative data from a variety of sources, as called for by scholars (Chen, et al., 2009; Ordanini & Parasuraman, 2011; Sebastiani & Paiola, 2010) who consider it important for the advancement of service innovation research from a SDL-driven point of view (see Section 2.5.1).

Third, this study adopted realism as its underlying scientific paradigm, with the case-study method being the most suitable research method for studies adopting realism (Healy & Perry, 2000; Perry, 1998). Furthermore, Gummesson argues that case studies help researchers to improve managerial decision making by offering a “holistic view of a specific phenomenon” (1991, p. 76). It is this holistic view on how service systems co-create value by means of ICT, called for by Vargo, et al. (2008) (see Section 2.3.3.4). Ultimately, the ability of case studies to provide this insight is understood to support the development of actual recommendations on “how to manage” (Lee & Park, 2009, p. 9618) service systems effectively. In response to Lee and Park’s (2009) appeal, this study aims provide the foundations for future research that can contribute to the provision of managerial guidelines regarding the effective and efficient use of ICT in service systems. Consequently, case studies represent a suitable research method for the investigating technology-enabled value co-creation processes in the context of the consulting industry.

Multiple case studies provide an even stronger base for theory building than *single*-case studies (Eisenhardt & Graebner, 2007; Yin, 1993, 2003), result in "theory that is accurate, interesting, and testable" (Eisenhardt & Graebner, 2007, p. 26), and are consequently used in this study. Theory that originates from the use of multiple cases is "better grounded, more accurate, and more generalizable" (Eisenhardt & Graebner, 2007, p. 27), with resulting constructs and relationships being more accurately defined (Dooley, 2002; Eisenhardt, 1989; Eisenhardt & Graebner, 2007; Lynham, 2002; Yin, 1993). The use of multiple cases also enables researchers to compare emergent findings and clarify whether these are unique to a single case, or occur consistently within the entire population of cases (Eisenhardt, 1991; Miles & Huberman, 1994b). Theory building using multiple case studies relies on replication logic (Eisenhardt, 1989; Yin, 1984). Here, each individual case "serves as a distinct experiment that stands on its own as an analytical unit" (Eisenhardt & Graebner, 2007, p.25). Consequently, multiple cases serve as "replications, contrasts and extensions to the emerging theory" (Eisenhardt & Graebner, 2007, p. 25; Yin, 1984). Theory is developed inductively by observing an empirical reality (Collis & Hussey, 2003) through "recognizing patterns of relationships among constructs within and across cases and their underlying logical argument" (Eisenhardt & Graebner, 2007, p. 25).

Eisenhardt (1989, p. 536) argues that while theory building from cases should preferably commence "as close as possible to the ideal of no theory under consideration […] because preordained theoretical perspectives or propositions may bias and limit the findings," this "ideal of a clean theoretical slate, […] is impossible to achieve" (Eisenhardt, 1989, p. 536), and most "scholars are not going to generate new theory from scratch. Instead, they generally work on improving what already exists" (Whetten, 1989, p. 492). Benson-Rea (2005) adds that the only possible way for a researcher to investigate a phenomenon without any pre-existing theoretical considerations would be an approach found in the purest form of grounded theory that does not take theoretical underpinnings prior to the empirical investigation into consideration (Glaser, 1978, 1992; Glaser & Strauss, 1967; Strauss & Corbin, 1990). Related to scientific paradigms such as constructivism (Stern, 1994, p. 273), pure grounded theory "emphasizes generating theory from data alone" (Perry, 1998, p. 788). Howevre, such an approach is not appropriate for this study given realism as the scientific paradigm. Realism explicitly approves the use of existing literature and considers it necessary for theory building (Healy & Perry, 2000; McCallin, 2003; Selden, 2005; Uruquhart & Fernandez, 2006; Whetten, 1989) further disassociates theory building using cases from grounded theory research, since it is "generally more useful in the conceptual development phase of theory building than case study research" (Dooley, 2002, p. 336). Finally, Eisenhardt and Graebner state that scholars should "avoid the term unless one is actually using the Glaser and Strauss (1967) approach" (2007, p. 30). This researcher agrees.[18]

This study followed Eisenhardt's suggestion that "investigators should formulate a research problem and possibly specify some potentially important variables, with some reference to extant literature" (1989, p. 539) at the beginning of an investigation. This approach is supported by Perry, who argues that "prior theory provides a focus to the data collection phase in the form of research issues" (1998, p. 790). This study did not develop any testable hypothesis from the existing literature, but utilised pre-existing research on service innovation, the SDL, connectivity and the role of ICT in service innovation in order to identify research gaps, outline research objectives and develop research questions that guide the investigation. These gaps, objectives and questions were presented in Chapter 2.5. Figure 3.2 outlines the process of the multiple case study method that was applied in this study.

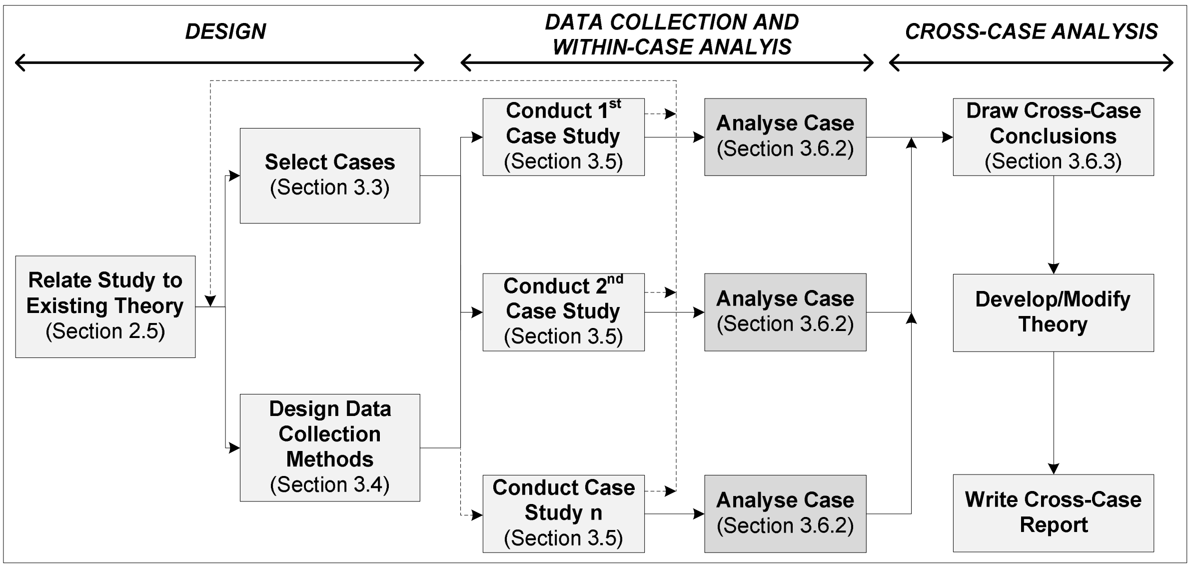


Figure 3.2: Multiple Case Study Method, adapted from Yin (1989)

18 A more pragmatic argument against a pure grounded theory approach in this study is the fact that a requirement for first year PhD students at the University of Auckland Business School is to conduct a preliminary literature review. Consequently, deliberately avoiding the literature and existing theory was not an option at the outset of this study.

3.2.5 Multiple Case Studies and Service Systems

With theory building from cases as the research strategy, and multiple case studies representing the research method in this study, it is now important to define the boundaries of an individual case. Miles and Huberman explain "the case is, in effect, your unit of analysis" (1994b, p. 25). With the service system as the basic unit of analysis in service research (Maglio & Spohrer, 2008), an individual case in this study is represented through a service system.

Current research utilising service systems has, according to Heinonen, et al. "focused on analysing an individual service system from the company's point of view" (2010, p. 532). This is especially problematic given that scholars have called for research to improve our understanding of value co-creation also from the customer's point of view (see Chapter 2.5). Ultimately, Heinonen, et al. summarise the current conundrum, and state that existing research approaches will "inevitably lead to an incomplete understanding of what the customer does with the service" (2010, p. 532). Grönroos addresses this methodological issue and calls for a "dyadic approach" in service research, where "metrics […] for both the firm and the customer should be used" (2010, p. 29). This study takes these recommendations into consideration and follows Heinonen, et al. who indicate that "a more critical view of the role of co-creation in service is needed, a view where the roles and input of both the customers and company are evaluated" (2010, p. 543). Hence, a single case, or unit of analysis, in this study consists of one, or a combination of consulting firms (*service provider*) that engage with one, or a combination of customer firms (*service customer*), during a technology-enabled value co-creation process of a *service target*. Figure 3.3 represents an overview.

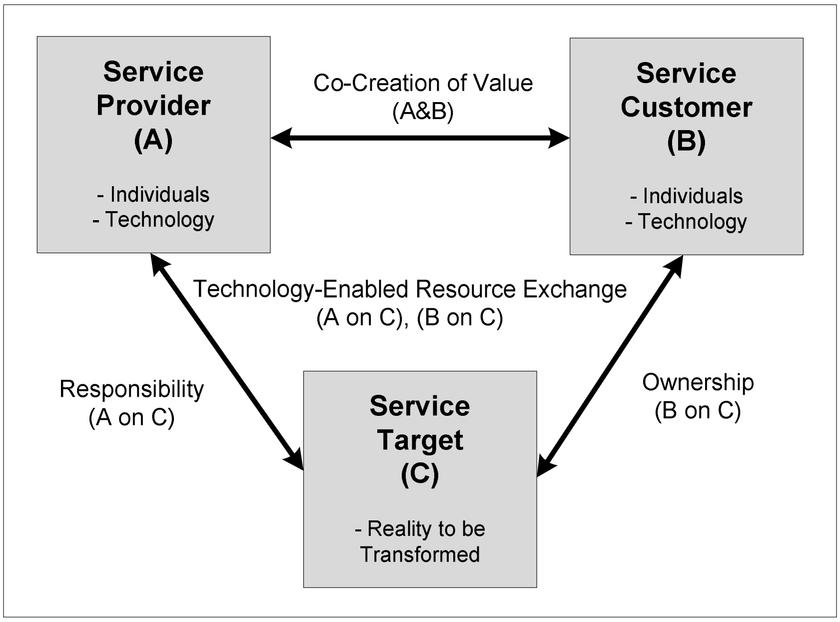


Figure 3.3: A Service System in this Study, adapted from Maglio, et al. (2006)

3.3 Case Selection

3.3.1 Preliminary Considerations

Selecting cases for a multiple case study is a fundamental decision for researchers. Some considerations in this decision making process include: *how many* cases are necessary and *how to select* each individual case (Eisenhardt, 1989; Miles & Huberman, 1994b). Since "there are no precise guides to the number of cases to be included" (Perry, 1998, p. 793), and "no ideal number of cases" (Eisenhardt, 1989, p. 545) available, the author will first explore the existing debate in the literature before outlining the approach taken in this study.

A group of scholars attempt to specify how many cases should be included in a multiple case study. Eisenhardt suggests "a number between four and ten cases" (1989, p. 545), while Hedges argues "four to six form a reasonable minimum for a serious project" (1985, p. 76). Perry summarises the debate and outlines that "the accepted range seems to fall between two to four as the minimum and[10], 12 or 15 as the maximum" (1998, p. 794). Alternatively, one may consider the *number of interviews* in a study rather than the number of cases (Perry, 1998). For example, "a PhD thesis requires about 35 to 50 interviews," (Perry, 1998, p. 794), with three interviews at different hierarchical levels in a single organisation being considered appropriate for one case. Similarly, Yin (2011) suggests to interview 25 to 50 participants. However, Patton provides an alternative viewpoint and argues that "the validity, meaningfulness and insights generated from qualitative inquiry have more to do with the information-richness of the cases selected […] than with sample size" (1990, p. 185).

The level of rich information that any number of cases can provide is "considered fundamental to deciding on the number of cases" (Perry, 1998, p. 793), and appears to be the most suitable approach when determining the number of cases to be included in any multiple case study. According to Miles and Huberman, information richness of a case "depends on how rich the within-case sampling is" (1994b, p. 30) and will ultimately provide researchers with confidence in their analytical generalisations (Miles & Huberman, 1994b). Information richness is accomplished when "theoretical saturation" (Eisenhardt, 1989; Gummesson, 1991, p. 85), or "the point of redundancy" (Lincoln & Guba, 1985, p. 204), is reached. This level of saturation describes a state when an additional case or interview does not reveal any new insights, and the researcher has no incentive to add more cases because "the marginal utility of an additional case approaches zero" (Gummesson, 1991, p. 85).

Understanding information richness as a mean to determine the number of cases or interviews for a study is important. Patton (1990) explains that, in order to identify information rich cases, it is most important to initially select cases that are worthy of being studied in depth. However, selecting cases for inductive theory building research differs considerably compared to the collection of large-scale data sets in deductive theory-testing studies (Eisenhardt, 1989). With theory-building rather than theory-testing being the purpose of inductive research like this study, the selection of cases is not driven by concerns for representativeness of an overall population, but by purposive *theoretical sampling* that addresses a conceptual question and aids to the selection of information rich cases (Eisenhardt, 1989; Eisenhardt & Graebner, 2007; Kuzel, 1992; Miles & Huberman, 1994b). Marshall defines theoretical sampling as a data-collection strategy that results in the "most productive sample to answer the research question" (1996, p. 523), with Eisenhardt suggesting that researchers investigate cases where the "process of interest is 'transparently observable'" (1989, p. 537). Consequently, this study used theoretical sampling to identify and select suitable cases that could provide the necessary rich data.

Following the recommendation by Miles and Huberman (1994b), a *criterion-based* theoretical sampling approach which is based on the initial definition of appropriate parameters helped to screen suitable cases before data collection, and ensured that all cases were comparable (Yin, 1984), and sufficiently represented technology-enabled value co-creation as the phenomenon under investigation (Miles & Huberman, 1994b). The parameters underlying the theoretical sampling of this study are outlined and justified in in following section, while the actual process of case screening and sampling is outlined in Section 3.3.4.

3.3.2 Population and Parameters for Case Selection

This section describes and justifies the actual parameters which were used to identify and screen potential cases before data collection commenced. Defining the population from which the sample of cases can be drawn is crucial in theoretical sampling (Eisenhardt, 1989). This approach helps to control extraneous variation and outlines the limits within which the findings of the study can be generalised (Eisenhardt, 1989). Following the recommendations by Eisenhardt (1989) and Miles and Huberman (1994b), the population of this study was defined in relation to the research objectives, and the case definition (see Section 3.2.4) as:

> **Service systems consisting of one, or a combination of consulting firms (*service provider*) that engage with one, or a combination of customer firms (*service customer*), during a technology-enabled value co-creation process of a *service target***

The parameters underlying a theoretical sampling approach attempt to "obtain the broadest range of information and perspectives on the subject of study" (Kuzel, 1992, p. 37) possible, and ensure that the phenomenon under investigation is clearly observable (Eisenhardt, 1989). This can be accomplished through "contrary evidence or views" (Yin, 2011, p. 88), for example by collecting data from sources that are likely to hold different views (Yin, 2011). Hence, this study explicitly includes the perspectives of senior managers, project managers, as well as line employees and consultants of the consulting *and* customer firm, who could likely provide these contrary views. The first screening parameter was defined as:

> **Can access be gained to both, the consulting and customer firm?**

Potential cases were also screened in regard to their ability to provide data related to the research questions investigating the emergence and impact of connective gaps. It was therefore necessary that the service system entities experienced and recognised connective gaps throughout the duration of their interaction. The second parameter was defined as:

> **Did the service system experience connective gaps?**

In order to sufficiently investigate the research questions, each case had to represent a *successful* instance of a service target, which implied that the project had to be *completed,* and was investigated in retrospective. Eisenhardt and Graebner (2007) argue that a retrospective approach is particular suitable when researchers attempt to utilise interviews as their main source of evidence (see Section 3.4.1). Participants can typically remember recent events well, which aids to the depth of the investigation and allows for the inclusion of more informants in the study. Completion of the consulting process is also important because it enables the researcher to investigate the interaction of the service system throughout the entire process, and not just at any given time, which makes the individual cases in the study comparable in regard to time. Furthermore, a consulting project in an early stage is unlikely to provide insights on impact of connective gaps on the service system over time. It was equally important to identify projects that were considered successful by the participant's standards. Successful projects are likely to have overcome connective gaps, which implies that participants were likely able to explain the means by which they accomplished this. This is relevant since this study attempts to build the foundation for future research that could result in managerial guidelines regarding the effective and efficient use of ICT in service systems (see Section 3.2.1). The third parameter was defined as:

Is the service target completed, or near its completion? Was it successful?

The fourth parameter screened potential cases in regard to the cultural diversity of the entities in the service system. Technology-enabled interaction of the service systems implied that the individual entities represented through consulting and customer teams were likely to be physically dispersed.[19] The idea of global virtual teams with culturally diverse members has been introduced in Section 2.4.1.2, and some scholars have discussed the effects of cultural diversity on virtual teams' performance (Carte & Chidambaram, 2004; Envaristo, 2003; Staples & Zhao, 2006). For example, Staples and Zhao (2006) found that while culturally heterogeneous virtual teams typically experience more conflict and less satisfaction and coherence than culturally homogeneous face-to-face teams, no statistically significant differences in regard to the level of performance existed. As a matter of fact, "the performance of the virtual heterogeneous teams was superior to that of the F2F [face-to-face]

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[19] Section 2.4.1.3 introduced the notion of *local virtuality*, as defined by Quan-Haase and Wellman (2005a, p. 215), as "the pervasive use of computer mediated communication for interaction with physical proximate people, even if located nearby." Consequently, physical distribution between consulting and client team was not a prerequisite if their interaction could be defined under the *local virtuality* umbrella.

heterogeneous teams" (Staples & Zhao, 2006, p. 389). This supports findings brought forward by Carte and Chidambaram (2004), who argue that the use of ICT can reduce negative implications of cultural diversity on team performance. While the effects of cultural diversity on the performance of a virtual team appear to be non-existent, it is important to recognise that existing studies are based on laboratory experiments rather than fieldwork; a methodological shortcoming common to virtual team research (see Section 2.4.1.2).

In order to avoid potentially biased findings that may have arisen from collecting data in culturally diverse teams the researcher followed the approach by Staples and Zhao (2006). Cultural similarity was confirmed when dispersed teams were similar in regard to their individualism/collectivism beliefs (Hofstede, 1984, 1997) and spoke the same language, which includes bi-lingual individuals. For example, if entities in a potentially suitable service system were based in different countries, the researcher only accepted the service system, if the individual entities were located in the same cluster of Hofstede's (1997) culture map, thereby eliminating potential bias regarding power distance and uncertainty avoidance.[20] Ultimately, this study does not attempt to investigate the role of cultural diversity in service systems, or to compare service systems from different cultural backgrounds. Instead, it was important to ensure that all service systems were culturally homogenous. Therefore, the fourth parameter was defined as:

Are the consulting and customer teams from culturally similar backgrounds?

3.3.3 Consulting as the Research Context

Closely related to the sampling of cases is the understanding and recognition of the *context* in which the study is situated, as "contexts drive the way we understand the meaning of events" (Miles & Huberman, 1994b, p. 102). The empirical research setting of this study is the consulting industry. This industry provides the ideal environment for the investigation of the research questions underlying this study, especially when taking the contextual and conceptual research implications brought forward by scholars advocating the SDL-perspective on service innovation research into account (see Chapter 2.5).

First, Payne et al. explicitly indicate that "professional services markets, such as consulting" (2008, p. 94) are an appropriate contextual research setting for empirical studies related to

[20] See Hofstede (1997, p. 83), for a figure comparing the cultural similarities of nations.

SDL-driven service innovation studies. Gadrey and Gallouj provide further support and state: "consulting constitutes the best 'laboratory' for exploring the possible specificities of innovation in services" (2002, p. 19).

Second, the literature review throughout Chapter 2 outlined in several instances that consulting, a knowledge-intensive service which typically depends on face-to-face participation and input from the customer during value co-creation (Bettencourt, et al., 2002; Fähnrich & Meiren, 2007; Xue & Field, 2008), has begun to shift into virtual realms. Fuelled by technological changes, and especially the unprecedented development of ICT, the need for physical contact as a mediator for customer input has supposedly, in certain instances, become irrelevant (Edvardsson, et al., 2010; Maglio & Spohrer, 2008; Sampson & Froehle, 2006). Consequently, it also addresses two research implications which SDL-driven service innovation studies should attempt to incorporate: change in the value co-creation process (Chen, et al., 2009), and the prevalence of ICT therein (Ordanini & Parasuraman, 2011), both of which are apparent and observable in the consulting industry.

Third, consulting is the "epitome of knowledge-based" service provisions (Anand, Gardner, & Morris, 2007, p. 407; Sarvary, 1999), meaning that the main assets of consulting firms are the specialised competences (i.e. knowledge and skills) of their employees (Engwall & Kipping, 2002). Furthermore, value co-creation in consulting is known to depend almost entirely on the effective sharing of the operant resource information between consultant and customer (Bettencourt, et al., 2002; Mills & Marguiles, 1980). Information, and the knowledge and skills as the main assets of consulting firms, are *operant* resources. Focussing on operant resources is the final research implication identified by scholars calling for the SDL-driven service innovation studies (Chen, et al., 2009; Michel, et al., 2008; Ordanini & Parasuraman, 2011). The consulting industry provides a setting where operant resources are particularly prevalent and observable, hence making it a suitable research context.

3.3.4 Case Protocol and Case Selection Process

The selection and screening of cases in this study was supported through a case protocol, an approach recommended by Yin (2003, 2011), which is known to help the researcher execute the study in a productive manner. A research protocol serves as a "mental framework" (Yin, 2011, p. 103), and broadly outlines how the researcher should act in a given situation without outlining a too narrowly defined set of interactions that may occur between the researcher and participants (Yin, 2003, 2011). Data collection based on a research protocol leads to unbiased data, increases the reliability of the study, as well as the efficiency of the researcher.

Following the recommendations by Yin (2003), the case protocol consisted of field procedures for the researcher, a schedule outlining key-dates for the data-collection, and procedures that specified how to gain access to organisations. The case protocol furthermore consisted of a research invitation, a participant information sheet which explained the study for potential participants, as well as information material for the screening interviews. Overall, these documents aimed at a general audience, an approach that typically helps to attract participants (Yin, 2003). The regulations at the University of Auckland required the researcher to submit these documents in a standardised format to the University of Auckland Human Participants Ethics Committee for approval prior to the actual field-phase. Undergoing such a process is considered important because it increases the researcher's awareness of potential ethical issues in the study (Yin, 2011). The actual case selection and screening commenced after the University of Auckland Human Participants Ethics Committee approved the study in February 2009, and the last interviews were conducted in November 2009. The entire case selection process can be illustrated by structuring it into a *definition*, *exploration*, *screening* and *decision* phase, which is outlined in Figure 3.4.

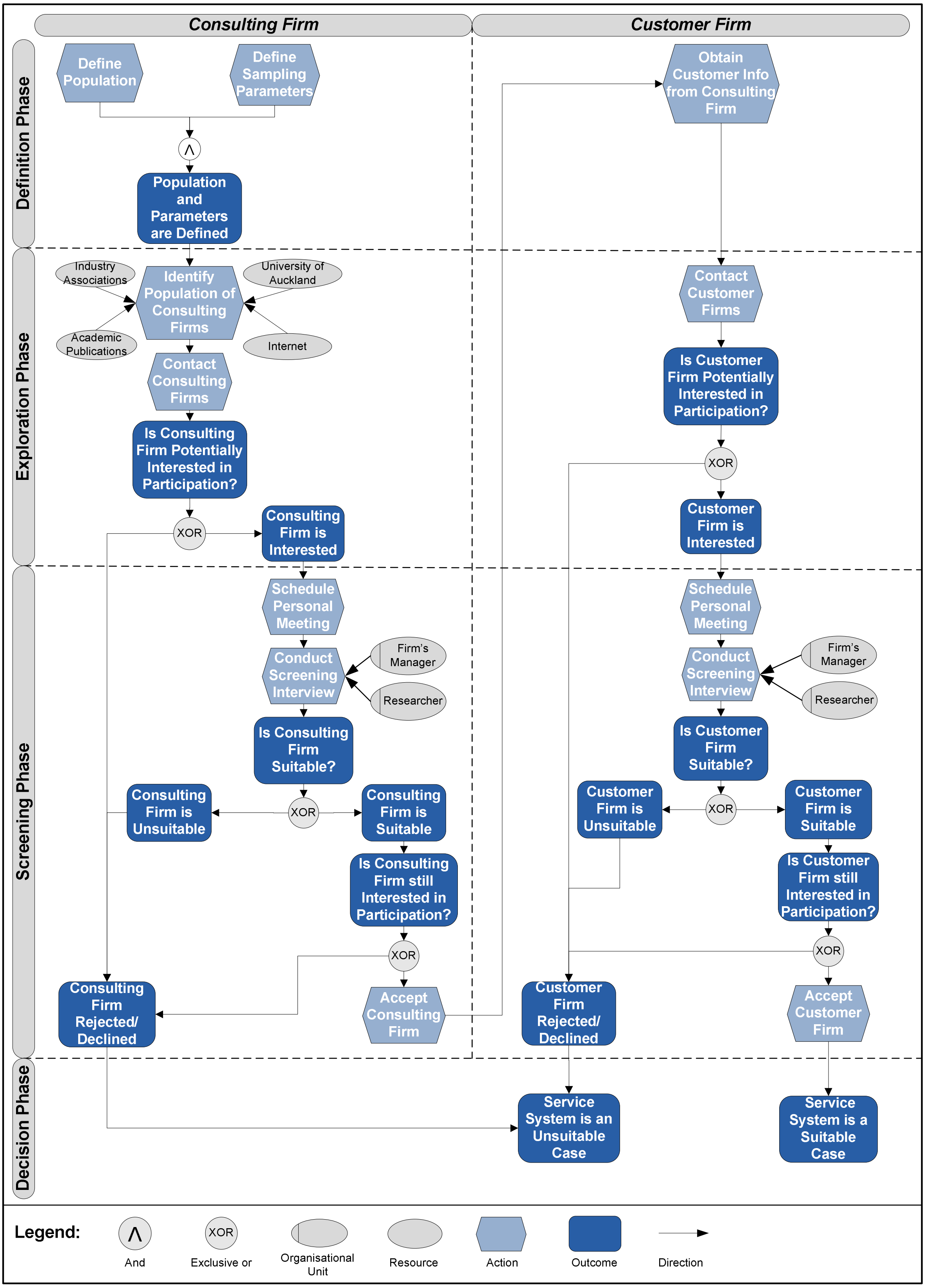

Figure 3.4: Case Selection Process in this Study

The population and sampling parameters outlined in Section 3.3.2 were developed during the *decision phase,* and instigated the case selection of the study. The researcher subsequently identified and contacted promising consulting firms as potential participants during the *exploration phase*. This approach was based on the assumption that every consulting firm has customers, yet, not every organisation that could be a potential customer firm uses consultants. Randomly contacting organisations that might use consultants did not appear to be an efficient strategy for the case selection. Consulting firms were consequently identified through relevant industry associations,[21] academic publications affiliated with practitioners interested in service science, the internet, as well as the networks of the University of Auckland.[22] For example, some consulting firms presented themselves as technologically advanced organisations that utilise ICT for distributed work, and advertised this on their websites as a mean to attract prospective staff. Other consulting firms that were contacted had won prizes by industry associations, and were praised as organisations with a strong international customer base, both of which strongly implied the existence of distributed or ICT-enabled work arrangements. Ultimately, this approach resulted in a population of 27 potentially suitable consulting firms which were contacted via email by the researcher. 11 consulting firms declined to participate or never responded, and 16 consulting firms agreed to meet with the researcher for a screening interview. An overview of the identified and screened organisations is provided in Appendix A.1.

The *screening phase* was particularly important because the researcher had to determine if these previously identified consulting firms could potentially be included in the study. Consequently, the researcher met with senior managers or other executives of these consulting firms, and in two instances even with the entire consulting team, in order to conduct an initial screening interview which lasted approximately one hour. These screening interviews were conducted at the consulting firm's premises, as well as via video conference and telephone for two North American organisations. Throughout the screening interview, the researcher explained the study and determined if the consulting firm had a project that met the selection parameters (see Section 3.3.2). It was especially important to identify if the consulting firm was willing to include their customers in the study, as well as the extent to which ICT supported the interaction between the consulting firm and customers. Furthermore, if consulting firms had a project they considered appropriate for the study, it

[21] Of particular importance were the New Zealand Trade and Enterprise (http://www.nzte.govt.nz/), and the German Association of Management Consultants "Bundesverband Deutscher Unternehmensberater BDU e.V" (http://www.bdu.de), who publicly advertised this study in their newsletter to members.

[22] The researcher attended industry events at the University of Auckland to approach consulting firms.

was then necessary to determine if the team experienced connective gaps throughout the project. The researcher approached this by following Pace (2004) and others (Allison & Duncan, 1988; Han, 1988; Hoffman, Novak, & Yung, 2000), who presented potential participants in their respective studies with a written description of flow, in order to determine if these individuals were suitable participants. For example, Pace (2004) relied on a simple (i.e. non-academic language) textual description of flow in his investigation of flow experiences of web-users, which was given to potential participants in order to determine if they could relate to the phenomenon. Similarly, a description of the theorised connective states of hypo and hyper connectedness based on Kolb, et al. (2008), was given to the managers and/or teams of the consulting firm as part of the screening interview (see Appendix A.7).

If the consulting firm fulfilled all selection parameters (eight consulting firms overall), and was still willing to participate in the study (four consulting firms overall), the researcher then obtained the contact details for the customer firm, contacted that firm, and conducted another screening interview with one of their managers. If the customer firm fulfilled the selection parameters (five customer firms), and was willing to participate (four customer firms), the entire service system was selected in the *decision phase* as an appropriate case for the study (four service systems). Whenever more than two consulting and/or customer firms were part of a service system (two potential service systems), the researcher iterated the screening process for each additional firm. The researcher also kept a diary for field notes throughout the entire case selection process, which later assisted in the development of the interview questions for the main study (see Section 3.4.1).

3.4 Data Collection

3.4.1 Overview of Methods and Processes

Section 3.4 outlines the methods and processes that were used to collect the empirical data for this study. Eisenhardt (1989, p. 537) argues that theory building researchers should always combine multiple data collection methods because this leads to “stronger substantiation of constructs” in the emergent theory.

The data collection methods in this study include semi-structured interviews, field-notes, observations, and documentation provided by case firms. The researcher applied Yin’s (2003) principles for collecting evidence, and created a case study database consisting of folders and *nVivo* 7 files, which included all interview transcripts and guidelines, copies of field-notes, observations and other documentation provided by the participants. A case study database enables other independent researchers to access the raw data for verification, and consequently increases the overall reliability of a case study (Yin, 2003).[23] The following sections outline how the researcher collected the data, beginning with semi-structured interviews as the main source of evidence in this study.

3.4.2 Semi-Structured Interviews

This study relied predominantly on qualitative interview data because these are "appropriate for studying phenomena that are not well understood" (Edmondson & McManus, 2007, p. 1155), and particularly suitable when the "phenomenon of interest is highly episodic" (Eisenhardt & Graebner, 2007, p 28). Technology-enabled value co-creation processes and connectivity, are both not well understood, and connective gaps are, though empirically un-investigated, suspected to be sporadic in nature. Consequently, conducting interviews as a mean to collect qualitative data about these phenomena is a suitable approach in the context of this study.

Interviews are described as "encounters between the researcher and informants directed toward understanding informants' perspectives on their lives, experiences, or situations as expressed in their own words" (Taylor & Bogdan, 1998, p. 88). Here, a researcher can enter "into participants' worlds" (Rossmann & Rallis, 2003, p. 180), and "understand experiences and reconstruct events" (Rubin & Rubin, 1995, p. 3) in which the researcher did not participate. Other advantages of interviews are that they are targeted and can focus directly on the case study topic (Yin, 2003), and are useful when participants cannot be observed directly, for example when a study takes a retrospective angle on the phenomenon under investigation (Creswell, 2003), which was the situation here.

Interviewing as a means to collect qualitative data can be distinguished in the two extremes of *structured* and *qualitative*, or unstructured interviews (Yin, 2011). *Structured* interviews rely on a script that defines the interaction between the researcher and participant in great detail, for example formal questionnaires that pre-define researcher's behaviour and demeanour. This approach is "likely to be a survey or poll" (Yin, 2011, p. 133) with closed-

[23] The University of Auckland Human Participants Ethics Committee approved this study but required that access to all data is restricted to the researcher and to the supervisors.

ended questions relating to positivism (see Section 3.2.2), and is consequently not appropriate for this study. *Qualitative* interviews however, do not rely on a formal questionnaire, or use a script to closely define the interaction between researcher and participants (Yin, 2011). Researchers rather attempt to initiate a conversation, using open-ended questions that vary depending on the context of each interview, and allow participants to freely express their experiences and perceptions of a reality (Yin, 2011).

This study relied on the use of *semi-structured interviews* for data collection, which combine the advantages of both approaches. Semi-structured interviews are based on broad open-ended questions or themes (May, 1997), which guide the interviewer and structure each interview without constraining its course (de Ruyter & Scholl, 1998; Patton, 1990). The researcher can therefore probe when new or interesting themes emerge, an approach considered a quality criterion for case studies within the realism paradigm (see Section 3.8). Here, the using an "interview protocol with probe questions based on what the researcher wants to find out" is strongly recommended (Healy & Perry, 2000, p. 120). Consequently, semi-structured interviews result in rich *and* consistent data that is insightful and represents a participant's perception, thoughts or experiences most accurately (May, 1997; Yin, 2003).

The interview protocol that was used to guide the semi-structured interviews in this study, contained questions that were developed using the existing literature, as well as insights gained through the screening interviews (see Section 3.3.4). This decision was based on de Ruyter and Scholl (1998) and Rubin and Rubin (1995, p. 200), who stated that "main questions are prepared in advance after the researcher has studied available background material or conducted preliminary interviews." Following recommendations by Coviello (2005), the resulting interview questions deliberately avoided academic language and terminology, but were phrased in natural language, which allowed participants to express themselves in their own words. The questions were also discussed with other researchers who were experienced in qualitative research at The University of Auckland Business School, and subsequently revised to improve clarity. They were then re-phrased to suit the perspective of the consulting *and* customer firm's participants, and also translated into German by the researcher, in order to be able to interview German participants who might not be fluent in English. These translations were then verified by two German bi-lingual researchers at The University of Auckland Business School and feedback was subsequently incorporated in the German interview protocol. This resulted in a total of four different versions of the interview protocol (see Appendix A.6). It is also important to outline that the interview protocol was slightly altered during the course of the data collection process, and that the inclusion of new questions was mainly motivated by concepts and themes that emerged throughout the interview process. This evolution of interview questions is part of the theory building process, and a core element in theory building research. It has been recommended by Harris and Sutton (1986) and Eisenhardt, who argues that "adjustments can be made to data collection instruments, such as the addition of questions to an interview protocol […which] allow the researcher to probe emergent theories or to take advantage of special opportunities" (1989, p. 539).

Interviews were conducted with employees from consulting and their customer firms. The researcher attempted to interview every employee that was involved in the various projects in order to incorporate the experiences of all entities within the service system. This approach was motivated by the limitations affiliated with interviewing. For example, interviewees may provide responses that are intended to satisfy the researcher and the participant's memory can be biased as well. Eisenhardt and Graebner recommend "using numerous and highly knowledgeable informants who view the focal phenomenon from diverse perspectives. These informants can include organizational actors from different hierarchical levels, functional areas, groups, and geographies" (2007, p. 28). The researcher attempted to limit the potential bias affiliated with interviewing by first, interviewing employees from the consulting and customer firms, and second, by interviewing participants from different hierarchical levels, including senior management, project management and line employees in all firms. The team members that were involved in each project under investigation were identified by the project or senior manager who had been interviewed during the screening process (see Section 3.3.4). All team-members were then, in accordance with the process outlined by the University of Auckland Human Participants Ethics Committee, contacted by the researcher, and invited to participate in the study. Even though participation was voluntary, all invited team-members agreed to be interviewed for this study. Interviews were then scheduled for a time and date that was convenient for each participant, and resulted in 37 completed interviews.

Most interviews were conducted at the local premises of each participant in several locations across New Zealand, Germany and Canada. However, due to budgetary constraints, some interviews had to be conducted via video-conference or telephone.[24] Denscombe (2003), as well as Thomas and Purdon (1994) support this approach and argue that "doubts about the reliability of factual information obtained over the telephone and its comparability with information obtained face-to-face have largely been discounted. There is no general reason to think that the measures obtained by telephone are less valid" (Thomas & Purdon, 1994, p. 4). Rather, "evidence suggests that people are as honest in telephone interviews as they are with face-to-face type interviews" (Denscombe, 2003, p. 9). While interview questions were primarily open-ended, probing and re-phrasing of questions provided a more thorough understanding of the themes discussed and triggered the memory of the participants. The researcher also followed the rules of good interviewing brought forward by Carson, Gilmore, Perry and Gronhaug (2001), which include the use of encouraging murmurs to signal understanding, an open body posture, maintaining eye contact, and expectant smiling when participants pause, in order to trigger additional comments. Each interview was audio taped, as recommended by Lee (1999), with permission granted by each participant in advance, and additional notes were taken by the researcher. All interviews lasted approximately one hour and were conducted in English, except for the interviews in Germany, which were conducted in German by the researcher who is bilingual in German and English.

3.4.3 Field Notes, Observations and Documentation

Field notes based on observations were collected to complement the interviews (Yin, 2011). They are an important means of achieving the overlap between data collection and data analysis which is considered critical in theory building through case studies (Eisenhardt, 1989). As recommended by Eisenhardt (1989), the researcher took notes during, and immediately after each interview was completed, as well as directly after each site-visit. This process aimed at documenting an utmost comprehensive reflection of the previous events, because "it is often difficult to know what will and will not be useful in the future" (Eisenhardt, 1989, p. 539). These field notes were usually extended into fuller notes in an electronic format as recommended by Yin (2011), and subsequently added to the case study database for analysis.

The observations in this study were not limited to a particular setting, scene or behaviour, as suggested by Fontana and Frey (1994), but occurred throughout the duration that the

[24] A list of all interviews is attached in Appendix A.8

researcher spent at the individual case sites. Each site-visit lasted between one half to four full days and enabled the researcher, through a variety of formal and/or informal activities, to establish a significant rapport with employees of the case firms. The researcher had, in all but one instance, an allocated office or meeting room for the interviews and duration of his visit available, but was otherwise free to spend time at the premises of the firm where he engaged informally with the participants and other employees. Due to the varied interview schedules, the researcher often had to wait several hours in between interviews. This led to a variety of instances where he was invited to participate in informal activities such as lunches, or an evening out with one of the consulting teams. This provided an opportunity to engage with participants and other employees, and to discuss the study and related themes that were subsequently summarised from memory by the researcher and included in the field notes.

The researcher also collected documents such as meeting schedules, project plans, lists of team-members, email templates, or commercial information material. Ultimately, these objects can "yield invaluable data about things not directly observable […] and more historical information" (Yin, 2011, p. 147). Furthermore, after the interviews were completed, the researcher sent each participant regular status emails in regard to the overall progress of the study. This led to a variety of responses from participants, and provided the researcher with additional information about the cases investigated.

3.5 Case Overview

This study is based on data collected from four cases that each represent a service system consisting of one, or a combination of consulting firms, that engaged by means of ICT in technology-enabled value co-creation processes with one, or a combination of customer firms. These four cases include empirical qualitative interview data from 37 participants who are affiliated with 11 organisations (six consulting firms and five customer firms). It is also important to outline that these numbers correspond well with the recommendations regarding the amount of multiple-data sources found in the literature (see Section 3.3.1). The recommended number of cases to be included in a multiple case study ranges from 2-15 (Eisenhardt, 1989; Hedges, 1985; Perry, 1998), with four included in this study, while the recommended number of interviews ranges from 25-50 (Perry, 1998; Yin, 2011), with 37 included in this study. Finally, the amount of organisations should not exceed 15 (Perry, 1998), and 11 are included in this study. Table 3.2 provides an overview of the cases.

Case	Category	Number of Participants			Number of Interviews		
		Senior Management	Project Management	Team Member	Service Provider	Service Customer	Total
A	*Service Provider*	1	1	3	5	4	9
	Service Customer	1	1	2			
B	*Service Provider*	2	3	4	9	3	12
	Service Customer	0	1	2			
C	*Service Provider*	1	2	2	5	5	10
	Service Customer	1	0	4			
D	*Service Provider*	1	1	0	2	4	6
	Service Customer	1	1	2			
Total		*8*	*10*	*19*	***21***	***16***	***37***

Table 3.2: Overview of Cases

Most importantly though, the decision to end the data collection phase typically involved "both practical and theoretical considerations" (Dooley, 2002, p. 342). While time and budgetary constraints would have allowed for another two months of data collection, the researcher decided to conclude the process because theoretical saturation (Eisenhardt, 1989; Eisenhardt & Graebner, 2007) was reached. Theoretical saturation is "the point at which incremental learning is minimal because the researchers are observing phenomena seen before" (Eisenhardt, 1989, p. 545). Lincoln and Guba (1985) explain that theoretical saturation occurs whenever one or several of the following scenarios emerge: exhaustion of resources, means that further engagement with existing data sources do not reveal new information; saturation of categories, a point when categories used for coding are established and no new data is necessary to advance the study; and emergence of regularities, which describes consistencies in the data collection process such as when new data sources do not reveal additional insights. Finally, overextension describes where new information gained through additional data sources is unrelated to the themes that have previously emerged and are not related to the research objectives (Dooley, 2002; Lincoln & Guba, 1985). The point of saturation was reached after 33 interviews when exhaustion of resources, emergence of regularities and overextension were evident. The remaining four interviews were nevertheless conducted due to the previous agreement with the case sites.

3.6 Data Analysis

3.6.1 Overview of Analytical Phases and Stages

Data analysis involves "categorizing, tabulating, or otherwise recombining the evidence, to address the initial propositions of a study" (Yin, 1984, p. 5). Miles and Huberman (1994b) outline that the "choices of [...] research questions, of samples, of the "case" definition […] is an essential part of data analysis" (Miles & Huberman, 1994b, p. 430), and that data analysis and collection in qualitative studies is therefore spread throughout the study. Researchers can therefore correct initial errors and adjust research instruments such as interview protocol in accordance with emerging themes (see Section 3.4.1). This process is fundamental to theory building which "occurs via recursive cycling among the case data, emerging theory, and later extant literature" (Eisenhardt & Graebner, 2007, p. 25). While the researcher followed these guidelines, it should be noted that the final analysis continued after theoretical saturation was reached in the interview stage, and approach consistent with Miles and Huberman, who outline that there are "no fixed boundaries separating 'interim' analysis, later analysis, or indeed final analysis" (1994b, p. 432). Ultimately, the analysis of the qualitative data in this study was based on recommendations and processes by Yin (2011), Miles and Huberman (1994b) and Eisenhardt (1989), and separated in a within-case and cross-case stage.

