



## Journal of Service Management

Firm self-service technology readiness

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### Article information:

To cite this document:

B. Ramaseshan Russel P. J. Kingshott Alisha Stein , (2015), "Firm self-service technology readiness", Journal of Service Management, Vol. 26 Iss 5 pp. -

Permanent link to this document:

<http://dx.doi.org/10.1108/JOSM-08-2014-0216>

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## Firm self-service technology readiness

### Introduction

In today's fast-paced world, technology-facilitated transactions have become an integral part of firm service delivery. Rapid growth in information technology, technological advances and the emergence of new business models have contributed to the use of self-service technology (SST) by firms enabling customers to take on new roles in the provision of products and services. Through SST customers are able to check their bank balances and transfer funds on their mobile phones, travellers check-in to their flights with simple SST kiosks, and consumers purchase products on the internet without needing to speak to an employee. As SST continues to become more efficient and convenient to firms and their customers, organizations of all sizes are increasingly using SST to operate more productively in the quest to better serve their customers.

While SST can provide significant financial benefits (e.g., cost reduction and improved efficiency) for firms as well as the provision of additional value for customers (Hunter and Perreault, 2007; Padgett and Mulvey, 2007; Zhu *et al.*, 2007), many firms find that implementing and managing an effective SST system is more difficult than it looks (Bitner *et al.*, 2002). This could be primarily attributed to the lack of readiness of the firms to adopt and use SST. Therefore, it is critical for firms to assess whether they have the mechanisms necessary to be SST ready so that firms can identify areas of improvements in their SST operations.

SSTs have now become an integral part of firm service delivery (Lin and Hsieh, 2011), however there is a paucity of studies related to firm SST readiness. To date, the extant literature on SST has predominantly focused on customers' use and evaluation of SST (e.g., Collier and Sherrell,

2010; Curran and Meuter, 2007; Davis-Sramek *et al.*, 2010; Lin and Hsieh, 2011; Meuter *et al.*, 2005; Parasuraman, 2000; Shum *et al.*, 2006). Available studies in this area limit their scope to factors impacting technology usage within the firm (e.g., Davis, 1989; Homburg *et al.*, 2010). These studies do not consider whether firms are ready to use technology, specifically SST. Understanding firm readiness to use SST is critical given that such technologies provide a wide array of operational benefits (Bitner *et al.*, 2002; Dabholkar, 1996; Radas and Shugan, 1998) and can help improve firm performance (De Clercq *et al.*, 2008). Moreover, much literature argues that technology adoptions do not attain managerial expectations (Davis-Sramek *et al.*, 2010; Maklan and Knox, 2008); firms use technology without considering their capability to do so (Abrahamson and Rosenkopf, 1993; O'Neil *et al.*, 1998). Bitner *et al.* (2002) caution that firms must understand it is critical for them to be very clear on the strategic purpose for SST which means firms must develop clear plans in relation to the application of such technologies. Hence the relevance of the question as to whether firms are SST ready.

In this article, we begin by presenting a conceptual analysis of firm SST readiness which forms the basis for developing a new firm SST readiness scale. Following this, we identify the underlying dimensions of firm SST readiness. Then, we: (1) present a new construct that we label *firm SST readiness*, (2) outline its conceptual domain, (3) examine the psychometric properties of the scale using standard scale validation procedures, and (4) test whether firm SST readiness affects important firm outcomes.

## **Theoretical background**

Given that our research is framed around the concept of ‘readiness’, we begin our discussion with an explanation of the readiness construct and its use in different organizational and technological contexts. The term ‘readiness’ refers to the *state of being fully prepared for something*. The concept of readiness has been employed in several contexts including organizational behavior, strategic change, and management of technology. For instance, in the organizational behavior literature, Eby *et al.* (2000) investigate readiness relative to organizational members’ beliefs and attitudes about imminent change by taking into account the factors that can foster or influence transformative change. In the context of strategic change, Kaplan and Norton (2004) explain the concept of readiness as the extent to which organizational assets, processes and activities indicate that the organization is ready to move from a current state to a new desired state. Readiness, in the context of technology, has been defined as an individual’s propensity to embrace or use new technology (Parasuraman, 2000; Parasuraman and Colby, 2015). Considering the varying conceptualizations of ‘readiness’ in the extant literature, we find it necessary to contextualize ‘readiness’ in the firm SST setting to arrive at a conceptual definition of firm SST readiness.

At the outset, it is important to emphasize that firms need to regard any internal technology usage as a strategic imperative (Bitner *et al.*, 2002). Thus, there is an imperative need for a broader understanding of the elements contributing towards the effective application of SSTs in the firm’s service delivery system. This corroborates the view that technological innovation in the firm needs to be regarded as a management process, and not simply a functional activity (Ottenbacher and Harrington, 2010). Therefore a firm’s capacity to successfully adopt and use new ideas, processes, or products (Hurley and Hult, 1998) must also factor the firm’s

environment and wider stakeholders into the decision. This means that if a service firm's readiness to use SST in the value proposition is a function of the firm's operational environments and stakeholders, a suitable conceptual grounding upon which to base SST readiness must concurrently account for these factors.