The within-case analysis is a "key feature" (Eisenhardt, 1989, p. 540) in multiple case studies, and a way to manage the "staggering volume of data" (Eisenhardt, 1989, p. 540). Each case is analysed separately which helps researchers to familiarise themselves with all cases before patterns can be generalised across cases (Eisenhardt, 1989; Miles & Huberman, 1994b). The within-case analysis was structured using Yin's (2011) phases of compiling (see Section 3.6.2.1), disassembling (see Section 3.6.2.2) and reassembling (see Section 3.6.2.3). The analytical stages of interpreting and concluding are embedded in disassembling and reassembling, as well as part of the cross-case stage.

The cross-case analysis was an equally important part of the data analysis (Eisenhardt, 1989; Miles & Huberman, 1994b), and is motivated by the desire to increase the generalizability of the within-case findings. Here, a variable-oriented strategy helped to identify themes across cases (Miles & Huberman, 1994b, p. 175). Ultimately, researchers argue that this approach leads to "more sophisticated descriptions and more powerful explanations" (Miles & Huberman, 1994b, p. 172) and ultimately better theory (Eisenhardt, 1989).

3.6.2 Within-Case Analysis

3.6.2.1 Compiling Data

The first analytical phase in the within-case analysis of this study involved compiling (Yin, 2011). The core objective of this phase was to organise the qualitative data in a systematic fashion which results in "stronger analyses and ultimately [...] more rigorous qualitative research" (Yin, 2011, p. 182). This was achieved by utilising the case study database, and Computer Assisted Qualitative Data AnalyiS (CAQDAS) software nVivo 7,with its use being highly recommended (Miles & Huberman, 1994b; Richards, 2002; Richards & Richards, 1994; Yin, 2011).

The data was also "cleaned" and "verified" (Yin, 2011, p. 182) by re-reading the field notes and re-listening to the interview recordings, an approach recommended by Yin (2011). The interviews were transcribed using the verbatim principle (Spradley, 1979), thereby capturing the "exact terminology, colloquialisms, and labels used by those being interviewed" (Yin, 2011, p. 159). Approximately 20% of the interviews were transcribed by the researcher, with the remaining interviews being transcribed by a professional academic transcribing organisation who signed a confidentiality agreement and was was recommended by The University of Auckland, thus complying with the procedures outlined by The University of Auckland Human Participants Ethics Committee. These transcripts were then re-read by the researcher and compared to the original recordings, in order to eliminate potential transcription errors.

Finally, formatting field notes and transcripts using the same font, line spacing and margins helped to achieve a degree of consistency throughout the data (Yin, 2011) and improved readability. Table 3.3 summarises the analytical techniques used during the compiling phase.

Analytical Techniques used during Compiling Phase	Rationale
Use of case study database	Prevents loss of data, provides structure
Use of nVivo 7 software	Prevents loss of data, provides a variety of functionalities
Re-reading of field notes and interview transcriptions	Familiarisation and verification of data, helps to identify distinctive features and insights in data
Re-listening of interview recordings	Familiarisation and verification of data, helps to identify distinctive features and insights in data
Formatting of field notes and transcripts	Increases consistency and clarity

Table 3.3: Summary of Analytical Techniques used for Data Compilation

3.6.2.2 Disassembling Data

The second analytical phase involved disassembling the compiled data into individual fragments (Yin, 2011). Since “no fixed routine” (Yin, 2011, p. 186) exists for disassembling data, the researcher applied the recommendations by Yin (2011), as well as Miles and Huberman (1994b), and utilised the analytical techniques of *contact summary sheets*, *coding* and *memoing* during this phase.

A *contact summary sheet* is a “single sheet with some focusing or summarizing questions about a particular field contact” (Miles & Huberman, 1994b, p. 5). Contact summary sheets identify the main themes, issues and insights gained from a field contact such as an interview. Following Miles and Huberman (1994b), the researcher created a template, which was used to summarise the key findings and insights gained from each interview (see Appendix B.1), and significantly supported the development and advancement of the initial set of codes (Miles & Huberman, 1994b; Yin, 2011).

“Coding is analysis” (Miles & Huberman, 1994b, p. 56) and involves “assigning new label or codes to selected words, phrases, or other chunks of data” (Yin, 2011, p. 187), which helps “moving methodologically to a slightly higher conceptual level” (Yin, 2011, p. 187). Coding is a process of abstraction and results in new categories or concepts that are based on the data (Holton, 2007), and eventually leads to the emergence of new theory (Bazeley, 2007). Individual codes typically “range from the descriptive to the inferential” (Miles & Huberman, 1994b, p. 58), are abstract representations of objects or phenomena (Strauss & Corbin, 1990), and provide an opportunity to retrieve, organise, and assign meaning to raw data such as paragraphs in interview transcripts (Miles & Huberman, 1994b).

The researcher adopted the coding-approach brought forward by Miles and Huberman (1994b) who distinguish between *descriptive*, *interpretive*, and *pattern* codes, and initially used descriptive codes in the disassembling phase. This early stage of coding was accomplished by “summarizing segments of data” (Miles & Huberman, 1994b, p. 69). The descriptive codes used in this process initially assigned a descriptive “class of phenomena to a segment of text” (Miles & Huberman, 1994b, p. 57), were data driven, and adopted the terminology provided by participants as appropriate for realist researchers, resulting in descriptive “categories and their properties” (Strauss & Corbin, 1998, p. 143) that were as close to the data as possible.

Finally, *memoing* aided significantly to the process of theory building (Charmaz, 2006; Miles & Huberman, 1994b; Yin, 2011). Memos are defined as "a set of notes specifically dedicated to a qualitative researcher's on going ideas during the coding of qualitative data" (Yin, 2011, p. 310), and are a "theorizing write-up of ideas about codes and their relationships as they strike the analyst while coding" (Glaser, 1978, p. 83). Memos "are one of the most useful and powerful sense-making tools at hand" (Miles & Huberman, 1994b, p. 72), representing the "methodological link, the distillation process, through which the researcher transforms data into theory" (Lempert, 2007, p. 245), and the "core stage in the process of generating theory" (Glaser, 1978, p. 83). Memos essentially track the progress of the coding process and help to identify initial relationships among codes, as well as clusters or themes that emerge in the data (Yin, 2011). Memos are consequently conceptual and focus on the interpretation, rather than the reporting of data (Miles & Huberman, 1994b). Throughout the study, memoing and coding was done simultaneously. Especially after the initial codes were developed and partially refined, memoing aided significantly to move from "empirical data to a conceptual level" (1994b, p. 74) as Miles and Huberman outline. This is crucial because the development of key categories and their relationships leads to an "integrated understanding of events, processes, and interaction in the case" (Miles & Huberman, 1994b, p. 74). Table 3.5 summarises the analytical techniques used in this study during the disassembling phase.

Analytical Techniques used during Disassembling Phase	Rationale	Example
Contact Summary Sheet	Summarises key findings and insights for each interview, aids to code development	Appendix B.1
Descriptive Coding	Summarises and describes data by developing and using early categories	Appendix B.3
Memoing	Sense-making tool that describes and structures the thoughts of the researcher; helps to identify initial relationships among codes and themes in the data; tracks the coding progress and transforms data into theory	Appendix B.4

Table 3.4: Summary of Analytical Techniques used for Data Disassembling

3.6.2.3 Reassembling Data

Reassembling aims to "reorganize the disassembled fragments or pieces into different groupings and sequences" (Yin, 2011, p. 179), thereby identifying more abstract themes which are be the foundation for further interpretation and conclusion (Yin, 2011). The analytical techniques of *memoing*, as well as *interpretive* and *pattern* codes (Miles &

Huberman, 1994b) were used in order to reassemble emerging categories with "propositions about their relationships" (Pace, 2004, p. 338).

Interpretive codes are more complex than descriptive codes (Miles & Huberman, 1994b), and can be perceived as means to merge descriptive codes into abstract categories and subcategories (Uruquhart, 2001). *Pattern* codes however, are codes that "identify an emergent theme, configuration, or explanation. They pull together interpretive codes into a more meaningful and parsimonious units of analysis, and are a "meta code" (Miles & Huberman, 1994b, p. 69), representing "the groundwork for cross-case analysis by surfacing common themes and directional processes" (Miles & Huberman, 1994b, p. 69). Here, directional processes represent the emerging relationships between individual categories identified through interpretive and pattern codes. Just like in the descriptive phase, memoing assisted significantly to the process of interpretive and pattern coding, and was especially useful when identifying the relationships between categories that represented emerging themes throughout the cases. Appendix B.3 presents an example of the coding structure generated during data analysis.

Analytical Techniques used during Reassembling Phase	Rationale	Example
Interpretive Coding	Develops categories, summarises descriptive codes	Appendix B.3
Pattern Coding	Identifies core categories and relationships	Appendix B.3
Memoing	Sense-making tool that describes and structures the thoughts of the researcher; helps to identify initial relationships among codes and themes in the data; tracks the coding progress and transforms data into theory	Appendix B.4

Table 3.5: Summary of Analytical Techniques used for Data Reassembling

3.6.3 Cross-Case Analysis

The cross-case analysis in this study was based on a variable-oriented strategy (Miles & Huberman, 1994b, p. 175) which aims to identify themes that occur across cases and results in constructs of the emerging theory. This approach is supported by Eisenhardt & Graebner, who argue that researchers conducting multiple case studies should focus on constructs and relationships that exist in the majority of cases, thereby resulting in theory that is "more parsimonious (and also more robust and generalizable)" (2007, p. 30). Consequently, the researcher initially identified cross-case similarities and differences by comparing individual themes across cases that had emerged during the within-case analysis. Graphic representations in the form of tabulation and matrices were used during this process. Flowcharts further assisted the process by identifying and verifying relationships among constructs that had emerged through memos and pattern coding (Miles & Huberman, 1994b).

Analytical Techniques used during the Cross-Case Analysis	Rationale	Example
Tabulation/Matrixes	Aid to identify cross-case similarities and differences	Cross-case Matrixes are displayed throughout Chapter 4
Flowcharts	Aid to identify relationships among themes	Appendix B.2

Table 3.6: Summary of Analytical Techniques used for Cross-Case Analysis

3.7 Assuring Validity and Reliability of the Study

Evaluating qualitative research and case studies is typically approached through the validity and reliability of a given study (Healy & Perry, 2000; Miles & Huberman, 1994b; Yin, 2003). A study is considered valid when data collection and analysis are executed in a fashion that leads to an accurate reflection and representation of the phenomenon under investigation (Yin, 2011). Reliability however, is concerned with the appropriateness of the research instruments used (Churchill, 1987). A good level of reliability implies that the research instrument results in the same data everytime it is used, and that any possible variation in the data is due entirely to the phenomenon under investigation (Denscombe, 2003). In order to ensure the reliability and validity of case studies, researchers should apply techniques that strengthen a study's claims, findings, or explanations of events (Maxwell, 2009; Yin, 2011). Healy and Perry refer to scientific paradigms and argue that "the quality of scientific research done within a paradigm has to be judged by its own paradigm's terms" (2000, p. 120). With realism as the scientific paradigm underlying this study, it is therefore necessary to outline how realism-specific quality criteria and techniques were applied in order to assure the validity and reliability of this study. Table 3.7 provides this overview and refers to the relevant sections in this thesis.

Evaluation Criteria	Explanation of Criteria	Recommended Techniques	Application in this Study
Ontological appropriateness	Research deals with complex phenomena	Select appropriate research problem (how and/or why questions)	Section 2.5.2
Contingent validity	Generative mechanisms, not cause-and-effect	Use theoretical sampling for case selection, in-depth questions, describe context of cases	Sections 3.3.1, 3.3.3, 4.2
Multiple perceptions of participants	Neither value-free nor value-laden, rather value aware	Use multiple interviews and supporting evidence, ask broad questions before probes.	Section 3.4, Appendix A.6
Methodological trustworthiness	The research can be audited	Summarise data using relevant quotations, describe case selection and interview procedures	Sections 3.3 and 3.4; Chapter 4
Analytic generalisation	Theory building rather than theory testing	Identify research issue before data collection, use case study protocol	Sections 2.5.1 and 3.3.4
Construct validity	-	Use prior theory, case study database	Chapter 2; Section 3.4

Table 3.7: Case Study Evaluation Criteria for the Realism Paradigm, adapted from Healy & Perry (2000)

3.8 Chapter Summary

This chapter provided a detailed overview and justification of the research strategy and methodology adopted in this study. By using the research strategy of theory building from cases, this study attempts to build theory and thereby make a theoretical contribution. The chapter further outlined the case selection process and provided a justification for the consulting industry as the research context. Finally, data collection and analysis processes were justified and explained in detail. The following Chapter 4 presents the findings of this study.

4. STUDY FINDINGS

4.1 Chapter Introduction

Chapter 4 explores the contextual background of each case investigated, and describes the findings of the cross-case analysis. Each case in this study represents a service system consisting of one, or a combination of consulting firms (service provider), that engage with one, or a combination of customer firms (service customer), in technology-enabled value co-creation processes of a service target. This chapter is structured as recommended by Yin's (1984, p. 131) linear-analytic approach for composing research reports, which is "most advantageous when […] a thesis or dissertation committee comprise[s] the main audience." Here, Yin (1984, p. 130) argues that the findings from the within-case analysis in multiple case studies must not be included into the final manuscript because "the individual cases, in a sense, serve only as the evidentiary base for the study." Consequently, "there may be no separate chapters […] devoted to the individual cases," but each "section [is] devoted to a separate cross-case issue" (Yin, 1984, p. 129), with relevant information from the individual cases presented accordingly (Yin, 1984). This approach is used, and Section 4.2 initially introduces and describes the contextual background of each service system inherent in this study. This "descriptive account" (Miles & Huberman, 1994a, p. 429) of the unit of analysis is considered necessary by researchers advocating the philosophical perspective of realism, and Mintzberg (1979) as well as Bonoma (1985) similarly outline that theory building from cases requires the initial description of the unit of analysis. Consequently, Section 4.3 subsequently describes the resource exchange processes in the service systems investigated. Finally, Section 4.4 addresses the role of technology-enablement in service systems, while Section 4.5 focuses on the role of relationships between service system entities. Sections 4.4 and 4.5 therefore provide insights into technology-enabled value co-creation processes in service systems from the technological and social or relational perspective suggested previously. Figure 4.1 presents a detailed overview of the structure of the chapter.

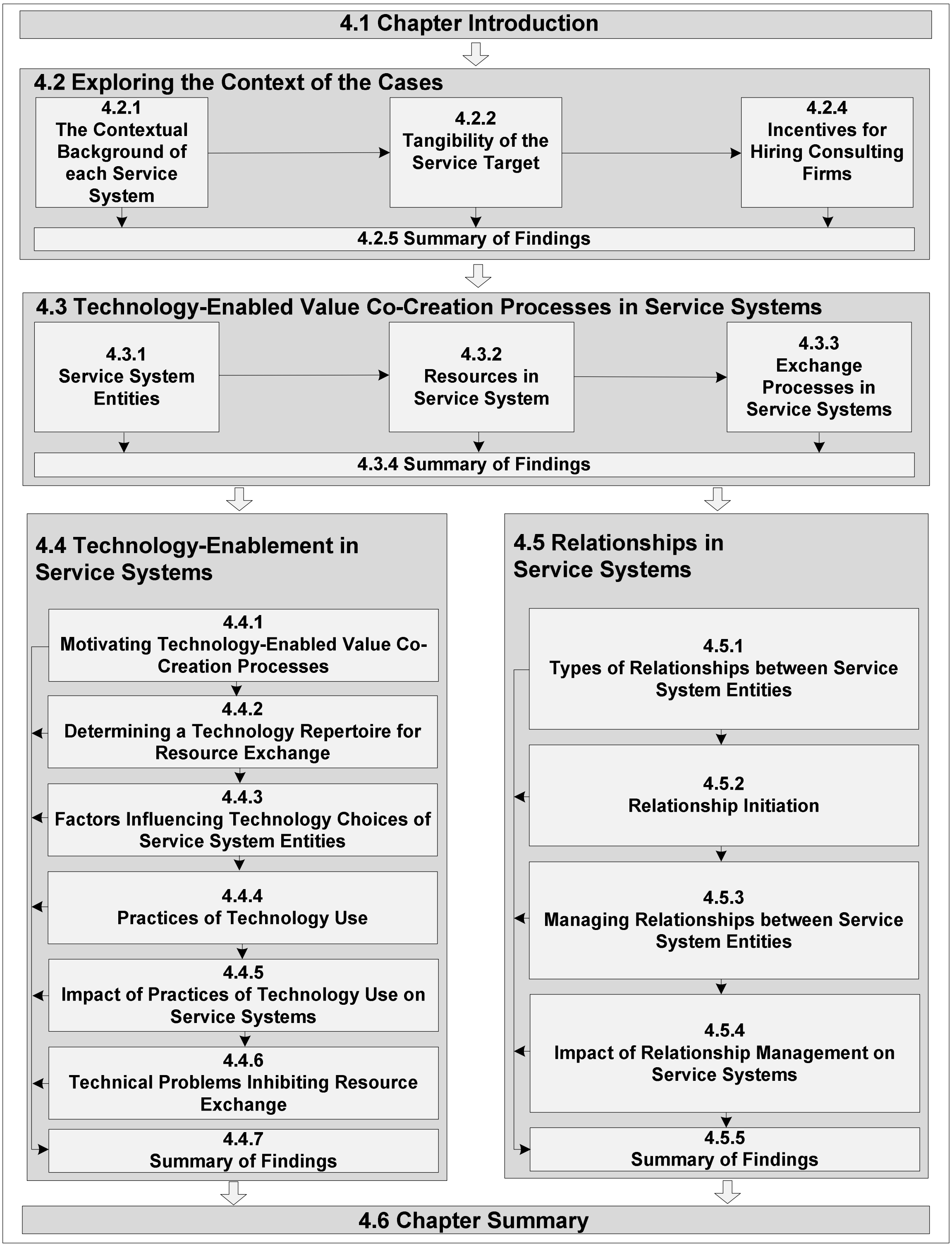

Figure 4.1: Structure of Chapter 4

4.2 Exploring the Context of the Cases

4.2.1 The Contextual Background of each Service System

4.2.1.1 Case A: IT-Strategy Planning

The service system represented by Case A co-created a set of strategic IT processes and tools which supported budget allocations and cost reductions. The service customer was located in Finland and affiliated with a multinational telecommunications conglomerate, while the service provider was located in Germany, and part of a global "big 4" consulting and professional service firm. Table 4.1 presents an overview of the case.

	Service Provider	Service Customer
Location	Southern Germany	Southern Finland
Number of Organisations	1	1
Number of Participants	5	4
Roles of Participants	Senior Manager (1) Project Manager (1) Consultant (3)	Senior Manager (1) Project Manager (1) Team Member (2)
Total Project Duration	12 months between 2007-2009	
Service Target	Development, implementation, and support of IT strategy processes	
Total Financial Volume	NZ$6 Million	

Table 4.1: Summary of Service System Representing Case A

The Service Customer

AlphaNet (AN) is a global telecommunications conglomerate which manufactures mobile, fixed and converged network equipment, in addition to the implementation and maintenance of telecommunication networks. The organisation was founded in 2006 as a joint-venture between Finish Alpha Group and German Network AG. AlphaNet employs approximately 70,000 employees in 150 countries, generating revenues of approximately NZ$30 billion in 2009, and claims that it provides telecommunications equipment connecting a quarter of the world's population.

The customer team that participated in this study was part of the "Short Term Planning (STP)" project and located in southern Finland. It consisted of a project manager, two line employees and a senior manager who oversaw the associated "Transparency Wrap-Up (TWU)" initiative from a German subsidiary. While staffing had changed slightly between

2008 and 2009, between four and six AlphaNet employees worked on the project at any time. The participants of the service customer that were interviewed for this case include:

- *Senior Manager (GER)*: responsible for several divisions within AlphaNet; managed projects that either increase the performance of IT systems or decreased their cost.
- *Project Manager (FIN)*: an expert for virtual work who facilitated the roll-out of appropriate communication technologies and processes.
- *Team Member 1 (FIN)*: focused on research and development projects; joined the STP project in January 2009, in order to optimise the performance of internal IT systems.
- *Team Member 2 (FIN)*: established a reporting structure and scorecards which attempted to increase the financial transparency of the organisation.

The Service Provider

AlphaTech Consulting is part of the global network of one of the "big 4" global professional service and consulting firms, employing approximately 170,000 employees in over 140 countries. AlphaTech Consulting employs approximately 4,600 employees in its 17 German offices, and generated revenues of NZ$1.2 billion here in 2009.

The consulting team that participated in this study is part of the "CIO Advisory Unit," a sub-division of AlphaTech Consulting's strategy consulting practice that defines itself as a top-management consulting practice for IT related topics. Typical projects align a customer's IT with the overall business strategy or intend to reduce costs. AlphaNet is a major client for the practice with a history of over 30 completed projects at the time of the interview. The German team that was interviewed consisted of 3 consultants, a project and a senior manager:

- *Senior Manager (GER)*: responsible for all consulting engagements with AlphaNet.
- *Project Manager (GER)*: joined the STP project in early 2009, coordinated the project and is an expert in IT value management.
- *Consultant 1 (GER)*: performed operational tasks and was the key contact for AlphaNet employees; planned and facilitated all virtual interactions.
- *Consultant 2 (GER)*: performed the same tasks as Consultant 1.
- *Consultant 3 (GER)*: performed operational tasks and was a trainer for AlphaNet employees.

The Service Target

The service target in this case is represented through the STP project which had its origins in 2007 when the IT divisions of Alpha Group and Network AG were merged into AlphaNet's internal IT division, or "Infrastructure Services Unit (ISU)." ISU provides ICT services such as printing, email or telephone for all global AlphaNet employees. The STP project was part of a larger initiative which aimed at developing a financial reporting-structure including staffing decisions, risk management, and project planning for the ISU. The initiative attempted to reduce costs while increasing the transparency of the firm's overall IT expenditure. This was necessary because neither Alpha Group, nor Network AG had suitable processes or tools available that were transferable into the new organisation.

AlphaTech Consulting subsequently supported the ISU team during the STP processes, which attempted to allocate ISU's annual budget of 350€ million on a semi-annual basis. This task involved the planning of the upcoming budget for all global sub-units within the ISU and their suppliers. However, while AlphaNet's management had originally intended to use AlphaTech Consulting for the operational support of the initial STP round only, internal changes within the ISU, as well as a lack of sufficiently skilled AlphaNet employees, resulted in AlphaTech Consulting supporting the 6th STP round in late 2009. The goal of this STP round investigated in this study, was to identify potential cost-saving opportunities, targeted at 50€ million, as well as the training of AlphaNet employees, which should execute upcoming STP rounds independently. AlphaTech Consulting charged AlphaNet approximately NZ$1 million for each STP round, so that the overall volume of the project from 2007-2009 is valued at NZ$6 million.

4.2.1.2 Case B: Asset Management

The service system represented by Case B co-created an Infrastructure Asset Management Framework (IAMF). The service customer was located in the capital of an eastern Canadian province, and affiliated with a local government institution. The service provider was located in eastern Australia, two locations on New Zealand's north island, and several locations across eastern and central Canada. These entities were part of three collaborating consulting firms with expertise ranging from strategy consulting to infrastructure and transport management advice. Table 4.2 presents an overview of the case.

	Service Provider	Service Customer
Location	Eastern Australia North Island, New Zealand One eastern and one central province, Canada	Various locations in an eastern Canadian province
Number of Organisations	3	1
Number of Participants	9	3
Roles of Participants	Senior Manager (2) Project Manager (2) Technical Manager (1) Consultant (4)	Project Manager (1) Team Member (2)
Total Project Duration	10 months between 2007-2008	
Service Target	Development of an infrastructure asset management framework	
Total Financial Volume	NZ$2.5 million	

Table 4.2: Summary of Service System Representing Case B

The Service Customer

The service customer in Case B is the BetaMinistry of an eastern Canadian province. The ministry's main responsibility is to plan and manage the province's infrastructure such as its transportation means, healthcare providers, schools or government buildings. For example, the institution evaluates strategic infrastructure policies of other ministries, makes recommendations to the government, or coordinates specific projects, such as the IAMF.

The customer team that participated in this study was the "Asset Management Working Group (AMWG)," a division within Beta Ministry who plans, budgets, and coordinates infrastructure projects throughout the province. This team also coordinated the interaction of the wider group of government institutions involved in the project. It was based in the capital of the province, and consisted of the division's director, here referred to as Project Manager, and 2 government employees, here referred to as Team Members:

- *Project Manager (CAN)*: responsible for the execution of the IAMF project.
- *Team Member 1 (CAN)*: performed operational tasks, coordinated project deliverables with consultants.
- *Team Member 2 (CAN)*: performed operational tasks as a policy analyst.

The Service Provider

The service provider in Case B consisted of three collaborating consulting firms who bid for the project as one group. RoadConsult and AssetConsult were approached by BetaStrategy Consulting due to their specialised knowledge in asset management. BetaStrategy Consulting is the primary consulting firm in this case, and also considered a “big 4” global professional service and consulting firm. BetaStrategy Consulting employs a staff of approximately 140,000 in over 140 countries and generated global revenues of NZ$30 billion in 2009, compared to NZ$1.4 billion through its 30 Canadian offices. RoadConsult employs a staff of 2,500 in New Zealand, Australia, Canada and the UK, and consults in areas such as asset management, infrastructure development and environmental planning. In 2009, the organisation generated revenues of NZ$300 million, mainly through public sector customers. Asset Consult is an engineering and management consultancy based in North America with a staff of 700, and was included in the project for their experience with condition assessment and evaluation of government buildings.

The consulting team that was interviewed for this study consisted of two senior managers, two project managers, one technical manager, and four consultants from BetaStrategy Consulting, Road and Asset Consult. Each team-member had a unique expertise that was considered relevant for the project, and members were located in NZ, CAN, and AUS:

- *Senior Manager 1 (NZ):* managed all of RoadConsult’s operations across Australasia, Canada and the UK.
- *Senior Manager 2 (CAN):* an associate partner with the BetaStrategy Consulting who worked as an expert for financial evaluations of infrastructure assets.
- *Project Manager 1 (CAN):* managed the project for BetaStrategy Consulting.
- *Project Manager 2 (CAN):* managed AssetConsult’s building engineering division, an expert for the condition assessment of large building portfolios.
- *Technical Manager (CAN):* led the development of the IAMF for RoadConsult.
- *Consultant 1 (AUS)*: RoadConsult’s expert on asset valuation and infrastructure condition assessment.
- *Consultant 2 (CAN)*: BetaStrategy Consulting’s expert for change management.
- *Consultant 3 (CAN)*: RoadConsult’s expert for strategic asset management.
- *Consultant 4 (CAN)*: RoadConsult’s expert for ICT in asset management.

The Service Target

The service target in Case B is represented through the IAMF framework that was developed for the eastern Canadian province. Infrastructure asset management consists of developing and applying strategies and tools in order to plan, manage and sustain physical public infrastructure assets such as transportation ways, schools, government buildings or utility grids. Financial constraints are a typical challenge, and over 20 government departments in the province were affiliated with the management of its assets. Nevertheless, in 2007 it became evident that all departments approached infrastructure asset management individually and unsystematically. Consequently, the AMWG wanted to find a way that could help the various departments manage their assets more effectively, and also increase consistency throughout the province in terms of processes, tools, and terminologies used.

The project that the AMWG called for resulted in a 400-page document that was specifically customised to the needs and requirements of the province. It included an evaluation of the current asset management approaches and specifically outlined best practices and guidelines which should improve the province's asset management over the next decade. The document should serve as an instruction manual with practical guidelines that could be distributed to the individual government units that were responsible for the province's infrastructure assets. Also intended as a 10 year improvement plan, the framework contained presentation materials guiding the government units in the process of managing their assets. Furthermore, the working group recognised that the process of developing the framework itself would lead to increased awareness and engagement from the various ministries, thus providing learning and training opportunities through the NZ$2.5 million project.

4.2.1.3 Case C: UNCLOS New Zealand

The service system represented by Case C co-created a New Zealand's submission in response to the United Nations Convention on the Laws of the Sea (UNCLOS), which allows coastal nations, under certain circumstances, to extend the limits of their nautical exclusive economic zones. The service customer was located in New Zealand, Japan and, temporarily, at the east coast of the USA, and affiliated with two government institutions, while the service provider was located on New Zealand's north island, and part of a consulting and research firm. Table 4.3 provides an overview of Case C.

	Service Provider	Service Customer
Location	North Island, New Zealand	North Island, New Zealand Hokkaido, Japan East Coast, USA (temporarily)
Number of Organisations	1	2
Number of Participants	5	5
Roles of Participants	Senior Manager (1) Project Manager (2) Consultant (2)	Senior Manager (1) Team Member (4)
Total Project Duration	36 months between 2004-2008	
Service Target	Development of a submission to the UN's Continental Shelf Commission on the Limits of the Continental Shelf (CLCS)	
Total Financial Volume	NZ$44 million (total allocated project volume)	

Table 4.3: Summary of Service System Representing Case C

The Service Customer

The service customer in Case C is represented through GammaDataHub, and GammaMinistry (GM). As a government institution, GammaDataHub utilises geographic data for the management and regulation of public and private property rights in New Zealand. For example, the institution maintains a database of topographic data which is relevant for commercial or defence purposes. The role of GammaMinistry is to negotiate the country's foreign and trade policy, and to advance national interests on a global scale.

The team interviewed consisted of members of the "Continental Shelf Project (CSP)" team. These included one senior manager and four government employees, here referred to as Team Members, from GammaDataHub and GammaMinistry that were involved in the initiation, preparation and coordination of the submission to the UN's CLCS:

- *Senior Manager (NZ)*: coordinated the project for GammaDataHub.
- *Team Member 1 (NZ)*: supported the project as GammaDataHub's assistant.
- *Team Member 2 (NZ)*: initiated relationships between the various government institutions for GammaDataHub.
- *Team Member 3 (NZ)*: prepared submission and negotiated with UN commission for GammaMinistry.
- *Team Member 4 (JP)*: prepared final submission and negotiated with UN commission for GammaMinistry.

The Service Provider

The service provider in Case C is the research and consulting firm GammaScience Consult (GSC), which is considered one of the world leaders in its field. GSC consults to public and private sector clients in fields such as petroleum, mineral, and geothermal energy exploration and production. GSC generated approximately 40% of its NZ$60 million revenues in 2009 through consulting, while other revenue streams include publicly and commercially funded research contracts and grants. The organisation has 3 offices across New Zealand, where it employs a staff of 370.

The consulting team that participated in this study provided GammaDataHub with the capabilities and technical expertise necessary to collect and interpret the geophysical data and apply it to the UNCLOS charter. The team executed the data analysis and interpretation, assisted GammaDataHub with the creation of the report to the CLCS, and participated in the negotiations between GammaMinistry and the CLCS. It was based in the south of New Zealand's north island, and consisted of two project managers and two consultants. A senior manager of the organisation was also interviewed.

- *Senior Manager (NZ)*: executive with extensive experience in projects involving physically dispersed customers.
- *Project Manager 1 (NZ)*: coordinated project within GSC, negotiated with the CLCS.
- *Project Manager 2 (NZ)*: coordinated tasks between GSC and the service customers during data analysis and report writing.
- *Consultant 1 (NZ)*: a subject matter expert on marine geophysics, who defined project requirements based on UNCLOS article 76.
- *Consultant 2 (NZ)*: analysed seismic data and contributed to final report.

The Service Target

UNCLOS defines that coastal nations have the exclusive rights over natural resources, as well as sedimentary species (e.g. oysters and sponges), located on the continental shelf within an exclusive economic zone of 200 nautical miles from that nation's shores. However, article 76 of UNCLOS outlines a process which allows such nations to prolong the geographical limits of their exclusive economic zone, thus gaining access to additional natural resources. However, interpreting and applying the legal UNCLOS guidelines when attempting to extend the exclusive economic zone is a challenging process which requires geological and seismic data. States are required to create and submit a report to the CLCS, including specific geo-seismic information regarding the parts of the continental shelf the nation attempts to claim as new territory. States may, upon approval by the CLCS, re-define the limits of their exclusive economic zone of the continental shelf. New Zealand ratified UNCLOS in 1996, and GammaDataHub initiated the “Continental Shelf Project,” in order to ultimately create such a submission for the CLCS. Based on the outcomes of preliminary projects between 1997 and 2002, GammaDataHub and GammaMinistry commenced in 2004, with the advice of GSC, to prepare New Zealand’s submission to the CLCS.

The development of the submission to the CLCS, as well as the subsequent negotiations with the commission represent the service target investigated in case C. Here, a particularly high level of accuracy and completeness was required, because a negative evaluation by the CLCS would have had severe consequences for New Zealand’s economy and government which already gained revenues exceeding NZ$100 million annually from licenses affiliated with the original exclusive economic zone. The final report consisted of four main sections and over 500 pages of appendices. It described the full extent of the NZ$44 million project, summarised the data used to re-define the boundaries of the continental shelf, and highlighted the geological setting of the nation’s landmass and its connections to the continental shelf, according to UNCLOS. After the submission was launched in April 2006, GSC further participated in the negotiations with the CLCS. The commission confirmed in September 2008 that New Zealand could extend its control over its continental shelf by approximately 50% to 1.7 million square kilometres, or roughly the size of Western Australia.

4.2.1.4 Case D: Hedge-Accounting

The service system represented by Case D co-created an IT system for hedge-accounting practices in order to comply with the International Accounting Standards (IAS). The service customer was based in central Germany and affiliated with a multinational bank, while the service provider was located in central and northern Germany, and part of a management and IT consulting firm.

	Service Provider	Service Customer
Location	Central Germany Northern Germany	Central Germany
Number of Organisations	1	1
Number of Participants	2	4
Roles of Participants	Senior Manager (1) Project Manager (1)	Senior Manager (1) Project Manager (1) Team Member (2)
Total Project Duration	9 months in 2009	
Service Target	IT system for hedge-accounting processes	
Total Financial Volume	NZ$ 1-2 million (range provided by participants)	

Table 4.4: Summary of Service System Representing Case D

The Service Customer

DeltaFinance (DF) is an online retail bank located in central Germany and part of the Delta Group which had 85 million private, corporate, and institutional customers in over 40 countries in 2009, and employed a staff of over 100,000. In Germany, DeltaFinance operates as an online retail bank and offers bank accounts, mortgages, stocks, insurances or retirement plans to 7 million customers. In 2009, the organisation employed 2700 staff, and generated profits of approximately NZ$580 million.

The customer team interviewed for this study consisted of one senior manager, one project manager, and two team members. The team is part of the organisation's accounting division and is responsible for the assessment of market risks. They work as an interdisciplinary unit, and were involved in the initial conceptualisation, implementation, and roll-out of the hedge-accounting IT system:

- *Senior Manager (GER)*: director of the organisation's accounting division.
- *Project Manager (GER)*: manager of the accounting team, who coordinates the interaction between the various sub-units of DeltaFinance.
- *Team Member 1 (GER)*: a subject-matter expert for hedge-accounting.
- *Team Member 2 (GER)*: performed operational tasks including the definition of requirements and the testing of subsequent software updates.

The Service Provider

DeltaTech Associates (DA) is a European management consulting firm working in the fields of IT strategy and operations, organisational change and transformation, as well as human resources. The organisation also has its own research and development division which implements highly customised ICT solutions in conjunction with the firm's consulting division. Typical customers of DeltaTech Associates include financial institutions, healthcare providers and insurances. DeltaTech Associates employs over 550 staff through 12 offices within Europe and generated revenues of NZ$ 213 million in 2009.

The consulting team interviewed for this study was based at the organisation's German headquarter, and included the managing director and project manager that had both worked with DeltaFinance on the hedge-accounting project. While the senior manager was responsible for the organisation's overall interaction with the service customer, the project manager had participated in the hedge-accounting project and coordinated the interaction between the DeltaFinance employees in central Germany, and DeltaTech Associates' developers in northern Germany, who implemented the IT system.

- *Senior Manager (GER)*: managing director of the organisation's IT-consulting division.
- *Project Manager (GER)*: facilitated the interaction between DeltaTech Associates' and DeltaFinance's employees.

The Service Target

Financial institutions use derivatives to reduce, or "hedge," their exposure to economic risks like changing interest rates, volatile foreign exchange rates, or other unforeseen circumstances. However, since derivatives reduce the volatility of their overall financial portfolios, the IAS demands that these financial instruments are included into an organisation's profit and loss account. Yet, the problem associated with that requirement is that the value of a derivative is constantly adjusted, depending on the external economic risks which they intend to offset. Consequently, the volatility inherent in the derivative-driven hedging process has an impact on the organisation's profit and loss statement. In order to achieve consistency of a profit and loss statement, the accounting technique of hedge-accounting is applied. Hedge accounting is a technique that reduces the volatility of an organisation's financial statements, which is desirable on financial markets. However, according to the IAS, hedge accounting can only be incorporated if a variety of criteria are met, most importantly formal documentation and specific tests, both of which require appropriate IT systems and procedures that can monitor each hedging process.

The service target investigated in Case D involves the conceptual development of such an appropriate IT solution for hedge-accounting, the implementation of the appropriate software solution, training of the employees of DeltaFinance, and especially the on-going process of operating, maintaining and improving the system through DeltaTech Associates.

4.2.2 Tangibility of the Service Target

The service targets of the cases investigated in this study can be distinguished by their degree of tangibility, which further aids to the understanding of the contextual background of the cases investigated. In this study, tangibility is used as a term describing the means by which the knowledge and skills, or service (see Section 2.2.2.4), of the service providers were applied and transferred to the service customers. In Cases A and D, this application and transfer was based on the *intangible processes* of financial IT planning processes (Case A), or the on-going improvement of the hedge-accounting IT system (Case D). In Cases B and C however, the application and transfer of knowledge and skills was embedded into a *tangible output*, represented through the UNCLOS report (Case C), and the IAMF document (Case B).

Cases A and B, respectively, represent two ideal examples that illustrate the divergent degrees of tangibility of the service targets in this study in more detail. Described by one participant as an "extended workbench project," the co-creation process underlying the service target in Case A was perceived as similar to the operational work performed by AlphaNet's employees:

> You know, this is not really a typical consulting project anymore. Usually, the client has a problem and wants a solution for that. Then the consultant comes in, works on it for a few months, and then presents a solution. But for us, it's really more like, we are working as if we were regular [AlphaNet] employees. *Consultant 1 (Case A)*

> The guys [AlphaTech Consulting] are supporting us in the operative work, so it is not like development work. *Project Manager SC (Case A)*

The application of the consultant's skills and transfer of knowledge to the service customer in Case A was informal, and accomplished through a process of continuous virtual interaction between AlphaNet's employees and AlphaTech Consulting's consultants. These were embedded into the customer team in a mentoring and training role, where they facilitated the STP planning and decision making processes:

> We basically train them [AlphaNet], and tell them ‘ok, we will hold your hand one last time and do this process [STP] together with you’. *Consultant 2 (Case A)*

As indicated previously, the service targets in Cases B and C are contrasting to Cases A and D, and are characterised by a tangible output, rather than informal training or an interactive continuous process. While in cases A and D the process or interaction itself represented the service target, service customers and providers in cases B and C interacted in order to ensure that the consultant’s created the IAMF document and UNCLOS reports.

> The output was a 400 page instruction manual and a whole lot of presentation material and a lot of classified knowledge transfer. *Technical Manager SP (Case B)*

Consequently, one participant describes Case B from the exact reverse standpoint than Consultant 1 in Case A did:

> [Case B] was creating a framework that came from the intellectual capacity of the various people of the consulting team [and was] handed over to the client [....] Many other consulting engagements are different from this. You are doing a consulting contract and it’s an operational thing, doing a diagnosis and then you say ‘ok, here is a new way of working, let’s facilitate this, and let me help you and we will work you through’. A lot of working together, and facilitating the client making decisions, and this one wasn’t. ‘Here you are, take it and go away’. *Consultant 2 SP (Case B)*

Participants reported that tasks during the co-creation of an intangible service target in Cases A and D were highly interdependent, meaning that service provider and customer predominantly executed tasks jointly and simultaneously. The tasks affiliated with the tangible service targets in cases B and C however were executed independently, meaning that service provider and customer predominantly performed tasks consecutively, rather than jointly and simultaneously, as indicated by Consultant 2. The following section will provide further insight into the background of the cases investigated, and outline why the various service customers initially decided to hire consultants.

4.2.3 Incentives for Hiring Consulting Firms

The cross-case analysis also showed that the projects in all cases were initiated by service customers and were motivated by the service customers' desire to gain access to the *experience*, as well as the *expertise* and specialised *skills* of the consultants.

The experience that consulting firms possess, due to their interaction with a variety of actors within an industry, motivates customers to pay a premium; even though they might be able to execute particular tasks themselves, i.e. without the involvement of the consulting firm. Two participants commented on this issue:

> The client wants to gain access to our experience. Where did we solve this problem already and how did we do it? Otherwise he wouldn't need a consultant. He could just go and solve the problem himself. But when it comes to gaining access to experience, well then they are happy to pay a lot for that. It's just like going to the doctor- you don't want to be with the guy who has never done it! *Senior Manager SP (Case A)*

> We could easily have done a policy framework, but what I wanted to do was make sure that we have practical expertise, as in experience doing asset management […], and that's why we wanted to get the consultants involved. *Project Manager SC (Case B)*

Throughout all cases, consulting and customer organisations also argued that the consultants possessed specialised skills and a level of expertise which was considered superior to that of the customer employees. Within all cases, the ability to gain access to the consultants' expertise and skills represented another incentive for customers to engage with consulting firms for the duration of the various projects. For instance, Beta Consultant's Project Manager and Team Member 3 in GammaMinistry explain:

> We had the knowledge to do and they [Beta Ministry] didn't, and that's why we were hired. They were hiring expertise. *Project Manager 1 SP (Case B)*

> They [consultants] really could do something that we were not able to do, and so it was very much worth having them involved. *Team Member 3 SC (Case C)*

As the initiator of the co-creation process, service customers utilised Requests for Proposals (Cases B and C), directly contacted consulting firms (Case D), or relied on pre-existing personal relationships to the service provider's senior management, to gain access to the experience and skills of the consultants (Case A):

> How did the project start? Well, it is basically all based on a long-term relationship that I maintain with [AlphaNet]. You know, it is a personal relationship, where they asked me 'can you help us?' and that was three years ago after their [AlphaNet] merger, it was like 'we have this problem with our IT management, can you assist us somehow?' So that was an entirely personal thing. *Senior Manager SP (Case A)*

Understanding the contextual background of each case, including the different service targets within the cases investigated and the service customer's motivation to hire consultants are important foundations for the subsequent sections. The following section summarises these findings before Section 4.3 presents the findings of this study regarding the technology-enabled value co-creation processes in the cases investigated.