Whilst SST literature draws upon a number of theoretical foundations (e.g. Dabholkar and Bagozzi, 2002; Zhu *et al.*, 2007), we ground our research in socio-technical systems theory (Pasmore, 1988; Pasmore and Sherwood, 1978). The rudiments of this theory stem from the earlier work of Trist and Bamforth (1951) and Trist *et al.* (1963) who contend that modelling firms this way helps conceptualize the interrelatedness of the firms' social and technical subsystems in relation to their operational environments. More recently, Pasmore *et al.* (1983) contended that firms "will function optimally only if the social and technical systems of the organization are designed to fit the demands of each other and the environment" (p. 1182). Such demands pertain to service firm performance and service delivery outcomes aimed at meeting customer needs. We posit that in the context of firms using SSTs to better serve customers, the socio-technical systems vantage helps to explain how firm outcomes are derived through the interplay between its technical and social systems (Lui *et al.*, 2006) - elements that are intrinsic to the modern service firm. The main justification for our approach pivots upon the core premise underpinning socio-technical systems theory, namely that firms comprise both technical and social systems that work in tandem to produce desirable outcomes (Smith *et al.*, 2010, p. 441). Such outcomes for the service firm ultimately pertain to creating value for both the firm and its customers through the application of SSTs. Smith *et al.* (2010) provide empirical support for an integrated service recovery system grounded in socio-technical systems theory, suggesting the

merit of this conceptual perspective in a service firm context. In proposing this socio-technical system approach to help explain how firms adopt the use of SST in creating customer value we further acknowledge the critical role such technologies now play in the service delivery process. Thus the ability of the service firm to adopt a more holistic approach through incorporating SST into the value proposition can be explained from the perspective of socio-technical systems theory as this vantage integrates technology, people and the environment in order to optimize firm outcomes. This is critical given that modern firms comprise many operational elements that need to be synchronised to ensure customers are served in an appropriate manner. Typically a firm has a range of internal and external stakeholders such as customers, value chain members and employees. It is vital that both customers and employees are able to successfully embrace innovative technology-based service solutions if they are to create value for both stakeholders (Parasuraman and Colby, 2015). Socio-technical systems theory helps to explain how these internal and external elements can be integrated in the process of optimising firm outcomes (Das and Jayaram, 2007), thus providing a suitable conceptual basis on which to depict SSTs in the process of value creation.

Accordingly, socio-technical systems theory is an apt theoretical basis to explain the successful use of SST in business operations because technology usage within the firm occurs in the context a social environment (Burkhardt, 1994; Homburg *et al.*, 2010). Moreover, existing SST literature implies the critical importance of propagating social interaction with customers to help increase SST success by organisations. Such a technology-social nexus underpins socio-technical systems theory suggesting further the merits of using the theory to help explain firm SST readiness. For example, evaluating the SST interface (Zhu *et al.*, 2007) as well as customer evaluations of the

usage of SST (Liljander *et al.*, 2006) are essential to ensure new technology effectiveness in continuing to better serve customers. On that basis, given technology-driven service separation (i.e., receiving a service in the absence of the employee) is becoming a key aspect of firm operations (Keh and Pang, 2010), we can see how socio-technical systems theory serves as the linchpin in explaining how the firms, customers and SST are interlinked. Theoretically, such engagement implicitly comprises a variety of social and technical facets of the firm-customer relationship. From the above discussion, socio-technical systems theory suggests that the ability of the firm to link its technical and social elements with its environment is instrumental in helping to understand firm SST readiness.

Within a service delivery system, typically a firm's socio-technical system comprises its SST, employees and management, as well as a variety of firm related factors such as organizational design and the nature of its inherent culture. Indeed, within an integrated service recovery system, Smith *et al.* (2010) conceptualize the firm's technical elements to comprise the means by which customers can engage the firm, whereas the social system consists of interactions among actors in the value chain. From a socio-technical systems theory perspective, we can see how these aspects can be integrated throughout the firm's internal policies, processes and procedures meaning that socio-technical systems not only consist of people and technology but also embody those planning and operational tasks necessary for proper application of SST. This corroborates the main goal of socio-technical systems theory intervention, namely to employ both technology and people to create stakeholder value through joint optimization between these two critical entities (Pasmore *et al.*, 1982). Given that maximising firm and stakeholder outcomes is the ultimate purpose of acquiring SST (Cunningham *et al.*, 2009; Curran *et al.*, 2003; Walker *et al.*,

2002), firms need to synchronise their socio-technical system with their internal and external environments. According to socio-technical systems theory, firms maximise output when they are able to use technology to link the environment with the socio-cultural elements (i.e., the organizational culture and employees) within the firm. However, the introduction of SST in organizations leads to consumers taking on some employee roles within the service delivery process. As a consequence, socio-technical systems theory helps to explain the intricate link between the employee, the technology and the environment, as well as the customer who assumes the role of quasi-employee. Based on the above discussion, we define firm self-service technology readiness as *the ability of firms to effectively embrace and integrate SST with their internal structures and processes, employees, customers, and channel members, to create stakeholder value.*

### **Conceptual domain of firm SST technology readiness**

The pertinent work within the marketing and management literature relating to technology readiness formed the basis for the conceptual domain of the new construct. Our reasoning is based upon marketing's traditional domain and structure that has been expanded to incorporate the role of technology (Parasuraman, 2000). To highlight the prevalence of technology in customer-employee-company interactions, Parasuraman (1996) extended Kotler's (1994) triangle model by proposing a "pyramid model" of services marketing, incorporating technology as a new dimension. The pyramid model underscores the importance of the effective management of the three links: company-technology, technology-employee, and technology-customer (Parasuraman, 1996). We propose the diamond model (Figure 1) as an extension of the pyramid model in consideration of the significant role played by channel members in enabling SST in



organizations. The diamond model helps to conceptualize how socio-technical systems theory relates to the central role technology plays in linking key elements within and external to the organisation – firm, employees, customers and channel members.

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**Insert Figure 1**

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According to socio-technical systems theory (Pasmore, 1988), firms must have the right blend of structure, employees, and technologies linked to their external environment in order to maximize firm outcomes. Under the guise of socio-technical systems theory we note that the firm’s “social system” comprises people who work with one another and the interrelationship between them (e.g., Pasmore *et al.*, 1982). Modern service firms do however operate in the context of value chains so these systems extend beyond firm boundaries. Accordingly, various channel members are inter-related. The resulting integration of intra-organizational resources and inter-organizational capabilities, through the socio-technical system, can lead to higher firm performance (Xu *et al.*, 2014). On that basis, we posit that the specific elements within the firms’ operational environment, namely – organizational factors, employees, customers, and channel members, will impact upon firm SST readiness. Specifically, integrating these elements is critical to ensure that firms maximize their coordinated efforts within the value chain, thus delivering value to their customers and stakeholders (Ganesan *et al.*, 2009). SST has become an intricate component in the firm’s service delivery (Lin and Hsieh, 2011), and as a result, it is critical for managers to be able to effectively integrate SST within the operations of their organization affecting employees, customers, and channel members. Each of these elements is discussed below.

### ***Organizational factors***

Socio-technical systems theory indicates how organizational structure (e.g. Cartelli, 2007; Pasmore *et al.*, 1982; Shani *et al.*, 1992) and aspects relating to innovative culture (e.g. Lyytinen and Newman, 2008; Pan and Scarbrough, 1996), regarding technology of the time, help to solve the “optimization problem”. The seminal work of Woodward (1965) reveals how technology had impacts the need to redesign the organizational structure of the firm. Indeed, organizational structure plays a significant role in firm decision making with regard to new technology adoptions (Kesting and Ulhoi, 2010). Thus we anticipate this condition to hold in relation to SST decisions and application within the service organization. For effective technological decision-making and related processes, interactions need to permeate both horizontally and vertically throughout the firm. Under the guise of socio-technical systems theory, individuals or teams have the latitude to control their own behavior (Manz and Stewart, 1997), meaning decentralized decision making plays a role in contributing to the so-called optimization problem facing service organizations. Organic (or horizontal) organizational structures that encourage decentralised decision making thus promote higher levels of interaction between personnel. Socio-technical systems theory advocates the need for firms to have a horizontal organizational and involved decision-making structure (Cummings, 1978; Das and Jayaram, 2007) in order to help join social and technical systems together to maximise joint optimization. We see evidence of this where firms use technology in which “cross-functional” processes are deemed critical to the operational success of the technology (Payne and Frow, 2005).

Innovative cultures are central to strategic success due to their propensity to encourage innovative behavior, creativity, and, the willingness to take calculated risk (Menon and Varadarajan, 1992). The extent to which creativity and innovation occur within a firm greatly depends on an organization's culture (Tushman and O'Reilly, 1997). Firm culture is critical to long term technological capabilities (Panne *et al.*, 2003). However, Pasmore *et al.* (1982) make the point that many studies grounded in socio-technical systems theory erroneously view technology as a given, yet clearly it is constantly evolving. Thus firms need to be innovative to keep abreast of the many technological changes. With this in mind, we see how innovative cultures help firms focus upon leveraging internal competencies (O'Cass and Ngo, 2005), thus directly impacting the firm's ability to successfully use SST. Moreover, firms that propagate these types of cultural environments encourage the sharing of ideas about various aspects of technology to increase the probability of successful use within the firm. According to socio-technical systems theory, knowledge integration between different stakeholders is a central requirement of the socio-technical system (Pasmore, 1988). Pan and Scarbrough (1996) find an interactive relationship between knowledge management processes and the firm culture, termed info-structure and info-culture respectively, helps contribute to business objectives. Personnel within the organization are therefore able to disseminate knowledge about new technology and in this way innovation can be something sought by the firm rather than simply another input factor that needs to be managed (Frohman, 1998). More generally, Susman and Chase (1986) reveal how firms adapt to new technologies through increased teamwork, more communication and increased integration in the context of manufacturing. They argue further that, under the guise of the socio-technical systems approach, firms must propagate a culture embraced by employees and managers alike that is open to new ideas. By this we mean that decision makers and

personnel within the firm that are open to embrace technology will possess an innovative culture, which in turn increases the success of SST.