4.2.4 Summary of Findings

This section provided an overview of the contextual background of each case investigated. Each service system was discussed by focussing on the service provider, service customer and service target. Furthermore, this section classified the various service targets into intangible processes and tangible outputs, and provided insights into the incentives for hiring consulting firms. Table 4.5 summarises the background of the service systems investigated.

	CASE A: **IT-Strategy Planning**	**CASE B:** **Asset Management**	**CASE C:** **UNCLOS New Zealand**	**CASE D:** **Hedge-Accounting**
# Service Provider	1	3	1	1
# Service Customer	1	1	2	1
Description of Service Provider	IT Consulting	Asset Management	Energy Exploration	IT Consulting
Description of Service Customer	Tele-communication	Government Institution	Government Institution	Financial Services
Type of Service Target	Intangible Process	Tangible Output	Tangible Output	Intangible Process
Duration	12 months	10 months	36 months	9 months
Financial Volume	NZ $6 million	NZ $2 million	NZ $44 million	NZ $1.5 million

Table 4.5: Summary of Contextual Background of the Cases in this Study

4.3 Technology-Enabled Value Co-Creation Processes in Service Systems

The literature review in Chapter 2 highlighted that the initial exploration and description of technology-enabled value co-creation processes, i.e. the means by which service systems interact and exchange resources via ICT, is the necessary first step when attempting to build theory leading to a better understanding of value co-creation in a technology-enabled environment. By building on the argument brought forward by Anderson, et al. (1999), and Füller (2010), that any interaction, including value co-creation, can be described using the three core constructs of entity (who?), content (what?) and process (how?), this section presents the findings of the cross-case analysis in regard to technology-enabled value co-creation processes in the service systems investigated, and thereby addresses RQ 1 of this study. Section 4.3.1 discusses the identified roles performed by service system entities (who?), Section 4.3.2 presents the findings addressing the resource exchanged (what?), before Section 4.3.3 and 4.3.4 describe the processes underlying this interaction (how?) between the entities.

4.3.1 Service System Entities

4.3.1.1 Roles of the Service Customer

The service system entities representing the service customer can be distinguished into four *groups*:

- *Senior Managers* oversee the co-creation of the service target in their organisation. They typically lead a larger business or government unit, but do not interact with the service provider on a day-to-day basis; instead, they interact with senior managers of the service provider on a limited, but interpersonal basis.
- *Project Managers* are responsible for the successful co-creation of the service target. Perceived as the "key contact," "primary contact," or "project sponsor," by the service providers, these individuals are typically powerful middle managers who frequently interact with the service provider while leading the group of core team members.
- *Core Team Members* possess specialised skills and are the "key players" or "sub group," that the consultants interact most frequently with. For example, the AMWG in case B, or the ISU in case A, represented the core team.

- *Other Team Members* form the "broader group" of service customers that are considered "sub clients," the "audience," or "recipients" by the consultants. These employees differ in background and experience, and typically contribute to the co-creation process only when their input is required. Since these employees are typically part of a wider matrix-organisation, it is often challenging to access their knowledge.

The four main *roles* that service customers performed during the technology-enabled value co-creation processes varied across cases, and were aligned with the degree of tangibility of the service target rather than the group to which an entity belonged. This study defines the roles that service customers performed as *task allocator*, *enabler*, *conductor* and *quality controller*, and argues that these are either *proactive*, meaning that they are performed and independently triggered by the service customer, or *reactive*, meaning that the service customer performed the role in response to an action by the service provider. Figure 4.2 illustrates the scenario:

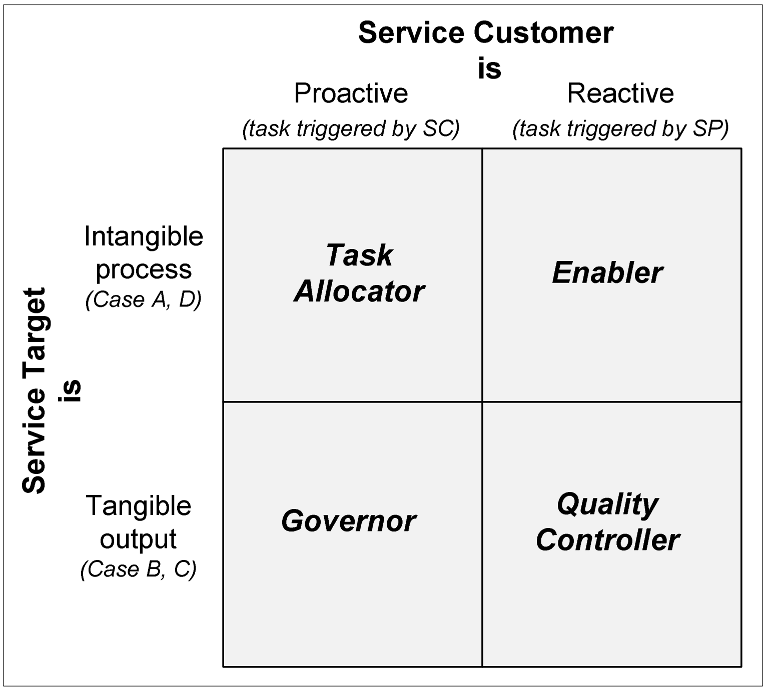

Figure 4.2: Roles Performed by Service Customers during Value Co-Creation

Service customers in Cases A and D performed the role of *task allocator*. This proactive role involved the selection and allocation of tasks to be performed by the consultants. While project managers were particularly active in this role, some core team member also assigned tasks to the consultants. These tasks were affiliated with the intangible processes underlying the service targets in Cases A and D, and ranged from report writing to conceptual planning:

We did everything for the project sponsor. She didn't work at all and just told us what to do. *Consultant 1 (Case A)*

We gave [the consultants] the task to come up with a summary: 'two or three pages, just describe how we can do it [implement IT-system].' *Team Member 2 SC (Case D)*

The *governor* role was described as the "piggy in the middle" by one participant, and embodied the most varied and complex proactive role that customers performed during the co-creation of the tangible service target in Cases B and C. Typically performed by the service customer's project manager who had also commissioned the project, the governor represented a single point of contact for consultants and other customer team members, which reduced the complexity of the interaction amongst a large group of distributed entities. Governors interacted with the service providers and disseminated information between all other service customer entities that were involved in the co-creation process:

The consultants […] talked to us as the project management team […], and then we would also coordinate with the ministry teams, which was to say, 'here is what the consultants are providing, here is what they're sending to us', and then those ministry teams would provide details back to us, feedback in their thoughts on the consultants' material [Quality Controller]. So everything was kind of going in and out through us. *Project Manager SC (Case B)*

[Beta Ministry] had 1 or 2 people who would co-coordinate things, so that you didn't have 20 people to deal with [....] For projects of this scale you typically set up the 'here is the lead person that knows what is happening on both ends.' *Senior Manager SP (Case B)*

The *enabler* was a reactive role that service customers in Case A and D performed. The purpose of this role was to empower and assist the service providers who completed the tasks which were allocated to them by task allocators. Especially core team members performed the enabler role which included answering routine questions from consultants, consolidating information for the consulting team, or explaining specific issues to consultants:

I create KPI metrics from the IT services, consolidate them to a unit overview, and then deliver the information forward to [AlphaTech Consulting]. *Team Member 2 SC (Case A)*

> The issues [hedge-accounting] that we are dealing with here are quite complex. So you have to try to explain it to these colleagues [DeltaTech Associates], which are not so familiar with it all, but actually have to implement it in the IT system. You need to explain them [DeltaTech Associates] what the problem is. *Project Manager SC (Case D)*

Finally, the other reactive role that service customers performed was the *quality controller*. This role existed in Cases B and C, was performed by core and other team members, and mainly involved controlling the tangible output created by the service providers. As quality controllers, service customers read, reviewed, and approved draft chapters of the IAMF and UNCLOS reports and, through the governor role, provided feedback to service providers regarding the desired contents of future chapters:

> My role was really to act as a quality assurer to the work that was done by [GSC]. *Team Member 4 SC (Case C)*

> They [GSC] would prepare a draft and [Team Member 4] and I would look at that and maybe make a few changes. And then basically once we had the document that we were happy with, we would send that back. *Team Member 3 SC (Case C)*

> The deliverables came in by chapter: we will get a rough draft and a first opportunity to comment and return it back to [BetaStrategy Consulting] [....] The reason we did that was just to control some of the things that were said. *Team Member 2 SC (Case B)*

4.3.1.2 Roles of the Service Provider

The service system entities representing the service provider can be distinguished into three main *groups*:

- *Senior Managers* typically own the consulting firm as partners and manage an entire business unit. They oversee several projects at a time and personally meet their customers on a regular basis which helps to initiate new projects and to align their organisation’s strategy with market demands.
- *Project Managers* represent the consulting firms during the co-creation of the service target. While they occasionally perform technical tasks and thereby take on the role of a technical manager, their core purpose is to manage the consulting team on daily basis,

allocate budgets, and send deliverables to customers. In Cases B and C, the project managers were involved in more than one project.

- *Consultants* are highly educated knowledge workers with specialised technical expertise and experiences. They execute operational tasks affiliated with the service target and interact with service customers accordingly.

Service providers performed four roles which varied across the cases and were, just like the roles of service customers, aligned with the degree of tangibility of the service target, rather than the group that individual entities belonged to. This study defines the roles that service providers performed as *facilitator*, *performer*, *conductor* and *expert*, and argues that these are either *proactive*, meaning that they were performed and independently triggered by the service provider, or *reactive*, meaning that the service provider performed the role in response to an action by the service customer. Figure 4.3 illustrates the four roles that service providers performed.

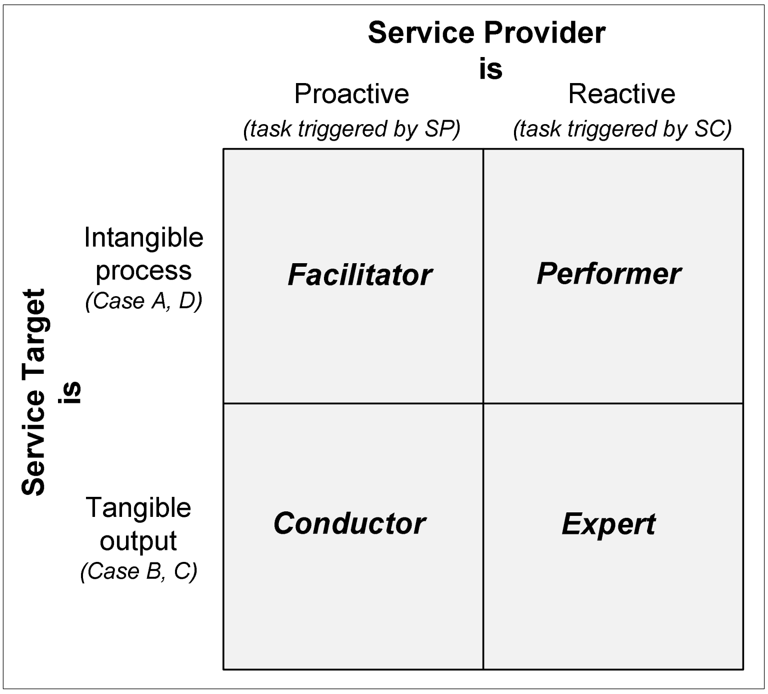

Figure 4.3: Roles Performed by Service Providers during Value Co-Creation

The *facilitator* is a proactive role which was performed by consultants in case A as well as the project manager in case D, and perceived as a main point of contact for the service customer. However, unlike the governor role, the facilitator did not channel the entire virtual interaction between service customer and service provider entities. Instead, facilitators attempted to institutionalise technology-enabled interactions and exchange processes between all service system entities; for example, by facilitating weekly telephone conferences (see Section 4.3.3.3). Consequently, individual service system entities still interacted independently with each other, but were, as a collective, brought together by the facilitator in regular intervals. The facilitator provided agendas and disseminated relevant information before and after each institutionalised interaction, which assisted the informal knowledge transfer in regard to the intangible service target:

> We are a facilitator in this project. This means that we organise and guide the [virtual] meetings, create presentations, collect input and prepare it for them [AlphaNet]. So we organise the infrastructure, set up WebEx and all that. *Project Manager SP (Case A)*

Allocating the facilitator role to the service provider was a conscious decision, and driven by the service customer's belief that consultants were not only responsible for this task, but also more skilled here. Two customer representatives in case A and D commented on this issue:

> It is their [DeltaTech Associates] job to coordinate those things; to drive the development of the system forward. *Project Manager SC (Case D)*

> They [AlphaTech Consulting] have more self-control and better methods when they work. And they are professionals who have done similar things before, so they know how to keep such a project on track. *Senior Manager SC (Case A)*

The *conductor* role was proactively performed by service providers in Cases B and C, and was perceived by some customers as a "touchstone" or "single point of contact" for the interaction with the consulting team. The role of the conductor was performed by one distinct member of the consulting team, which created a single point of contact for the distributed service providers and customers alike:

> There was one point of contact […], particularly when we were drafting the document […], the draft would be done by different people and commented upon by different people and being channelled through a single contact point. *Team Member 2 SC (Case C)*

The role is consequently comparable to the service customer's governor role, however, differences exist. Perceived as distinctly different from the service provider's project manager, the main responsibility of the conductor was to manage the consultants during the co-creation of the tangible service targets. This involved disseminating information, technical guidance and allocating tasks to consultants, as well as merging the various draft chapters into one final consistent document, which was subsequently submitted to the service customers, who then acted as quality controller:

> I drop into a project team and sit alongside the project-manager and don't deal with the day-to-day billing aspects of the project, but I am responsible for the overall technical outputs of the project […], then work with the project manager to say 'this is the time-frame we need to work to', he can then drive the project, but I am responsible to foreseeing the inputs [....] The one I just did for instance in [eastern Canada], we had 3 different consulting firms, and my role was to […] take the overall authorship of the final report. *Technical Manager SP (Case B)*

> I would say [conductor] managed the distributed consulting side. *Team Member 2 SC (Case B)*

The conductor collected and filtered information from the service customer that could then be incorporated into subsequent drafts of the reports. In Case B, service customers performing the role of governor perceived their interactions with the conductor as particularly useful, because it reduced complexity and enabled them to easily collaborate with a consulting team that was distributed across various locations:

> The one person [conductor…] represents the various service providers. So, for me, I felt that I was being well-served by the team, because I was being well-served by [conductor]. I didn't care that I didn't see [consultant 3] once in my life, but I knew that […] what I said to [conductor] was reflected in whatever [consultant 3] turned in. That's all I needed to know. *Team Member 2 SC (Case B)*

The reactive *performer* role however, was activated by the service customer's role of task allocator, and triggered the enabler role whenever consultants required input information in order to act as performers. Consequently, performers, enablers and task allocators typically jointly interacted with each other in a symbiotic relationship. The performer role did not involve any decision making, and was limited to the execution of relatively standardised tasks that were affiliated with the intangible service target only. For example, the consultants in Cases A and D created presentations for the service customer, altered the hedge-accounting software in accordance with customer needs, or answered service customer questions:

> The client decides. The client doesn't work at all. It is more like that we are the 'assholes' that have to do everything. The client doesn't do anything. The client pays us money, and we do it. *Consultant 1 (Case A)*

> The job of the consultant is to change and customise our [hedge-accounting] system. So when we need to change anything, then they [DeltaTech Associates] are the ones who do it. *Senior Manager SC (Case D)*

On the contrary, *experts* were consultants with specialised knowledge in an area that was relevant for the co-creation of the tangible service target. Rather than performing a variety of broad operational tasks, as the performers did, the contribution of experts in Cases B and C was limited to a relatively narrow area only. For example, experts were responsible for writing individual chapters of the reports, the collection of empirical data, or analysis thereof:

> I was heavily involved in writing the submission. Everyone within [GSC] has specialist areas, so I obviously concentrated on those areas […] which were my specialty. *Consultant 1 (Case C)*

Furthermore, experts have, compared to performers, the authority and responsibility to make decisions for the service customer. For example, one participant recalls his experience during the seismic data-collection on board of a ship during the creation of the UNCLOS report:

> **Participant:** The people on board had to decide whether to curtail or extend [seismic] lines based upon the information that was coming in […] and those were quite high money decisions, and involved a lot of ship time, money which is very, very expensive.
> **Interviewer:** How much was it?
> **Participant:** At that stage, it's probably about NZ$200,000 a day […] in ship time, so decisions made are quite crucial. We did communicate that we would make those decisions and communicated those back to [GammaDataHub] on shore [....]. They had the power to override us, but they never did that, and you wouldn't expect them to. They put you on board to make those decisions. *Consultant 1 (Case C)*

Experts did not interact as closely with service customers as performers, but executed their tasks independently and in conjunction with the other members of the consulting team. This emphasises that the conductor acts as the main service customer contact in cases with tangible service targets. Direct interactions with customers represented an exception:

> There is interaction back and forth about ‘ok, here is what we are suggesting’ and the client says ‘no, yes or whatever,’ and so in that respect you are ‘with’ that person, but that is a small piece of the entire work that you do. And in this case probably that was 5%...or less? [....] This meant we are working a lot more with the consulting team than with the client. *Consultant 2 (Case B)*

Finally, the tangibility of a service target influenced which roles service providers and customers performed. While the scope of each role differed, the facilitation of the exchange of resources, joint activities, or independent tasks were common. Intangible service targets were characterised through task interdependence, while tangible service targets were characterised through task independence. The interaction between service providers and customers was, in cases with intangible service targets, unstructured but initiated by the facilitator. In cases with tangible service targets service provider and customer entities interacted through the governor-conductor interface. Figure 4.4 summarises the scenario.

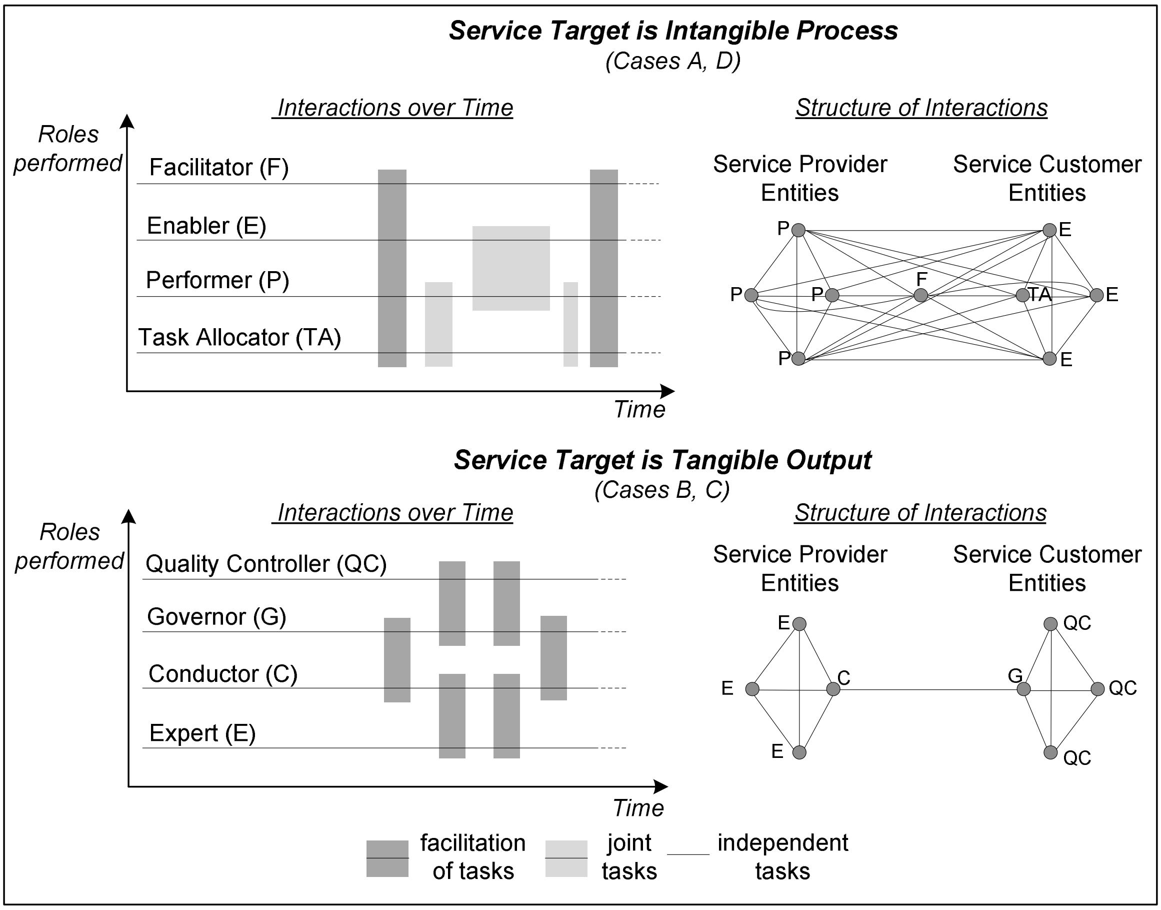

Figure 4.4: Relationship between Tasks, Roles and Structure of Interactions

4.3.2 Resources in Service Systems

4.3.2.1 Role of the Operant Resource Information

Information is the key resource that is exchanged between service providers and customers. Service providers in all cases recognised that timely access to the right quantity and quality of information is crucial for the successful co-creation of the service target, and that failure to accessing information imposes the threat of project failure:

> Every service depends on information from the client that we don't have. And if we don't get these [information] in time, and in the right quality, or if we get the wrong information, then the entire project might fail. *Project Manager SP (Case A)*

While each of the four roles performed by consultants differs in its informational needs, service providers unanimously recognised that their understanding of the service target, and the customer's organisational context, were, at least in the early stages of a project, inferior compared to that of service customers:

> When you begin, you have a very small amount of information available compared to the client. Let's be honest: the client always has the advantage when it comes to having whatever information. Because they have been with that company for 10 years already. So, when you begin the project, the first thing is always to try and get the relevant information. Consultant 3 *(Case A)*

Participants also agreed that the only means of accessing the required information is by interacting with the service customers. As outlined in Section 4.3.1.1, the service customer employees possessed the relevant information for the co-creation of the service target:

> Consulting 101: you need client input. *Senior Manager SP (Case B)*

> You're heavily reliant on extracting information from the client [....] I don't think there's any other way to it. *Consultant 3 (Case B)*

4.3.2.2 Challenges in Accessing Information

While information itself is considered crucial, accessing the information necessary for the successful co-creation of the service target could be a challenge for service providers. Especially the service providers and customers in Cases A and B appeared to struggle when attempting to exchange information, while the service providers and customers in Cases C and D did not encounter this scenario. For example, both service customer and provider in Case A criticised the deficient flow of information between their teams in Germany and Finland:

> Information sharing is something that we need to pay more attention too. Sometimes, I feel that the [AlphaTech Consulting] guys are not well enough informed, if we are doing something here, that is sometimes obvious. *Project Manager SC (Case A)*

> They [AlphaNet] do a lot by themselves and don't keep us in the loop, so we miss out on a lot [....] You know, consultants are often perceived as externals, that they don't want to include 'because this is our company' [....] It seems they don't want to communicate everything openly with us, and see things like 'this is mine, you don't need to work with me.' *Consultant 1 (Case A)*

The situation in Case B appeared even more severe. According to one participant, some service customer entities used information as a mean of power and control, and purposefully withheld it from their service providers:

> A lot of the time, people [at Beta Ministry] were looking at information as power, and we're withholding it, we're not sharing it! *Team Member 2 SC (Case B)*

However, the condition described by participants in Cases A and B differs tremendously from the perception of information sharing voiced throughout Cases C and D. One way of explaining the seemingly superior information exchange here is the different outlook on this issue by individual service customers. In Cases C and D, both project managers argued that sharing information with consultants is crucial for the success of their projects, and subsequently in their own interest. Their own active involvement in the co-creation process through the sharing of relevant information was seen as a mean to ensure that the service target would meet their expectations, and the goals of their respective organisations:

> My natural inclination is to work with a service provider [....] Because if I do not trade with them, I do not know whether I get what I want. *Project Manager SC (Case C)*

> Information is an important issue. We don't keep any information from our external consultants, not for the project. You can't do it. That would threaten our goals. *Project Manager SC (Case D)*

The cross-case analysis revealed two factors which constrained the degree to which service customers in Cases A and B attempted to exchange information with their providers. These factors identified by this study were the service customer's *inability* and *unwillingness* to share relevant information. For example, in Case A, the service customer's *inability* was rooted in the fact that certain types of information were restricted from external workers:

> Dealing with the consultants is a bit more difficult. You have to be a bit more aware on what you are saying or revealing […] some information is restricted from external workers. *Team Member 1 SC (Case A)*

Furthermore, while performing the enabler role, some service customers lacked the technical skills necessary to provide the consultants with the desired input information:

> You're asking them for something, and the client says 'sure I'll do it,' and when you get it, you realise that it is just not what you wanted. Not because you didn't specify it clearly enough, but because the client simply didn't have the skill to do it. *Consultant 3 (Case A)*

The customer's *unwillingness* to share relevant information with the consultants could be observed in both Cases A and B. Unwillingness implied that service customers did not share relevant information with the service providers, even though this resource was available. One participant explained that this behaviour was rooted in AlphaTech Consulting being perceived as a potential competitor, which created an 'us vs. them' attitude amongst some of AlphaNet's employees:

> I heard two colleagues say that the service consultants are just 'trying to learn from us,' and somehow look better in front of the senior management. 'They are using us,' and 'us vs. them' attitudes are surprisingly common. *Team Member 2 SC (Case A)*

The customer's unwillingness to share relevant information with service providers in cases A and B was also related to individual career goals that other team members and senior managers pursued. Consequently, contributing to the co-creation process by providing information was perceived as a potential threat to one's own future:

> People are just doing 'Operation Cover Your Ass', because at the end of the day nobody wants to put anything out there that could come back and hurt their careers [....] I could easily sense that in a lot of people it was like 'look, I don't want to say anything

> or do anything, because I can get on with my career by just sitting down, keeping quiet […] and coast into retirement beautifully. *Team Member 2 SC (Case B)*

The implications of missing, delayed, or otherwise insufficient information are potentially severe for the success of the co-creation process. Participants related missing information to subsequent mistakes, and ultimately to delays, when attempting to co-create a service target:

> To understand how they [Beta Ministry] work […], you need some information [....] If you have a question, and if it gets responded to more quickly, you're able to proceed. Until you get a response, either you wait and the schedule gets affected, or you don't have that information, and you make an assumption and you move on. And then there's the outcome of whatever assumption you made, and there's always a chance for re-work afterwards, which no one likes. *Project Manager 2 SP (Case B)*

Finally, this section outlined the importance of the operant resource information for the success of value co-creation processes in service systems inside the consulting industry. It also described the challenges that service providers face here when attempting to access this resource from service customers, as well as the potential implication resulting from missing information. The following section will provide insights into the actual exchange processes between service providers and customers.

4.3.3 Exchange Processes in Service Systems

4.3.3.1 Technology-Enabled Exchange Processes

The types of Information and Communication Technology (ICT) that were available throughout the cases did not differ largely. However, the extent to which they enabled interactions between service system entities and facilitated the exchange of resources during the co-creation of the service targets varied. Table 4.6 presents an overview of the patterns of ICT usage between service providers and customers across the cases investigated.

AVAILABLE COMMUNICATION TECHNOLOGY	INTANGIBLE SERVICE TARGET *(Cases A, D)*				TANGIBLE SERVICE TARGET *(Cases B, C)*			
	Service Provider		Service Customer		Service Provider		Service Customer	
	Facilitator	*Performer*	*Task Allocator*	*Enabler*	*Conductor*	*Expert*	*Governor*	*Quality Controller*
Videoconferencing	*twice*	*twice*	*twice*	*twice*	-	-	-	-
Telephone 1:1	-	*ad-hoc*	*ad-hoc*	*ad-hoc*	*weekly*	*ad-hoc*	*weekly*	*ad-hoc*
Teleconference with GCTs[25]	*weekly*	*weekly*	*weekly*	*weekly*	-	-	-	-
Teleconference w/o GCTs	-	-	-	-	*monthly*	*ad-hoc*	*monthly*	*monthly*
Email	*weekly*	*ad-hoc*	*ad-hoc*	*ad-hoc*	*weekly*	*ad-hoc*	*weekly*	*ad-hoc*
Mobile Email	-	*ad-hoc*	*ad-hoc*	*ad-hoc*	-	-	-	-
File Sharing/Intranet	-	*ad-hoc*	*ad-hoc*	*ad-hoc*	-	-	-	-

Table 4.6: Patterns of Technology-Use between Service Providers and Customers

Videoconferencing

Only AlphaNet had videoconferencing available and this technology was consequently just utilised in Case A. However, videoconferencing was not widely accessible and therefore used twice during the entire project. Here, a ‘Halo-room’ provided the participants with the opportunity to interact synchronously via audio and life-sized video images at two defined locations in Germany and Finland. This type of ICT was very expensive to use. Participants rated the ‘Halo-rooms’ as a highly realistic mode of interaction and considered it superior to the telephone, but nevertheless inferior when compared to interpersonal interaction:

> It is a really new feeling when you go in a room like that. It is quite realistic. And people are almost real sized. *Team Member 1 SC (Case A)*

> When you interact with a video conference, it is an intermediate mode between personal interaction and having a phone call. *Team Member 2 SC (Case A)*

[25] GCT = Group Collaborative Technology.

Telephone

One-on-one telephone calls enabled the interaction of all service system entities, however the extent to which this technology was used varied considerably across cases and roles. Telephone calls were typically used ad-hoc and for particularly short, clearly defined, and urgent tasks. Especially performers, task allocators, enablers, experts, and quality controllers, or roles involved in the operational tasks during the co-creation of the service targets utilised the telephone, which provided a reliable way of interaction and mean to exchange resources:

> There was a lot of ad-hoc interaction. You know, whenever you had a spontaneous question [....] Or the customer got in touch and said 'I need this information.' And that usually happened via telephone. *Project Manager SP (Case D)*

However, service system entities performing roles concerned with the facilitation of the co-creation process utilised the telephone more consistently than roles performing individual or joint tasks. For example, the conductor and governor in Case B had weekly scheduled telephone calls:

> We had a standard phone call we would do once a week I think, with them [BetaStrategy Consulting], to make sure we check in. *Team Member 1 SC (Case B)*

Teleconferencing

Teleconferences were utilised whenever information had to be disseminated to an entire group, for example during facilitation or governance of the co-creation process. In Cases A and D, the teleconferences were supported by Group Collaborative Technologies (GCTs) which allowed participants to hear each other and share an electronic document such as a Power Point presentation simultaneously. Teleconferences were such a prominent mode of interaction between service providers and customers in Cases A and B, that participants here referred to this interaction as "meeting," or, in Case D, as "jour fixe":

> Our meetings are rarely face-to-face. We [AlphaTech Consulting] sit in a meeting room, but have the telephone and WebEx [GCT]. It's called a 'live-meeting,' so everybody can see the same slides and hear the presenter. And this is only a face-to-face meeting for the people that are in the same room. *Consultant 1 (Case A)*

However, the frequency by which teleconferences were used varied considerably. While participants in Cases A and D relied on weekly teleconferences, participants in Case C utilised these only on an ad-hoc basis, or monthly in Case B. Here, those sessions were typically tied to milestones of chapters, with the expert for that particular chapter presenting:

> The purpose […] was to provide information, as to provide a status of where we're at [....]. We'd prepare a PowerPoint presentation deck which was distributed to everybody so they [Beta Ministry] had it on the phone. They could look through it as we had the speaker, the topical expert of that particular chapter speaking […], and to invite their feedback, but not necessarily on the phone. It was like we invited them: 'e-mail us, send us texts, call us if you want, here's our number'. *Project Manager 1 SP (Case B)*

While teleconferences were utilised to interact with a group of physically dispersed entities, the large group size in teleconferences, as well as their often rigid format which had to be controlled by a moderator, made this technology less interactive. Perceived as a "speaker situation," or "one-way communication," teleconferences therefore represented means for disseminating, rather than gathering information (see also Section 4.4.2.1):

> It was too big. I mean a group of 42 is pretty much a one-way communication. You can't really have it interactive. We tried to make it interactive but, I must admit, it was a bit difficult. *Project Manager 1 SP (Case B)*

> The people on the phone [Quality Controller], usually it was one way, like they were just listening. They just wanted to get a sense of what we were up to. They wouldn't give information back over the phone. *Project Manager SC (Case B)*

Emailing

Emails were the most widely used communication technology that essentially represented the standard means of interaction between service providers and customers in all cases:

> Email is always the preferred method […], the de-facto standard of interacting. *Team Member 2 SC (Case A)*

> We always communicate by email, all the time. *Consultant 1 (Case C)*

> 80 to 90% of our communications […] were by email. *Consultant 4 (Case B)*

Emails were typically used on an ad-hoc basis to disseminate input information, allocate and coordinate tasks, or sent deliverables such as draft chapters to service customers. Furthermore, the facilitator, conductor and governor roles used weekly emails to govern the progress of their projects, and also to initiate teleconferences. Participants perceived email as particularly suitable whenever routine questions, documents, or facts had to be transmitted. However, participants also argued that email was unsuitable for more complicated interactions, such as discussions or creative processes:

> Email is, for me personally, fine for conveying facts, conveying information, but if you actually want to explore ideas or if you want to let's just say discuss a problem, I think people more often have a hard time expressing those things well in emails. *Project Manager1 SP (Case C)*

File Sharing

Finally, file sharing provided service system entities with a means to access resources via a central repository, rather than through direct exchange. The file sharing devices were typically linked to the service customer's intranet (Cases A and D), but rarely used by the service providers:

> The way we are storing information is, we have this document management system. We put all our stuff there, but it's a kind of passive archive. *Project Manager SC (Case A)*

While file sharing was also available in Cases B and C, it was not used for the interaction between service providers and customers, but only for the interaction between the consultants themselves. Whenever documents such as draft chapters or status reports had to be transferred between service provider and customer, emails were used for this exchange.

4.3.3.2 Interpersonal Exchange Processes

Even though the interaction between service providers and customers was dominated by ICT-enabled exchange processes, it was not entirely free of interpersonal interactions. While face-to-face contact between service providers and customers remained the exception rather than the rule, the cross case analysis identified a common pattern regarding these interpersonal exchange processes. First, the frequency of face-to-face contact between a service provider and customer entity was higher if the role performed by that entity was related to facilitation or coordination, rather than the performance of independent or jointly performed operational tasks. Consequently, conductors and governors had more face-to-face contact than, for example, enablers or quality controllers which, in some instances, never met face-to-face. Second, face-to-face interactions were typically triggered by certain events or stages during the co-creation of the service target. For example, presentations of chapter drafts to the service customer in Case B, or the need to gain access to the physical IT systems of the service customer in Case D, triggered a face-to-face exchange between service providers and customers, who otherwise interacted in a technology-mediated environment only. Figure 4.5 illustrates this scenario.

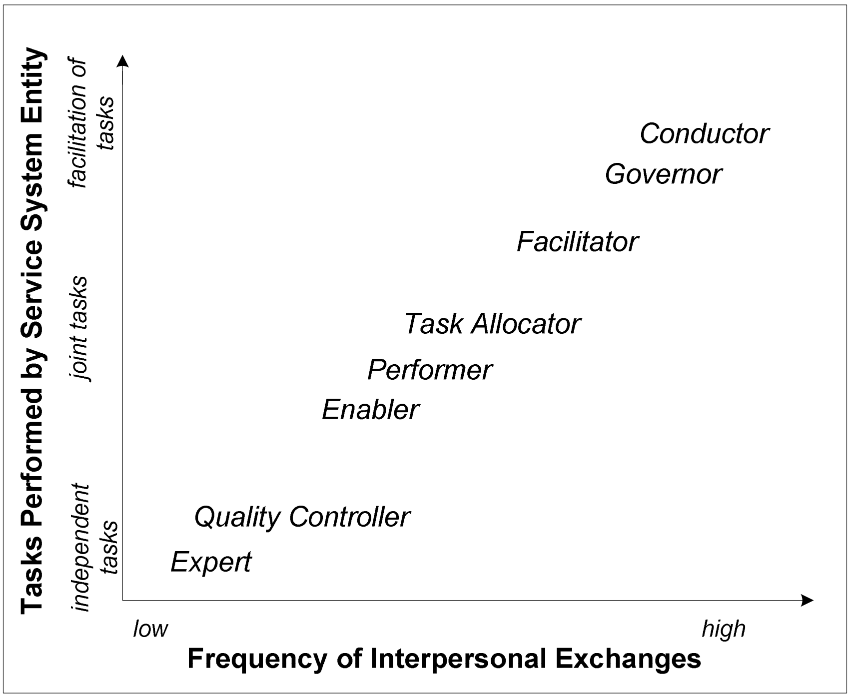

Figure 4.5: Interpersonal Exchanges of Service System Entities

The vast majority of enablers and quality controllers never interacted in a face-to-face fashion with any service providers, but relied largely on ICTs for that interaction:

> When dealing with the client [quality controller], there were some that we never saw face-to-face. *Consultant 2 (Case B)*

> I [enabler] never met them [AlphaTech Consulting] in person. *Team Member 2 SC (Case A)*

The situation is slightly different for experts and performers alike. While some experts or performers never interacted face-to-face with service customers, those face-to-face interactions that did occur, were triggered by exceptional circumstances. For example, in Case D, performers travelled to the service customer's location in order to integrate and implement the hedge-accounting software into the IT system of the customer, a task which could not be performed virtually:

> You can't do the work from somewhere else, because whenever you want to integrate the software into the environment of the customer, you have to interact with them there [at the customer's location]. *Senior Manager SP (Case D)*

Similarly, an expert in Case B travelled once to the customer's location after the completion of an IAMF chapter, in order to present and discuss the findings:

> After I had finished my chapters I flew back up to [eastern Canada], once, to have a face-to-face meeting with the client [....] so that was probably the only time I had a face-to-face with the client. *Consultant 4 (Case B)*

Since facilitators and task allocators focussed their efforts on the actual governance and coordination of the co-creation of the service target (see Section 4.3.1), they interacted more frequently with each other than with others. For example, the facilitator in Case A did not have any face-to-face interaction with the service customer for the first six months of the project, but learned that this lack of interpersonal contact had a negative effect on the process of financial IT planning. Consequently, the consultants in the facilitator role eventually decided to introduce monthly visits in Finland:

> I worked on the project for over half a year before I flew up to Finland and met them [AlphaNet] for the first time. *Consultant 1 (Case A)*

> We really tried to increase our presence there [AlphaNet's location]. We tried to meet them personally every five or six weeks […], to see the team and to discuss things. *Consultant 2 (Case A)*

The conductor and governor in Case B had the most frequent face-to-face contact throughout all cases. Here, the conductor interviewed some of the quality controllers at the outset of the project, but also initiated fortnightly personal meetings with the governor, to support the otherwise entirely technology-enabled interaction:

> We [conductor] met with them [governors] face-to-face [....] I think we met with them every two weeks, we just said 'ok, we will come up and see you', might be nothing to say, might be a lot to say, but it's just an opportunity to catch up. *Technical Manager SP (Case B)*

The conductor in Case C however, did not interact as frequently with the governor of the service customer. Their interaction was triggered by project deadlines, which is when fortnightly face-to-face meetings occurred:

> **Participant:** We did have meetings, especially when you are coming up to the deadlines, you get together quite often.
> **Interviewer:** Face to face?
> **Participant:** Yes, face to face. Quite often, I mean, would be not more than fortnightly [...], you certainly wouldn't see them every day. *Project Manager 2 (Case C)*

While the actual exchange of information between service system entities during the co-creation of the various service targets was enabled by means of ICT and, where appropriate, enhanced by interpersonal exchange processes, these processes were not only influenced by the inherent challenge to access the information, but also by external time constraints. The following section outlines the resulting implications for the service systems investigated.

4.3.3.3 Time Constraints

Participants across all cases outlined that the actual time spent for the co-creation of the service targets represents the major cost factor for the projects. Even the cost related to the physical distribution between the service system entities and subsequent communication cost do not exceed the cost for a man-hour:

> The biggest cost in a project is people's time [...], and if it costs me 10 or 20$ an hour to make a phone call to the UK [...], that is a tenth or twentieth of the cost of a man-hour, and therefore the time involved just dominates. *Senior Manager SP (Case B)*

Given these cost constraints, it was in the best interest of both the service customer and provider to interact as efficiently as possible, in order to reduce the time and subsequent cost necessary for the co-creation of the service target. While service customers were interested in minimising their spending, service providers perceived the need to maintain competitive as the key factor that drove the desire for fast project-turnarounds:

> **Participant:** It's really essential to be able to provide the services as cost effectively as possible, which means really as fast as possible.
>
> **Interviewer:** Why is time so important?
>
> **Participant:** Well, firstly it's man-time. So, the longer you spend doing a project, the more expensive it's likely to be. But it also means the faster you can turn a project around, the faster the company [service customer] can have the data [i.e. service target]
>
> *Senior Manager SP (Case C)*

Service providers consequently faced the challenge of allocating their available time in a most efficient manner. Ultimately, participants outlined that the total time available within a working week or day is limited, and therefore needed to be allocated on both operational tasks and the management of the relationship with other service system entities (see section 4.5.3) in an optimal fashion:

> Your communication budget is limited. Basically the time that you have available is constrained. And you need to deal within these time constraints; you need to work, communicate with the client, with your team. So really, the question is how can I allocate this communication-budget most effectively? Should I spent my time reading or analysing things, or would it be better invested if I just talk informally to the client?
>
> *Project Manager SP (Case D)*

Delta Associate's project manager in Case D indicated that service providers faced the need to simultaneously perform their roles but also, within the limited timeframe available, to manage the relationship to their customers. As indicated in Chapter 2, the technology-enablement (i.e. technical connectivity), relational factors between service system entities (i.e. social connectivity), and their interrelationship are the two key research themes addressed by this study. The following section summarises the findings of this study regarding resource exchange and co-creation processes before Section 4.4 describes the role of technology-enablement in the service systems investigated.

4.3.4 Summary of Findings

This section described the technology-enabled value co-creation processes in the service systems investigated. The results of the cross case analysis were presented by focussing on the identified roles performed by service system entities (who?), the resource exchanged (what?), and the processes of this interaction (how?) between the entities. Furthermore, this section outlined the implications of time constraints on these processes. Table 4.7 summarises the key findings.

Roles Performed by Service System Entitles	The roles that service system entities perform during interactions and resource exchange can be distinguished in *proactive* and *reactive roles*, and these also depend on the degree of tangibility of the service target. Furthermore, these roles vary regarding the tasks which they embody, and in their degree of technology-dependence.
Resources in Service Systems	*Information* is the fundamental operant resource required for the co-creation of the service targets. Service customers retain this resource, and service providers face the potential challenges of the customer's inability and unwillingness to share information when attempting to access this resource.
Exchange Processes in Service Systems	*Technology-enabled exchange processes* in the service systems investigated predominantly rely on emails and telephone. *Interpersonal* exchange processes occur in exceptional circumstances only, and are more likely to involve service system entities which perform roles related to coordination of the resource exchange rather than operational tasks. Furthermore, *time constraints* influence exchange processes and require an optimal allocation of the time of an individual entity.

Table 4.7: Summary of Findings Regarding Technology Enablement

4.4 Technology-Enablement in Service Systems

Understanding value co-creation processes in a technology-enabled environment was identified throughout Chapter 2 as a key research priority for service science, and is addressed through the research objective of this study. Section 4.4 presents the findings of the cross case analysis regarding the role of technology-enablement in service systems and outlines what motivates and drives the observed shift from traditional face-to-face co-creation processes into virtual realms, how ICTs for the exchange of resources are selected, and which factors influence individual service system entities to choose and utilise these. It therefore provides the foundation necessary to address RQs 2 and 3.

4.4.1 Motivating Technology-Enabled Value Co-Creation Processes

The initial decision to rely on a technology-enabled exchange processes was, across all service systems, motivated by the *physical distribution* between the service system entities, subsequent *cost factors*, and *legal implications*. Figure 4.6 presents an overview of these three factors that motivated the shift towards technology-enabled value co-creation processes in the service systems investigated.

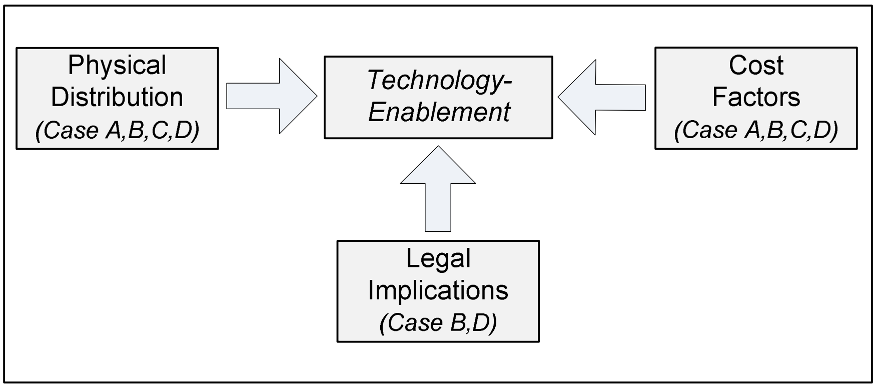

Figure 4.6: Factors Motivating Technology-Enablement in Service Systems

The *physical distribution* between service providers and customers was the key factor that influenced the decision across all cases to rely on technology to enable the co-creation process of the various service targets. Physical distribution in case A for example, was rooted in a shortage of local consultants, thereby resulting in technology-enabled interactions:

> We had to adopt the virtual work, because the team from [AlphaTech Consulting] is in [German city] and we are here in Finland. *Project Manager SC (Case A)*

Physical distribution also implied that any attempts to unite the service system entities at one location would increase costs due to the then extensive need for travel and loss of time (see Section 4.3.3.3). Subsequently, participants in all cases reported that the desire to minimise cost influenced the decision to rely on technology for their interactions:

> Virtual work is cheaper because we save the cost for travel. We also save time because of that. That is a huge issue [...] it is all cost driven. *Project Manager SP (Case A)*

> Cost and practicality, […] it just wouldn't have been feasible to build that cost into the project, to bring that many folks from so many disparate places together. *Consultant 3 (Case B)*

Service customers in Cases C and D however, decided to rely on technology-enabled exchange processes, even though they had the opportunity for face-to-face interactions with their consultants. Here, participants explained that the time of consultants represented a cost-factor which they attempted to reduce by relying on virtual interactions (see also Section 4.3.3.3). These were perceived as less time consuming than face-to-face interactions, and hence, more economical:

Participant: You are aware of not wanting to use them [GSC] any more than necessary, because their time is really expensive [….]

Interviewer: How did you reduce the time that you spend with your consultants?

Participant: I guess part of it was around thinking about not having any more face-to-face meetings […] because that takes up quite a lot of time. *Team Member 3 SC (Case C)*

Legal implications in Cases B and D required that the interaction between the service provider and customer had to be documented. Participants claimed that they preferred technology-enabled interactions over face-to-face interactions whenever they wanted to protect themselves by documenting their interaction:

> We use a lot of email, even when our client is just down the road we use a lot of email. And that brings a number of benefits. It is an easy way to document interactions. *Senior Manager SP (Case B)*

> You have to save-guard yourself. We have to do it and the consultants have to do it as well. And that happens in writing, usually via email. *Project Manager SC (Case D)*

In conclusion, the initial decision to rely on technology-enabled resource exchange processes during the co-creation of the service targets was driven by the physical distribution between the service systems entities, subsequent cost factors or legal implications. However, equally important decision was to decide which types of technology to utilise. The next section presents the findings of this study regarding that issue.

4.4.2 Determining a Technology Repertoire

The cross-case analysis also identified how service systems selected and decided upon the types of technology that enabled interactions and the exchange of resources during the co-creation of the service targets. Across all cases, service providers unanimously agreed that the initial selection of technology was based upon the service customers' desires and existing ICT infrastructure, and therefore constrained or enabled by the availability of the types of technology already used within the context of the service customer's organisations:

> My client has had the technology, and I've used it in that instance because it was available and they make a practice of using it. *Project Manager SP (Case B)*

> Working for a big customer means that there is very little freedom to choose your own way of working from a tools perspective [types of ICT]. *Project Manager SC (Case A)*

Even though service providers adapted the existing technology infrastructure of service customers, this did not imply that all types of technology that service customers had at their disposal were available within the service system. For example, the researcher conducted an interview at the premises of the service customer in Case D, which was equipped with video-conferencing equipment, leading to the following dialogue:

> **Interviewer:** I see that you have videoconferencing equipment in this room. Do you use that as well to interact with [DeltaTech Associates]?
> **Participant:** No, not for the consultants, we don't do it.
> **Interviewer:** Why not?
> **Participant:** We probably could if we wanted to, but we don't [want to]. *Senior Manager SC (Case D)*

Ultimately, service providers adapted their customer's ICT infrastructure because customers were familiar with these tools, and these were easily available:

> The email list for example, phone calls, people are familiar with those. We weren't using any kind of different communication they [service customers] were not used to. *Project Manager 2 SP (Case C)*

Adapting to a service customer's communication technology infrastructure also meant that service providers could not introduce new types of technology that were potentially superior to the ones used by their customers. The service customers' potential unfamiliarity or inability to integrate new types of technology into their existing IT infrastructure were seen as potential barriers by both service customers and providers:

> Some of them [AlphaNet] might not know the tool and have concerns. And is it even possible to use it within their technical infrastructure? And even if that works, they might think 'that is too complicated,' and 'where is the benefit?' And they have to get used to this tool anyway, which usually takes a bit longer. So they would only focus on that, rather than the content- on what we are trying to do with it. So, I think the barriers are just too high. *Consultant 2 (Case A)*

> If it [new ICT] came from the consultancy firm, I would not see it as a good option. You have to take into account the organisational culture and the ways of working. *Team Member 1 SC (Case A)*

In summary, the technology repertoire available to service system entities depended on the preferences and existing technical infrastructure of the service customer. However, the existence of a particular type of ICT did not automatically result in its availability to the service providers. Similarly, service providers could not introduce new and potentially superior types of ICT, but were constrained by the preferences of the service customer, resulting in a static technology repertoire. Figure 4.7 exemplifies this situation.

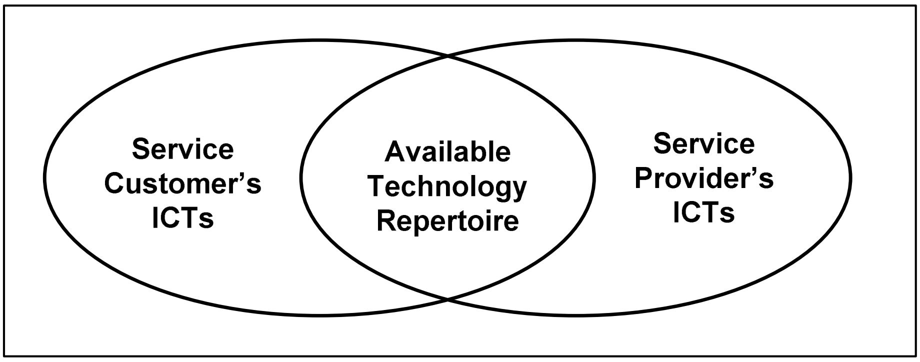

Figure 4.7: The Available Technology Repertoire

4.4.3 Factors Influencing Technology Choices of Service System Entities

While section 4.4.1.1 provided insights into the factors that motivate the adoption of technology-enabled value co-creation processes and Section 4.4.1.2 discussed how the technology-repertoire was assembled in the cases investigated, this section provides insight into the factors that influenced the decision of individual service system entities to choose, or not choose, the various types of ICT available to them.

Extrinsic factors, *the task* at hand, as well as *intrinsic factors* influenced individual service system entities to choose between the various types of ICT that were available to them from the technology repertoire within their respective service systems. It is important to initially understand how these factors influence a service system entity when choosing technologies, because these decisions influence the overall ability of the service system to effectively and efficiently exchange resources, and hence, co-create value. Technology choices thereby represent an antecedent for the emergence of connective gaps, and are hence important in the context of RQ 2 and 3 of this study. Table 4.8 presents an overview of the distribution of these factors across all cases.

FACTORS INFLUENCING TECHNOLOGY CHOICES		CASES			
		CASE A: *IT-Strategy*	**CASE B:** *Asset Management*	**CASE C:** *UNCLOS NZ*	**CASE D:** *Hedge-Accounting*
Extrinsic Factors	*Accessibility of Technology*	✓		✓	✓
	Group Size	✓	✓	✓	
	Time Zones		✓	✓	
The Task	*Urgency*	✓			✓
	Significance	✓	✓	✓	✓
	Ambiguity		✓		✓
Intrinsic Factors	*Preference for Rich ICTs*	✓	✓	✓	✓
	Group Familiarity	✓	✓	✓	✓

Table 4.8:Factors Influencing Technology Choices of Service System Entities

4.4.3.1 Extrinsic Factors

Extrinsic factors including the *accessibility of technology*, *group size* of the service system entities involved, as well as varying *time zones*, influenced the decision of an individual entity to choose, or not choose, a particular type of technology in order to interact and exchange resources with others.

Accessibility of Technology

As outlined in section 4.4.1.2, the technology repertoire defined the total amount of ICTs that were available to service providers and customers alike during the co-creation of the service target. However, the actual accessibility of these ICTs intended for the interaction was, in several instances, restricted. For example, cost-saving pressures in Case A affected the ability of the employees in AlphaNet to use the telephone, which was initially defined as part of the technology-repertoire, and directly call their consultants in Germany. While service system entities therefore had to find alternative, though often less suitable means to interact with each other, one-on-one phone calls in Case A were subsequently uncommon, and the interaction between individual consultants and AlphaNet employees was dominated by the use of emails instead:

> Use more phone calls! But that costs more money than emails. And costs are a sensitive topic here [....] Calling abroad is something that nowadays should be avoided. *Team Member 2 SC (Case A)*

Even though AlphaNet had advanced videoconferencing (Halo) sites as part of their technology repertoire, this technology could only be utilised twice throughout the entire project. The Halo rooms were constantly occupied by the senior management and had to be booked several months in advance. This challenging condition inhibited the ability of the entities within that service system to interact through this type of technology:

> The Halo meetings are really booked, they are very popular now. And it is very difficult, so you have to book several months in advance. *Team Member 1 SC (Case A)*

Group size

The total group size of all service system entities involved in the co-creation of the service target had an equally strong impact on an individual's decision to choose certain types of communication technology over other alternatives. For example, participants criticised that the telephone could only be used to disseminate information to one other entity at a time. Hence, whenever information had to be disseminated to a larger group, utilising the telephone was considered insufficient:

> One reason why I didn't use the phone more, we were a team of so many people involved, so it wasn't often just a question of speaking to one person. You often needed to make sure that things were communicated to everyone. And if I picked up the phone to call one person, all I was doing was pushing the burden to one person, making sure that the other people found out. *Team Member 4 SC (Case C)*

Time Zones

Different time zones between service system entities meant that some technologies were less suitable for an effective interaction than others. One participant in Case C preferred email over the telephone or teleconferences, because emails were not constrained by the time difference between Japan and New Zealand. However, varying time zones were not necessarily considered as a negative factor because they enabled service system entities to work across time-zones:

> The time-difference […] meant that for half of my working day, no one was in the office in [City in New Zealand]. So email was more effective. It meant that I could work throughout my working day, write messages, and they would then be there for people to read if they got into the office in the morning, whereas if we would rely on the phone only, we would just have a couple of hours each day. *Team Member 4 SC (Case C)*

Finally, the common pattern that emerged throughout the cross case analysis is that extrinsic factors influenced the decision of service system entities to choose between the relatively rich one-on-one telephone call and leaner emails when interacting with others. Extrinsic factors therefore impact the level of richness of ICTs that entities choose within the context of their service systems.

4.4.3.2 The Task

The *urgency*, *significance*, and *ambiguity* of the task to be performed also influenced technology choices of service system entities.

Urgency

Task urgency meant that service system entities decided to utilise a richer (i.e. telephone) type of communication technology rather than email as the default medium. Especially participants in Cases A and D reported that their tasks were frequently characterised through urgency, and related this to the high degree of task interdependence when co-creating intangible service targets. Especially in Case A, an urgent task was commonly accepted as the only reason to utilise the telephone, despite the fact that its usage was discouraged:

> Practically, email is always the preferred method [....] Unless the topic is urgent, then we are using the telephone. *Team Member 1 SC (Case A)*

Significance

Throughout all cases, participants preferred emails over any interpersonal technologies such as telephone, whenever the results of the interaction were considered significant enough to be documented. Also, emails were perceived as an anonymous mean to convey such significant, yet unfavourable messages, and enabled the messenger to avoid direct contact with others:

> Whenever it is something uncomfortable, bad news, people use different communication channels, compared to when things are just fine. It is easy and anonymous to send an email to a list and write 'you have to save that much next year, 'instead of sitting in a meeting [teleconference] and talking to everyone directly. *Project Manager SP (Case A)*

Ambiguity

Ambiguous tasks resulted in the decision to choose richer ICTs, and to avoid email as the default technology. Decision making in ambiguous circumstances was considered easier and faster through more direct (i.e. telephone) means, compared to written interactions via email.

> Some things that are very specific can be solved in writing, or decided in writing, but the complex, the more esoteric [ones], the less certain the perimeters around the decision you are making are, you probably get to a point where you make that decision personally. Be it over the phone, or video conferencing, or at a meeting. I think uncertainty is probably a good indicator. Well, whenever you have lots of different perimeters around a decision. *Senior Manager SP (Case B)*

Finally, task-related factors also influenced service system entities to choose between the relatively rich one-on-one telephone call and lean emails when interacting with others. Task related factors therefore also impact the level of richness of ICTs that entities choose within the context of their service systems.

4.4.3.3 Intrinsic Factors

Intrinsic factors including *preference for rich ICTs*, as well as the degree of *familiarity* with other entities equally influenced technology choices within service systems.

Preference for Rich ICTs

The impact of an individual's preferences regarding richer types of ICT wit were recognised by participants from both service provider and customer firms throughout all cases. Personal preferences particularly influenced the decision to utilise the telephone for a one-on-one interaction with others, instead of relying on email as the default alternative. This factor was considered to be inherently ingrained into the personality of an individual:

> Some folks have a hard time calling, and others don't, but prefer to write an email. It depends on the individual. *Project Manager SC (Case D)*

Overall, two types of personalities existed. The *visual types* dislike communication technologies such as telephones and teleconferences which rely on voice-based interactions only. These individuals prefer interpersonal face-to-face interactions or video conferencing, since it enables them to perceive the body-language of their partners, which they consider crucial:

> I am more of a visual person than 'audiotive.' I don't like that much, just speaking on the phone. If I can't see the person, what he is doing with his hands, and what are the gestures and posture are. *Team Member 1 SC (Case A)*

The *auditory type*s however, were individuals that are not only comfortable with voice-based interactions, but actually preferred those over emails or other types of technology, including videoconferencing:

> Personally, I am someone who prefers calling. *Consultant 3 (Case A)*

> I am already so used to voice conferences [....] Halo was different. Maybe you have to get used to it. It was a little bit strange to see someone from the other part of the world sitting right beside you. *Team Member 2 SC (Case A)*

Group Familiarity

Finally, an increased sense of familiarity and social ties amongst service system entities resulted in an increased ability and willingness to choose a richer and direct type of technology (i.e. telephone) over default emails when interacting with each other. One participant explained that familiarity increased the confidence of one's own abilities when interacting with others:

> The person I did speak to by phone was actually [Jane] from [GammaMinistry], and that was because […] I knew her much better than I knew everyone else, so I had a lot more confidence in my ability to speak with her on the phone. *Team Member 4 SC (Case C)*

Conversely, and throughout all cases, participants from both service provider and customer firms expressed an inherent urge to avoid calling others which were unfamiliar in order to avoid the direct contact:

> You should probably call people more often, but then you end up sending an email instead, because you just dislike the direct contact. *Consultant 1 (Case A)*

In summary, the various factors influencing technology choices of service system entities all have an impact on the richness of the types of technology chosen. Table 4.9 provides an overview:

OUTCOME OF AN ENTITIES TECHNOLOGY CHOICES	EXTRINSIC FACTORS			THE TASK			INTRINSIC FACTORS	
	Accessibility of Technology (constrained)	*Group Size (large)*	*Time Zones (different)*	*Urgency (high)*	*Significance (high)*	*Ambiguity (high)*	*Preference for Rich ICTs*	*Group Familiarity (high)*
Preference for Richer Technology (i.e. 'Telephone')				✓		✓	✓	✓
Preference for Leaner Technology (i.e. 'Email')	✓	✓	✓		✓			

Table 4.9: Summary of Factors Influencing Technology Choices

4.4.4 Practices of Technology Use

Several practices of technology use by individual service system entities were identified throughout the cases of this study. The *proactive practices* include *impression management*, *safeguarding*, and *technology misuse*. Similarly, *fulfilling expectations* and the *inability to disconnect* represent *reactive practices* of technology use. Like the factors influencing individual technology choice, it is important to understand these practices since they influenced the overall ability of the service system to effectively and efficiently exchange resources, and hence, co-create value. Table 4.10 provides an overview across all cases.

PRACTICES OF TECHNOLOY USE		CASES			
		CASE A: *IT-Strategy*	***CASE B:*** *Asset Management*	***CASE C:*** *UNCLOS NZ*	***CASE D:*** *Hedge-Accounting*
Proactive Practices	*Impression Management*	✓	✓		
	Safeguarding	✓	✓		✓
	Media Misuse	✓	✓		✓
Reactive Practices	*Fulfilling Expectations*	✓	✓		✓
	Inability to Disconnect	✓	✓	✓	

Table 4.10: Practices of Technology Use of Service System Entities

4.4.4.1 Proactive Practices

Proactive practices of technology use are behavioural patterns that service system entities display when utilising ICTs. These include impression management, safeguarding and media misuse.

Impression Management

Impression management could be observed as a behavioural pattern used by individual service system entities that attempted to increase their status amongst their peers. This practice of technology usage involved sending emails during the weekend or to include all other entities as recipients for every email sent:

> **Participant:** Not every email should be sent to everyone, as a common rule. But not everyone is applying that one.
> **Interviewer:** Why do people do that?
> **Participant:** Good question. Maybe their topic is so important that everyone must know what they are doing. I think it also has to do with personal motives, like getting the status. *Team Member 2 SC (Case A)*

While impression management was particularly visible in Case A, participants in other cases were equally familiar with it. For example, the senior manager in Case B linked this behaviour to the availability of mobile emails via ‘BlackBerry’ phones:

> And a lot of people use their BlackBerries to say ‘look I am working on 4pm on Sunday afternoon, did you notice that’. *Senior Manager SP (Case B)*

Impression management increased the overall volume of emails for all service system entities within Case A, but also enlarged the group size during teleconferences. Especially employees of AlphaNet participated in a variety of teleconferences in order to be perceived as 'visible' and involved in the STP project. One consultant outlined that the number of attendees had continuously increased over time, even though these individuals could not contribute to the discussions and were largely passive. Instead, attending teleconferences was seen as a mean to avoid operational tasks, while managing one's own status within AlphaNet:

> **Participant:** They [AlphaNet] always have so many people in those meetings [teleconferences]. Some attend, and it doesn't make any sense for them to be there. But they are online anyway.
> **Interviewer:** And why is that?
> **Participant:** Because being in a meeting and surfing the Internet or whatever means they are visible. And that is more fun than to do real work. *Consultant 1 (Case A)*

Safeguarding

Like the practice of impression management, safeguarding implied sending emails to multiple recipients, even though these emails were not directly relevant for all recipients. The practice of technology use equally increased the total volume of emails for all entities in the service system and was seen as a way to document the interaction between individuals. Safeguarding was particularly common in Cases A and D but, though to a lesser extent, also visible in Case B. Participants explained that safeguarding, as well as impression management, was common in times of increasing project demands, for example, whenever operational challenges emerged and ingrained into the personality of individual entities:

> **Participant:** The volume of emails increases whenever problems arise. I think it has to do with documenting things, like 'I sent you this email, and you knew what was going on.' And you do it by using the [email] distribution list, so that everybody else knows what is happening [....]
> **Interviewer:** Could you give me an example please?
> **Participant:** For example, some colleagues might say 'no, can't do something, I don't have time', this is when people copy their manager on the email [....] It always happens whenever there is a lot of pressure; and the larger the project, the higher the volume of

> these types of emails [...] and there are always people in the project who just don't want to work, or are unable to perform their tasks. *Team Member 1 SC (Case D)*

Safeguarding did typically not result in a solution to the problems it initially attempted to solve. In Case A for instance, the situation was similar to the one described by Team Member 1 in Case D, and individual entities utilised safeguarding as a practice when attempting to influence others to perform allocated tasks. The recipients of these safeguarding emails had previously not completed their assigned tasks, and claimed that they were unaware of these. However, over time, the volume of emails within the system had increased to a point where safeguarding emails were ignored, and tasks were, once again, not completed.

> There are situations where people say 'I wasn't aware of this [task]' and this will then cause more work. […] And people think that by sending the email to everyone, this problem solves itself. But it is not true in our case, because people are then not reading those emails [anymore]. *Team Member 2 SC (Case A)*

Finally, safeguarding was also perceived as a practice of technology use rooted in a lack of familiarity and social ties amongst the service system entities. Here, lacking understanding of the roles and tasks of other service system entities, or even laziness, resulted in individuals sending emails to the entire project team:

> It takes effort to sort through who you're going to send it [email] to, it's quicker and it's easier to 'cc', just in case. That would be one reason. I guess the other reason is, if you don't have a clear understanding of what the other team members' roles are in the project, then you 'cc' them, just in case. *Consultant 4 (Case B)*

Media Misuse

Individual actions such as handling errors and the utilisation of technology in a fashion for which it was not intended to, can be summarised as media misuse. Participants in Cases A, B and D reported that this behaviour was detrimental to the overall performance of the service system, because it inhibited the effective and efficient exchange of resources. A variety of examples for media misuse emerged; yet, within the cases investigated, this practice of technology use was constantly related to service customers, and never service providers. Just like safeguarding, media misuse was particularly common in Case A and D, but also evident in Case B. For instance, during a visit to Finland, one consultant observed that some employees of AlphaNet distracted themselves during teleconferences by surfing the internet:

> They [AlphaNet employees] don't pay attention and surf on websites of some Finnish newspapers, or EBay or YouTube, and don't really listen to what's going on. *Consultant 1 (Case A)*

The same participant further criticised that interactions via teleconferences were often challenging because some individuals utilised their telephones in a fashion which disturbed others. Walking through hallways, or participating in teleconferences while driving created a background noise which made it difficult for others to follow the presentation:

> Sometimes the voice-quality is really bad, because with 60 participants, there is always someone that is not on 'mute' while walking through a hallway. And then you hear the feet on the ground 'tak-tak-tak'. Or they are outside and you hear the wind, or you hear the car while they are driving [....] And this is why it is so important that the people always mute the microphone in order to avoid this. But then again, they forget to 'un-mute', so really, everybody needs to learn and stick to these rules. *Consultant 1 (Case A)*

Similarly, another consultant of AlphaTech Consulting explained how some participants misuse the chat function and video cameras in *WebEx*, the GCT used to support teleconferences in Case A, and thereby disturb the entire group:

> The chat function is good, but it's often embarrassing when people sent their messages to all participants, which happens in every meeting. But I think the video-function is problematic, because what happens is that people usually just play with the camera, and it doesn't add any value. *Consultant 3 (Case A)*

In summary, the proactive practices of technology use are typically driven by factors such as operational challenges or a lack of social ties within service system entities. They are actions by individual service system entities that affect the entire service system, for example by increasing the total volume of emails, or the number of participants in a teleconference. Proactive practices of technology use are therefore relevant for RQ 2 which addresses the emergence of connective gaps. This relationship will be further discussed in section 5.4.

4.4.4.2 Reactive Practices

Reactive practices of technology use are behavioural patterns of individual service system entities when utilising ICTs, which are driven by norms and expectations within the service system. They include fulfilling expectations, as well as the inability to disconnect.

Fulfilling Expectations

Communication expectations within the service system had a major impact on the practices of technology use of individual service system entities. The need to fulfil communication expectations was typically driven by social norms defined by the respective service customers. Here, service customers expected immediate responses to emails which put a considerable pressure to respond quickly on the service providers, and consequently influenced how emails were utilised:

> When I write an email, I expect a response the same day [....] That is important to me. *Team Member 2 SC (Case D)*

> People now expect responses almost immediately for an email, as opposed to when email fist came out, people were happy hearing from you within a day or a couple of days. But now, if they don't get a response, they'll call you shortly after. *Project Manager 2 SP (Case B)*

Communication expectations nevertheless were dependent on individual service system entities. The project manager in Case A described the communication expectations and the resulting implications on individual consultants that AlphaTech Consulting faced particularly well:

> They [AlphaNet] expect really fast responses, like immediately. Or at least within the next 2 hours. And if you get an email at 10pm in the evening, well then you need to answer it that same day. I remember […] one of the senior managers used to write his emails from 10pm until 12pm, and he expected a response then and there. And if you didn’t [respond] you got into trouble. *Project Manager SP (Case A)*

Inability to Disconnect

Participants in Cases A, B and C complained about the constant distractions and interruptions throughout their working days which constrained these individuals from performing their tasks effectively:

> My days are like this: you are in a meeting [teleconference], or actually, you are in several meetings each day. And then you get a call, which means you have to leave the room. After that, you respond to an email, use the chat- all at the same time. So obviously what happens is that you can't focus on the task, on the meeting anymore. *Consultant 1 (Case A)*

The *ability to disconnect* from any communication technologies was perceived as the only mean to effectively complete tasks. Consequently, disconnecting increased the productivity of an individual service system entity, and helped them to overcome the challenges they faced. The consultants in Case A relied on their weekly "home-office day" to perform complex tasks, or waited until the majority of the AlphaNet employees had left. One project manager in Case B used the evenings at home to work:

> If I could have chunks of time or could just focus on work, it would be easier for me to get it all done [....] It's just that the distractions in the daytime are incredible: the staff coming to you, and the clients calling, and the e-mails coming through. I get e-mails from staff, from clients, from the management up above [....] What ends up happening is that my focus time is at home, in the evening [....] That's when it's finally quiet, no one's calling me at ten o'clock at night, that's when I can sit down and put in some of my best focused effort. *Project Manager 2 SP (Case B)*

Participants also realised that, as a practice of technology usage, disconnecting was not only difficult, but oftentimes impossible to achieve. This *inability to disconnect* was perceived as being rooted in the *individual's habits* and an *individual's control* over the actual technology-enabled interactions with other service system entities. An individual's habit and control however, were both influenced by social norms and expectations within their organisation and/or group. For example, both service customers and providers agreed that an individual's ability to disconnect consequently requires a significant amount of strength:

> Everybody has to decide that [disconnect] for themselves, and it depends if they are strong enough. *Project Manager SP (Case A)*

> It's great if you can say ‚I'll go outside for a walk' at 2pm, and then you connect to a conference with your mobile, but keeping the balance, […] that is not a question of technology, but a question of individual habit. *Senior Manager SC (Case A)*

Since all cases investigated represented environments where continuous connectedness ICT is theoretically possible, the only mean to control this inflow of information lies with the individual who needs to make the conscious decision to disconnect, though often does not have the ability to do so:

> A lot of us as individuals have an inability to switch off. This is probably the best way to put it. And the technology these days make it hard to switch off. So if you have got a BlackBerry and its operating 24 hours a day, then you know what's going on; including weekends. And the only ability to switch off is your ability not to pick that thing up and read it. And therefore it comes down to an individual and their decisions that they make, and the control that they have. *Senior Manager SP (Case B)*

As the senior manager in Case B pointed out, the *level of control* which an individual service system entity possesses over their technology usage is crucial for their ability to disconnect. While service customers generally had more control over their technology usage and interactions than service providers, the rank in the organisational hierarchy of an individual influenced their ability to control their technology usage. This can be exemplified by focussing on the ability of an individual employee of AlphaTech Consulting to ignore incoming emails on their BlackBerry device. In general, consultants and project managers never switched their BlackBerry devices off and responded to incoming emails and requests even during the weekends. Furthermore, this is significant because AlphaTech Consulting's guidelines stated that employees were not expected to respond to emails on the weekend, but had to keep their devices only on 'standby', a demand justified with technical arguments:

> **Participant:** I can turn it [BlackBerry] on standby, and I think this means that people can call me, but I don't see emails anymore.
> **Interviewer:** And do you do it?
> **Participant:** No, never. It's always on. *Consultant 1 (Case A)*

Similarly, the project manager explained that his BlackBerry was always on, and that it was common practice within AlphaTech Consulting. He also pointed out, that while it was his own decision to respond to incoming emails during the weekend or evening, he felt under pressure to respond at all times:

> Of course, you could switch it off with this button here […] but I never do it. Mine is always on, I think everybody here [at AlphaTech Consulting] keeps it that way. It is up to me […] if I respond to an email [....] But it is difficult because this flashing red light puts a certain pressure on you. *Project Manager SP (Case A)*

The senior manager of AlphaTech Consulting however, as well as senior managers in other cases, frequently disconnected. Senior managers argued that their ability to allocate tasks to other employees implied that they could switch off, and that others could function as an intermediary and interact with the customer in their place. Furthermore, since being disconnected did not result in any negative consequences for the senior managers, these individuals willingly accepted that delays were a result of being disconnected:

> It is a lot easier for me [to disconnect] because I have several people I can ask to do things. I have the project manager and if he is unavailable, then I go and talk to a consultant, and so on. And if I am in a workshop and unavailable or whatever, so be it. It's not the end of the world [...] and if it means that we have a two hour delay, then that is ok, too. *Senior Manager SP (Case A)*

The senior manager in Case D also explained that he consciously disconnected in order to perform tasks which required his undivided attention:

> There is a point when I consciously switch off, because I cannot work otherwise [....] I think it is about 20 to 40% of my work time, because if I want to read something, then I cannot talk on the phone. And this is why I switch this thing [BlackBerry] off. *Senior Manager SP (Case D)*

While individual entities with a higher hierarchical standing found it easier to disconnect, exceptions exist. The senior manager in case C experienced an inherent urge to be connected and to be available. Consequently, this participant was the only senior manager who diverged from this group of participants, and used his BlackBerry to email during the weekend:

> I do feel I need to be available. I'm actually much better at switching off than I previously have been, but I will still, even on the weekend, I tend to do a quick scan of emails and voice mail messages. And I will not necessarily immediately get back, but I will if there is a priority issue with a key client, they will get a response. *Senior Manager SP (Case C)*

Proactive and reactive practices of technology use influence the effectiveness and efficiency of the resource exchange, and thereby value co-creation processes in service systems. However, they should not be viewed separately, but in combination when addressing the emergence and consequences of connective gaps on service systems through RQ 2 and 3. While Chapter 5 will discuss these practices in more detail, the following section outlines the impact that these practices of technology use have on service systems.

4.4.5 Impact of Practices of Technology Use on Service Systems

The practices of technology usage influenced the ability of service systems to effectively and efficiently exchange resources. This understanding is important because the effects are directly related to the impact of connective gaps on service system, and therefore relevant for RQ 3. Table 4.11 provides an overview.

IMPACT OF PRACTICES OF TECHNOLOGY USE		CASES			
		CASE A: *IT-Strategy Planning*	***CASE B:*** *Asset Management*	***CASE C:*** *UNCLOS New Zealand*	***CASE D:*** *Hedge-Accounting*
Service System Entity	*Performance Impairment*	✓	✓		✓
	Weakened Social Ties	✓	✓		✓
Exchange Processes	*Interrupted Exchange Process*	✓	✓		✓
	Lacking Access to Resources	✓	✓		✓
Service Target	*Delays*	✓	✓		✓
	Increased Costs	✓			✓

Table 4.11: Impact of Practices of Technology Use on Service Systems

4.4.5.1 Impact on Service System Entities

Performance Impairment

Proactive and reactive practices of technology use had an impact on the ability of service system entities to perform their assigned roles and associated tasks whenever these practices occurred. Participants in Cases A, B and D related the combination of proactive and reactive practices of technology use to frequent *distractions* resulting from the increasing volume of emails, increasingly large group sizes during teleconferences, as well as the *constant level of connectedness* that participants experienced.

Frequent *distractions* through emails resulted in the interruption of tasks and ultimately, in the inability to perform these. While the proactive practices of technology use like impression management and safeguarding increased the volume of emails, the reactive practices simultaneously increased the relative inability of an individual to control this exceedingly distracting inflow of information. Consequently, participants explained that their ability to focus and perform their roles in an uninterrupted fashion was limited. For example, the particularly high communication expectations in Case A caused employees of AlphaNet to often interrupt their current tasks when new emails arrived. One participant argued that the existing communication expectations, combined with his inability to disconnect, resulted in interruptions during the day and his inability to perform the tasks associated with his role:

> Emails pop up which are marked as highly important, so you really need to read them right away, well I have the habit of reading them right away, when they are marked highly important. And this is causing some interruptions, when you are trying to concentrate on something else [....] I think it is a common habit here, because if you don’t check them, you get a real backlog of emails, and again you get distressed because of not following your email. *Team Member 2 SC (Case A)*

Similarly, one participant in Case B outlined how communication expectations from service customers could impact on the career progression of consultants, which further reinforced the pressure on these individuals to be constantly connected:

> In her performance review, it came up that if her Blackberry had been on, she would have been able to respond more quickly and her client would not have been upset [....] So they [management] were sort of indicating that she should have had her Blackberry on, but that's actually a faux-pas, not to have your Blackberry on. *Project Manager 2 SP (Case B)*

Constant connectedness implied that service system entities were typically unable to perform their regular tasks. However, while constant connectedness was commonly perceived to have a negative impact on an individual’s operational performance, participants also agreed upon that this condition was typically bound to temporal phases such as upcoming deadlines or events. Monthly hedge accounting processes in Case D, submission deadlines for the UNCLOS and IAMF reports, or the so called monthly “cluster review” meetings in case A, represented such phases of constant connectedness. Here, immediate responsibilities resulted in an individual’s inability to perform the regular operational tasks associated with their role. Just like AlphaNet’s senior manager who linked the increased risk for social isolation to particularly intense project phases, a consultant in Case A explained that the need to attend teleconferences resulted in his inability to act as a performer during the “cluster review” phase:

> There as phases where you have to attend all those meetings [teleconferences], just to know what’s going on. But you still have all the tasks that you need to finish as well. So, yes, there are certainly phases where I say ’I am stuck in meetings all day long, and don’t know how to do my tasks’. It gets pushed back. But it depends; there are other days where you don’t have that. *Consultant 2 (Case A)*

Weakened Social Ties

Participants in case A reported that the increasing intensity of technology-enabled exchange processes that culminated in the proactive and reactive practices of technology use imposed the threat of social isolation, the lack of trust and familiarity amongst all entities, and ultimately, weakened social ties. For example, participants reported that the interaction and information they received was perceived as too formal whenever safeguarding or impression management were prevalent, and this resulted in a feeling of social exclusion:

> I only received information out of the status report, so that was only formal communication. And I didn’t know what was happening in [AlphaTech Consulting] during the project, so I felt a bit left out of the project. *Team Member 1 SC (Case A)*

As outlined previously, operational challenges resulted in an increase in the proactive practices of technology use, but also reduced the frequency of interactions amongst service system entities. The impact of such subsequent infrequent interactions on the levels of trust between individual service system entities can be exemplified by focussing on Case B. As Section 4.3 outlined, the majority of the interaction between service provider and customer entities was here channelled through the conductor and governor roles. Consequently, any interactions between experts and quality controllers occurred by means of technology and no face-to-face contact whatsoever existed between these individuals. Ultimately, one expert described that the relationship to quality controllers lacked familiarity and trust, due to the infrequent interactions:

> Maybe once every 2 weeks we were having a phone call and that was it. So we got to know the voices and the names, but beyond that you did not know them at all. And I would say the level of trust with those people was really low. *Consultant 2 (Case B)*

4.4.5.2 Impact on Resource Exchange Processes

Interrupted Exchange Process

The practices of technology use and choice had an impact on the service system entities; however, this ultimately constrained the flow of the exchange processes as well. For example, media misuse (see Section 4.4.3.1), or a mismatch between group size and chosen communication technology (see Section 4.4.2.1), were both perceived to interrupt the exchange processes. While the previous section already outlined how the increasing volume of emails distracted entities, other episodes of media misuse equally influenced the resource exchange processes. For example, the project manager in Case B reported how a chat tool he used for a limited time period was misused solely for interpersonal, rather than operational interactions, and therefore interrupted his workflow:

> Instant messaging was used for the social interaction [...] more than for business purposes. It was like, ‘where we do we want to go for lunch’ and ‘he feels like a smoke-meat sandwich,’ type thing. I found that to be interrupting of my productivity. *Project Manager SP (Case B)*

Interrupted exchange processes due to practices of technology use and choice were, once again, particularly visible in Case A. One employee of Alpha Net described that planning and arranging teleconferences, as well as technical challenges were particularly time consuming. Approximately 10% of the total pre-allocated time of the teleconference was utilised to initiate a functioning interaction amongst the participants:

> **Participant:** There is a lot of hassle with getting things moving in the first place, so arranging a meeting virtually, waiting for people to join, and then there are technical difficulties. So much more time is consumed by those topics [....]
>
> **Interviewer:** Okay, what happens when you meet virtually? What are the problems?

> **Participant:** Well, the first problem is of course the schedule. People are quite busy and we might wait for someone to join the meeting and are unaware of he or she is really going to join at all. And of course if you are dealing with technical meeting tools, sometimes people are having a hard time seeing or hearing each other via voice conference. So let's say it takes approx. 10% on average of a one hour meeting to set things up. *Team Member 2 SC (Case A)*

Ultimately, the interruptions of the exchange processes limited the access and exchange of the necessary quantity and quality of the resource information within the service system.

Lacking Access to Resources

Since teleconferences typically followed a predefined schedule, losing 10% of the allocated session time had implications to the overall ability of the service system entities in case A to interact effectively. After experiencing continuous difficulties while interacting via teleconferences, participants reported that they attempted to anticipate the loss of session time, and prioritised discussion points by allocating less relevant issues to the end of the meeting agenda. However, this practice ultimately resulted in an inability to perform tasks because these discussion points were frequently left out and not discussed amongst participants during the teleconferences:

> **Participant:** What we have done is that […] we are trying to save the unimportant topics, say to the end, but those are then quite often left out due to time constraints.
> **Interviewer:** So you need to structure the meeting in such a way, that you can get everything done, in case there is a technical gap?
> **Participant:** Well, that has become practice, so I think that wasn't originally planned, but as experience grows, the understanding on how things are developing here, this has become practice. *Team Member 2 SC (Case A)*

Lacking access to resources was also rooted in the technology choices, i.e. a mismatch between the chosen type of technology for an interaction and the group size. Conducting teleconferences with large groups resulted in disengaged and passive participants which ultimately led to a lack of information sharing amongst all participants in teleconferences. This pattern could be observed in Cases B and A, where impression management further increased the group size during teleconferences. However, only BetaStrategy Consulting acknowledged this problem, and redeemed it by reducing the self-inflicted large group size:

> [It was] one of the reasons that we went to the smaller groups, we did the big groups, but […] you're not going to get detailed feedback from everybody. It's easier to sit back and just let the other people talk, right? […] You can be present but not engaged, whereas we would do the smaller working groups, we'd actually get people to […] drill down in the specifics in the chapter. *Team Member 1 SC (Case B)*

4.4.5.3 Impact on Service Target

Delays

The practices of technology use influenced the performance of service system entities and the resource exchange processes which ultimately delayed the completion of the service target in Cases A and D:

> We received information a little bit later. It influenced the decision making in the project. *Team Member 1 SC (Case A)*

The lacking access to information meant that certain deliverables could not be completed in time. Participants explained that the delays of the service target were rooted in their inability to gain approval from senior managers in teleconferences, because these were interrupted by the previously discussed practices of technology use:

> We had to postpone the launch of some of the reporting structures and practices we created in the project, because we didn't have time to run these by the stakeholders of the project, who eventually had to approve the outcome. *Team Member 2 SC (Case A)*

Increased Costs

Section 4.3.3.3 outlined that the time of consultants represented the biggest cost-factor in the service systems investigated. For example, the senior manager in Case D described a situation where the lacking access to information implied that the consulting team was unable to complete its tasks which led to subsequent delays and, overall, increased the total costs for the service customer:

> I say 'I need the following information, can you deliver my dear customer?' and they say 'yes, sure we can,' […] and I tell them 'you know, without that information, we cannot continue!' and they say 'yes, we know that.' But then - nothing happens. So what can you do? We can't send the team home, and as you can imagine, this gets

> really expensive! What we do here costs the client easily €2,000 a day [...] for each consultant! So, when we have three consultants that cannot work for three days, it is really expensive, and they [service customer] just burned €12,000 [sic]. And they don’t find that funny anymore. *Senior Manager SP (Case D)*

Cost increases were not only rooted in the delayed access to the resource information, but also in the overall loss of efficiency of the co-creation process whenever proactive and reactive practices of technology use were prominent. For example, while the goal of AlphaNet was to reduce the cost of its IT division, the constant challenges affiliated with the practices of technology use and choice during the STP planning processes had a financial impact on the service target in this case:

> The work is not done efficiently and the results are not really good either. And in the end, for [AlphaNet], it means that they exceed their budget, because they didn’t plan and work efficiently. *Consultant 1 (Case A)*

Ultimately, the findings of this study indicate that proactive and reactive practices of technology use have an impact on service system entities, the exchange process and, ultimately, the service target and therefore on the process of value co-creation. While section 5.4 will discuss this issue further through the connectivity lens, the following section provides insight into technical problems and their impact on the resource exchange process.