### ***Employees***

Employees play a central role in the adoption of new technology (Essén, 2009; Lui *et al.*, 2006; Pasmore *et al.*, 1982) and these personnel are a key component in the social sub-system that underpins socio-technical systems theory (e.g. Das and Jayaram, 2007; Manz and Stewart, 1997). Typically, employees who are involved in the organization's new technology processes and decisions, get conversant and experienced with the technology (Marler and Dulebohn, 2005). This in turn enables the technologies, such as SST, to be embraced more effectively by employees throughout the firm. Shum *et al.* (2008) point out that those employees committed to the firm are willing to put extra effort into ensuring the success of change initiatives, such as new technology. It has also been found that the capacity of firms to manage their knowledge base and human resources practices impacts innovation performance (Herrera *et al.*, 2010). This conforms to socio-technical systems theory given that it is synonymous with a firm's work design and the extent of employee involvement in decision making (Appelbaum 1997). It is critical to get this balance right because findings in the socio-technical systems theory and other literatures reveal when employees are required to 'heavily adapt' to technologies this inadvertently impacts firm performance (Frohlich and Dixon, 1999; Gupta *et al.*, 1997). This in effect means the employee job design and work systems need to be harmonized with current roles to optimize firm outcomes. Such harmony helps to align the four interacting components of the socio-technical model, namely task, structure, people and technology (Seidel *et al.*, 2013) suggesting the employee narrative is one of the pillars that underpins firm SST readiness. From a theoretical

vantage considering that SST permeates throughout the firm and across industries, socio-technical systems theory is critical in helping managers understand the best way to model firm-employee interface. Additionally, Cadwallader *et al.* (2010) point out that employees are ultimately involved in the implementation of technology and can thus act as catalysts or barriers to acceptance of new technology. In socio-technical systems theory, employees represent the social sub-system that ultimately comprises the composite of these individual's aptitudes, skills, attitudes and beliefs across lateral and vertical relationships within the firm (Shani *et al.*, 1992, p. 98). Thus, firms that are capable of engaging their employees in aspects of technology, particularly in relation to its use within the value chain, will increase their readiness to use SST.

Organizations are increasingly involving their employees to help design and implement new technology solutions to build ownership of the process and speed up technology adoption. Socio-technical systems theory recognises employees can contribute to firms in many ways in relation to strategic decisions (Manz and Stewart, 1997) indicating that engaging these personnel is a critical process related to SST readiness. Employee involvement is a core element in strategic planning and execution and has an overall positive impact upon firm strategy (Collier *et al.*, 2004; Menon *et al.*, 1999). When employees are exposed to innovation through involvement they learn how to use technology effectively and this experience will also permeate throughout the firm. The process of acquiring and using SST should be embodied into the roles of employees to enhance involvement and experience about how technological innovation will impact upon their roles. Such involvement enables employees to perform their roles better when using new technologies (e.g. Davis, 1989). Employee involvement is essential to the adoption process in order to leverage benefits from employees using technology (Fenton-O'Creevy, 2001). This is

reflected in socio-technical systems theory literature (e.g. Beekun, 1989; Cummings, 1978; Das and Jayaram, 2007; Lyytinen and Newman, 2008; Manz and Stewart, 1997; Walker *et al.*, 2008). The corollary to this body of socio-technical systems literature is that employee involvement is crucial to ensure synergies between the social and technical systems in the process of helping optimise firm outcomes. Thus, encouraging employees to become involved in many aspects of the application of SST is a critical step in firm SST readiness.

### ***Channel members***

Firms operate within wider and longer value chains. Thus channel members should be considered as an integral part of a firm's SST readiness process. For technology adoption to have positive outcomes for firms and their channel partners there is a need for constant interaction among both types of entity. Socio-technical systems of the firm must interact constructively with their environments (Fox, 1995) including members of the firm's value chain. Maffei and Meredith (1995) argue that upstream and downstream integration of operations is important, implying a clear need for closer integration with channel members in the value chain. Xu *et al.* (2014) explain how firms in the value chain are able to synchronise members of the supply chain with the aim of maximizing customer value. Many firms have become integrated into larger value chains and/or networks in the quest to better serve customers (e.g. Devaraj *et al.*, 2007; Subramani, 2004; Wu *et al.*, 2006). Each participant firm plays a role in creating customer value. From the vantage of socio-technical systems theory, Walker *et al.* (2008) make the point that when the socio-technical system becomes an 'open system' it emulates a living entity that is capable of adapting and responding to the environment. Such a sociotechnical system also comprises actors that include: "customers, managers, maintainers, developers and users"

(Lyytinen and Newman, 2008, p.596). On that basis, we posit such an open system is also analogous to integrating aspects of the service firm's internal environments with that of value chain members, and, such interactions help contribute to the value proposition. From a pragmatic perspective, these interactions for example could encapsulate suppliers of SST systems, training in the use of the systems or even interaction with them to help configure the SST into the service operations. In relation to the acquisition of SSTs this spans both the technical and social systems of the service and supplier firms. However, other channel members, such as suppliers of products and services, would also require similar patterns of engagement across each firm's respective social and technical systems.

The need to engage channel members through respective social systems is corroborated through earlier literature on the role of technology in the value chain that has identified the critical importance of integration of several business functions – production, data exchange, warehousing, direct communication, and electronic payment (Rosenberg and Hirschman, 1980). Rosenberg and Hirschman (1980) also point out that channel members need to interact simultaneously, rather than sequentially (or vertically), to accomplish organizational goals. More contemporary forms of technology such as e-business (Osmonbekov, 2010) and supply-chain technology (Davis-Sramek *et al.*, 2010; Richey *et al.*, 2010) have shown the importance of integrating buyer-suppliers and the value chain in the process of delivering customer value. For instance, the literature suggests that integration and interaction with channel members is the key to technological success within organizations (Devaraj *et al.*, 2007; Frohlich and Westbrook, 2001; Johnson, 1999; Kent and Mentzer, 2003). Typically, within the banking sector the provision of SST (such as ATM machines, their maintenance and cash replenishment activities

are commonly outsourced to different third party channel intermediaries) requires effective coordination and integration of channel members. Therefore, based upon prior literature, we infer that successful SST usage is a function of effective interconnectedness between entities within the value chain – particularly those that use and/or benefit from the technology.

### ***Customers***

In the process of using SST, customers play a significant part in service production by assuming the role of co-producers and contribute to the process of service delivery (Bitner *et al.*, 2010; Wang *et al.*, 2012). This is consistent with socio-technical systems theory which states that firms are made up of people producing products and services using technology (Pasmore *et al.*, 1982, p.1182) in which the customer co-creates value through the use of SST. Through this, we see how SSTs enhance the role that technology can play in customer interactions with firms by empowering customers to co-produce services and co-create value (Lin and Hsieh, 2011). Considering the increasing adoption of SST by customers (Wang *et al.*, 2012), it is important for firms to identify ways to enhance the use of SSTs among their customers (Meuter *et al.*, 2000). The earlier work of Leavitt (1972) indicates firms modelling their operations from the perspective of socio-technical systems will mean that the use of new technological tools will change the actors and the tasks these actors perform. This is consistent with literature in the SST domain whereby customers are playing more prominent roles in the process of co-creation, which has implications for the firm. For example, to effectively use SSTs to coproduce a service/product, customers must know what is expected of them and therefore must be motivated and be able to operate SST (Meuter *et al.*, 2005). This is especially important given that service employees usually are not present to educate or train customers in SST settings (Meuter *et al.*,



2000). The technology readiness index developed by Parasuraman (2000) and cross validated by Lin and Hsieh (2012) empirically reveals the propensity of customers to adopt new innovation but in doing so it also highlights the importance of the link between firms' technology and their customers and employees. Lin *et al.* (2010) found that technology was the most effective mechanism to enhance firms' innovation capability through their collaborative efforts with customers. On that point, Wang *et al.* (2010) reveal how a socio-technical systems approach can be used to model customer services and that customer interaction with the firm contributes to synergies between the social and technical systems. Such interaction yields positive firm and customer outcomes. In a related customer service domain, by drawing upon socio-technical systems theory, Smith *et al.* (2010) emphasize the importance of integrating social and technical systems into the service recovery process. Clearly, the manner in which the firm models the customer interface through SSTs is intrinsically linked to success or failure of such technologies. From this, we infer that customers play a key role in firm SST readiness.

By grounding our study in socio-technical systems theory we are able to observe the critical importance of linking the firm's internal and external operational domains through the use of SST. This link was earlier identified by Parasuraman (2000) who depicts technology as the linchpin between the firm, its customers and its employees. We have thus taken a strategic approach to explain how the adoption and use of SST within a firm is a strategic imperative. Such a holistic perspective recognizes the interplay between social and technical factors in the process of optimising firm outcomes (Pan and Scarbrough, 1999). This implies that SST needs to become a central component of the value creation strategy for the firm when dealing with

stakeholders. On the basis of the above, we now discuss the process and approach that was used in the development and validation of the firm SST readiness construct.