4.4.6 Technical Problems Inhibiting Resource Exchange

The ICTs forming the technology repertoires were, overall, reliable and did typically not inhibit the effective exchange of resources. While technical problems were not seen as a major challenge in any case, participants in Case A explained that different technology infrastructures across countries can constrain the usability of certain types communication technology:

> Not all countries are on the same level of infrastructure like Finland and Germany are. So when we are talking to Asia Pacific or some place in Africa then the Softphone [AlphaNet’s internal VoIP System] is not an option, because their bandwidth is not sufficient. *Team Member 2 SC (Case A)*

The resulting *low quality* of technical connections could potentially inhibit participants from performing their roles and tasks. While low quality technical connections were an extremely rare occasion throughout all cases, low quality voice connections reportedly inhibited an individual's ability to perform their role in selected instances.

> The voice quality was really bad a few times, and then you can't have the meeting [teleconference]. It's like when one part of the group is somewhere else. It would be unfair if only those people that are together start discussing things and the others are left out. *Project Manager SP (Case A)*

Even though technical problems related to a lack of bandwidth did not exist in the context of Case C, participants here were the only ones to report a hindrance that was rooted in the communication technology itself, rather than an external technical factor. When attempting to send email attachments exceeding a particular size, participants were unable to complete this task, due to limitations:

> There was a limit on how many MB [Mega Byte] of attachments you can receive. So when you are dealing with a document with lots of scientific data attached, we often couldn't get it through email, because our system wouldn't let us. *Team Member 3 SC (Case C)*

While the technical problem experienced by participants in Case C was rooted in the relatively small technology repertoire, Alpha Net's senior manager argued that technical problems could easily be overcome by having one or several alternative technical solutions available during any interaction:

> We always have a backup solution, which means if one line doesn't work [teleconference connection], then we make sure that we have a second or third one available. And if that fails, we turn the speaker of our mobile phones on [....] Or if we are in a conference and the video is gone, then we share the slides via email, so if it is a really important meeting, then we are prepared and have them already in the email outbox. *Senior Manager SC (Case A)*

A relatively large technology repertoire was consequently sees as the solution to overcome and/or avoid interrupted co-creation processes. The following section summarises the findings related to the role of technology-enablement in service systems before section 4.5 discusses the role of relationships.

4.4.7 Summary of Findings

This section presented the results of the cross case analysis regarding technology-enablement in the service systems investigated. The section outlined the factors that motivate the shift towards technology-enabled value co-creation, the means by which the technology-repertoire used is determined, as well as the factors influencing individual service system entities to choose ICT with varying degrees of richness when interacting with others. Furthermore, the section identified and discussed the various proactive and reactive practices of technology-use, as well as their impact on service systems. Table 4.12 summarises the key findings of this section.

Technology-Enablement in Service Systems	*Physical distribution* between service system entities, *cost factors* and *legal implications* are the key factors motivating technology-enabled resource exchange in service systems. The *selection of technologies* enabling these processes is based upon the service customers' existing ICT infrastructure, and therefore constrained by the availability of the types of technology already used within the service customer's organisation.
Technology Choices of Service System Entities	*Extrinsic* and *intrinsic factors*, as well as the *task at hand* influence individual service system entities to choose particular types of technology when engaging in exchange processes. These selected types of technology vary in their richness.
Practices of Technology Use of Service System Entities	Both *reactive* and *proactive practices* of technology use exist in service systems. Proactive practices typically increase in the volume of emails and participants in teleconferences. Reactive practices are enforced by social norms such as communication expectations, and lead to a state of constant connectedness of individuals, who are more likely to experience an inability to disconnect if they lack control over their interactions or have the personal habit to seek constant connectedness.
Impact of Practices of Technology Use on Service Systems	Technology choices and practices of technology use influence the ability of service systems to effectively and efficiently exchange resources. The *inabilities to perform allocated roles, as well as weakened social ties, are* commonly experienced by service system entities. Subsequent *interruptions* and *lacking access to resources* during *the exchange processes* lead to *delays* and *cost increases* of the service target.

Table 4.12: Summary of Findings Regarding Technology-Enablement

4.5 Relationships in Service Systems

The literature review in Chapter 2 identified that understanding the role of relationships between service system entities is equally important as the need to understand the role of technology in service systems. This section presents the findings of the cross case analysis regarding relationships in service systems. It outlines the types of relationships identified, the means used to initiate and maintain these, as well as the barriers service system entities faced in the process. Finally, the section provides insight into the impact of functioning relationships between entities on service systems.

4.5.1 Types of Relationships between Service System Entities

Service providers and customers throughout all cases differentiated between *social* and *interpersonal working* relationships amongst themselves and others. *Social relationships* were defined as on-going relationships that exceed the boundaries of the interactions necessary for the co-creation of the service target, and occur on a personal level between two service system entities. They were consequently perceived to span into engagements beyond the workplace, including informal activities. For example, senior managers of consulting firms reported that they use social relationships with their peers from customer firms to secure future projects and contracts (see Section 4.2.4). Core team members and project managers of the service providers and customers however, did not experience or engage in any social relationships, and considered these irrelevant and non-existent within the context of their service systems:

> I'm reading social as after work engagement, whereas interpersonal is at work. […] I don't think I had any social interactions with the consultant team. I had interpersonal interactions, and I think those are critical to actually be able to talk to someone in a reasonable way, and be understood, and understand what they are trying to say [....] But I think that's distinct from 'let's go have a beer'. *Team Member 1 SC (Case B)*

> We didn't have any social relationships [....] We tend to be pretty professional. *Project Manager 1 SP (Case C)*

Interpersonal working relationships between the service providers and customers however were perceived as a key success factor for the co-creation of the service targets by participants throughout all cases. Described as "being on the same wave-length," a "collegial environment," or "professional rather than personal relationship," functioning interpersonal working relationships leading to a "connection beyond the project," were considered highly desirable by service customers and providers alike. However, these were, other than the social relationships, typically constrained to the duration of the actual co-creation of the service target, and did not exceed this boundary. Here, participants considered sharing personal details about themselves as a fundamental threshold leading to good interpersonal working relationships:

> It doesn't have to be social engagement like going to the pub or anything, but I think it's important to have a discussion that doesn't always start with 'how's the project going'. [Team Member 1], who is in the client's team, I know he has 2 young daughters, and so when I called and asked him 'how are your daughters' it's a personal connection that should last beyond the project, because if all you have a is project based connection, your connectivity dies the moment the project dies. *Technical Manager SP (Case B)*

> There was a lot of story-telling, friendly banter, 'what did you do in [Canadian province]? Where did you go?' You would run races, you'd talk about it. People talk about families [....] It was really a collegial environment. *Team Member 2 SC (Case B)*

Initiating and maintaining relationships however, represented key challenges that were constrained by a variety of barriers which the following section discusses.

4.5.2 Relationship Initiation

Participants throughout all cases agreed that interpersonal working relationships should ideally be initiated in a face-to-face setting. While these "initial ice breaking" or "kick-off" events were generally considered key success factors, they were not conducted within all cases investigated in this study. In Case A for example, such an event was not held but substituted with a Halo video conference. However, not all team members could participate here and after some consultants had changed throughout the project (see Section 4.5.2.1); using Halo rooms had become increasingly difficult within AlphaNet (see Section 4.4.2.1). Ultimately, this chain of events was perceived to result in a dysfunctional relationship between service customer and provider entities in Case A:

> What I would have done in the beginning is this kind of kick-off: that all persons get to see everyone else. It is much easier to work together then, having this kind of team feeling. It is good to know the other side. It is not just the voice on the telephone when you know the person. No personal attachment to that person. There were even feelings and discussions in Finland, that there was a kind of competition going on between the German and the Finnish side. That was not good. *Team Member 1 SC (Case A)*

All other cases however, had conducted an initial kick-off meeting involving all entities. These sessions were typically held early on, and aimed at initiating functioning working relationships through project related activities. Here, participants reported that these events strengthened social ties, for example by increasing the level of familiarity and trust amongst the group, as well as a mutual understanding of roles, project requirements, goals, and communication expectations:

> At the very beginning of the project we had a start-up team building session, I would call it, in [Canadian province], where we brought together all the team members. I'd say that was probably a big, big factor in the success of the project […] because a lot of these people were just meeting for the first time, and it was a good opportunity to put a face to the person, so that when you had subsequent conversations, be it email or telephone, you already had a relationship established.[…] It was also the purpose of the social gathering, because we had ample time to sit and talk about non project related things, and just get to know the people. *Consultant 3 (Case B)*

Both service providers and customers rated this approach to initiating interpersonal working relationships as highly beneficial:

> You have a chance to engage on a more personal level and you get a bit more insight into how the person works, how they think, how they react, I think you get more levels of trust when you are talking to somebody face to face, because a lot of barriers are effectively in place until you actually see somebody in person. *Consultant 2 (Case C)*

Participants also recognised that these events should be re-iterated in regular intervals throughout the project, in order to maintain these newly initiated relationships:

> I think you have to build and re build that trust through face to face communication every so often. […] you have to bring them back for various interactions, at least every 3 months and have another 1 or 2 day session with them. *Consultant 2 (Case B)*

However, while some interpersonal interactions occurred (see Section 4.3.3.2), none of the cases actually arranged such a subsequent face to face session involving all entities. Managing interpersonal working relationships was considered a separate activity from their initiation, and will be discussed in the subsequent section.

4.5.3 Managing Relationships between Service System Entities

4.5.3.1 Relationship Barriers

Several barriers constraining the initiation and management of relationships between individual service system entities could be identified. Table 4.13 presents an overview.

RELATIONSHIP BARRIERS		CASES			
		CASE A: *IT-Strategy Planning*	***CASE B:*** *Asset Management*	***CASE C:*** *UNCLOS New Zealand*	***CASE D:*** *Hedge-Accounting*
Temporal Barriers	*Time*	✓	✓	✓	✓
	Semantic Gap	✓		✓	✓
Extrinsic Barriers	*System Configuration*	✓			✓
	Procurement Issues	✓	✓	✓	✓
	Operational Challenges	✓			✓
Intrinsic Barriers	*Biased Perception*	✓	✓		✓
	Technology Choices	✓	✓		✓

Table 4.13: Relationship Barriers Across Cases

Three main types of relationship barriers could be identified. Temporal barriers include a time-lag, extrinsic barriers originate within the wider service system, and intrinsic barriers are entirely dependent on the individual service system entities.

Time

Participants across all cases agreed that initiating interpersonal working relationships between service providers and customers was constrained by the factor time. Relationship building was perceived as something that cannot be forced, but evolves over time. Hence, relationships were initially limited to exchanges related to the co-creation of the service target:

> With a new consultant, you don't have anything in common but the project, the task. And there is no other exchange. That comes with time. *Project Manager SC (Case D)*

As the project evolved, service customers and providers typically became more familiar with each other, resulting in an improved working relationship and mutual understanding:

> I think the relationship evolves, and I think we developed more respect and understanding for each other as we went through the process. And your comfort level with dealing with them [BetaStrategy Consulting], it expands, things were going well on the project, we were happy with the way it was developing. So, as you go along, I think your relationship is more trusting with them. And you get a better sense of the knowledge and expertise that they're bringing to the table. So, I think that we had probably a better relationship at the end than we had at the beginning because, I think, that takes time to develop. *Team Member 1 SC (Case B)*

Semantic Gap

The ability of service system entities to effectively interact and initiate interpersonal working relationships was, in Cases A, C and D, constrained by semantic gaps that were rooted in the different types of *operational* and *organisational* languages. Here, operational language refers to the terminology required for performing tasks during the co-creation of the service target. Organisational language however, included abbreviations, jargon, or terms used specifically in the organisational context of the service customers. While service providers attempted to adapt the terminology of their customers, varying organisational languages represented a great challenge:

> You have to distinguish between two levels. The first one is operational. You need to have that expertise in order to understand the language. I remember when I started at [DeltaTech Associates], I didn't have a finance background, so it really felt like I had to learn a foreign language! And the second level describes the reality at your client. You could do the same type of project with two different clients, and you'll see that they speak a completely different language. *Project Manager SP (Case D)*

> IOPNT, IS Head, ITM, IS Clusters, ISOD, F&C – nobody can understand that at first. *Consultant 1 (Case A)*

One's ability to adapt to varying operational and organisational languages was considered a major challenge when attempting to initiate relationships by the participants in Cases A, C and D. Similarly, service customers equally explained that their inability to understand service providers left them feel disconnected and isolated on an interpersonal level:

> I am not a scientist, I am a project manager. This was a very technical project, and on a social level sometimes, that could leave me behind if they [GSC] talk 'fill-off filters' and 'peptesulphides'. *Senior Manager SC (Case C)*

System Configuration

The configuration of the service system represented another barrier when attempting to initiate interpersonal working relationships. Here, the influencing factors included the *group size* of the involved entities, as well as their *degree of continuity* of these entities in the service system. Overall, participants preferred interactions in small groups which they considered to be more efficient, responsive, adaptable to changes, and effective when interacting with by means of communication technology. While participants in Case A criticised the large numbers of participants in teleconferences (see Section 4.4.3.1), participants in Cases B and C specifically linked their conductor-led interactions (see Section 4.3.1.2) in small groups to the success of their projects, and their ability to foster mutual relationships:

> It is the personal interaction that is quite important, and that's perhaps tied in with having smaller groups. *Consultant 2 (Case C)*

> It was that reasonably small group of people […] that helped, I think, to foster a team atmosphere that then carried through for a much longer time. *Team Member 3 SC (Case C)*

The lacking *degree of continuity* of service provider entities in Cases A and D however, was criticised by the respective service customers. Several consultants of AlphaTech Consulting and DeltaTech Associates changed during the earlier phases of these projects, resulting in the loss of knowledge that these individuals had accumulated:

> There were at least two or three persons changing during these [first] five months, I found that not very comfortable that people were changing from the [AlphaTech Consulting] side. [Fritz] was working on that subject for more than one year when I joined the department, and he left three months later, […] so I lost the information and experience from more than one year. *Team Member 1 SC (Case A)*

On the contrary, participants in Cases B and C argued that specifically the degree of continuity amongst service providers and customers helped to initiate, and ultimately maintain interpersonal working relationships in their projects:

> The same people worked on it in [GSC], so there was this continuity. And then we had reasonable continuity in other organisations as well, so you had time to build up the relationship. *Team Member 3 SC (Case C)*

Procurement Issues

Procurement issues faced by service customers throughout all cases were a key factor that led to the strict differentiation between social and interpersonal relationships. Especially the service customers in Cases B and C had strict implications imposed on them, meaning they could not accept invitations to meals or any other informal activities outside of the workplace which service providers preferred to use when attempting to initiate relationships before the technology-enabled interaction commenced:

> It's not really part of the culture of the government folks and the reason for that is a procurement reason [....] They don't get too cosy or comfortable with the consultants or it would be seen by others as not independent, and I understand that. It makes social relationships, going out to dinner and wining and dining, and doing that kind of stuff pretty difficult with the government client. It's forbidden on their part really. I mean, they actually have a rule that says they cannot get a gift of more than $25, so you pretty much can't even take them to lunch. *Project Manager SP (Case B)*

Operational Challenges

After the pressure to reduce the IT expenditure of AlphaNet increased, solving this operational goal became a priority. However, this implied that neither the employees of AlphaNet, nor the consultants of AlphaTech Consulting attempted to actively engage in initiating, maintaining or developing relationships anymore:

Participant: [Alpha Net] currently has many challenges, at least in the cost side, but people are concentrating more on putting those fires down, and not really having the time to improve the social side of the organisation [....] I think what has happened when the problems arose, is that the isolation between Germany and Finland has increased. So we are more interacting with people in Helsinki here, maybe even more tightly than before, and the German team [AlphaTech Consulting] is concentrating on the topics on their table amongst themselves. And I think the interaction between these two different locations has to some extent decreased [....]

Interviewer: Could you give me an example? Were things different a few months earlier?

Participant: Yes, well I would say that a couple of months ago we still had weekly meetings [teleconferences][....] But now, since we have so many urgent topics to deal with, people are not attending those meetings [teleconferences] at all. Or they are cancelled due to more important topics. And therefore the connection is getting looser and looser over time. *Team Member 2 SC (Case A)*

As Team Member 2 in Alpha Net reported, frequent interactions between service system entities were seen as a key success factor when maintaining and developing interpersonal working relationships. However, operational challenges constrained the ability of individual service system entities to frequently interact, and hence manage their interpersonal working relationship.

Biased Perception

The mutual perception between service providers and customers varied considerably in Cases A, B and D, and ultimately had an impact on their ability to initiate interpersonal working relationships. Service providers perceived customers typically as outsiders to their team that fulfil the necessary function as a source of information:

We are the [AlphaTech Consulting] team working for the client. And I consider this to be my team, first and foremost. *Consultant 2 (Case A)*

We were the team, the service team, and then there was the client. *Project Manager 2 SP (Case B)*

Only Case C was an exception. Here, the consultants from GSC described their customers positively, and rated their overall relationship highly:

> We had a fantastic relationship with both clients. *Project Manager SP (Case C)*

The perception that service customers in Cases A, B and D had of their service providers however, did not mirror the image previously expressed by the consultants. A clear mismatch was evident, with consultants being perceived as partners with equal status that were not only part of the service customer's team, but even viewed as friends and partners:

> We do see them [DeltaTech Associates] as partners, and it's not like they come in, do the software, and then 'that's it and bye'. *Project Manager SC (Case D)*

While these diverging perceptions were deeply ingrained in Cases A, B and D, service providers nevertheless recognised that their perception of customers made it difficult to initiate and maintain interpersonal working relationships:

> Your client is always your client [....] They're not exactly the same as staff or employees or whatever, and you have to respect that, understand where the boundaries are, and where you need to maintain that professionalism. In a way, that gets in the way of creating the social side of things […], of building real social bonds. *Project Manager 1 SP (Case B)*

Technology Choices

Managing interpersonal working relationships between service system entities in technology-enabled settings provided to be particularly challenging in Case A. Since no relationships had been initiated amongst all participants in the beginning of the project, and since some consultants had subsequently changed, making the right *technology choices* when interacting with others was considered vital for the successful management of working relationships. Richer types of technology like telephones provided the opportunity for one-on-one interactions, and subsequently the opportunity for informal exchanges that could foster such a relationship. Therefore, when attempting to manage an interpersonal working relationship with others, participants recognised that the telephone was more appropriate than emails or teleconferences, which typically involved a larger group (see Section 4.3.3.1). However, as outlined in Section 4.4.2.1, the employees of AlphaNet were restricted in their ability to use the telephone due to cost saving measures. Consequently, the attempt to maintain and develop the relationships was driven by AlphaTech Consulting:

> A teleconference has the same character like all other speaker situations: one guy is talking, and the others are listening. So you can't talk about the weather with everyone! [...] it is just like when you go to a party, and you meet a new group of people. After 30 seconds, everyone starts talking to each other, and you don't talk to the group: 'How are you guys? You? - You? - You? - Vacation? - Vacation? - Vacation?' this is why I think that if you want to socialise, you have to use the telephone. *Consultant 3 (Case A)*

In conclusion, temporal, intrinsic and extrinsic relationship barriers represented key challenges when attempting to initiate and manage interpersonal working relationships within the service systems investigated. However, the findings also indicate that the characteristics of individual service system entities, as well as the exchange process itself were key factors for successful relationship management beyond the barriers identified. Consequently, the following section will discuss these findings in more detail.

4.5.3.2 Relationship Management

The *personality* and *responsiveness* of a service system entity, as well as the *transparency* and *frequency* of the exchange process were, throughout all cases, the crucial factors that helped to manage interpersonal working relationships:

MANAGING RELATIONSHIPS		CASES			
		CASE A: *IT-Strategy Planning*	***CASE B:*** *Asset Management*	***CASE C:*** *UNCLOS New Zealand*	***CASE D:*** *Hedge-Accounting*
Service System Entity	*Personality of Individual*	✓	✓	✓	✓
	Responsiveness of Individual	✓	✓	✓	✓
Exchange Process	*Frequency of Interactions*	✓	✓	✓	✓
	Transparency of Interactions	✓	✓	✓	✓

Table 4.14: Factors Influencing Relationship Management

Several participants described a link between "trust and actions," where one could only develop and manage a functioning interpersonal working relationship over time, if one's actions and the exchange process itself were perceived as responsive, transparent, and if the personalities of the interacting entities aligned:

> You can't build a trust relationship […] over a couple of weeks. It does take […] some time, because […] it needs to be followed up by demonstration. So you've got to match words to actions. *Team Member 2 SC (Case C)*

Personality of Individual

All participants rated the personality of an individual service system entity as the most fundamental element aiding to the successful initiation, development and management of working relationships, and subsequent effective resource exchange processes. Personality was commonly understood to incorporate the *emotional intelligence* of an individual, as well as the degree of *professionalism* displayed. Personality was perceived as such a critical element that both AlphaTech Consulting and DeltaTech Associates assembled their project teams based on the personality of their individual consultants:

> The personality of a consultant is just as important as his technical skills. And personality implies how they communicate, and this doesn't include the operational elements, but how someone interacts with others. You know, some people like to sit in their room all day, and then maybe present results. And others really like to be on stage and drive the communication forward. And we use this criterion when we choose consultants and their roles in projects [....] I think it is important for every project, to choose the right personality of consultants. *Senior Manager SP (Case A)*

An individual's *emotional intelligence* was perceived as being related to one's personal strengths and weaknesses, and therefore influencing an entity's ability to interact with others, or to maintain and develop relationships:

> Emotional intelligence is something that we are starting to work on as an organisation as well. So, understanding what people's individual strengths and weaknesses are [....] Our really good projects, the project managers, and in fact the project team, listen well and interact well with their clients. The really bad projects, they assume that they know everything, they don't listen to the client, they don't try to understand what the client wants, they deliver what they think the client wants - which is often not what they really want - and then the client gets something that they weren't expecting, and it all goes to shit! *Senior Manager SP (Case B)*

An individual entities' emotional intelligence and its impact on the flow of the technology-enabled value co-creation process were prevalent and commented on by participants in all service systems. For example, in case C, a communication style that was perceived as "constructive" in terms of word-choice, friendliness and openness, made it easier for service providers and customers to interact and co-create the UNCLOS report:

> The way we treated each other was quite important in terms of the tone of our communication [....] The way that you write your email saying 'thank you for the draft, looking really good, my concerns are this'. It is that communication that sounds friendly and open, and I think that we are all, by default, through personality or training, but we all communicated in that more constructive manner, and that was really important I think. If our style was more abrupt, or more dogmatic, it would have been harder. *Team Member 3 SC (Case C)*

Empathetic technology-enabled interactions in case A meant that consultants had the strong incentive to "make the client look good." This resulted, for example, in publicly associating the consulting team's achievements with AlphaNet's project manager instead. The consultants were also conscious to never criticise members of AlphaNet's core team during public interactions such as teleconferences, and fostered compromises. Especially task performers often had to negotiate with enablers, in order to receive the information necessary for the completion of their role. However, the employees of AlphaNet, performing the enabler role often felt overburdened with those requests, but, by showing empathy in one-on-one telephone conversations, the team of AlphaTech Consulting managed to maintain the working relationship with these service customers:

> It is important that you always suggest a compromise when you want something from them. When they call you and say 'no, I can't do it. You guys are asking for too much' and you tell them 'I know, it's really bad, but maybe you can at least do this and that', then it leaves them feeling ok. They are less frustrated. *Consultant 3 (Case A)*

Finally, emotional intelligence included the ability to develop and manage interpersonal relationships though technology-enabled interactions. This highly rated skill relied on showing interest in others, and by engaging on an interpersonal level beyond the task. For example, consultants asked service customers questions when talking on the telephone (see Section 4.5.1), and provided them with a feeling of being a recognised and valued individual:

> Every human wants to be taken seriously and needs self-confidence. And you can give it to them by asking questions about themselves. Like, 'what do you do...oh great, really'? We want to be understood, be recognised, and be taken seriously [....] Recognition is a basic human need. So, how do I give that to someone? By asking questions and showing some interest […] 'how is your family, what are your hobbies? Oh, great, you ran a marathon – I am impressed! And you went to a rock concert? How was that?' If they can talk about themselves, if someone is listening, it means: I am interested in you! And this is the same as recognition. And I think this is something that you can do a lot better through personality than through the job [....] The job is always work and rational. But this is how we are as humans; we don't want to be rational all the time. It's the same for me. If somebody listens when I talk about my hobbies and says 'oh that's all great', then I am happy, too. *Senior Manager SP (Case D)*

The personality of an individual service system entity also encompassed the degree of *professionalism* displayed. Professionalism, as demonstrated by service providers, was perceived as particular important by service customers, who related it to improved relationships and the success of their projects. Professionalism incorporated, on the most rudimentary level, the technical skills that consultants possessed in order to perform their tasks. Furthermore, a perceived sense of "dedication for the project," having one's "heart and soul" in the project, and the desire to "support one's service customer," were comments made by service customers who explained how the professionalism displayed by their providers influenced relationships within the context of the service systems. Service customers in case B for example, valued the type of feedback that they received from BetaStrategy Consulting when making suggestions regarding the IAMF as particular positive:

> Their [BetaStrategy Consulting] approach to the work, they are professional, and they don't get mad at you if you suggest a change to the document, or they say 'that's helpful,' and 'thank you,' and they'll make that change. *Team Member 1 SC (Case B)*

Participants also acknowledged that professionalism and the professional personality of all service system entities mattered more than sympathy for another individual:

> There is an obligation on both sides to behave professionally. And that should be more important, than whether you think they [GSC] are a nice person. *Team Member 3 SC (Case C)*

Responsiveness of Individual

While personality was related to an individual's behaviour beyond the task and role performed, *responsiveness* however, described that entities' behaviour while performing the actual tasks associated with its role. Individuals were perceived as responsive when they reliably and consistently performed allocated tasks, or meet schedules and expectations regarding outcomes. Consequently, by "doing what you said you would," responsive individuals were perceived as trustworthy, and this behaviour aided improved interpersonal working relationships and thereby strengthened social ties between entities:

> I think responsiveness, that's one way to gain trust. You know that someone is reliable and that you can trust them [....] I have to say responsiveness is at the top of the list, assuming technical competence is a given. And responsiveness to just communication, whether it's email, or telephone, or whatever it is. You're submitting things as required; you're meeting your schedule for deliverables. *Project Manager 2 SP (Case B)*

Transparency of Interactions

Across all cases, both service providers and customers outlined that the transparency of the interaction within the service system influenced the overall relationship and could strengthen social ties between entities. The transparency of interactions was also referred to as a "no surprises environment" and seen as a major factor leading to the success of projects.

> Our clients assume that there is a certain core component of the engineering that is a given. You are expected to do that. This is the service that you provide. The difference comes in the way that you deal with your client: the way that you interact with them; the way that you share information; the way that you operate in "no surprises" environments so that they know what's going on. *Senior Manager SP (Case B)*

Transparency was typically contingent on the behaviour of the facilitators and conductors who coordination of the co-creation process. For example, BetaStrategy Consulting increased the transparency of their interactions with Beta Ministry by defining communication expectations regarding the ICT interactions upfront during the face-to-face initiation workshop (see Section 4.5.2.2):

> You build trust through action! How you work with people, a shared understanding of ethics and a common approach. So, for example […], in our communications protocol

> at the beginning of the project, we said, 'here's how we're going to communicate. Here's what we're going to do if we have issues, this is how we'll resolve them.' These are kinds of things that you can build in at the front end of a project to gain that trust, so everybody knows what's going to happen because you've discussed it and agreed to it in advance. *Project Manager SP (Case B)*

Maintaining a high level of transparency *during* the co-creation process however, was considered equally important to those actions taken *before* any interactions between service providers and customers commenced. Here, an approach of "openness" ensured that customers were aware of challenges that arose during projects, thereby further adding to the "no surprises environment" that typically aided to the maintenance and development of functioning interpersonal working relationships:

> I'm pretty open with a client, if I run into a problem, or something's not going our way that we didn't anticipate, I will try and advice the client as early as possible [....] Even if it's not good information, I'd rather 'let's get it out in the open. Let's discuss it and let's solve it together'. *Project Manager SP (Case B)*

Frequency of Interactions

Finally, frequent interactions between individual service system entities were perceived as the prerequisite when managing interpersonal working relationships. While participants recognised regular face-to-face interactions assist in the management of newly initiated relationships, only AlphaTech Consulting attempted to meet the team of AlphaNet at their premises in the later project phases. Nevertheless, frequent technology enabled interactions (see Section 4.3.3.1) were seen as sufficient substitutes if the other factors of personality, responsiveness and transparency were in place:

> It's more frequent communication […] not necessarily personal […] it doesn't have to be golf, or lunch, or dinner, but it does have to be frequent updating. *Project Manager 2 SP (Case B)*

> Keeping regularly in contact [....], especially when you have a lot of international people in the virtual team, talking about personal things makes you feel not so isolated. *Project Manager SC (Case A)*

4.5.4 Impact of Relationship Management on Service Systems

Table 4.15 outlines the impact that *functioning relationships* had on service system entities, the exchange process and, subsequently, on the service target.

IMPACT OF RELATIONSHIP MANAGEMENT ON SERVICE SYSTEMS		CASES			
		CASE A: IT-Strategy Planning	**CASE B:** Asset Management	**CASE C:** UNCLOS New Zealand	**CASE D:** Hedge-Accounting
Service System Entity	*Strengthened Social Ties*	✓	✓	✓	✓
	Improved Understanding of Roles		✓	✓	✓
	Increased Commitment		✓	✓	
	Increasingly Efficient Technology Choices	✓		✓	✓
	Increasingly Efficient Technology Usage	✓	✓	✓	✓
Exchange Processes	*Improved Access to Information*	✓	✓	✓	
	Reduced Need for Frequent Interactions		✓	✓	
Service Target	*Avoiding Delays and Cost Increases*	✓			✓

Table 4.15: Impact of Relationship Management on Service Systems

4.5.4.1 Impact on Service System Entities

Functioning interpersonal working relationships had a direct and positive impact on individual service system entities. Here, the benefits include improved and strengthened social ties amongst entities, an improved understanding of roles, as well as an increased commitment to the service targets. Furthermore, and most importantly in the context of the service systems investigated, functioning interpersonal working relationships increased the efficiency of an individual's technology choices and usage which helped to overcome the challenges affiliated with the practices of technology use in the service systems investigated in this study (see Section 4.4.4).

Improved Social Ties

Participants in all cases explained that functioning interpersonal working relationships between service providers and customers improved social ties by reinforcing and increasing the sense of familiarity and trust amongst them. Any type of interpersonal meeting allowed individuals to familiarise themselves with the personalities of others. Especially understanding the standing of others within the hierarchy of their organisations, the extent of their networks, or perceived ability to perform tasks, were factors that could only be understand during interpersonal interactions. Furthermore, a sense of belonging and "team spirit" was also associated with strengthened social ties:

> That [initial kick off] is one of those things about making them feel like they were really part of the team and they weren't just sitting in, you know, Australia or somewhere, writing something that may or may not ever appear in the final report. *Technical Manager SP (Case B)*

Most importantly, this sense of familiarity and trust was a prerequisite for effective and efficient technology-enabled interactions and resource exchange in the service systems:

> I think you can trust someone better if you know them, so if there is some ambiguity in the communication or there is a delay for some reason you tend to assume that it's for a good reason, rather than because they're being unreliable or were not trustworthy or something like that. *Team Member 3 SC (Case C)*

Improved Understanding of Roles

Functioning interpersonal working relationships resulted in an improved understanding of the roles that individual entities within the service system performed. Participants in Cases B, C and D, where a face-to-face kick off meeting had occurred, reported that their understanding of the roles of others, as well as project goals had drastically improved after interpersonal working relationships with others had been established. Furthermore, understanding the roles of others was also linked to avoiding safeguarding as a practice of technology use:

> One reason for why the team worked well was that there was a clear sense among all the organisations that everyone knew what they were supposed to do. If you brought that clear sense to a distributed team, I think that would help if everybody knew what their role was and what the expectations were, so that people didn't need to spend much time working that out. *Team Member 4 SC (Case C)*

Furthermore, one consultant of AssetConsult compared the IAMF project to other projects where initial kick off meetings did not occur, and that subsequently performed worse:

> There's been a lot of projects that I've worked on where the study team really hasn't had the chance to have a good discussion on the proposal and what you're planning to do, so you're starting off without a common understanding of how the project is going to be, so that face to face meeting was good. *Consultant 4 (Case B)*

Increased Commitment

Service Providers and customers in Cases B and C linked their functioning interpersonal working relationships to an increased commitment of the consultants. The intrinsic motivation displayed by consultants was related to the degree of professionalism (see Section 4.5.3.2), and therefore further strengthened the social ties within these service systems. Consultants reportedly increased their efforts whenever they felt valued, which subsequently increased their personal enjoyment while working. Consequently, participants perceived it as beneficial to maintain and develop interpersonal working relationships:

> If the client is completely disengaged, you deliver exactly what you were asked to deliver and you don't really bother about delivering anything special, because you don't feel valued and think 'what the hell am I wasting my time for'. Then, once you see the client is actually interested and excited about the work, you naturally try and perform better anyway. [...] You naturally work harder for someone that you like. And the more we got to know the client, the more that feeling build, and the more we pushed on to deliver more. *Technical Manager SP (Case B)*

> If you actually like people, then they like you. You can get a lot more work done, easier, or you sometimes get extra work you have not paid for [....]. It is a natural human thing. They want to please. Whereas if I had a straight contractual relationship, I would just got what I asked for. *Senior Manager SC (Case C)*

Increasingly Efficient Technology Choices

Participants in Cases A, C and D reported that their willingness to choose richer types of communication technology, as well as their ability to utilise these increased as a result of established and functioning interpersonal working relationships with others. Specifically, participants were more likely to choose richer ICTs (i.e. the telephone) and call their peers, than to rely on Leaner alternatives (i.e. emails) as the default technology instead (see also Section 4.4.3):

> I think it is really important to get to know all the people […], to really build that personal contact [....] Then you know whom you're working with, and you're more willing to call them, instead of just sending an email. And then things get sorted out a lot faster. *Consultant 1 (Case A)*

> Once we've got the personal relationship, it becomes much easier to use these remote communication methods. It becomes easier to pick up a phone. *Senior Manager SC (Case C)*

Furthermore, the telephone was considered to be the only suitable and accessible mean when attempting to develop interpersonal working relationships with others (see Section 4.5.3.1). Within the context of the service systems investigated, only the telephone enabled two entities to informally share personal information about them directly, which was considered to be a fundamental threshold when attempting to initiate interpersonal working relationships (see Section 4.5.1).

> It's not only the job anymore, but you're joking. Even on the phone. This has somehow gotten a lot easier after regular personal meetings. *Team Member 1 SC (Case D)*

Participants also reported that they experienced a reduced need for richer types of technology after interpersonal working relationships had been established. For example, one consultant in case A reported that an increased sense of familiarity between himself and the employees of AlphaNet eventually meant that they had become more comfortable using teleconferences, and did not require video conferencing anymore, thereby overcoming the problems associated with the accessibility of technology (see Section 4.4.2.1), but it also enabled them to overcome technical problems when these occurred:

> If you know the team, you don't need to book that Halo room with the video conference anymore. You have to go there, there is only one room, and it's difficult to book anyway. But when everyone knows each other, and knows how meetings are structured, and what is important for the others - then you don't need the video conference anymore. *Consultant 2 (Case A)*

Ultimately, functioning interpersonal working relationships enabled individuals to choose richer types of communication technology, but also to utilise technology more efficiently.

Increasingly Efficient Technology Usage

Participants in all cases reported that functioning interpersonal working relationships increased the efficiency of all technology-enabled interactions and ultimately led to a more effective and efficient exchange of the key resource information:

> Meeting people face-to-face drastically improves the ability to then communicate with them by other methods, for example by telephone or by email. And I think it’s just because humans are more comfortable with the familiar than the unfamiliar. *Team Member 3 SC (Case C)*

Strong social ties amongst participants decreased the need for formality during technology-enabled interactions. Especially interactions via email benefited from a reduced need for formality, because participants were able to use informal language, resulting in shorter and more concise emails:

> I think some of the language we used over email was very informal [....] I don't think that would have worked in a more formal setting where you didn't have those trust relationships. *Team Member 2 SC (Case C)*

As the formality of emails decreased, the efficiency of these technology-enabled interactions increased. Participants reported that while an abbreviated communication style was preferable, conventions such as the biased perception between service provider and customer (see Section 4.5.2.1) oftentimes resulted in a more formal email style. However, as interpersonal relationships developed, the need for formality reduced:

> It often can take longer to write this sort of courtesy email, than it can to write the ‘yes, got it’ kind of email. And so you are losing a bit of efficiency by trying to rely on that [formal emails], rather than creating opportunities for the actual relationship to develop. So that you can move to a slightly more shorthand and more relaxed style of communication [....] You can say things differently to your family or maybe close friends, than you can to someone that you don’t know. It is that sort of situation, isn’t it? The more you know someone, and the more you know how they work, the easier it is to communicate with them, and the less time you need spent thinking, ‘how are they going to read this email that I am writing to them’. Because you already know how they read it. *Team Member 4 SC (Case C)*

4.5.4.2 Impact on Resource Exchange Processes

Functioning interpersonal working relationships between service providers and customers were also seen to directly and positively impact the resource exchange process. The benefits include improved access to information, as well as a reduced need for interactions.

Improved Access to Information

Established interpersonal working relationships and the resulting strengthened social ties meant that service customers were more open and trusting with their consultants, and could share even sensitive information, thereby overcoming the inability to share information (see Section 4.3.2.2):

> On the personal level, the level of trust needs to be achieved before sensitive information can be exchanged. *Team Member 2 SC (Case A)*

Additionally, service customers were also willing to offer additional information that exceeded the quantity of information requested. One employee of Beta Ministry described how his interpersonal relationship with an employee of AssetConsult aided to his willingness to share additional insights, whereas a lack of trust would have resulted in a more distant behaviour:

> I wouldn't give you a fuller picture. I'll be like, ‘okay, let's just stick to these key points’, […] and not give anything that might provide you extra insight. You ask ‘what is’, I'll be like ‘this is this’. I wouldn't tell you, ‘Oh, but it's brought from here, and this is how we got here.’ *Team Member 2 SC (Case B)*

As one consultant of AlphaTech Consulting explained, fostering interpersonal working relationships was especially important with enablers who had to frequently prioritise their own workload, and consequently did not always supply the required information back to the consultants. However, maintaining functioning relationships with these individuals could improve the ability to access required input information:

> Personal relationships with these people [enabler] are really important. Not just ’oh yeah, he knows what he’s doing’, but rather ‘he is nice’ [....] they have a lot to do, and if they like you, then your priority with them is higher. *Consultant 3 (Case A)*

Reduced Need for Frequent Interactions

The service providers in Cases B and C reported that strong social ties resulting from adequately managed interpersonal working relationships with their customers increased their ability to interact in a more flexible and independent fashion. Only after a trusting relationship was established were service customers willing to “let go.” However, service providers considered the ability to perform their roles in a somewhat independent fashion as beneficial, because it enabled them to reduce the frequency of interactions, as well as the level of technology-dependence.

> I think if […] your client trusts you, you don't have to bring everything to them. They say ‘ok, we need this done, I know you do good work’, and ‘we don't talk every week, if you just could send me a progress report every two weeks that would be fine’. *Consultant 4 (Case B)*

4.5.4.3 Impact on Service Target

The positive influence that functioning interpersonal working relationships had on service system entities and resource exchange processes, consequently impacted the service target.

Avoiding Delays and Cost Increases

Functioning interpersonal working relationships were able to offset the practices of technology use and choices that resulted in interruptions, delays and subsequent cost increases of the service targets. For example, when one participant in Case D described how the kick off meeting with DeltaTech Associates aided to the performance of the hedge-accounting project, he compared it to another one which he participated in. Here, the absence of such an event resulted in a lacking understanding of the project goals, as well as in a lacking understanding of the various roles that entities performed here. Hence, the participant explained that this particular project experienced significant delays and was completed over

> There was no real coordination amongst us as the [DeltaFinance] team. And perhaps that’s because the goals weren’t that clear. Basically, we couldn’t stick to the schedule and it was delayed by one or two months. And obviously that increased the costs of the project. Also, it was not clear who was responsible for what. So, three of us ended up doing the same thing. *Project Manager SC (Case D)*

4.5.5 Summary of Findings

Table 4.13 summarises the key findings of this section regarding the role of relationships for resource exchange in the service systems investigated in this study.