### **Developing the firm SST readiness scale**

We conducted a series of studies to identify and refine items that tap into the conceptual domain of the firm SST readiness construct. These studies were triangulated with the extant literature and include interviews with key informants, discussions with expert panel members, field surveys, and analysis. Specific details of each of these studies are discussed below.

#### **Study 1: Item generation and selection**

At the outset, semi-structured interviews were conducted with managers of different firms from several industries responsible for establishing and implementing SSTs in their organization. These firms, which included airlines, hotels, financial services, and car rental companies, were selected because of the high usage of SST in their industry. In order to capture relevant information, we developed a research protocol for interviews with these key informants. These individuals were specifically asked to reflect upon the process of bringing SST into their organisations and from that ‘journey’ identify what they felt were critical aspects related to SST in order to capture the issues surrounding the implementation and usage of SST. In all, a total of eight interviews were conducted as this was the point where themes converged (Eisenhardt, 1989). Each interview was personally conducted by one of the authors, ranging between 45 minutes to 1 hour in duration. Interviews were recorded and transcribed to conform to the 24 hour rule (Eisenhardt and Bourgeois, 1988) to ensure that they accurately reflected what was discussed. Key themes that emerged provided critical direction for a more comprehensive

examination of the extant literature. Following this, we conducted an extensive literature search on firm SST readiness. Based upon the review and the semi-structured interviews, 47 items were identified<sup>1</sup>. The initial pool of 47 items was subjected to an assessment of content validity to enable deletion of items that were deemed to be conceptually inconsistent. Ten experts were exposed to individual items and were asked to evaluate the degree to which the items are representative of the construct's conceptual definition. The initial pool of 47 items was then listed in a random order and presented to expert panel members for screening and an initial face validity check. The experts were asked to rate the items as 'highly representative', 'somewhat representative', or 'not representative' of the construct of interest. Items were retained if the majority of the experts rated them highly representative (Saxe and Weitz, 1982). There was unanimity among the expert panel members regarding the suggested omission of several items that did not adequately reflect the firm SST readiness construct and items that had implicitly overlapping meanings. This resulted in 35 items that best reflect the expert opinion of firm SST readiness.

## **Study 2: Item reduction and dimensionality of the scale**

Study 2 was aimed at examining the readability and relevance of the items identified earlier. This consisted of two phases. Phase 1 comprised a pre-test of the 35 items among 20 managers randomly selected from different banks to seek feedback on the content assessment, adequacy and readability of the scale items. The banking industry is an exemplar case of the service industry that is becoming more reliant upon SST, therefore provided a suitable context for this study. For instance, core banking services are delivered through conventional means (e.g.,

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<sup>1</sup> A full list of items is available from the corresponding author upon request.

traditional branch transactions), as well as SST (e.g., telephone and online banking). Initially, we compiled a sampling frame that comprised bank managers across Australia from banks that have been extensively using multiple forms of SST within their operations. All managers within the sampling frame are considered to be experts as they typically have 10-15 years of experience in all facets of banking, inclusive of the introduction and use of SSTs. The key informants (20 managers) acted as an expert industry panel to determine the face validity of the items and elimination of similar items (Hair *et al.*, 1995). The instrument was distributed through both traditional and electronic mail. The managers were personally contacted via telephone and asked to provide relevant feedback in relation to each of the items. In line with Clark and Watson (1995), our item removal decision was based on a consideration of having a sound balance for good theory and the feedback from the bank managers. We recognize that simply retaining the items based on expert feedback (bank managers) may not necessarily yield the scale that best represents the target construct. Similarly, items that reflect the theoretical core of the construct may not necessarily resonate strongly with practitioner/expert views. Thus, before eliminating each item, we assessed both the relevance of the item to the underlying theory and the expert opinion. This process resulted in a reduction from 35 to 22 items.

In phase 2, we mailed the survey instrument to 1000 managers of several different types of service organisations selected at random from a business directory. This yielded 177 completely usable responses comprising managers from airlines (12%), banks (27%), insurance firms (16%), general service retailers (33%) and telecommunications (12%). The experience of these managers in their current roles ranged from 7-15 years. The average age of the managers was 43 years, which suggests that they are relatively experienced practitioners in their respective

industries. The respondents were asked to indicate the extent to which they agreed with the items using a 7-point Likert type scale (1 = “strongly disagree,” and 7 = “strongly agree”). The items were designed to reflect the key aspects likely to enhance (or impede) the extent of firm SST readiness. The data collected in this phase were analyzed to empirically verify the relevance of the items. An exploratory factor analysis of all the 22 items was conducted simultaneously using Varimax rotation. This resulted in a four-factor solution with eigenvalues greater than 1 (variance explained = 76.79%). The three items: “SST gives our customers benefits that cannot be provided by our employees”, “Our employees are very willing to use SST”, and “We consider it important to involve other channel partners in developing new SST” were initially included in the research instrument, although they had been viewed inconsistently by the bank manager participants in phase one. The low item to total correlations of .51, .29 and .47 respectively further empirically confirms earlier concerns made by the bank managers. As a result, the three items were omitted from the scale. The results presented in Table 1 show that of the total 19 items, five items loaded onto each of the first, second and third factors with four items loading onto the fourth factor. The reliability scores ( $\alpha$  value) for each of these four factors were .922, .904, .927 and .898 respectively, fulfilling the criterion of Nunnally and Bernstein (1994). Subsequently, a CFA was conducted, the results of which are shown in Table 1.