Types of Relationships	Social and interpersonal working relationships can exist between service system entities. Social relationships are long-lasting connections between two entities that span beyond the co-creation of the service target. However, here, they were considered irrelevant and non-existent. Interpersonal working relationships occur between two entities and are limited to the duration of the co-creation of the service target.
Initiating Relationships	When interpersonal working relationships are initiated in a face-to-face scenario, social ties including the level of familiarity and trust amongst service system entities, as well as their understanding of roles, project requirements and communication expectations, increases.
Relationship Barriers	The biased perception of service system entities, semantic gaps, system configuration, procurement issues and time represent barriers that constrain the ability of service system entities to initiate relationships. Technology choices of service system entities and operational challenges regarding the service target inhibit the ability to manage interpersonal working relationships with others due to infrequent exchanges that are limited to operational tasks.
Relationship Management	Interpersonal working relationships have to be managed after their initiation. Frequent interactions, the personality and responsiveness of an individual, as well as the transparency of interactions are crucial here.
Impact of Relationships	Functioning interpersonal working relationships improve the ability of service systems to effectively and efficiently exchange resources. Specifically, service system entities experience strengthened social ties, an improved understanding of roles, an increased commitment to the service target, as well as increasingly efficient technology choices and usage. This improves the access to information and reduces the need for frequent interactions. Indirectly, functioning relationships help to avoid delays and increased costs.

Table 4.16: Summary of Findings Regarding Relationship in Service Systems

4.6 Chapter Summary

This chapter presented the results of the cross-case analysis that was based on the empirical findings resulting from this multiple-case study. First, the chapter provided an overview of the contextual background of every case investigated. Consequently, each service system was discussed by focussing on the service provider, service customer and service target. Furthermore, the various service targets were classified into intangible processes and tangible outputs, and insights provided into the incentives for hiring consulting firms.

The chapter subsequently discussed the results of the cross case analysis regarding the technology-enabled value co-creation processes in the service systems investigated. These results were presented by focussing on the identified roles performed by service system entities (who?), the resource exchanged (what?), and the processes of this interaction (how?) between the entities. Furthermore, the implications of time constraints on these processes were outlined.

The results of the cross case analysis regarding the role of technology-enablement were presented by focussing on the drivers of technology-enablement, the means by which the technology-repertoire is determined, as well as the possible problems affiliated with technology-enablement. Furthermore, the chapter outlined the factors that influence individual service system entities to choose ICTs with varying degrees of richness, and discussed the various proactive and reactive practices of technology-use, as well as their impact on service systems.

Finally, the chapter also addressed the role of relationships in service systems. Specifically, the study distinguished two types of relationships that can exist between service system entities, identified relationship barriers and means to initiate relationships, and ultimately outlined how relationships are managed in a technology-enabled environment within service systems set in the context of the consulting industry. Ultimately, the chapter described the impact of relationships on service systems, and argued that functioning interpersonal working relationships represent the antidote when attempting to overcome the challenges affiliated with the proactive and reactive practices of technology use.

5. DISCUSSION

5.1 Chapter Introduction

Chapter 5 discusses the findings, develops subsequent theory, and addresses the research objective. According to Eisenhardt (1989), theory building requires the initial comparison of findings with the existing literature to identify similarities and contradictions. Consequently, the findings of this study are compared to the relevant literature presented in Chapter 2. Subsequently, this chapter proposes two models in Section 5.5 that address the research questions and objective. The first model describes the socio-technical context of value co-creation, and the second provides insights into into the antecedents, emergence and impact of connective gaps on service systems. It thereby addresses the question of whether or not technology-enablement influences the ability of a service system to co-create value. These models result from the inductive theory building process underlying this study (Colquitt & Zapata-Phelan, 2007). As suggested in the literature, these models consist of box-and-arrow figures with propositions indicating the relationships between constructs (Colquitt & Zapata-Phelan, 2007; Eisenhardt & Graebner, 2007; Whetten, 1989). Figure 5.1 outlines the structure of this chapter.

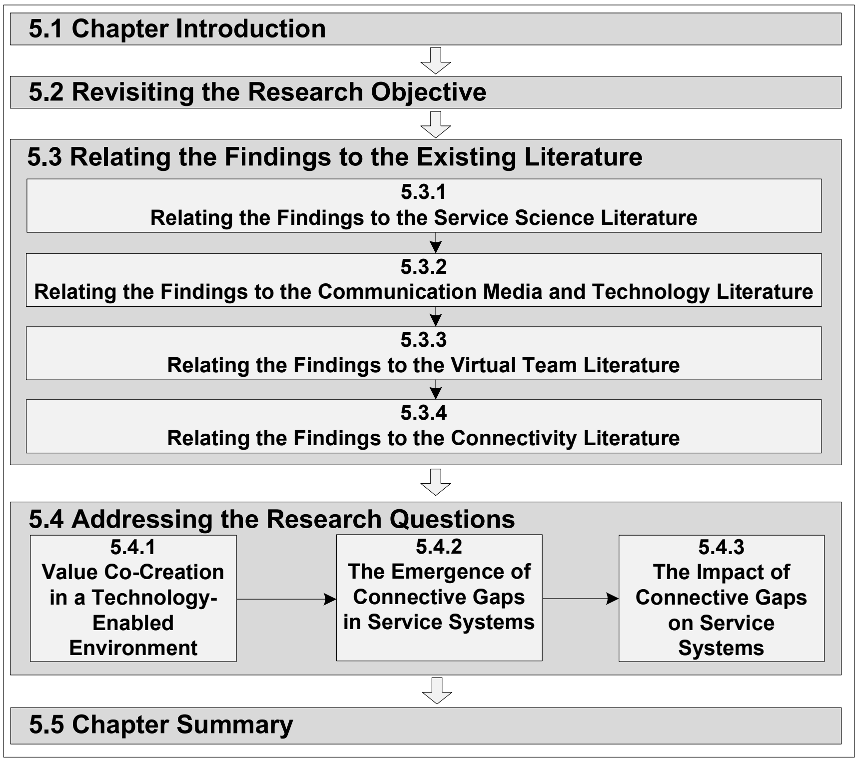

Figure 5.1: Structure of Chapter 5

5.2 Revisiting the Research Objective

As outlined in Chapter 2, the objective of this study is to investigate technology-enabled value co-creation processes in the context of the consulting industry through a connectivity lens. This study thereby attempts to empirically explore and describe the socio-technical context in which resources can be exchanged and value be co-created by means of ICT, as well as to understand the impact that technology-enablement may have on the ability of a service system to co-create value. The central research objective of this study was defined as:

> **To investigate technology-enabled value co-creation processes in the context of the consulting industry through a socio-technical connectivity lens and, by doing so, to understand how technology-enablement in a service system can impact its ability to co-create value.**

Four retrospective case studies were conducted within the consulting industry. Each case was represented through an entire service system consisting of one, or a combination of consulting firms (service provider), that engaged with one, or a combination of customer firms (service customer), in technology-enabled value co-creation processes of a service target. As recommended by Eisenhardt (1989) and Perry (1998), a set of research questions addressing the research objective were derived from the literature and guided the study:

1. **How do service systems exchange resources and co-create value by means of ICT?**
2. **How do connective gaps emerge in a service system?**
3. **How does the emergence of connective gaps impact the ability of a service system to co-create value?**

By focussing on the emergence and consequences of connective gaps on service systems, this study attempts to build theory which can help us to understand how technology-enablement can impact a service system's ability to co-create value. However, before the emerging theory can be presented, researchers should initially compare empirical results with a broad range of existing literature, and highlight similarities and contradictions (Eisenhardt, 1989; Eisenhardt & Graebner, 2007). This process "enhances the internal validity, generalizability, and theoretical level of theory building from case study research" (Eisenhardt, 1989, p. 545). Consequently, the following section discusses the findings of this study as presented in Chapter 4 with the existing literature. However, this study also addresses some previously unexplored areas, and these findings are not included into this initial comparison, but discussed in Section 5.4.

5.3 Relating the Findings to the Existing Literature

The literature review identified research gaps at the intersection of the SDL, service innovation and ICT, and connectivity (see Section 2.5). Consequently, this study is situated at the nexus of these bodies of literature, and the key findings are now related to the existing literature on the SDL, service innovation and ICT, here summarised as "service science" literature (Section 5.3.1), the field of communication media and technology (Section 5.3.2) and virtual team studies (Section 5.3.3), both of which were discussed in the context of the connectivity literature (Section 5.3.4).

5.3.1 Relating the Findings to the Service Science Literature

In order to describe the socio-technical context of value co-creation, Section 4.3 presented the findings of this study regarding technology-enabled value co-creation processes in the service systems investigated. By using the three core constructs of entity (who?), content (what?), and process (how?) (Anderson, et al., 1999; Füller, 2010), Section 4.3 provided insights into the roles of service providers and customers as co-creators of value (who?), outlined the role of the operant resource information (what?), and the challenges when attempting to access and exchange information, and provided insight into the technology-enabled and interpersonal exchange processes (how?).

With service defined as the "application of competences (knowledge and skills) for the benefit of another" (Vargo & Lusch, 2008a, p. 256) value co-creation, on the most rudimentary level, depends on the process of applying and exchanging specialised competencies (knowledge and skills) between service system entities (Vargo, et al., 2010). This study found that this exchange process differed depending on degrees of tangibility of the service targets. In Cases A and D the exchange of knowledge and skills was embedded into the *intangible processes* of financial IT planning and the continuous improvement of the hedge-accounting system, respectively. In Cases B and C however, the application of knowledge and skills was formally embedded into a *tangible output*, as represented through the UNCLOS report and IAMF document. It is important to outline that this differentiation does not challenge the understanding of service as represented through the SDL, but is rather consistent with the SDL where physical objects like goods - or reports - are considered "intermediate artefacts of specialization" (Vargo & Morgan, 2005, p. 51) that provide a transportation mechanism for service (Vargo & Lusch, 2004, 2006).

Throughout all cases, information was identified as the operant resource that was exchanged between service providers and customers. This finding is consistent with Mills and Marguiles (1980), Bettencourt, et al. (2002), and Xue and Field (2008), who argue that the resource information is crucial in a consulting context. However, the ability to access and exchange information in the sufficient quantity and quality required by service providers, emerged as a key challenge. This study revealed the existence of an inherent disparity regarding the availability of information between service providers and customers. Service customers had an informational advantage and service providers struggled, in certain instances, to gain access to that resource. In Cases A and B the struggle was particularly prevalent, and customers displayed an intrinsic unwillingness and inability to share relevant information with service providers. The customer's unwillingness to exchange relevant information with service providers stands in stark contrast to the argument brought forward by Vargo and Lusch that "all actors involved in an exchange are relational, and thus openly share relevant information, [or that] service systems promote the symmetric flow of information and communication" (2010, p. 150). However, it should be noted that the findings of this study regarding the customer's unwillingness and inability to exchange information with service providers do not indicate that the argument of open and unconstrained information exchange by the authors is invalid. For example, customers in Cases C and D explicitly indicated that their willingness and motivation to openly share information with service providers was a key success factor. Instead, this study supports Möller's theoretical argument that customers "might lack the willingness and ability to integrate themselves" (2008, p. 206) in the process of value co-creation. Möller subsequently argues that service firms "need to provide circumstances that enable different customers […] to perform as co-creators" (2008, p. 206). However, the idea of non-professional socialising as a sufficient means to enhance the willingness of customers to share resources with service providers, as suggested by Möller (2008), is not supported by the findings. Intrinsic and extrinsic relationship barriers, like the biased perception of customers by service providers or procurement issues, imply that non-professional socialising is not a viable mechanism to enhance the willingness of customers to share information with service providers. Instead, initiating and managing functioning interpersonal working relationships, rather than social relationships, ensures on-going access to information from customers and helps to overcome connective gaps.

This study also identified and described the four roles of task allocator, enabler, conductor and quality controller that were performed by service customers. The service provider roles of facilitator, performer, conductor and expert were also identified and, just like the customer roles, linked to the varying degrees of tangibility of each service target. In contrast to these findings, early work investigating the contribution of customers in service typically conceptualised the customer rather narrowly as partial employees (Mills, Chase, & Margulies, 1983; Mills & Morris, 1986), or differentiated between varying levels of participation (Bitner, Faranda, Hubbert, & Zeithaml, 1997). A more recent study by Bettencourt, et al. (2002) investigated the contribution of customers in knowledge intensive service provisions, whereby the authors adopted the perspective of service customers as partial employees, and argue that service customers perform roles similar to the employees of the service provider as long as role clarity, motivation and ability are given (Bettencourt, et al., 2002). However, the findings of this study indicate that the roles performed by service customers and providers *vary* in scope, yet are mutually dependent. For example, task allocators may allocate duties to performers; conversely, no service provider could exert that power over employees of the service customer. While the individual roles performed by service customers and providers differ, they form a symbiotic relationship, as indicated through their alignment on the proactive-reactive spectrum. Most importantly though, all tasks performed by service provider and customer as part of their roles either aid to the *facilitation* of resource exchange and co-creation (facilitator, governor, conductor), are *jointly performed* (task allocator, enabler, performer), or represent *independent activities* (quality controller, expert). This empirical insight into the roles and tasks performed by service providers and customers addresses the gap in the SDL oriented service innovation literature regarding the lack of understanding over the roles that customers and service providers as value co-creators perform (Edvardsson, et al., 2010; Grönross, 2011; Michel, et al., 2008; Payne, et al., 2008; Sebastiani & Paiola, 2010).

The need to understand the extent to which ICT induces changes to the value co-creation process was identified as another gap in the service science literature, and subsequently addressed in this study (Chen, et al., 2009; Edvardsson, et al., 2010; Froehle, 2006; Sebastiani & Paiola, 2010). Froehle (2006) argues that the types of ICT that service provider rely on to interact with their customers, as well as the extent of their usage, remain un-investigated. Throughout all cases, the findings clearly indicated that entities performing roles concerned with the joint or individual execution of tasks rely predominantly on email, and substitute these interactions with one-on-one telephone calls. On the contrary, all group interactions are predominantly conducted using teleconferences. This finding was somewhat surprising, given the argument that advanced ICTs like video conferencing make the need for physical contact between a service provider and customer, as a mediator for customer input, less relevant (Lee & Park, 2009; Maglio & Spohrer, 2008; Sampson & Froehle, 2006). While this study provides empirical support for the argument of reduced physical contact between service providers and customers in the context of the consulting industry, the findings also indicate that the shift towards technology-enabled interactions is driven by the physical distribution between service system entities, subsequent cost factors, and legal implications, and that interpersonal face-to-face exchanges were nevertheless surprisingly prevalent in all service systems investigated. However, it can be argued that the degree of ICT dependence of an individual entity depends on the role performed by that entity. Ultimately, interpersonal face-to-face interactions represented an exception to an otherwise entirely technology-mediated exchange processes. The following section discusses technology-enablement in service systems in more detail, and compares the respective findings with communication-media and technology studies.

5.3.2 Relating the Findings to the Communication Media and Technology Literature

Communication media and technology studies focus on the technical characteristics of ICTs, and the how these are chosen and used by individuals. While the applicability of this body of literature as an analytical lens in service research has been contested in Chapter 2, Eisenhardt (1989) argues that the literature used to compare empirical findings should be as broad as possible. Since the communication media and technology literature was initially discussed in the context of connectivity, the following section relates the findings of this study to these studies.

Investigating media choice, or “an individual’s decision to use a medium in a particular communication incident” (Trevino, et al., 2000, p. 163), is one way communication media and technology studies attempt to understand technology-enabled interactions. This study identified several extrinsic, task related, and individual factors that influence service system entities to choose a particular type of ICT when interacting with others. Extrinsic factors such as the limited availability of technology, group size, or different time zones resulted in the selection of leaner ICTs such as email, while urgent and ambiguous tasks implied that service system entities opted for richer ICTs, such as the telephone, instead. Whenever tasks were considered significant enough to be documented, leaner ICTs, and particularly email, were preferred. Similarly, intrinsic factors such as a high degree of familiarity between two entities resulted in the selection of richer ICTs, while personal habits had an indistinct impact here.

These findings are consistent with studies that relate the dependent variable media richness to the independent variable media choice. However, the findings of this study only partially support the rational choice model underlying this body of literature, which assumes that actors choose communication media after a coherent and unconstrained evaluation of the medium and task at hand, resulting in an optimal task-media fit (Arnott & Tan, 2001; Daft & Lengel, 1986; Dennis & Kinney, 1998; Newberry, 2001; Schmitz & Fulk, 1991). Instead, the findings indicate that rational media choice existed only in a few isolated instances, like in the case of task urgency or ambiguity. Participants unanimously described their tendency to avoid interactions using particularly rich ICTs like the telephone whenever they were unfamiliar with others and when social ties were weak. This behavior was prevalent, despite the fact that benefits affiliated with richer ICTs like the telephone over, for example, email as the then default option, were clearly understood. Further support for this behavior is provided by the related finding that functioning interpersonal relationships and strong social ties between individual entities resulted in an increased willingness to choose richer ICTs. The findings further indicate that frequent interactions between entities using richer types of ICT helped to maintain interpersonal working relationships which, in turn, ensured the service provider's access to the resource information. This behavior can be linked to social presence theory which argues that utilising richer media promotes the benefits of perceived closeness with others (Culnan & Markus, 1987; Schmidt, et al., 2001; Short, et al., 1979). Ultimately, while participants were able to rationalise the benefits of one type of ICT over another, extrinsic, intrinsic, and task related factors affected their media choices in ways that do not align with the optimal task-media fit model suggested by rational choice scholars.

The findings of this study do align, to a certain degree, with collective choice models who argue that media choice is influenced by social (Fulk, 1993; Fulk, et al., 1990; Kinney & Dennis, 1994; Riemer & Filius, 2009) and individual factors (King & Xia, 1997; Rice & Case, 1983; Trevino, et al., 2000). However, factors like the experience of an actor regarding the use of a particular medium (King & Xia, 1997; Rice & Case, 1983; Trevino, et al., 2000), or team-norms and co-worker attitudes toward technology that are cited (Fulk, et al., 1990), were not supported by this study. Instead, factors like group familiarity and size influenced the quality of social ties between entities, and therefore technology choices. Furthermore, task related factors like task urgency and task significance, or extrinsic factors like the accessibility of technology equally affected technology choices of service system entities. However, social norms and attitudes regarding the use of technology exhibited by service customers influenced initial decisions regarding the available technology-repertoire in all service systems. Service providers throughout all cases adopted the norms and standards exhibited by their customers, and utilised those ICTs that were available and provided to them by service customers.

The second main research stream in communication media and technology studies investigates how individuals utilise ICTs for interactions. Media use is defined as "an individual's general pattern of use over time" (Trevino, et al., 2000, p. 163). This study identified several proactive and reactive practices of technology use. Driven by the desire to gain status and to increase visibility within their project teams, individuals in Cases A, B and D, particularly service customers, used ICTs in a fashion that was described as safeguarding and impression management. The communication media and technology literature provides some support for this behaviour. For example, studies related to the adaptive structuration theory (de Sanctis & Poole, 1994) suggest that successful media use is dependent on a set of factor relationships in the social context of an actor, and that communication media are often used in ways other than originally intended (Schwabe, 2001). Both practices of safeguarding and impression management implied the utilisation of ICTs in an unintended fashion, and these actions were motivated by the social context of the service systems. Other authors argue that problems during technology-enabled interactions are related to the ability of individuals to utilise ICT rather than the technology itself (Powell, et al., 2004). Challenges such as a lack of technical expertise or one's inability to solve technical problems are known to negatively affect an individual's performances and satisfaction (Kayworth & Leidner, 2000; van Ryssen & Hayes, 2000). The proactive practices of technology use identified in this study represent empirical examples in a technology-enabled value co-creation context that extend our understanding of behavioural patterns of technology use. While this study identified only media misuse as a proactive practice related to a lack of technical expertise, it is important to outline that safeguarding and impression management were conscious actions that impacted the entire service system and not rooted in an entity's lack of technical skils (see Section 5.4).

The proactive practices of technology use, in conjunction with technology choices and the reactive practices of technology use resulted in interruptions and weakened social ties. This connective gap (see Section 5.4.3) ultimately cumulated in an insufficient access to resources, and thus an inability to perform roles. While the practices of technology use affected individual service system entities in the first instance, the entire co-creation process was subsequently affected as well, which resulted in delays and cost increases. The findings indicate that the various factors influencing individuals to choose and use media, as well as the practices by which these are used, are the main factors that influence the service system's ability to exchange resources. Similar findings have been brought forward by O'Sullivan who, in an early study on self-presentation in technology-mediated contexts, argues that distorted perceptions of others during technology-mediated interactions are related to "the choices that individuals make rather than the technology itself" (2000, p. 428). Ultimately, when interacting by means of ICT, "individuals can make what are likely considered appropriate and commendable choices […] as well as inappropriate and reprehensible ones" (O'Sullivan, 2000, p. 428).

Finally, while comparing the findings of this study to the extant communication media and technology literature has highlighted some similarities, the previously identified shortcomings of this body of literature have been reinforced. As criticised by Chidambaram, et al. (1998) or Riemer and Filius (2009), individuals tend to use communication media not in isolation but in combination, which makes investigating the choice and use of a *single* medium only, as is typically the case when applying the analytical lens advocated by communication media and technology studies, neither feasible nor realistic. This inherent conflict provides further support to why an investigation of technology-enabled value co-creation processes through that lens would have been inappropriate.

5.3.3 Relating the Findings to the Virtual Team Literature

In contrast to the communication media and technology literature, virtual team studies focus on the virtual team, rather than technology, as the unit of analysis. While the applicability of the virtual team literature as an analytical lens in service research has been contested in Chapter 2, the theory building standpoint underlying this study justifies it to relate the findings to this body of literature because it broadens the perspective on the unit of analysis and thereby enhances the theory building process (Eisenhardt, 1989).

Froehle (2006) was amongst the first researchers who acknowledged the shift of value co-creation processes into virtual realms and argues that such technology-enabled interactions between customers and service providers should be perceived as a "type of virtual team" (Froehle, 2006, p. 12), where approaches and findings from this body of literature would be applicable. As outlined in Chapter 2, virtual teams are commonly characterised through the attributes of *location*, *temporal*, and *relational independence*, as well as *technology use* (Martins, et al., 2004). By applying these attributes to the contextual background of the service systems investigated, all of these service systems can be defined as a virtual team. Every service systems investigated exhibits the characteristic of location independence because every service provider was physically dispersed from their customers and, in Cases B, C and D, service providers and/or customers were also individually dispersed. In Cases B and C, team members were located in different time-zones and the asynchronous communication medium email was the standard mean of interaction in all cases, thereby validating the attribute of temporal independence (Kayworth & Leidner, 2002) as well as technology use (Bell & Kozlowski, 2002).

Relational independence describes the oftentimes different organisational backgrounds and affiliations of individual members in virtual teams (Maznevski & Chudoba, 2001; Townsend, et al., 1998; Zigurs, 2003). The inter-organisational aspect described by relational independence was evident in all service systems investigated. More specifically, in Cases A and D, two different organisations were part of the service system, while Cases B and C consisted of four, and three different organisations, respectively. Ultimately, the findings of this study indicate that Froehle's (2006) argument is indeed valid, and that the service systems investigated can be characterised as virtual teams.

The initiation of relationships in virtual teams is widely discussed, and researchers argue that face-to-face interactions are particularly crucial in the early stages of a virtual teams' formation (Ariss, et al., 2002; Coutu, 1998; Sitkin, et al., 1998; Wong & Burton, 2000; Yoo & Alavi, 2001). Participants in this study unanimously agreed that their "kick-off" events contributed positively to the future interactions. However, the findings also indicate that such meetings can be substituted by high-quality video conferences as was the situation in Case A. However, despite its strong start, frequent changes to Case A's system configuration, combined with the restricted availability of ICTs and a lack of subsequent virtual or interpersonal interactions, led to an increasingly dysfunctional service system. This finding indicates that the initiation of relationships amongst members of virtual teams is important; however these relationships need to be managed and maintained. In this context, Krumpel

(2000) and Majchrzak, et al. (2000) argue that face-to-face interactions generally improve performance in virtual teams. Yet, the findings of this study indicate that the performance within the service systems improved not specifically because of any face-to-face interaction, but because these interactions represented a catalyst, resulting in participants being able to build interpersonal working relationships. The subsequent performance gains were linked to participants' increased willingness to choose and use richer types of ICTs, engage in interpersonal conversations, and their subsequently increased willingness to exchange and share relevant information. However, these improvements were related to the strengthened social ties among team members which resulted from the interpersonal working relationships, as discussed by Maznevski and Chudoba (2001) or Suchan and Hayzak (2001). Other benefits of face-to-face interactions discussed in the literature include the team's ability to clearly define the project (Ramesh & Dennis, 2002) and a clearer team-structure (Kaiser, et al., 2000). This study provided additional insights here and indicates that the prevalence of clear project definitions in Case C and a clear understanding of the roles performed by others in Case B, eventually helped to avoid safeguarding as a detrimental proactive practice of technology use.

The study identified several barriers that service providers and customers faced when attempting to initiate or manage functioning interpersonal working relationships, and the virtual team literature provides some support for these findings. For example, Qureshi and Vogel (2001) argue that the lack of a shared terminology within team-members inhibits the effective and efficient exchange of information. The problems affiliated with differing terminology between service providers and customers were characterised as semantic gaps, which represented a key challenge in the early stages of the projects. Other authors argue that virtual teams tend to focus on the task rather than social interactions (Burke & Chidambaram, 1996; Walther, 1995), resulting in weakened social ties (Warketin & Beranek, 1999). While virtuality itself, as suggested by the authors, did not result in an excessive focus on the task, operational challenges did trigger this behavior. Operational challenges typically motivated individuals to shift their focus on task-based virtual interactions only, to reduce the frequency of interactions, and thereby to decrease the opportunity for informal interactions which weakened social ties as suggested by Warketin and Beranek (1999).

Information-sharing in virtual teams is considered crucial for their success (Krumpel, 2000; Suchan & Hayzak, 2001) and calls for an "information sharing culture" (Powell, et al., 2004,

p. 11) have been raised in the literature. However, the findings indicate that an entities' willingness to share information, and consequently the performance of the service systems overall, was predominantly contingent to the system's ability to manage relationships amongst its entities. This issue will be further discussed in Section 5.4.

Finally, while comparing the findings of this study to the virtual team literature has highlighted several similarities, the shortcomings of this body of literature, like the solitary focus on team structures and lack of ICT perspective, prevail. Consequently, Kolb, et al. link communication media and technology studies, together with the virtual team literature to connectivity research by stating that "we used to ask which media were best for certain tasks […] we must now ask the question: 'how much' connectivity do we need?" (2012, p. 5). Hence, the next section relates the findings of this study to the empirical connectivity literature.

5.3.4 Relating the Findings to the Connectivity Literature

Very few empirical studies to date have investigated connectivity and its states in technology-mediated environments. However, available contributions are growing in numbers. For example, Collins and Kolb (2012) examine connectivity through a quantitative study in distributed teams, and link it to innovation outcomes and creativity. Quan-Haase and Wellman (2005a) and Wajcman and Rose (2011) both provide qualitative case studies and relate connectivity to communication effectiveness and team performance. It should be noted that Quan-Haase and Wellman (2005a) and Wajcman and Rose (2011) focus only on the utilisation of ICTs in intra-organisational contexts and on the state of hyper-connectivity, while omitting alternative conceptual connective states and gaps, respectively. Some studies originating from the Information Systems (IS) literature focus on investigating flow as advocated by Csikszentmihalyi's (1975, 1977), instead of connective flow as advocated by Kolb and colleagues (Kolb, et al., 2012; Kolb, et al., 2008). These studies therefore omit other connective states and are limited to flow-experiences of single individuals interacting with simplistic ICTs instead of inter or intra-organisational information systems in group contexts (see Section 2.4.3.3). Both the findings from the IS literature, and especially the study by Collins and Kolb (2012), represent important contributions. However, due to their very different methodological and/or conceptual scope, these studies are not included in the discussion of the findings of this study. Instead, this section relates the findings of this study only to qualitative studies that empirically link connectivity to performance in distributed work contexts. Other conceptual perspectives regarding connectivity will be incorporated in section 5.5 where the research questions and objective of this study are addressed, and subsequent propositions delineated.

The most intriguing similarity underlying the studies of Quan-Haase and Wellman (2005a), Wajcman and Rose (2011) and this present work, is the analogous assumption, and empirical validation, that ICT-enabled interactions dominate contemporary work environments. Wajcman and Rose (2011, p. 956) state that "the predominant mode of communication during the workday is now technologically mediated rather than face-to-face." This statement aligns with the argument underlying this study that co-creation processes via a traditional face-to-face interface are shifting into virtual realms. Quan-Haase and Wellman (2005a) explain that the types of ICTs available to knowledge workers generally includes instant messages, emails, telephone and mobile solutions. Contrary to this argument, and as indicated in Section 5.3.1, this study found that the repertoire of available ICTs is indeed relatively limited, with emails representing the de-facto standard of interaction across all service systems investigated, and teleconferences providing an alternative typically used in group settings. The extent to which individuals utilise ICTs depends on their roles and tasks performed. Also, the repertoire of potentially available ICTs was determined by the service customer. It is important to outline that the two empirical studies discussed here relate the introduction and ubiquitous availability of ICTs in organisations and knowledge-work to hyper (Quan-Haase & Wellman, 2005b) or constant connectivity (Wajcman & Rose, 2011). The key themes that emerged throughout both studies were the *impact* that hyper connectivity has on the systems in which it occurs, and the *agency*, or the means by which individuals act when attempting to overcome challenges affiliated with hyper or constant connectivity. These themes are subsequently discussed in relation to the findings of this study.

Quan-Haase and Wellman (2005a) found that participants in their study frequently experienced technology-mediated requests for information from others which led to interruptions and distractions of their on-going tasks. The constant need to multi-task, and the increasingly uncontrollable information overload ultimately implied that these individuals were unable to perform tasks. Quan-Haase and Wellman explain that social norms within the organisation meant that employees had to be constantly available, and conclude that "hyper connectivity stops them [employees] from getting their own work done. Their densely knit, hyper connected networks lead to interruptions in completing tasks" (2005a, p. 305). On the contrary, Wajcman and Rose state that “participants in our study did not perceive incoming mediated communication as a negative distraction” (2011, p. 950) because, as the authors argue, the ubiquitous presence of ICT-enabled interactions in contemporary work-environments, or constant connectivity, represents an “essential part of knowledge work” (Wajcman & Rose, 2011, p. 950) and should consequently not be understood as interruptions. While the findings reported by Wajcman and Rose (2011) may be bound to the context of the single case investigated by the authors, the findings of this present multiple-case study point in a different direction.

Participants in three of the four cases investigated reported that the increasing volume of emails, which represented the standard means of interaction, did result in interruptions of independently and jointly performed tasks by service providers and customers alike, and ultimately resulted in dysfunctional exchange processes. However, while Quan-Haase and Wellman (2005a) rightly argue that interruptions in technology-enabled work contexts are the result of social norms, this notion must be extended. This study showed that communication expectations, as a type of social norm, encouraged participants to constantly try to be available for incoming emails, and that an individual’s inability to disconnect further enhanced this state. The combination of these reactive practices of technology use with the identified proactive practices of technology use like safeguarding, media misuse or impression management that increased the total volume of emails in the system, as well as the group size during teleconferences, represented the main source of interruptions and resulted in hyper connected entities (see Section 5.4.2). Ultimately, not *just* social norms resulted in hyper connectivity as indicated by Quan-Haase and Wellman (2005a), nor the ubiquitous availability of ICTs, as argued by Wajcman and Rose (2011). Instead, the *combination* and interrelationship of the proactive practices by which ICTs were chosen and utilised, together with existing social norms driving reactive practices of technology use, implied that the volume of emails could increase and ultimately result in such interruptions and distractions from on-going tasks. Similarly, the combined occurrence of impression management and media misuse increased the group size in teleconferences, which led to disengaged participants and interruptions became consequently more common. Impression management combined with media misuse limited the access to resources and interrupted co-creation processes. Furthermore, impression management and safeguarding were initially driven by operational challenges and a lack of group familiarity. These relationship barriers could therefore be seen as the antecedent of hyper connectivity as a connective gap, and not social norms (Quan-Haase & Wellman, 2005a), or the ubiquitous availability of ICTs (Wajcman & Rose, 2011).

Another differentiator between this study and the work by Wajcman and Rose (2011) is that the authors do not differentiate between roles, and perceive all knowledge workers as a homogenous group of entities that interact constantly, directly, and independently with other similar individuals by means of ICT. They argue in this context that “communications have become more direct in that they no longer go through a third party, such as a secretary. Knowledge workers […] transmit information that is less likely to have been filtered” (Wajcman & Rose, 2011, p. 950). However, the findings of this study indicate that the degree of technology-dependence and utilisation of an individual depend, to a certain degree, on that individual’s role and tasks performed, resulting in a variety of interactions that are not always constant, direct, or independent. In fact, the various roles identified by this study were very heterogeneous. For example, the conductor and governor facilitated the process of co-creation within the service systems and did, in fact, filter the communication between service provider and customer, respectively. Consequently, other roles such as quality controller or expert which were heavily dependent on each other, received filtered and not direct information, as indicated by Wajcman and Rose (2011). Furthermore, the findings also indicate that while email and telephone were, overall, the most common means of interaction, the extent and types of ICTs used, differed depending on the role performed by an individual, as well as the type of service target inherent in the service system (see Sections 5.3.1 and 5.3.2). Consequently, the understanding of the dynamics of knowledge work as portrayed by Wajcman and Rose (2011), and their subsequent argument that connectivity is always constant, appears to be not applicable in a technology-enabled value co-creation context as investigated and portrayed by this study.

Agency, or the means by which individuals act when attempting to overcome hyper or constant connectivity, is discussed by both Quan-Haase and Wellman (2005a), and Wajcman and Rose (2011). However the findings of both studies can be associated with the rational choice model discussed in Sections 2.4.2.1 and 5.3.2, respectively. For example, Quan-Haase and Wellman describe “media etiquette” (2005a, p. 301) as one possible solution to avoid interruptions. The authors argue that individuals have the ability to recognise the advantages of the various types of ICT available to them, and consciously select ICTs with varying degrees of richness in order to optimise task-media fit. Both studies argue that individuals do not utilise ICTs randomly, but are able to find an ideal fit between ICTs with varying degrees of richness and recipient, complexity, or urgency of a message. As previously discussed in Section 5.3.2, this behaviour was not observed in this study, and rational media choice existed only in few isolated instances like in the case of task urgency. One assumption made by this researcher that could explanation these different findings is that, unlike in some cases investigated in this study, the employees within the organisations investigated by Quan-Haase and Wellman (2005a) and Wajcman and Rose (2011) may have had functioning interpersonal relationships established. As outlined previously, strong social ties originating from functioning interpersonal relationships were the key factor that ultimately resulted in the selection of richer ICTs which helpted to avoid hyper-connectivity.

Another approach that individuals may utilise to overcome the challenges affiliated with hyper connectivity is, according to Wajcman and Rose the “time-shifting dimension” (2011, p. 944) of ICTs, which describes the ability of modern ICTs to store messages (i.e. voicemail or email). According to the authors, utilising ICTs in such a fashion implies that “constant connectivity does not inevitably mean constant interruption,” because one can decide when to respond, and thereby avoid being interrupted (Wajcman & Rose, 2011, p. 952). Another consequence originating from this time-shift is an individual’s ability to consciously disconnect from technology, or “resist the push for accessibility” (Wajcman & Rose, 2011, p. 956), for example by working in a quiet workspace where no ICTs are available. Wajcman and Rose (2011) further explain that participants in their study could control their technology-enabled interactions, utilise the time-shifting functionalities of ICTs, and disconnect when necessary.

This study confirms that conscious acts of disconnecting from ICTs can be viewed as a prerequisite when attempting to avoid interruptions. However, unlike in the study of Wajcman and Rose (2011), participants in three of the four service systems investigated experienced an inherent inability to disconnect. Identified as reactive practices of technology use (see Section 4.4.3.2), an individual’s inability to disconnect and need to fulfil expectations were influenced by social norms. The resulting personal habits and level of control over ICT-enabled interactions displayed by an individual, implied whether or not disconnecting was a valid alternative. While, service customers and senior managers typically had more control, a finding consistent with Wajcman and Rose (2011), factors such as communication expectations or an individual’s urge to be connected prohibited participants from disconnecting. Also, the findings of this study did not support Wajcman and Rose's (2011) argument that individuals can utilise the time-shifting functionality of ICTs. The findings rather indicate that social norms such as expectations regarding email response-time outweighed an individual's willingness to use the time-shifting ability of ICTs, in order to delay a response.

In conclusion, by following recommendations of Eisenhardt (1989) and Eisenhardt and Grabner (2007), Section 5.3 related the findings of this study to the existing literature that is considered relevant in the context of this study. It outlined similarities and differences between the findings of this study and the literature, and thereby emphasised particularly significant findings. As indicated by Eisenhardt, reaching closure is the last step in theory building, where the "final product of building theory from case studies may be [...] propositions" (1989, p. 545). The following section addresses the research questions, and presents the propositions and models representing the theoretical contribution of this study (Colquitt & Zapata-Phelan, 2007).

5.4 Addressing the Research Questions

Section 5.4 represents the final step of the theory building process underlying this study. The proposed research questions that guided this study are addressed and the extant literature is, where appropriate, taken into consideration. The findings of each subsection are illustrated by models and propositions that clarify the relationship between constructs. These models should be seen as complementary because they address technology-enabled value co-creation processes as the phenomenon under investigation from varying perspectives, an approach supported by Strauss and Corbin (1998). Figure 5.2 summarises the structure of this section.

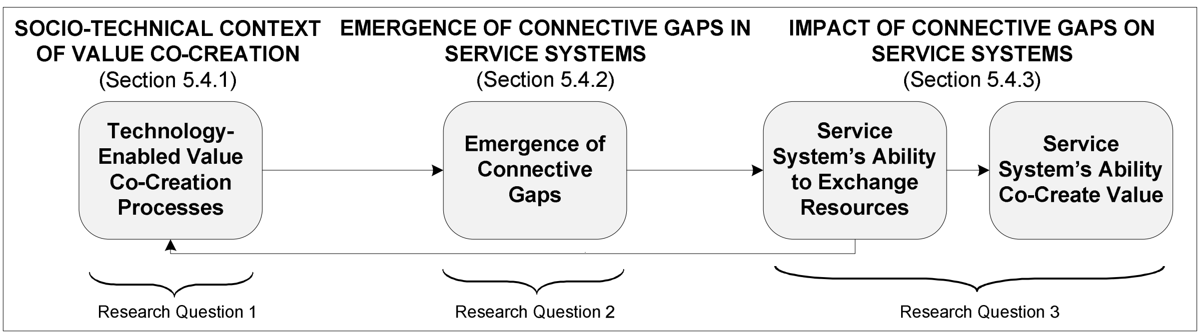

Figure 5.2: Overview and Interrelationship of Research Questions

5.4.1 Value Co-Creation in a Technology-Enabled Environment

In order to gain insights into the previously un-investigated socio-technical context of value co-creation, researchers suggest that it is necessary to initially explore and describe technology-enabled value co-creation processes (i.e. the means by which service systems interact and exchange resources via ICT in order to generate a benefit). This approach is considered the necessary first step when attempting to build theory leading to a better understanding of value co-creation in a technology-enabled environment (Bonoma, 1985; Vargo, et al., 2008). Consequently, RQ 1 explores how service systems in the consulting industry exchange resources and co-create value by means of ICT:

How do service systems exchange resources and co-create value by means of ICT?

Section 4.3 described the investigated processes, and Sections 4.4 and 4.5 provided insights into the roles of technology and relationships between entities as mutually dependent enabling factors therein. While this illustration is important and necessary, Pettigrew explains that “the purpose of process analysis is not just to […] tell the story, but to identify patterns in the process” (1992, p. 8). This section will consequently apply Pettigrew’s (1992) suggestion, and identify patterns across the processes investigated. These patterns represent key findings and are highlighted through propositions related to the constructs of *service system entities*, *resources*, as well as *ICT* and *relationships*. The resulting model in Figure 5.3 displays the socio-technical context in which service systems can exchange resources and co-create value by means of ICT.

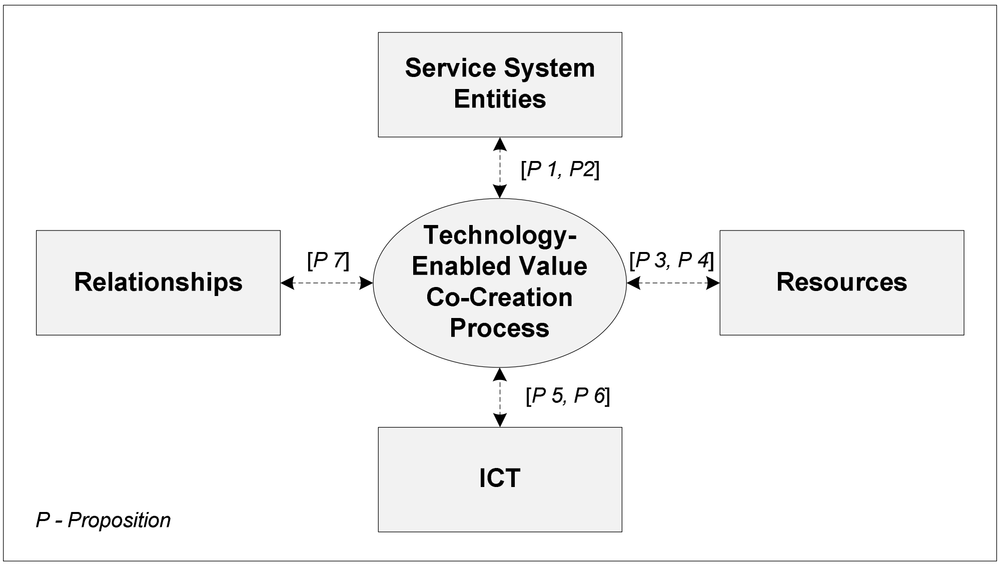

Figure 5.3: The Socio-Technical Context of Value Co-Creation

This study found that the degree of tangibility of the service target influences the characteristics of the technology-enabled value co-creation process. Varying degrees of tangibility describe the means by which the knowledge and skills of service providers are applied and exchanged with customers. This transfer occurs through intangible processes, or culminates in tangible outputs, a finding consistent with the foundational premises of the SDL (Vargo & Lusch, 2004, 2006). Technology-enabled value co-creation processes affiliated with intangible service targets are characterised through a high degree of task interdependence, meaning that tasks are jointly and typically simultaneously performed by service provider and customer. Value co-creation processes affiliated with tangible service targets are characterised through a high degree of task independence, meaning that tasks are typically performed consecutively, and rather independently by both parties. Consequently, the degree of tangibility of the service target influences the roles and their degree of technology dependence performed by service providers and customers alike.

This study identified a total of eight roles that are either proactively or reactively performed by *service system entities* representing both the service provider and customer. While the tangibility of the service targets influence the scope of all roles, the roles performed by service system entities during value co-creation processes incorporate tasks that *facilitate* the exchange of resources, are *joint activities*, or *independent tasks*. Roles that engage in the facilitation of the co-creation process are the conductor, facilitator and governor. The common purpose of these roles is to reduce the complexity of the technology-enabled interactions amongst a large group of physically distributed service system entities by providing a single point of contact, filtering and disseminating information from other entities, or institutionalising and coordinating joint activities within the larger group of service system entities. Performer, enabler and task allocator, on the contrary, are roles that engage in joint activities necessary for the co-creation of intangible service targets only. Co-creation processes between service customers and providers in service systems with tangible service targets however, are channeled through the conductor-governor interface, and experts and quality controllers here perform their tasks relatively independently.

Understanding value co-creation processes as a distinct sequence of mutually dependent tasks extends our understanding of the nature of value co-creation processes as advocated by the SDL. For example, Grönroos argues that “the statement that customers, as well as firms, are always co-creators of value makes only one logical conclusion possible: both the firm and the customer are involved in an unspecified, all-encompassing process of value creation" (2011, p. 287). Yet, the findings of this study indicate that value co-creation processes may not be unspecified and all-encompassing, but complex sequences consisting of independent activities, joint performances of tasks, as well as activities that facilitate these joint performances. Furthermore, the extent to which service provider and customer jointly or independently perform tasks depends on the degree of tangibility of the service target.

The findings of this study also indicate that the extent to which individual service system entities rely on ICTs throughout the value co-creation process strongly depends on the role performed by an entity. In general, entities performing roles concerned with the facilitation of the co-creation process interact more frequently in a face-to-face fashion with others than entities performing operational roles affiliated with joint activities or independent tasks. For example, some experts and quality controllers, who generally performed independent tasks, rarely met face-to-face and consequently relied almost exclusively on ICTs for their interactions with others. On the contrary, the conductor and governor roles were largely concerned with the facilitation of the interaction amongst all entities, and interacted comparatively frequently in an interpersonal fashion with each other. Proposition 1 is consequently defines as:

Proposition 1: *Both service provider and customer entities perform roles that facilitate the co-creation process, incorporate joint activities, or are independently performed. Entities performing roles related to the facilitation of the co-creation process are less reliant on ICTs, and have more face-to-face contact than entities performing independent or joint roles that strongly depend on ICTs.*

The findings furthermore indicate that the types of ICT used to exchange resources are task and role dependent. Entities performing roles concerned with the joint or individual execution of tasks rely predominantly on email, and substitute these interactions with one-on-one telephone calls. On the contrary, all group interactions are predominantly conducted using teleconferences. Proposition 2 is therefore defined as:

Proposition 2: *The facilitation of the value co-creation process is a group activity that occurs via teleconferences, while individual or joint tasks depend on one-on-one interactions between service system entities utilising email or telephone.*

It was not surprising to find that information was identified as the key *resource* that was exchanged within the service systems investigated, and that its accessibility was considered a prerequisite for successful value co-creation. However, contrary to arguments advocated by the service science literature (Vargo, et al., 2010), it was surprising to find that service providers struggled with customers' unwillingness or inability to share resources. Service customers retain an informational advantage, especially in the early project phases, and personal career ambitions or lack of social ties can result in a service customer's unwillingness to share information. Similarly, institutionalised restrictions and a lack of operational skills meant that customers may be unable to provide consultants with the required information. Based on these findings, the following proposition is suggested:

Proposition 3: *Service systems set in the consulting industry do not promote the unconstrained flow of the key resource information between service providers and customers. Instead, co-creation processes in this context are characterised by the inherent threat of resource scarcity that is rooted in the service customer's potential unwillingness and/or inability to share relevant information with the service provider.*

Another related finding is that time, and subsequent cost restrictions, equally constrain value co-creation processes of service systems in the consulting industry. The business model in this industry implies that service customers purchase the time of their consultants in order to gain access to their experience, knowledge and skills during a specified period. Ultimately, the individual man-hour represents the greatest cost factor in consulting projects, and both consulting and customer firm have an incentive to minimise the duration of the project in order to decrease costs and remain competitive, respectively. Consultants typically try to decrease the duration of the projects by increasing the efficiency of the technology-enabled value co-creation process. This can be accomplished by allocating their limited time-budget in an optimal fashion on the independent tasks, joint activities or facilitating activities that are part of their roles. This finding supports earlier work by Murphy who discussed the impact of ICTs on today's work environments, and stated that "time has become by far the scarcest factor of production" (2007, p. 18). Proposition 4 is therefore defined as:

Proposition 4: *The greater the time constraints faced by a service system, the greater the need to improve the efficiency of the technology-enabled value co-creation processes within that system.*

This study identified that technology-enablement and the resulting reliance on *ICTs* within service systems is driven by the physical distribution between service system entities, subsequent cost factors and legal implications. An unexpected finding in this context was that throughout all cases, service customers always determine the technology repertoire that is available to all service system entities. Consultants adapt to the ICT infrastructure of their service customers and accept any constraints regarding the suitability or availability of ICTs that might result from this approach. Furthermore, consultants cannot introduce or utilise alternative ICTs because of potential conflicts with the customer's ICT infrastructure, organisational culture, or lack of operational skills. When viewed through a connectivity lens, these findings provide further insight into the socio-technical context in which value co-creation occurs. With technical connectivity defined for the purpose of this study as *the degree to which ICTs are readily available for all entities in the system and adequate for the successful exchange of resources* (see Section 2.4.3.2), it becomes evident that technical connectivity can, at least in the context investigated here, be described as predefined and static. This extended understanding of technical connectivity also implies that achieving a state of requisite connectivity or connective flow, as suggested in the literature (Kolb, et al., 2012; Kolb, et al., 2008), is therefore independent of altering technical connectivity as one of its perceived input dimensions:

Proposition 5: *Physical distribution amongst service system entities, subsequent cost-factors and legal implications, are the drivers of technology-enablement in service systems.*

Proposition 6: *The available technology repertoire within service systems set in the consulting industry is determined by service customers and cannot be altered by service providers throughout the value co-creation process. The level of technical connectivity that such a service system can experience, is therefore predefined and static.*

Although regarded as the enabler of information flows, in the context of connectivity, ICTs are known to represent "only part of the connective equation" (Kolb, 2008, p. 140). The role of *relationships* among service system entities in value co-creation processes is considered equally important, yet un-investigated, and this study explicitly included that element into the investigation (Edvardsson, et al., 2011; Kolb, 2008; Kolb, et al., 2008; Makarem, et al., 2009; Vargo, et al., 2008; Waverman, et al., 2009, p. 6). Social connectivity describes *the strength of social ties between entities that is necessary for the successful exchange of resources* (see Section 2.4.3.2), with high social connectivity referring to strong social ties, and low social connectivity describing weak social ties. The findings indicate that social connectivity can, at least in the context investigated by this study, be described as dynamic and manageable.

This study identified that interpersonal working relationships between individual service system entities are crucial for successful resource exchange and therefore value co-creation. While distinctly different from social relationships, interpersonal working relationships *metaphorically* exceed the boundaries of the interaction between two entities during value co-creation. They result in, and improve, social ties by increasing familiarity and trust; however, their quality depends on the actions and behaviour of individual entities while performing their roles during the entire co-creation process. Consequently, interpersonal working relationships are distinctly different from social relationships that *literally* exceed the boundary of the value co-creation process through interactions that occur outside of the working environment and surpass the performance of allocated roles.

The dynamic nature of social connectivity implies that the quality of interpersonal relationships between entities of a service system is not constant, but can fluctuate over time. While this means that social connectivity can grow, it can also diminish, a conundrum that has been theoretically described through the attribute of duality (Giddens, 1984; Kolb, 2008), and now empirically been verified through this study. For example, the findings show that organisational challenges, as well as the introduction or removal of service system entities, both negatively impacted the quality of social ties. Identifed by this study as changes to the system configuration, such introduction or removal of entities within a service system can result in weakened social ties. While such social ties need to be re-established with newly introduced entities, for example in the form of kick-off events, face-to-face meetings, or high-quality video conferences, interpersonal working relationships also need to be managed throughout the duration of the value co-creation process. Contrary to the static and predefined dimension of technical connectivity, social connectivity is therefore dynamic and manageable, and hence of tremendous importance when attempting to achieve a state of requisite connectivity or connective flow (Kolb, et al., 2012; Kolb, et al., 2008). Finally, the following proposition is suggested:

Proposition 7: *Social connectivity within service systems, which are set in the consulting industry, incorporates interpersonal working relationships between entities. Social connectivity varies in quality throughout the value co-creation process, but can be initiated as well as altered, and is therefore manageable and dynamic.*

Finally, this section proposed a model describing the socio-technical context of value co-creation. Section 5.4.2 discusses the emergence of connective gaps in service systems that engage in technology-enabled value co-creation processes, and thereby provides the first step towards an understanding of the potential impact of technology-enablement on the performance of service systems.

5.4.2 The Emergence of Connective Gaps in Service Systems

Connective states provide a mean to quantify the levels of connectivity experienced within a system, and thereby allow us to assess the impact of technology enablement on a service system's performance from a socio-technical angle. Especially the connective states of hypo and hyper-connectivity are of interest here, and in order to assess the impact of too much (i.e. hyper) or too little (i.e. hypo) connectivity on performance, it is considered "critical" (Kolb, et al., 2012, p. 1) to understand how these connective gaps emerge. Since no empirical studies to date investigated the mechanisms leading to their appearance, RQ 2 was defined as:

How do connective gaps emerge in a service system?

This section discusses the mechanisms that cause the emergence of connective gaps in service systems that engage in technology-enabled value co-creation processes. Figure 5.4 proposes the underlying model that was developed from the findings of this study (see also Appendix B.2). Section 5.4.2.1 discusses the antecedents of connective gaps, Section 5.4.2.2 outlines the mechanisms driving their emergence, and Section 5.4.3 explains their impact.

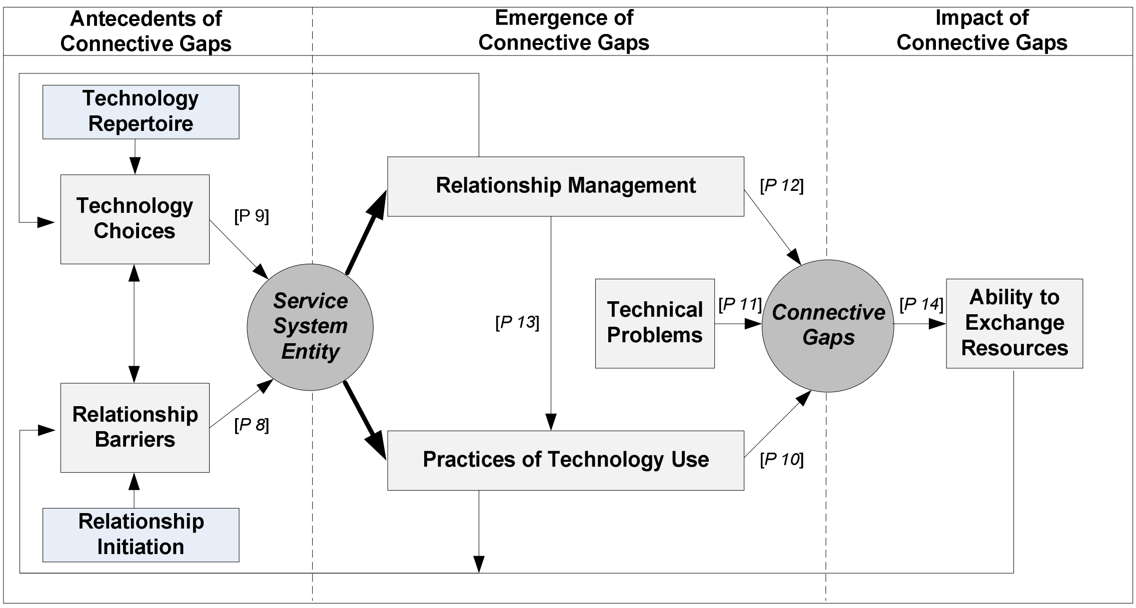

Figure 5.4: Antecedents, Emergence and Impact of Connective Gapes in Service Systems

5.4.2.1 Antecedents of Connective Gaps

Relationship barriers as well as the technology choices that service system entities make throughout the technology-enabled value co-creation process were identified as the antecedents of connective gaps.

Relationship Barriers

Relationship barriers constrain the ability of a service system to initiate and manage social connectivity through interpersonal working relationships, and thereby have an impact on the strength of social ties between entities. While this study identified temporal, extrinsic and intrinsic relationship barriers, it is important to understand which barriers represent the key antecedents that may lead to the emergence of connective gaps.

The findings indicate that the extrinsic relationship barriers of *system configuration* and *operational challenges* represent the first key antecedents leading to the emergence of connective gaps. System configuration describes the group size and level of familiarity of the entities within a service system. The findings indicate that small and stable groups of service system entities experience stronger social ties because it is easier to manage interpersonal working relationships in such an environment. Conversely, large groups with frequently changing members represent a barrier when attempting to manage interpersonal working relationships, and entities in such an environment subsequently experience weaker social ties. Nevertheless, the findings of this study confirm previous empirical findings that early face-to-face interactions between individuals in physically dispersed work contexts can initiate and strengthen social ties (Ariss, et al., 2002; Sitkin, et al., 1998; Wong & Burton, 2000; Yoo & Alavi, 2001). While high quality videoconferencing can provide a substitute for face-to-face interactions, the findings confirm that early relationship initiation results in clearer project definitions (Ramesh & Dennis, 2002) and improves group familiarity and role clarity (Kaiser, et al., 2000). Subsequently, initiating relationships helps to overcome the impact of relationship barriers in the early phases of a project, and can help to circumvent the emergence of connective gaps (see Section 4.5.2.2). However, unless relationships are re-initiated whenever entities change within the service system, the impact of system configuration as a relationship barrier prevails (see also Proposition 7).

Operational challenges are complications that arise during the co-creation of the service target. They represent an extrinsic relationship barrier and a key antecedent of connective gaps. Operational challenges alter the behavior of service system entities in a way that results in weakened social ties. Specifically, the findings indicate that entities re-allocate their already limited time whenever operational challenges emerge. This involves reducing the frequency of interactions with others and implies that any remaining interactions are typically purpose driven and do not occur with the intention of managing interpersonal working relationships through informal interactions. Ultimately, this behavior weakens social ties over time and increases the isolation between the physically dispersed entities. Weakened social ties, in turn, influence technology choices and the practices of their usage, and therefore increase the likelihood for the emergence of connective gaps. The following proposition is delineated:

Proposition 8*: Connective gaps are more likely to emerge if relationship barriers are not bypassed through processes of relationship initiation, and if relationships are not managed whenever the configuration of the service system changes or operational challenges arise.*

Technology Choices

Technology choices of individual service system entities describe the decision to use, or not use, a particular type of ICT while engaging in a technology-enabled value co-creation process. While this study identified extrinsic, task-related and intrinsic factors influencing technology choices, the common pattern underlying all factors is that they influence the level of richness that the chosen type of ICT displays. Furthermore, technology choices are not open and unconstrained to an unlimited array of potentially available types of ICT, but restricted to the technology repertoire which confines the level of technical connectivity that the service system can experience (see Proposition 6). Being the smallest common denominator, technology choices of individual service system entities set in the context of the consulting industry are limited to the decision between a richer one-on-one telephone call and email as the lean alternative when performing individual or joint tasks. Group interactions during facilitation or governance represent exceptions because these are always conducted via teleconferences, and hence no individual technology choice is viable here. It is now important to understand which factors influencing technology choices represent the key antecedents leading to the emergence of connective gaps.

The argument has been brought forward that high levels of connectivity might simply not be achieved because actors refuse to choose and use a particular technological link (Kolb, 2008;

Kolb, et al., 2012; Orlikowski, 1992). While the findings clearly indicate that technology choices of service system entities do, overall, not follow the rational choice model that, according to some authors, results in an optimal task-media fit (Arnott & Tan, 2001; Daft & Lengel, 1986; Dennis & Kinney, 1998; Newberry, 2001; Schmitz & Fulk, 1991), they do broadly align with collective choice models that argue technology choices are influenced by social and individual factors (Fulk, 1993; Kinney & Dennis, 1994; Riemer & Filius, 2009). Again, the *system configuration* emerged as a key factor that influences service system entities to choose richer (i.e. one-on-one telephone) over leaner (i.e. email) types of ICT. As discussed previously, service system entities that are part of smaller and stable groups have stronger social ties and are therefore more likely to choose one-on-one telephone calls over emails. Conversely, service system entities that are part of large groups where members change frequently, experience weak social ties, consciously avoid the direct mediated contact to unfamiliar others, and opt for email as the lean alternative instead. Consequently, the following propositions are put forward:

Proposition 9: *Service system entities are more likely to choose and use leaner ICTs over richer ones when social ties between them are weak.*

The findings of this study show that frequent interactions between entities using rich ICTs like the telephone, help to maintain interpersonal working relationships and strengthen social ties because richer ICTs like the one-on-one telephone allows for informal interactions. Consequently, technology choices of individual service system entities also represent an intrinsic relationship barrier and influence the quality of social ties. This finding is supported by social presence theory, which is rooted in the work of Granovetter (1973), and argues that utilising richer media promotes the benefits of perceived closeness with others (Culnan & Markus, 1987; Schmidt, et al., 2001; Short, et al., 1979).

5.4.2.2 Emergence of Connective Gaps

As antecedents of connective gaps, relationship barriers and technology choices of service system entities influence the practices of technology use and the process of relationship management. These two mechanisms, as well as the inability to address technical problems, lead to the emergence of connective gaps.

Practices of Technology Use

The practices of technology use refer to behavioral patterns that describe the means by which individual service system entities use ICTs during technology-enabled value co-creation processes. This study identified safeguarding, impression management and media misuse as the proactive practices of technology use, while the inability to disconnect and fulfilling expectations represented reactive practices.

Safeguarding and impression management as proactive practices of technology use are both driven by extrinsic relationship barriers. More specifically, the findings indicate that a lack of group and role familiarity (i.e. system configuration) results in safeguarding, while operational challenges provide an incentive for individual entities to engage in both, impression management and safeguarding. Media misuse however, is not contingent on these antecedents, but related to the skills of the individual service system entity only.

The impact of the proactive practices of technology use on the service system can be linked to the roles and tasks that service system entities perform (see Section 5.4.1). Impression management and safeguarding always increase the use, and therefore the total volume, of emails within the system. Interactions that predominantly rely on email not only represent an intrinsic relationship barrier, but an increased email volume also increases the likelihood of connective gaps for experts, quality controllers, performers, task allocators and enablers during the execution of individual and joint tasks. Impression management additionally increases the group size during teleconferences, thereby leading to disengaged service system entities that are more likely to engage in media misuse. Consequently, impression management and media misuse increase the probability for interruptions and therefore for connective gaps during group tasks, which implies that conductor, facilitator and governor are particularly obstructed in their ability to perform their roles when these practices of technology use are prevalent.

On the contrary, reactive practices of technology use are driven by social norms which can demand the constant availability of individual entities, influence personal habits, as well as the level of control that entities experienced over their ICT-enabled interactions. However, individual service system entities can nevertheless have the ability to disconnect and thereby avoid interruptions and distractions related to email or other forms of technology-mediated interactions. Yet, contrary to conclusions provided by Wajcman and Rose (2011), the findings of this study indicate that the inability of an entity to disconnect increases whenever they are unable to overcome social norms and alter their personal habits, or control over their ICT enabled interactions.

Ultimately, while safeguarding and impression management lead to an increased volume of emails, this does not automatically lead to the emergence of hyper-connectivity in every instance. Opposing arguments provided by Quan-Haase and Wellman (2005a) or Wajcman and Rose (2011), the findings of this study show that the *combination*, or joint occurrence, of the proactive and reactive practices of technology use result in the emergence of hyper-connectivity. While the proactive practices of technology use increase the volume of emails in the system in the first instance, they do not represent a sufficient condition for the emergence of hyper-connectivity. Instead, the reactive practices of technology use subsequently determine if such an increased email volume can interrupt individual service system entities during value co-creation, and thereby result in a connective gap. Consequently, while the proactive practices of technology use represent a mechanism leading to the emergence of hyper-connectivity, the reactive practices of technology use represent the *necessary* condition:

Proposition 10: *Proactive practices of technology use will only result in hyper-connectivity when social norms in the service system enforce reactive practices of technology use by demanding constant connectedness from entities, and if these entities display the inherent inability to disconnect.*

Technical Problems

Technical problems describe instances where the quality of technical connections between service system entities is insufficient for the tasks at hand, and interruptions that inhibit the effective exchange of resources may therefore occur. While the findings of this study indicate that technical problems do not represent a major issue affecting resource exchange in the service systems investigated, they can, under certain conditions, nevertheless lead to the emergence of hypo-connectivity as a type of connective gap.

The findings show that technical problems only interrupt the value co-creation process if service system entities do not have other alternative types of ICT at their disposal. Specifically, technical problems do not result in hypo-connectivity whenever entities can adjust their behaviour, and utilise alternative means of technology instead of the one experiencing technical problems. The size of the technology repertoire subsequently determines whether or not alternative types of ICT are available in a particular instance. In this context, Kolb (2008) suggests that the attribute of temporal intermittency describes that connections between entities can always vanish and concludes that connectivity can therefore only to a certain extent be influenced and controlled by the connected entities. While the findings confirm that connections can indeed vanish through technical problems, Kolb's (2008) argument that entities have only limited control over their experienced level of connectivity must be extended. The findings of this study show that while entities cannot prevent technical problems from happening, they have the power to control the density (Janssen, et al., 2006; Kolb, et al., 2008), or size of the technology repertoire. By increasing the amount of potentially available types of ICT in the technology repertoire, service customers can actively control, and reduce, the potential impact of technical problems on the service system, and thereby circumvent connective gaps from happening.

Proposition 11: *Technical problems will only result in hypo-connectivity when the available technology repertoire in the service system is limited, and if entities cannot increase the density of their technical connections.*

Relationship Management

Relationship management refers to the actions and the behaviour of individual service system entities when interacting and exchanging resources with others, as well as the resulting characteristics of the value co-creation process. While the practices of technology use only describe how individuals use ICTs, relationship management refers to the actions and behaviour of individuals during resource exchange that go *beyond* the utilisation of ICT. Most importantly, this study found that relationship management influences interpersonal working relationships, and therefore the quality of social ties between entities within the service system. It consequently becomes a central element when understanding how connective gaps emerge, but also how these can be avoided.

The study identified a set of behavioural patterns that service system entities actively engage in when attempting to manage their interpersonal working relationships with others. Behavioural patterns affiliated with the *personality* of an individual include publicly associating one's own project achievements with others, fostering compromises when attempting to gather information, avoiding publicly criticise others, and a level of interpersonal engagement beyond the task. Furthermore, sufficient levels of *professionalism* (i.e. the technical skills necessary to perform roles), as well as *responsiveness* (i.e. the ability to reliably and consistently perform tasks), are equally linked to the characteristics of individual service system entities, and improve the quality of interpersonal working relationships and subsequently the social ties between service system entities.

The behaviour of service system entities also influences the characteristics and perception of the process of interaction. *Frequent* technology-enabled interactions helps to maintain social ties, while operational challenges can, as outlined previously, reduce the frequency of interactions and thereby negatively impact the ability of service system entities to manage relationships. Consequently, it is not only crucial to interact frequently, but, as indicated by the findings of this study, these interactions need to be *transparent*. Increasing the transparency, for example, can be achieved by early defining communication expectations or increasing the awareness of operational challenges when they arise.

Ultimately, the impact of relationship management on service systems has clearly been highlighted by the findings of this study, and can directly be linked to the emergence, or avoidance, of connective gaps. Functioning and well managed interpersonal working relationships improve, first of all, the quality of social ties amongst the entities of a service system. Consequently, this 1) reduces the need for frequent interactions, 2) motivates service system entities to choose richer types of ICT over leaner ones, 3) increases the efficiency of their technology usage, and 4) improves the understanding of roles amongst entities. Therefore, successfully managing relationships offsets the causes and effects of safeguarding and impression management as proactive practices of technology use. However, successful relationship management can also offset the reactive practices of technology use. For example, defining communication expectations early on can alter social norms, and therefore help individuals to overcome the reactive practices of technology use. While successful relationship management cannot avoid the occurrence of media misuse, the findings indicate that improving social ties increases the commitment of service providers and the willingness of service customers to provide information (see Proposition 3). Finally, based on these findings, the following propositions are suggested.

Proposition 12: *Connective gaps are more likely to emerge if service system entities fail to engage in the management of interpersonal working relationships, and if social ties between service system entities are consequently weak.*

Proposition 13: *Successful relationship management will offset the effects of the proactive and reactive practices of technology use by reducing the total volume of emails in the service system and altering social norms that influence communication expectations.*

5.4.3 The Impact of Connective Gaps on Service Systems

Understanding how technology-enablement can influence a service system's ability to co-create value is a central research objective underlying this study. Chapter 2 argued that understanding the emergence and impact of connective gaps on service systems is likely to provide insights into the possible effects of technology-enablement on a service system's ability to co-create value. By expanding on question two, RQ 3 was consequently defined as:

> **How does the emergence of connective gaps impact the ability of a service system to co-create value?**

The findings of this study support the idea that connective gaps can be distinguished into the states of hypo and hyper-connectivity, and that these states have a detrimental effect on the performance of service systems. The performance and efficiency of a service system however, is measured by its ability to co-create value which, in turn, depends on its capacity to exchange resources amongst all entities (Prahalad & Ramaswamy, 2004; Spohrer & Maglio, 2010; Spohrer, et al., 2008). This section provides further insights into the potential consequences of connective gaps for service systems, and outlines how and why these connective states of hypo and hyper-connectivity inhibit and interrupt resource exchange and consequently technology-enabled value co-creation processes.

The effect of hyper-connectivity on service systems is of an *interruptive* nature, and rooted in the proactive and reactive practices of technology use that hinder service system entities from performing individual, joint, or group tasks. Hypo-connectivity, on the contrary, is of an *inhibiting* nature, and related to technical problems and shortcomings affiliated with the technology repertoire. Hypo-connectivity does not typically lead to interrupted performances of individual, joint, or group tasks, but *prevents* them from happening in the first place. Consequently, this study argues that connective gaps impact the ability of service systems to co-create value by limiting service system entities to access and exchange resources, and by constraining service system entities in their ability to perform roles.

The findings of the study also show that the impact of connective gaps on service systems increase with the frequency and duration with which connective gaps inhibit or interrupt the co-creation process. While connective gaps can potentially increase the duration of the co-creation process, they only occur for a certain percentage of the entire duration of that process. Time, however, is a constraining factor within service systems set in the consulting industry. Specifically, Section 5.4.1 outlined that time constraints increase the pressure on a service system to improve the efficiency of the value co-creation processes, which implies that avoiding, or at least minimising the duration of connective gaps becomes pivotal when attempting to improve its performance. Essentially, the longer service system entities are constrained in their ability to access resources, or to perform their roles, the more significant the resulting delays and cost increases will be. Such delays and potential cost increases represent operational challenges which, in turn, represent a type of external relationship barrier that can further lead to the emergence, or prolonging, of connective gaps. Consequently, the final proposition of this study is defined as:

Proposition 14: The emergence of c*onnective gaps in service systems limits access to resources and constrains its entities' ability to perform roles. The longer a service system experiences connective gaps, the higher the impact on its ability to co-create value.*

Ultimately, we now understand better how connective gaps emerge and how these impact a service system's ability to co-create value. However, now the question arises how service systems can avoid connective gaps and thereby ensure the effective exchange of resources and their ability to co-create value. Such an ideal value co-creation space could be perceived as identical to the state of connective flow as theorised in the literature (Kolb, et al., 2012; Kolb, et al., 2008). The findings of this study already indicate that the technology repertoire within service systems set in the consulting industry will not be altered during the co-creation process, which implies that technical connectivity is predefined and static (see Proposition 6). On the contrary, social connectivity is embodied through interpersonal relationships, and these are dynamic and manageable. While future research should investigate the matter further, it appears that achieving an ideal state of connective flow is contingent on altering and improving social connectivity only. The ability, or knowledge and skils, of a service system to achieve this ideal connective state therefore represents an operant resource which, according to the fourth foundational premise of the SDL represents a fundamental source of competitive advantage (see Section 2.2.2.4). Therefore, this study argues that the ability of a service system to manage social connectivity in a technology-enabled value co-creation context not only represents a prerequisite for the successful co-creation of value, but also a source of competitive advantage.

5.5 Chapter Summary

This chapter discussed the findings of this study in relation to existing service science literature, the field of communication media and technology and virtual team studies, as well as the connectivity literature. It furthermore addressed all research questions and proposed two models with associated sets of propositions. The first model described the socio-technical context in which service systems exchange resources and co-create value by means of ICT, and the second one provided insight into the antecedents, emergence and impact of connective gaps on service systems. The following chapter concludes this study and will address the research objective of this study.

6. CONCLUSIONS

6.1 Chapter Introduction

This study investigated technology-enabled value co-creation processes in the context of the consulting industry and applied connectivity as an analytical lens in the process. The objective of this study was to explore and describe the socio-technical context in which service systems set in the consulting industry exchange resources and co-create value by means of ICT, as well as to understand the impact that technology-enablement may have on the ability of such a service system to co-create value. Developed in this study is a model and a set of associated propositions which provide insight into the previously un-investigated socio-technical context of value co-creation. A second model and propositions explain the antecedents, emergence and impact of connective gaps in service systems that exchange resources and attempt to co-create value by means of ICT. The latter model thereby provides us with a proxy that can be used to assess the impact of technology-enablement on a service system's ability to co-create value. This chapter addresses the research objective of this study in Section 6.2, while Section 6.3 and 6.4 outline the contributions and limitations of this study respectively. Finally, Section 6.5 suggests future research opportunities. Figure 6.1 summarises the structure of this chapter.

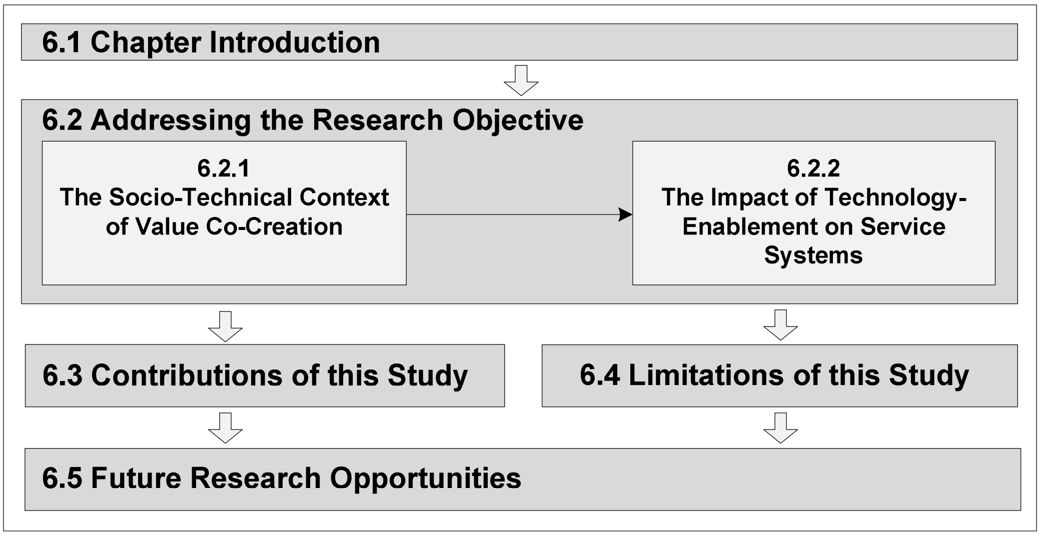

Figure 6.1: Structure of Chapter 6

6.2 Addressing the Research Objective

6.2.1 The Socio-Technical Context of Value Co-Creation

The model proposed in this study describes the socio-technical context in which service systems engage in technology-enabled value co-creation processes through four main constructs of service system entities, resources, ICTs, and the relationships between entities.

Service system entities perform roles during technology-enabled value co-creation processes that incorporate tasks that facilitate the process, are joint activities, or independent actions. This implies that technology-enabled value co-reation processes are complex sequences of exchanges between service provider and customer and not, as previously suggested (see Section 5.4.1), unspecified and all-encompassing processes. The findings also indicate that technology-enabled value co-creation processes are not entirely free of face-to-face interactions, but the extent to which individual entities exchange resources by means of ICT is contingent on their roles. These roles performed by an entity also influence the types of ICTs utilised by that entity in the process.

The successful performance of roles during the co-creation of the service target however, is contingent on the exchange of the operant *resource* information between entities. Nevertheless, service systems set in the consulting industry do not promote the unconstrained flow of information between entities in every instance, but experience an inherent threat of resource scarcity that is rooted in the service customer's unwillingness and/or inability to share information (see Section 4.3.2.2). This study found that time constraints also influence technology-enabled value co-creation processes in such service systems, and force service systems to improve the efficiency of the co-creation process.

Technology-enablement, which refers to the increasing reliance on *ICTs* in service systems, is driven by the physical distribution amongst service system entities, subsequent cost-factors and legal implications. Moreover, the technology repertoire that enables the exchange of resources is determined by service customers, and cannot be altered by service providers. Consequently, the level of technical connectivity a service system can experience is predefined and static, which suggests that achieving a state of connective flow, as proposed in the literature (Kolb, et al., 2012; Kolb, et al., 2008), is likely to be independent of altering technical connectivity as one of its perceived input dimensions. Connective flow is therefore possibly contingent on interpersonal working relationships between service system entities.

Functioning interpersonal working *relationships* between service system entities are ultimately a prerequisite for the effective technology-enabled exchange of resources, and consequently for the co-creation of value. These relationships strengthen social ties which, in turn, help to overcome and avoid connective gaps that interrupt or inhibit the exchange of resources. However, the quality of interpersonal relationships between entities of a service system, or social connectivity, is not constant but fluctuates over time. Unlike technical connectivity, social connectivity is therefore dynamic and manageable, and hence of tremendous importance when attempting to achieve a state of connective flow (Kolb, et al., 2012; Kolb, et al., 2008).

The first model proposed describes the socio-technical context of value co-creation (i.e. the environment in which technology-enabled value co-creation processes occur), it is important to link it to the second objective of this study. Specifically, this study questioned whether or not technology-enablement influenced the ability of a service system to co-create value, and addressed this question by analysing technology-enabled value co-creation processes through a socio-technical connectivity lens. This approach allowed the researcher to assess and compare the relative importance of ICT to relationships.

6.2.2 The Impact of Technology-Enablement on Service Systems

By focussing on the emergence and impact of connective gaps on service systems, this study investigated and provides insight into how technology-enablement can impact a service system's ability to co-create value.

It is evident that the origins of connective gaps are embedded within technology-enabled value co-creation processes as the modus operandi, and are not driven by ICT as an external force. More specifically, the emergence of connective gaps is rooted in the actions and in the decisions of service system entities that exchange resources and attempt to co-create value by means of ICT (see section 5.4.2). The sheer existence of ICTs in a service system however, does not determine whether or not these entities will engage detrimental behavioural patterns such as the proactive and reactive practices of technology use (i.e. safeguarding, inability to disconnect etc.). Consequently, technology-enablement does not negatively impact the ability of a service system to exchange resources, and therefore to co-create value. Instead, it is the actions and behaviour of human entities while utilising ICTs within a service system that influence a service system's overall ability to co-create value.

If the ability of a service system to co-create value is not constrained by its technology-enablement, but rather by the actions of human service system entities, then the question arises: what influences these actions? This study suggests that the quality of social ties between entities influences and triggers actions that either result in, or help to avoid, connective gaps. In this context, it is important to re-emphasise that human entities (i.e. service customers) determine the extent of the technology repertoire and thereby influence the likelihood of technical problems resulting in hypo-connectivity. Human motivations and actions evidently play a pivotal role for the effectiveness and success of technology-enabled value co-creation processes, while ICTs appear to play a comparatively minute role. Over a decade ago, O'Sullivan already argued that:

> "human goals and motivations are not likely to be much different regardless of whether interactions are mediated or not […] it appears new technologies may be providing nothing terribly new—just new ways of doing things that people have been doing throughout the history of social interaction" (2000, p. 428).

Co-creation of value, regardless of whether it is mediated through ICTs or not, is a type of social interaction between humans. ICT enables the exchange of resources and co-creation of value in scenarios where such processes would have otherwise been impossible; for example whenever service provider and customer are physically dispersed. The availability of ICTs in a service system however, does not influence human behaviour, goals or motivation regarding the value co-creation process. By extending the argument brought forward by O'Sullivan (2000), this study suggests that the incentives of entities when engaging in value co-creation processes are likely to be similar in technology-enabled and "traditional" environments. Ultimately, the insight that human actions and decisions – and not the technology – impacts a service system's ability to co-create value enhances our current understanding of value co-creation in a technology mediated environment as called for by some authors (Chase & Apte, 2007; Froehle, 2006; Lovelock & Gummesson, 2004; Ostrom, et al., 2010; Wünderlich, 2009). Future research should now focus on the factors that influence human behavior, goals and motivation when attempting to co-create value.

6.3 Contributions of this Study

This study addressed the call for empirical work at the intersection of SDL driven service innovation research, ICT and service innovation, as well as connectivity, by investigating and analysing technology-enabled value co-creation processes in the context of the consulting industry. Specifically, by applying connectivity as a dyadic analytical lens, this study explored and described the socio-technical context in which resources can be exchanged and value be co-created by means of ICT, and provided insights into the impact of technology-enablement on a service system's ability to co-create value. Therefore this study provides *theoretical*, *methodological* and *empirical* contributions that are subsequently discussed.

The *theoretical* contribution of this study is based on the two models that consist of box-and-arrow figures and propositions which emerged from the inductive theory building process underlying this study (Colquitt & Zapata-Phelan, 2007; Eisenhardt & Graebner, 2007; Whetten, 1989). The first model put forward by this study describes the socio-technical context in which service systems set in the consulting industry exchange resources and co-create value by means of ICT. The second model provides insights into the antecedents, emergence, and consequences of connective gaps on service systems, and thereby addresses the research objective of investigating the impact that technology-enablement can have on a service system's ability to co-create value. Both models provide descriptions and explanations of observed processes, and use constructs as well as propositions in order explain how or why these observed processes occur; they therefore fulfil the basic purpose of a theory as outlined in Section 3.2.2.

Section 3.2.2 described the criteria of originality, fit to empirical data, and ability to stimulate future research that, if fulfilled, confirm the existence of a theoretical contribution. First, the findings of this study are original (Corley & Gioia, 2011), because the socio-technical context of value co-creation, the mechanisms leading to connective gaps and their consequences, as well as the link between technology-enablement and a service system's ability to co-create value, all represent previously un-investigated phenomena that are now empirically explored, described by the two models within this study, and consequently better understood (see section 5.4.1). Second, the two models that are proposed by this study are grounded in empirical data as called for by Eisenhardt (1989). The inductive theory building process and the chosen coding approach ensured that the findings emerged directly from the empirical data. For example, this fit is evident when comparing the model depicted in Figure 5.4 with the construct map outlining the relationship between all constructs (see Appendix B.2). Third, Section 6.5 of this study provides suggestions for future research, thereby addressing the argument by Kilduff (2006) and Hambrick (2007) that the ability of a study to stimulate future research indicates the existence of a theoretical contribution.

This study furthermore provides two *methodological* contributions. First, the study applied the suggestions of Heinonen, et al. (2010), Grönroos (2010) and others (Chen, et al., 2009; Ordanini & Parasuraman, 2011), and collected data from service providers *and* customers. This approach extended the scope of previous investigations and resulted in valuable insights that would have otherwise not been possible. For example, the finding of biased perception, as a type of relationship barrier, emerged because the researcher was able to compare data originating from customers and providers (see Section 4.5.3.1). Second, utilising connectivity as an analytical lens addresses the call for a socio-technical lens on technology-enabled interactions in service research (Edvardsson, et al., 2011; Makarem, et al., 2009; Vargo, et al., 2008). Understanding connectivity in service systems in general, and understanding the emergence and consequences of connective gaps on service systems in particular, provides us with a proxy for understanding the impact that technology-enablement can have on a service system's ability to co-create value. This study was, to the author's best knowledge, the first one to apply connectivity in service research.

Finally, this study provides *empirical* contributions at the nexus of SDL and service innovation research, the role of ICT therein, and connectivity. The first empirical insight explains technology-enabled value co-creation processes, including the roles performed by service system entities, the relationships between these entities, and the technology enabling this process. The second empirical insight explores the technical *and* relational or "social" dimension influencing technology-enabled value co-creation processes, as well as the interrelationship of these dimensions (see Section 5.4.2). This study thereby addressed a significant empirical gap when compared to previous studies that focussed on the face-to-face environment only, or studies that included the technical, but omitted the relational dimension. Finally, by focussing on the emergence and impact of connective gaps on service systems, this study provided empirical insight into an under investigated area, and provides the first step towards understanding what may constitute connective flow in service systems. Table 6.1 summarises all research gaps and implications that were identified and subsequently addressed in this study.