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**Insert Table 1**

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After a close examination of the item semantics, the four factors were labelled as: managerial acquiescence, customer alignment, employee engagement, and channel integration. These dimensions of the construct are congruous with the main aspects underpinning socio-technical

systems theory, namely the ability of the firm to integrate technology, people and the external environment (Das and Jayaram, 2007). This conforms to our conceptualisation of the four dimensions. Managerial acquiescence denotes the structure and culture of the organization and reflects the degree to which managers of the firm recognise the importance of, are committed to, and are willing to provide adequate support for the use of SST. Customer alignment refers to firms' ability to configure their SST to suit customer needs. Employee engagement depicts the extent to which the firm ensures that employees are actively involved in the process of implementing and using SST. Channel integration refers to the extent to which the firm is able to synchronise its SST related business functions with those of its channel members. These descriptors and subsequent conceptualizations are in line with socio-technical systems theory that provides the conceptual underpinning for our study. We consider each of these four factors to comprise the underlying dimensions of the firm SST readiness scale.

### **Study 3: Reliability and validity of the firm SST readiness scale**

Study 3 consisted of administering a questionnaire to a sample of managers from large service organizations in the United States through a leading private market research firm. The questionnaire consisted of the 19 remaining items in the firm SST readiness scale to re-examine the scale using an independent data set, as recommended by Churchill (1979). An additional eight items designed to measure the key outcomes of firm SST readiness were included in the questionnaire with a view to examine the predictive validity of the scale as part of the subsequent study (i.e., Study 4). All 27 items in the instrument were measured on a seven point Likert type scale anchored by “strongly disagree” (1) and “strongly agree” (7). A total of 257 completely

usable responses (with an effective response rate of 21%) were collected. The average total professional experience of the respondents was 10 years, of which the average experience in managing SST within their operations was 8 years. In Study 3, we targeted the same industries as in Study 2 for comparability of the results, with airlines (15%), banks (30%), insurance firms (15%), general service retailers (32%) and telecommunications (8%). The average age of the managers was 39 years, which suggests that they are relatively experienced practitioners in their respective industries. Our initial analysis of responses confirmed the absence of non-response bias (Armstrong and Overton, 1977).

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**Insert Table 2**

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Results of the CFA presented in Table 2 above, indicate the data provide a good model fit with the Tucker-Lewis index (TLI) = .945; the comparative fit index (CFI) = .955; root mean square error of approximation (RMSEA) = .071;  $\chi^2(142) = 325.018$ ;  $p < .001$ ; and,  $\chi^2/df = 2.289$ . A further series of CFA tests was conducted, namely a null, single factor, four-factor and compared these with the proposed higher order model. Output from the analysis (Table 3) indicates further empirical support for the proposed theoretical model. In addition, following the approach used by Smith *et al.* (2009) we also employed the target coefficient (T) to test the efficacy of our higher order model in relation to the single factor model. By adjusting for degrees of freedom (Segars and Grover, 1998) we were able to calculate this t-statistic as a function of an adjusted  $\chi^2$  of the first order model 2.051 [252.21/123] divided by the second order model 2.289 [325.02/142] (Marsh and Hocevar, 1985) to be 0.896. As this value is near the upper bound limit of 1, it suggests a more parsimonious higher order model (Smith, et al., 2009).

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**Insert Table 3**

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Additional data from the CFA (see Table 4) indicate strong evidence of both discriminant and convergent validity. Discriminant validity was investigated in a number of ways. First, the test showing the correlations between constructs were significantly less than one (Bagozzi and Heathertin 1994), which indicates initial evidence of discriminant validity. Second, for all pairs of constructs, the average variance extracted (AVE) for each construct was found to be larger than the squared structural path coefficients between those constructs, in line with Fornell and Larcker (1981). The AVE ranged between 0.64 and 0.71 but the maximum value of the squared path was 0.55. The analysis confirms convergent validity with a minimum AVE of 0.64 (Fornell and Larcker, 1981), exceeding the minimum 0.5 threshold. Moreover, the composite reliability (CR) of each construct exceeded the 0.7 threshold (Hair *et al.*, 2006), indicating convergent validity. Overall our model fit statistics and tests for discriminant and convergent validity suggest a robust four factor solution for the firm SST readiness construct. However, to be certain this represents the best data fit we generated a single-factor solution for the construct. The subsequent fit statistic, namely: TLI = .602; CFI = .646; RMSEA = .19;  $\chi^2(152) = 1579.456$ ;  $p < .001$ ; and,  $\chi^2/df = 10.391$  indicate this alternative model to be unsuitable. On the basis of data fit between the two models we conclude that firm SST readiness comprises four dimensions.