Research Gaps and Implications			Description	Authors	Addressed by this Study through
SDL-driven Service Innovation Research	**Gaps**	*Empirical*	Lack of empirical work using the SDL-lens on service innovation.	Ordanini & Parasuraman 2011; Sebastiani & Paiola 2010; Nam & Lee 2010	conceptual, methodological and contextual research implications outlined in the literature advocating an SDL perspective on service innovation.
			Lacking understanding of how customers and providers engage in value co-creation.	Payne, et al., 2008; Michel, et al., 2008; Edvardsson, et al., 2010; Grönroos 2011	identifying roles and tasks performed by service customers and providers during technology-enabled value co-creation.
	Implications	*Conceptual*	Conduct research focusing on change in value co-creation processes.	Edvardsson, et al., 2010; Sebastiani & Paiola 2010	the shift to technology-enabled resource exchange in consulting represents a type of change to the value co-creation process.
		Methodo-logical	Use qualitative empirical studies focussing on operant resources: include customers	Michel, et al., 2008; Chen, et al., 2009; Ordanini & Parasuraman 2011; Ostrom, et al., 2010	a qualitative multiple-case study in consulting industry, including service providers and customers and focus on information
		Contextual	Conduct empirical studies within professional service firms such as consulting.	Michel, et al., 2008; Vargo, et al., 2008; Payne, et al., 2008	the contextual background of the consulting industry.
			Conduct empirical studies in contexts where role of ICT is dominant.	Chen, et al., 2009; Sebastiani & Paiola 2010; Ordanini & Parasuraman 2011	cases where resource exchange was enabled by means of ICT.
Role of ICT in Service Innovation	**Gaps**	*Empirical*	Lack of empirical work at intersection of ICT and service innovation.	Chesbrough & Spohrer 2006;Bitner, et al., 2010; Blomberg 2010; Mott 2010; Ostrom, et al., 2010	investigating technology-enabled value co-creation processes, as advocated in the literature.
			Impact of ICT on service systems is unknown.	Bogatin, 2006; Vargo, et al., 2008; Bowden, 2009; Ostrom, et al., 2010; Füller, 2010	providing empirical insights into this issue that represent foundations for future work
			Empirical studies are limited to face-to-face encounters, and findings are not applicable to ICT-enabled environment.	Bitner, et al., 2000; Bowen 2000; Froehle & Roth 2004; Froehle 2006; Chase & Apte 2007; Wünderlich 2009	providing insight into how service providers and customer engage by means of ICT in value co-creation processes, thereby addressing this gap in the literature.
			Limited knowledge of technology-enabled value co-creation processes.	Bogatin 2006; Bowden 2009; Füller 2010	a full description and exploration of technology-enabled value co-creation processes, thereby addressing this gap.
	Implications	*Conceptual*	Empirically investigate technology-enabled value co-creation processes.	Froehle & Roth 2004; Chase & Apte 2007; Lee & Park 2009	an empirical investigation of technology-enabled value co-creation processes.
			Empirically investigate technical *and* social dimensions of technology-enabled value co-creation processes.	Vargo, et al., 2008; Makarem, et al., 2009; Edvardsson, et al., 2011; Maglio 2010; Ostrom, et al., 2010	the social and technical dimension of technology enabled value co-creation by utilising the socio-technical connectivity lens.
Connectivity	**Gaps**	*Empirical*	Lack of empirical connectivity research in contexts that underwent technological change.	Kolb, et al., 2008; Kolb, et al., 2012	a connectivity lens on technology-enabled value co-creation processes in consulting industry
			Lack of empirical evidence on causes and consequences of connective gaps/states.	Kolb, et al., 2008; Kolb, et al., 2012	the provision of empirical evidence into the causes and consequences of connective gaps in service systems.
	Implications	*Methodo-logical*	Employ findings from the virtual-team literature to service research.	Froehle 2006; Martins, Gilson et al., 2004	the connectivity lens to investigate the socio-technical context of value co-creation.
		Conceptual	Explore social and technical dimensions of connectivity. Focus on interrelationships.	Chen et al. 1999; Pilke 2004; Kolb 2008; Kolb, et al., 2012	the exploration of the interrelationship between technology usage, technology choices and relationships between entities.

Table 6.1: Identified Empirical Research Gaps and Implications Addressed in this Study

6.4 Limitations of this Study

Possible limitations of this study can be related to the use of qualitative multiple case studies, the literature included in the theory building process, and in the context in which this study was conducted. As an objective and value aware individual, this researcher furthermore acknowledges that any reality examined is only imperfectly apprehensible, and that resulting findings are only probably true. This researcher also acknowledges that “because of basically flawed human intellectual mechanisms” (Guba & Lincoln, 1994, p. 205), imperfect observations of the reality under investigation may have occurred during data collection. Furthermore, while Eisenhardt and Graebner (2007) argue that retrospective case studies are particularly suitable when interviews are the main source of evidence, as was the case in this study, participants nevertheless had to rely on their memory when answering questions. The researcher attempted to minimise the potential bias by collecting additional documentation material provided by case firms, informal on-going interactions with members of the project teams, and interviews with multiple participants from all hierarchical levels. At the time of each interview, none of the projects had been completed for more than 12 months so that participants still seemed familiar with their projects. Furthermore, the researcher continued to engage with participants after the interviews, which seemed to “trigger the memory” of some participants and led to additional information provided via email.

As with all qualitative studies, the resulting empirical data is subject to interpretation during the analysis. The coding approach selected for this study consisted of descriptive, interpretive and pattern codes which are known to ensure a close relationship of the emerging theory with the data, and therefore minimise potential researcher induced biases (Miles & Huberman, 1994b). Eisenhardt and Graebner explain in this context that “although sometimes seen as ‘subjective,’ well-done theory building from cases is surprisingly ‘objective,’ because its close adherence to the data keeps researchers ‘honest’” (2007, p. 25). In order to ensure the methodological trustworthiness of this study, the researcher followed suggestions by Healy and Perry (2000) and summarised the data throughout Chapter 4 using relevant quotations, matrices and tables. Furthermore, a coding example is presented in Appendix B.3. This coding example and the data provided throughout Chapter 4 illustrate that the researcher attempted to adhere as close to the data as possible when presenting the findings of the data analysis.

The literature included in the theory building process can be seen as another possible limitation. This study followed Eisenhardt (1989) and Eisenhardt and Graebner (2007), and initially compared the empirical findings of this study with the extant literature on service science, communication media and technology studies, virtual team studies, and the connectivity literature. While the nexus of these bodies of literature relates to the research gaps and implications, scholars from other disciplines may have contributed findings that could be applicable within the context of this study as well. Therefore, this study does not claim that the literature included here is presented in its entirety. Furthermore, the selection of literature and research areas may even be biased by the researcher's individual and educational background, or his affiliation with The University of Auckland Business School.

A final limitation can be found in the context of the consulting industry where this study was conducted. While the consulting context was specifically chosen because technology-enabled value co-creation processes as the phenomenon under investigation was particularly visible, it cannot be argued that the findings of this study are context independent. For example, service customers and providers could perform other roles in different contexts while engaging in value co-creation processes, an issue that should be addressed in future studies.

Ultimately, "no methodology is perfect" (Leonard-Barton, 1990, p. 260), and the limitations identified here stand in contrast to the choices made by the researcher who attempted to design and conduct the study in a fashion that would address the identified gaps and implications most appropriately. As discussed previously, this study should be seen as a foundation for future research that can provide managerial guidelines on how to manage technology-enablement and value co-creation processes in service systems most effectively.

6.5 Future Research Opportunities

Research at the intersection of the SDL, ICT, and service innovation is likely to remain a key research priority within the service science research agenda. Connectivity provides a suitable analytical lens that can, and should, be used to understand interactions between service system entities in technology-mediated environments. However, several opportunities for future research at the intersection of these areas remain unaddressed. Specifically, this study suggests future research to apply new methodological approaches and to focus on new research contexts and empirical gaps that emerged from this work.

As a foundation for future research, this study provides two models with a set of 14 propositions that can be tested and verified by future quantitative work. Future studies could also provide insights into the relative importance of the individual factors influencing technology choices, as well as the various relationship barriers that represent antecedents for the emergence of connective gaps. Subsequent studies may investigate the same research questions with a different methodological set. For example, longitudinal case studies could provide explicit insights into the communication behaviour of all entities within a service system by collecting data displaying the ICT use of every entity throughout the entire value co-creation process. This could be achieved by electronically logging every instance of ICT usage, and by comparing the resulting data set to external events such as changes in the service system. Insights from systems theory and systems dynamics can provide an additional methodological angle here (Maani & Cavana, 2000). By utilising causal loop diagrams, as suggested by Maani & Cavana (2000), the interactions within service systems can be modelled. Future studies could subsequently simulate interactions and value co-creation processes between service system entities that may provide us with a clearer picture about the parameters and conditions under which connective gaps occur.

Extending the study to contexts other than the consulting industry can provide further insights into the socio-technical context of value co-creation, as well as the interrelationship between the underlying technical and human dimension. While replicating the study in the context of other professional services, such as legal services, may provide similar results, changing the focus on a different group of service system entities is likely to generate further insights. For example, the IS literature investigates the means that *digital natives* interact with ICTs (Vondanovich, Sundaram, & Myers, 2010). Digital natives are individuals born within the last 20 years that have grown up within an environment where ICTs are ubiquitous and pervasive. IS researchers argue that these humans are likely to use ICTs differently than their older counterparts, labeled *digital immigrant*s, who did not grow up in an ICT enriched environment (Vondanovich, et al., 2010).

The implications and opportunities arising from this paradigmatic shift for research on service and connectivity are vast. For example, future studies linking digital natives and technology enablement in service could investigate if social ties remain a key factor driving technology use and choice for digital natives. Are digital natives less likely to engage in pro and reactive practices of technology use, and are they therefore less susceptible to connective gaps? And what are the implications for service businesses that begin to engage with digital natives as customers or employees?

Other empirical gaps that arose and remained unanswered by this study address questions regarding the process of value co-creation and connectivity. While this study explicitly excluded the customer's value in-use perspective, future researchers could expand their studies beyond the resource exchange and co-creation process. Furthermore, and as indicated previously, service customers and providers may perform different roles and tasks in other empirical contexts. Future studies should verify if the distinction into individual, joint and facilitating tasks made by this study is applicable in other contexts as well. Such studies could also provide insights into the the factors that influence human behavior, goals and motivation when exchanging resources and attempting to co-create value.

Finally, scholars should continue to utilise connectivity as a socio-technical lens in service research. Many aspects of connectivity are not yet fully understood or empirically verified. While the findings clearly indicate a relationship between connective gaps, time and the performance of service systems, the link between time and connectivity has, to date, not been discussed or further explored. Researchers may find ways to re-conceptualise connective states in relation to time, and thereby provide insights into the evolution of service systems. Investigating the link between connectivity and time may provide insights into the emergence of connective flow, a construct which is still not fully understood and empirically explored. Ultimately, future work should investigate if simply avoiding connective gaps is sufficient for connective flow to emerge in a service system, or if other alternative factors exist. While this study provided suggestions regarding the relative importance of technical and social connectivity when attempting to achieve a state of connective flow, it remains unclear what constitutes connective flow in service systems. Similarly, managerial guidelines and recommendations on how to manage connectivity most effectively could provide insights that will enable service systems to minimise connective gaps, effectively exchange resources, and thereby ensure that entities are able to co-create value.

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APPENDIX A

Appendix A.1: Overview of Identified and Screened Potential Case Sites

1) Exploration Phase:

ID	Date Contacted	Area of Expertise (Consulting Firm)	Location	Identified through	Screening Interview?
1	February 2009	Strategy	Australia	University of Auckland Event	Yes
2	February 2009	Strategy	New Zealand	University of Auckland Event	No
3	April 2009	General Management, Auditing	New Zealand	University of Auckland Network	Yes
4	April 2009	General Management, Auditing, Strategy, IT	Germany	University of Auckland Network	Yes
5	April 2009	General Management, Auditing, Strategy, IT	USA	University of Auckland Network	No
6	April 2009	IT Outsourcing and Strategy	Germany	Internet/Website	Yes
7	April 2009	IT Outsourcing and Strategy	India	Internet/Website	Yes
8	April 2009	Aviation	New Zealand	University of Auckland Network	Yes
9	April 2009	IT Software Development	New Zealand	University of Auckland Event	Yes
10	April 2009	IT Outsourcing and Security	New Zealand	University of Auckland Network	Yes
11	April 2009	Marketing	New Zealand	Industry Association	No
12	April 2009	Health IT	New Zealand	Internet/Website	No
13	April 2009	Telecommunication	New Zealand	University of Auckland Event	No
14	May 2009	IT for Law firms	New Zealand	Internet/Website	No
15	May 2009	General Management/IT/Process	New Zealand	University of Auckland Network	No
16	May 2009	IT	USA	University of Auckland Event	Yes
17	May 2009	IT Infrastructure	New Zealand	Industry Association	No
18	June 2009	Education	New Zealand	Industry Association	No
19	June 2009	Energy Exploitation	New Zealand	Industry Association	Yes

ID	Date Contacted	Area of Expertise (Consulting Firm)	Location	Identified through	Screening Interview?
20	June 2009	IT Infrastructure, Outsourcing, Strategy	Germany	Academic Publication	Yes
21	June 2009	Strategy	Germany	Academic Publication	Yes
22	June 2009	Strategy	USA	Internet/Website	No
23	June 2009	IT/Financial Services	Germany	Internet/Website	Yes
24	June 2009	Strategy	Germany	Internet/Website	Yes
25	June 2009	Engineering	New Zealand	Industry Association	Yes
26	June 2009	IT Process Management	Germany	Internet/Website	Yes
27	July 2009	General Management/IT/Process	India	University of Auckland Network	No
Total:	***16 Screening Interviews***				

Table A.1: Overview of Identified and Contacted Consulting Firms in this Study

2) Screening Phase I:

ID	Date Contacted	Date of Interview	Screening Interview		Outcome	Cause (if declined)
			Participant	*Method*		
1	February 2009	February 2009	Manager	Telephone	Declined by firm	Consulting firm unwilling to include customer
3	April 2009	May 2009	Partner, Project Manager	Face-to-Face	Rejected by researcher	Interaction not technology-enabled
4	April 2009	June 2009	Entire Team	Face-to-Face	Conditionally accepted	-
6	April 2009	April 2009	Manager	Video conference	Declined by firm	Consulting firm unwilling to include customer
7	April 2009	April 2009	Manager	Video conference	Declined by firm	Consulting firm unwilling to include customer
8	April 2009	April 2009	CEO	Face-to-Face	Rejected by researcher	No suitable projects available
9	April 2009	April 2009	CEO, COO	Face-to-Face	Rejected by researcher	Interaction not technology-enabled
10	April 2009	April 2009	Senior Manager, Project Manager	Face-to-Face	Declined by firm	Unexpected project developments, otherwise suitable
16	May 2009	May 2009	CEO	Video conference	Rejected by researcher	Interaction not technology-enabled
19	June 2009	July 2009	Entire Team	Face-to-Face	Conditionally accepted	-
20	June 2009	June 2009	CEO, Project Manager	Face-to-Face	Declined by firm	Consulting firm unwilling to include customer
21	June 2009	June 2009	Manager	Face-to-Face	Declined by firm	Consulting firm unwilling to include customer
23	June 2009	June 2009	CEO	Face-to-Face	Conditionally accepted	-
24	June 2009	June 2009	Project Manager	Face-to-Face	Declined by firm	Unexpected government pressure, otherwise suitable
25	June 2009	June 2009	CEO	Face-to-Face	Conditionally accepted	-
26	June 2009	July 2009	Manager	Telephone	Declined by firm	Consulting firm unwilling to include customer
Total:	***4 Potential Case Sites***					

Table A.2: Overview of First Round of Screening Interviews with Consulting Firms

3) Screening Phase II:

ID	# of Customer Firms	# of Additional Consulting Firms	Screening Interview		Outcome	Cause (if declined)
			Participant	*Method*		
4	1	0	Project Manager	Video conference	Accepted by researcher	-
23	1	0	Manager	Face-to-Face	Accepted by researcher	-
25	1	2	Entire Team	Face-to-Face	Accepted by researcher →Screen additional consulting firm	-
19	2	0	Project Manager	Face-to-Face	Accepted by researcher	-
Total:	***4 Potential cases***					

Table A.3: Overview of Second Iteration of Screening Interviews: Customer Firms

ID	# of Consulting Firms	Area of Consulting Expertise	Screening Interview		Outcome	Cause (if declined)
			Participant	*Type*		
25	2	General Management, Auditing, Strategy, IT	Project Manager	Telephone	Accepted by researcher	-
		Engineering, Infrastructure	Project Manager	Telephone	Accepted by researcher	-

Table A.4: Overview of Second Iteration of Screening Interviews: Additional Consulting Firms

4) Decision Phase:

ID	Consulting Firm(s)	Customer Firm(s)	Screening Parameters				Outcome	Case ID
			SP and SC included?	*Connective gaps?*	*Complete/ successful ST?*	Cultural similarity ?		
4	AlphaTech Consulting	AlphaNet	✓	✓	✓	✓	Accepted as case	**A**
25	BetaStrategy Consulting, RoadConsult, AssetConsult	BetaMinistry	✓	✓	✓	✓	Accepted as case	**B**
19	Global Science Consult	GammaDataHub, GammaMinistry	✓	✓	✓	✓	Accepted as case	**C**
23	DeltaTech Associates	DeltaFinance	✓	✓	✓	✓	Accepted as case	**D**

Table A.5: Overview of Cases Included in Decision Phase

Appendix A.2: Research Invitation

DEPARTMENT OF MANAGEMENT AND
INTERNATIONAL BUSINESS

THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
Te Whare Wānanga o Tāmaki Makaurau

Level 4 Owen Glen G Building
12 Grafton Road
Auckland, New Zealand
Telephone 64 9 373 7599
Facsimile 64 9 373 7477
The University of Auckland
Private Bag 92019
Auckland, New Zealand

Research Invitation

Distributed Service Engineering: Integrating Customers in Service Innovation Processes through Requisite Connectivity

To Whom It May Concern:

My name is Christoph Breidbach and I am a PhD student at The University of Auckland 's Department of Management and International Business. For my doctoral thesis, I investigate how professional service firms deliver knowledge-intensive services in conjunction with their customers. A special focus will be taken on investigating the ICT-enabled means that enable the interaction between service provider and customer.

If you or members of your organisation are interested in participating in this research, or have any questions, please get in touch with me via email (c.breidbach@auckland.ac.nz) or call me at 0064- 21-02556677.

Participation is voluntary and completely anonymous. All participants will get access to the results of the research through an executive summary upon completion of the project.

Kind regards,

Christoph Breidbach

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE on 20.02.2009 for 3 years from, (Ref.2009/015).

Appendix A.3: Participant Consent Form

DEPARTMENT OF MANAGEMENT AND
INTERNATIONAL BUSINESS

THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
Te Whare Wānanga o Tāmaki Makaurau

Level 4 Owen Glen G Building
12 Grafton Road
Auckland, New Zealand
Telephone 64 9 373 7599
Facsimile 64 9 373 7477
The University of Auckland
Private Bag 92019
Auckland, New Zealand

CONSENT FORM

THIS CONSENT FORM WILL BE HELD FOR A PERIOD OF SIX YEARS

Project Title:

Distributed Service Engineering: Integrating Customers in Service Innovation Processes through Requisite Connectivity

I have been given and have understood an explanation of the research project. I have had an opportunity to ask questions and these have been answered to my satisfaction.

I understand that I am free to withdraw myself or any information or involvement within four weeks after the interview without giving a reason for doing so.

I understand that the outcome of the study will be used for this PhD-research, and academic publications arising from this research project. Some information revealed in the interview may be commercially sensitive. The submission of the thesis and subsequent publications will be delayed until at least 6 months after the interviews. This will ensure that the most recent commercial data will not be published and the sensitivity of any information disclosed will be reduced.

I understand that audio recordings of the interviews may be taken as this is commonly expected of qualitative research and ensures greater accuracy. A participant may ask for the tape to be turned off at any time during the interview process without giving a reason. Participants can withdraw the information provided within four weeks after the interview.

I understand that all information gathered, including consent form, audio tape and any transcript, will be separated and securely stored on university premises, and destroyed after six years.

I agree that the researcher may conduct interviews with the employees of my organization that are involved in service projects.

I agree to take part in this research.

I agree to being audio-taped and understand that, even if I agree, I may choose to have the recorder turned off at any time without giving a reason.

Name of the participant: ____

Date:___________________

Signature:____

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE on 20.02.2009 for 3 years. (Ref.2009/015).

Appendix A.4.1: Interview Protocol Consulting Firm

Interview Protocol: Consulting Firm

Part A: professional role of the participant and background of the firm

1) What is your job description and role at [consulting firm]?
2) What type of projects does [consulting firm] usually work on?

Part B.1: background of project under investigation: consulting team

3) Tell me about project [project name]?
   Probing for: - start and end-date?
   - number of consultants/other employees involved?
   - role of each consultant/other employees?
   - cost/fees charged to customer firm?
   - physical location of project/consulting team?
4) Tell me about the goals of project [project name]?
   Probing for: - who and how goals were defined?
   - were goals accomplished?
5) Tell me about your role in project [project name]?
   Probing for: - tasks performed, duration in project?
   - cooperated how (tasks)?

Part B.2: background of project under investigation: customer team

6) Tell me about the customer's role in project [project name]?
   Probing for: - number of customer employees involved?
   - role of customer employees (tasks to perform)?
   - physical location of project/customer team?
7) Please describe the day-today interaction with the customer team?
   Probing for: - processes or methods used?
   - main customer contact of participant?
8) Is it important to interact with the customer? Why?
   Probing for: - motivation to interact/not interact?
   - resulting advantages/disadvantages?

9) Lessons learned from interaction? Would you do anything differently next time?

Part C.1: elements of socio-technical connectedness with customer: ICT

10) Which types of ICT were used to interact with the customers? How were they used?

    Probing for: - who had access to them? How often were they used?
    - which medium was used to interact with which customer employee?
    - which medium was used for which task?

11) Who provided ICTs used for project?

Part C.2: elements of socio-technical connectedness with customer: social elements

12) Describe the interpersonal relationship that you had with the customer team?

    Probing for: - how was the relationship built? How was it maintained?
    - who initiated and maintained it?

13) Which customer employees participated in the process?

Part C.3: Causes and consequences of varying level of connectedness with customer

14) What are the advantages of an ICT-based interaction with customers?
15) Did you ever experience a situation similar to the following?

    Let participant read hypo/hyper/flow scenario descriptions.
    Explain.
    Probing for: - when did it happen? Why did it happen? How did it happen?
    - what were the consequences?

16) Do you have the ability to 'switch off' your ICTs? Why?

    Probing for: - true for all media? True in all situations/circumstances?

17) How did the ICT-based interaction with customers impact the outcome of the project?

    Probing for: - information sharing, trust, impact on social relationships
    - cost, quality, timeliness of delivery?

18) Lessons learned from interaction via ICT? Would you do anything differently next time?

Part D: outcome and consequences of project?

19) Do you remember any changes or major incidents in the project?

    Probing for: - what happened? Why did it happen? What were the consequences?

20) Looking back, how successful was the project for [consulting firm]?
21) What were the success factors that enabled you to achieve your goals?
22) If you could start gain, is there anything that you would do differently?

Appendix A.4.2: Interview Protocol Customer Firm

Interview Protocol: Customer Firm

Part A: professional role of the participant and background of the firm

1) What is your job description and role at [*customer firm*]?
2) What type of products/services does [*customer firm*] provide?

Part B.1: background of project under investigation: customer team

3) Tell me about project [*project name*]?

   Probing for: - start and end-date
   - number of consultants/other employees involved
   - role of each consultant/other employees
   - cost/fees paid to consulting firm
   - physical location of project/customer team?

4) Tell me about the goals of project [*project name*]?

   Probing for - who and how were goals defined?
   - were goals accomplished?

5) Tell me about your role in project [*project name*]?

   Probing for: - tasks performed, duration in project?
   - cooperated how (tasks)?

Part B.2: background of project under investigation: consulting team

6) Tell me about the consultant's role in project [*project name*]?

   Probing for: - number of consultants involved
   - role of consultants (tasks to perform)
   - physical location of project/consulting team?

7) Please describe the day-today interaction with the consulting team

   Probing for: - processes or methods used
   - main consultant contact of participant

8) Is it important for to interact with the consultants? Why?

   Probing for: - motivation to interact/not interact
   - resulting advantages/disadvantages

9) Lessons learned from interaction? Would you do anything differently next time?

Part C.1: elements of socio-technical connectedness with consultants: ICT

10) Which types of ICT were used to interact with the consultants? How were they used?

Probing for: - Who had access to them? How often were they used?
- Which medium was used to interact with which consultant
- Which medium was used for which task?

11) Who provided ICTs used for project?

Part C.2: elements of socio-technical connectedness with consultants: social elements

12) Describe the interpersonal relationship that you had with the consulting team?

Probing for: - how was the relationship built? How was it maintained?
- who initiated and maintained it?

13) Which consultants participated in the process?

Part C.3: Causes and consequences of varying level of connectedness with consultants

14) What are the advantages of an ICT-based interaction with consultants?
15) Did you ever experience a situation similar to the following?

Let participant read hypo/hyper/flow scenario descriptions.

Explain.

Probing for: - when did it happen? Why did it happen? How did it happen?
- what were the consequences?

16) Do you have the ability to 'switch off' your ICTs? Why?
17) *Probing for:* - true for all media? True in all situations/circumstances?
18) How did the ICT-based interaction with consultants impact the outcome of the project?

Probing for: - information sharing, trust, impact on social relationships
- cost, quality, timeliness of delivery?

19) Lessons learned from interaction via ICT? Would you do anything differently next time?

Part D: outcome and consequences of project?

20) Do you remember any changes or major incidents in the project?

    Probing for: - What happened? Why did it happen? What were the consequences?

21) Looking back, how successful was the project for [*customer firm*]?
22) What were the success factors that enabled you to achieve your goals?
23) If you could start gain, is there anything that you would do differently?

Appendix A.5: Description of Hyper/Hypo-Connectivity and Connective Flow

The following text was given to potential participants during screening and the interview:

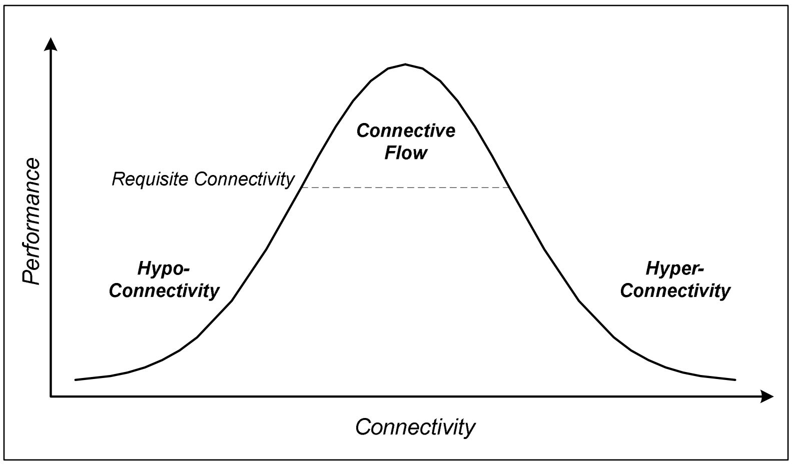


Figure A.1: Dimensions of Connectivity (Kolb, Collins et al. 2008)

Connectivity and Performance:

The word *connectivity* has been used by researchers to describe the quantity and quality of technical and social connections that exist between individuals and groups. Within the scope of this study, connectivity includes technical (i.e. email, video-conferencing, telephone etc.) and social (friendships, trusting relationships with peers, feeling of belonging) links and connections between yourself, your team, and your consultants/customers.

Performance is related to your ability to perform your tasks in an effective and efficient fashion. Performance could be related to effective and efficient meetings, the degree of information sharing between yourself, your team and your consultants/customers, or any other outcome that you consider relevant here. Please think about how the level of connectivity that you experienced during your project influenced the performance of yourself and your project.

Hyper Connectivity:

Hyper connectivity refers to a state during which you experience excessive amounts of connectivity, for example situations in your project when you had to be available for your peers and/or consultants/customers anywhere and anytime. Researchers have described hyper connectedness with terms such as “information and communication overload” or “constant social interruptions and chaos.”

Hypo Connectivity:

Hypo connectivity refers to a state during which you experience a lack of connectivity with your peers and/or consultants/customers. This could include lacking or ineffective ICTs, a lack of social connections or any other condition that you experienced, and which had a negative impact on your, and/or your project’s performance.

Connective Flow and Requisite Connectivity:

Requisite connectivity is a threshold condition when you experience sufficient level of connectivity, and feel that you are able to accomplish your tasks/project. You could experience this condition differently from your colleagues and it could differ depending on the task that you are working on. When ‘things go well’ for a while, researchers refer to *connective flow*. This is an ideal condition during which the performance of yourself and/or your project is highly efficient and effective. You could think about an optimal and rewarding experience that might have occurred within the duration of your project.

Appendix A.6: List of Interviews Conducted

NUMBER		PARTICIPANT					INTERVIEW		
Case	*No.*	*Category*	*Role*	*Location*	*Organisation*	*Nationality*	*Language*	*Method*	*Date*
A	1	Consulting Firm	Consultant	Germany	AlphaTech Consulting	German	German	Face-to-Face	23.09.2009
A	2	Consulting Firm	Consultant	Germany	AlphaTech Consulting	German	German	Face-to-Face	23.09.2009
A	3	Consulting Firm	Consultant	Germany	AlphaTech Consulting	German	German	Face-to-Face	01.10.2009
A	4	Consulting Firm	Project Manager	Germany	AlphaTech Consulting	German	German	Face-to-Face	23.09.2009
A	5	Consulting Firm	Senior Manager	Germany	AlphaTech Consulting	German	German	Telephone	09.10.2009
A	6	Customer Firm	Employee	Finland	AlphaNet	Finnish	English	Video-Conference	07.10.2009
A	7	Customer Firm	Employee	Finland	AlphaNet	Finnish	English	Video-Conference	08.10.2009
A	8	Customer Firm	Project Manager	Finland	AlphaNet	Finnish	English	Video-Conference	07.10.2009
A	9	Customer Firm	Senior Manager	Germany	AlphaNet	German	German	Telephone	01.10.2009
B	10	Consulting Firm	Project Manager	New Zealand	RoadConsult	New Zealander	English	Face-to-Face	04.08.2009
B	11	Consulting Firm	Senior Manager	New Zealand	RoadConsult	New Zealander	English	Face-to-Face	11.08.2009
B	12	Consulting Firm	Consultant	Australia	RoadConsult	Australian	English	Telephone	07.11.2009
B	13	Consulting Firm	Senior Manager	Canada	BetaStrategy Consulting	Canadian	English	Face-to-Face	12.10.2009
B	14	Consulting Firm	Consultant	Canada	RoadConsult	Canadian	English	Video-Conference	30.10.2009
B	15	Consulting Firm	Consultant	Canada	RoadConsult	Canadian	English	Video-Conference	07.11.2009
B	16	Consulting Firm	Project Manager	Canada	AssetConsult	Canadian	English	Face-to-Face	21.10.2009
B	17	Consulting Firm	Consultant	Canada	BetaStrategy Consulting	Canadian	English	Face-to-Face	14.10.2009
B	18	Consulting Firm	Project Manager	Canada	BetaStrategy Consulting	Canadian	English	Face-to-Face	15.10.2009
B	19	Customer Firm	Employee	Canada	BetaMinistry	Canadian	English	Face-to-Face	13.10.2009
B	20	Customer Firm	Employee	Canada	BetaMinistry	Canadian	English	Video-Conference	28.09.2009
B	21	Customer Firm	Project Manager	Canada	BetaMinistry	Canadian	English	Face-to-Face	13.10.2009
C	22	Consulting Firm	Project Manager	New Zealand	Global Science Consult	New Zealander	English	Face-to-Face	12.08.2009

Case	No.	Category	Role	Location	Organisation	Nationality	Language	Method	Date
C	23	Consulting Firm	Project Manager	New Zealand	Global Science Consult	New Zealander	English	Face-to-Face	13.08.2009
C	24	Consulting Firm	Consultant	New Zealand	Global Science Consult	New Zealander	English	Face-to-Face	13.08.2009
C	25	Consulting Firm	Consultant	New Zealand	Global Science Consult	New Zealander	English	Face-to-Face	13.08.2009
C	26	Consulting Firm	Senior Manager	New Zealand	Global Science Consult	New Zealander	English	Face-to-Face	12.08.2009
C	27	Customer Firm	Senior Manager	New Zealand	GammaDataHub	New Zealander	English	Face-to-Face	14.08.2009
C	28	Customer Firm	Employee	New Zealand	GammaDataHub	New Zealander	English	Face-to-Face	14.08.2009
C	29	Customer Firm	Employee	New Zealand	GammaDataHub	New Zealander	English	Telephone	26.08.2009
C	30	Customer Firm	Employee	Japan	GammaMinistry	New Zealander	English	Telephone	18.08.2009
C	31	Customer Firm	Employee	New Zealand	GammaMinistry	New Zealander	English	Face-to-Face	21.08.2009
D	32	Consulting Firm	Senior Manager	Germany	DeltaTech Associates	German	German	Face-to-Face	06.10.2009
D	33	Consulting Firm	Project Manager	Germany	DeltaTech Associates	German	German	Face-to-Face	06.10.2009
D	34	Customer Firm	Senior Manager	Germany	DeltaFinance	German	German	Face-to-Face	02.10.2009
D	35	Customer Firm	Project Manager	Germany	DeltaFinance	German	German	Face-to-Face	29.09.2009
D	36	Customer Firm	Employee	Germany	DeltaFinance	German	German	Face-to-Face	29.09.2009
D	37	Customer Firm	Employee	Germany	DeltaFinance	German	German	Face-to-Face	29.09.2009

APPENDIX B

Appendix B.1: Contact Summary Sheet

Case: C **Interviewee:** 27

1) Main Themes that Appeared During the Interview:

Background of project, knowledge transfer, setup in project change and co-creation

2) Which Research Questions Are Covered (indicate page-nr. of transcript)?

- **Regarding Customer Interaction:**

-How: Media use internal vs. external; customer used to "work virtually
-Who/How
-Information sharing
-Perception of customer
-Interaction cycles
-Perceived closeness of various customers

- **Regarding Connectivity:**

-Technical Connectivity is predefined, cannot be changed
-Limitations of virtual work/media general
-Relationship with customer and virtual work effect
-Relationship enables use of lean media
-Solution to connective gaps
-Hypo/Hypo-Cause
-Connective density
-Disconnect and performance; Connectivity and performance

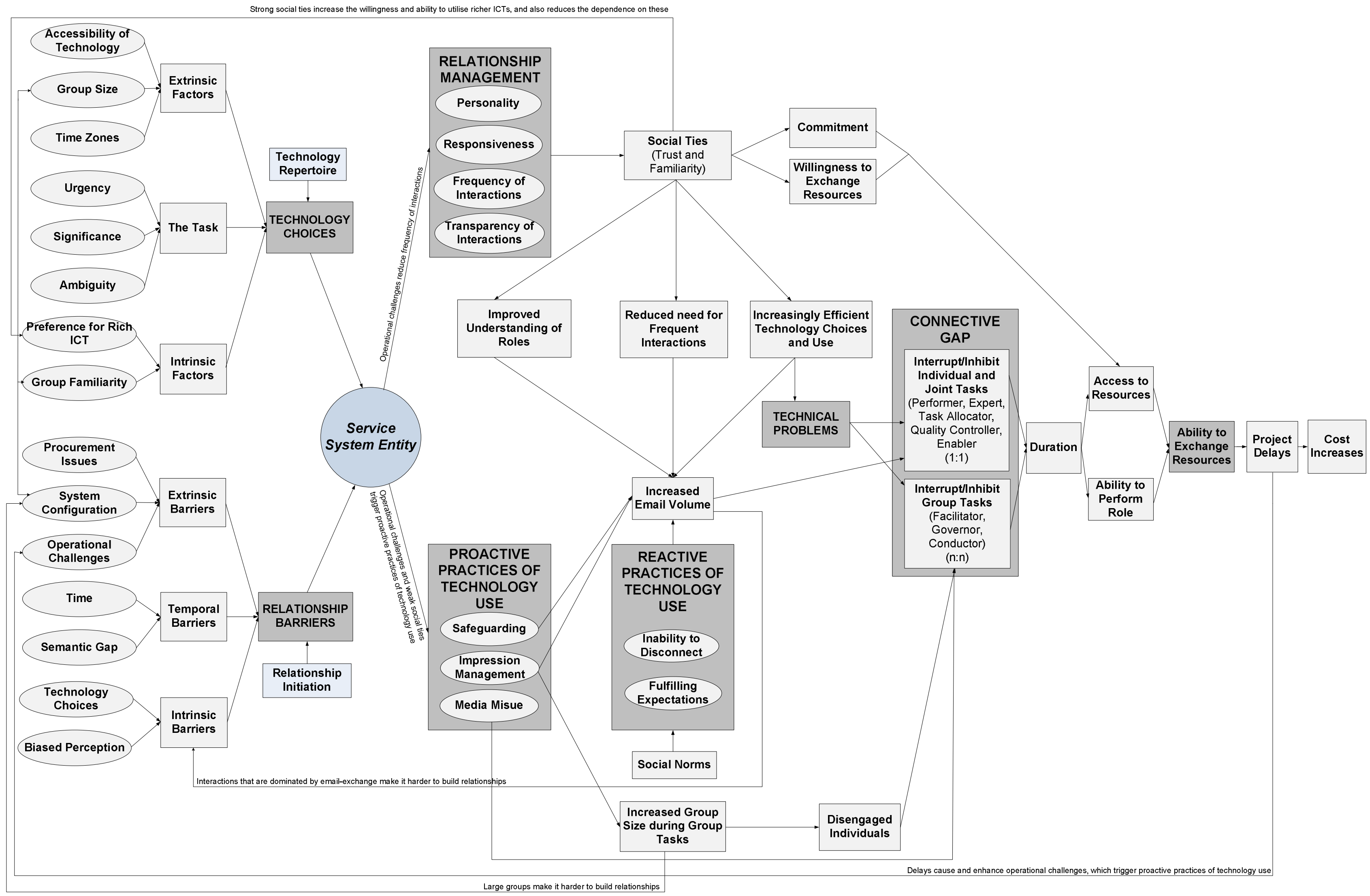
3) What New Ideas, Hypothesis or Findings were introduced?

- Relationship with client enables use of lean media
- Media use differs within and across team (consultant vs. client)
- Customer experience with virtual work and working with consultants may impact project
- Problems of virtual interaction well described
- Control of technology through customer

4) Additional Comments

- Issue of personal connectivity could be area for future research, or finding
- Idea: What are the prerequisites for virtual interaction? (technical infrastructure at customer site?)

Appendix B.2: Construct Map



Appendix B.3: Coding Example

Pattern Codes	Interpretive Codes	Descriptive Codes
Reactive Service Customer Role	*Quality Controller*	approving results, commenting, controlling and managing expectations, creation of the document, making changes, making suggestions, matching expectations, overview of tasks, provide information to consultants, providing feedback to consultants, providing feedback to core customer, providing recommendations to consultants, quality assurer, reading drafts, receiving information, reviewing material
	Enabler	answering questions, building slides, consolidating information, deliver information to consultants, developing templates, explain issues to consultants, supporting the consultants, using the software
Proactive Service Customer Roles	*Task Allocator*	allocate tasks to consultants, allocating tasks to consultants, ask the consultants, getting information from consultants, setting deadlines for task
	Governor	approve meetings, understanding the other customers, contacting the consultants, coordinate consultant's interaction with other customers, coordinate meetings, coordinates other customers, guiding consultants, managing the project, managing the relationship, organise meetings, planning the project, project management team, being the piggy in the middle, contract manager, single contact point, single player contact, circulate material, disseminate information, disseminate information to consultant, disseminate information to other team, disseminates information to the core team, obtaining information from other customers
Reactive Service Provider Roles	*Expert*	having expert knowledge, working on specialty areas, authoring chapters, collecting data, knitting the chapters together, making decisions, managing input, providing scientific input, providing technical input, working with data, writing reports, writing the chapter, writing the report, writing up the data
	Performer	being the asshole, consultant performs the work for the customer, no decisions made, operative work, altering the software, coaching and support, coming up with ideas, creating reports for management, creating presentations, creating templates, creating transparency for the customer, finding solutions, help the customer choosing the right software, implement the software, improve processes for customer, improving and advancing the software, making suggestions, optimize processes, outline alternatives, perform all tasks for customer, providing advice, support the management, support the planning, supporter, training the customer, updating the system

Pattern Codes	Interpretive Codes	Descriptive Codes
Proactive Service Provider Roles	*Conductor*	being a proxy for the customer, being the project lead, difference between conductor and PJM, main liaison with client, main point of contact for customer, no management power over consultants, not being the bottleneck, one point of contact, provides a bridge over time zones, reduces complexity, role distinctly different from PJM, single contact point while writing the draft, collaborating with project manager, coordinate with the client, coordinates with consultants, dealing with the client, filter for feedback, filtering the consultants work, making sure everyone is on the same page, managing the distributed consultants, presenting chapters to customer, provide leadership to customer, providing technical direction to consultants, seek customers feedback for buy in, sharing information with consultants support the PJM, translates technical language of report, vetoing input from consultants
	Facilitator	single point of contact, main point of contact, having one communication channel, facilitator, customer has direct access, customer expects us to run the project, consultants are more disciplined, connecting element between customer and other consultants, being the work stream lead, being the key contact, being more skilled than the customer, coordinate the project, coordinate the software development, coordinating and moderating the interaction, creating a meeting structure, disseminates information to customers, facilitate decision making, facilitates meetings, invites other team members to meetings, managing the meeting, moderating meetings, organising and running meetings

Appendix B.4: Memoing Example

First Insights into the Roles of Service Customers

I wonder how the consultants perceive the interaction with the customer, and who interacts when during the co-creation process with whom, and by what means? One of the first themes that emerged during the data analysis was the changing notion on who the customer actually is. It seems that the perception of "the customer" differs between the consulting team and customer team. Also, consultants on diverse hierarchical levels seem to have a different understanding about the customer, and what his role and contribution in the project is. Needless to say, this perception influences the ways how and when individuals interact with each other- which again influences the overall outcome of the project.

In any case, the results indicate that a rather intense contact between the teams exists. The partner works directly with his peers at the customer firm and is not immediately involved in the project. The project manager and the consultants work directly with a variety of customer employees, but not necessarily with the customer's management on day-to-day basis.

It seems that especially the consultants differentiate between the various employees that they interact with. This leads to behavioural changes towards each "group" of customer employees, and also to problems that occur during the interaction, such as a lack of information sharing. Information sharing appears to be another key theme that I need to investigate further. So what are the "groups" and how do they differ?

- *Project-Management (PJM)*: All consultants and their project manager perceive the customer's project manager as "their client" who is the main point of contact and provides direction on what they should do. The project manager is also called "sponsor".
- *Core-Team*: The customer's core team frequently and directly interacts with the consulting team. They are either directly supported in their tasks by the consulting team, or they support the tasks of the consultants. They are especially important for the consultants because they provide the majority of the relevant information that the consultants need. Again, the theme of information emerged.
- *Other Team-Members*: Additional team-members provide input information for tasks to be performed by consultants, or receive results from the consulting team. Their involvement is not as intense as the interaction with the core-team, but instead event-triggered, meaning that it only occurs on a case-by-case basis.