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**Insert Table 4**

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#### **Study 4: Predictive validity**



Study 4 comprised a re-specification of the four dimension firm SST readiness scale to test a structural model that included two key organizational outcomes expected from the use of SST: customer value and firm performance. These dual outcomes are intrinsic to the firm and are in line with the perspective of socio-technical systems theory. For example, Xu *et al.* (2014) empirically show how supplier and customer integration positively impacts firm business performance. Likewise, Smith *et al.* (2010) draw upon the theory to show how firms can improve customer recovery outcomes through their socio-technical systems model of service recovery. On that basis we argue that when viewed from the perspective of socio-technical systems the successful implementation of SST depends on the firm's SST readiness, which in turn should result in delivering increased customer value and enhanced firm performance. Firms use SST primarily to improve customer value (Beatson *et al.*, 2006; Johnson *et al.*, 2008) and firm performance (Bhappu and Schultze, 2006; Bitner *et al.*, 2002; Curran *et al.*, 2003; Rust and Huang, 2012), thus these variables have been considered herein to examine the predictive validity of our new firm SST readiness scale. In order to test the predictive validity of the instrument, we collected additional data relating to the two dependent variables (customer value and firm performance) from the same sample that was used in Study 3. We measured customer value by adapting 4 items from Blocker *et al.* (2011), while firm performance was measured using 4 items that were adapted from Stone *et al.* (2007).

To gauge the predictive validity of the firm SST readiness instrument, we tested a number of structural models comprising the two additional outcome variables – customer value and firm performance. Our aim here was to examine the impact of the new construct on each of dependent variables both individually and collectively. This was critical because the ultimate success of

SST usage is contingent upon attaining both outcomes – and thus conforms to optimising outcomes, which is in line with socio-technical systems theory (Pasmore, 1988; Pasmore and Sherwood, 1978). Accordingly, we first examined the impact of firm SST readiness on customer value. The resultant fit statistics: Tucker-Lewis index (TLI) = .923; comparative fit index (CFI) = .934; root mean square error of approximation (RMSEA) = .075;  $\chi^2(218) = 535.846$ ;  $p < .001$ ; and,  $\chi^2/df = 2.458$ , provide evidence of acceptable model fit (Smith *et al.*, 2009). Second, a structural model measuring the impact of firm SST readiness on firm performance was conducted. The results with: TLI = .931; CFI = .940; RMSEA = .073;  $\chi^2(218) = 516.839$ ;  $p < .001$ ; and,  $\chi^2/df = 2.371$ , indicating an acceptable model fit. Finally, considering that the sustainability of employing SST in the customer value proposition is a function of attaining both firm and customer outcomes, we constructed a structural model (Figure 2) that concurrently tested the predictive ability of firm SST readiness on both firm performance and customer value.

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**Insert Figure 2**

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The resultant fit statistics: TLI = .915; CFI = .924; RMSEA = .074;  $\chi^2(312) = 744.981$ ;  $p < .001$ ; and,  $\chi^2/df = 2.388$ , also provide evidence of acceptable model fit (see Table 5). Moreover, both structural path relationships between firm SST readiness and customer value ( $\gamma_{11} = 0.56$ ;  $p < .001$ ), and, firm SST readiness and firm performance ( $\gamma_{21} = 0.58$ ;  $p < .001$ ) indicate the influence of firm SST readiness on these two outcome variables.

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**Insert Table 5**

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## Discussion

This paper addresses an important gap in marketing and services research relating to the use of SST from the firm perspective. To date, research on SST has predominantly focused on customer propensity to use, customer preferences in relation to, and actual usage of SST (Collier and Sherrell, 2010; Curran and Meuter, 2007; Meuter *et al.*, 2005; Parasuraman, 2000) but little is known about firm SST readiness. In order for firms to effectively use SST in their operations, managers need to: (i) understand whether SST is critical for their operations, (ii) be clear on the strategic purpose of SST, (iii) assess their firm SST capabilities, and, (iv) develop clear plans in relation to adopting such technologies (Bitner *et al.*, 2002). Thus, firms require a mechanism to assess their readiness in implementing SST into their operations that encapsulate these important elements.

Our research presents a new multidimensional scale to measure firm SST readiness. We argue that as SST usage is a strategic imperative with strategic implications for the firm (Bitner *et al.*, 2002), its adoption should be embedded into the wider management process and not considered a functional activity. Accordingly, we have taken into account the firm's ability to effectively adopt or implement new ideas, processes, or, products as well as the firm's environment and wider stakeholders. These are inherent within the conceptual domain of the new firm SST readiness construct. Accordingly, this paper contributes to the literature by presenting (i) a conceptual analysis of firm SST readiness using socio-technical systems theory, and (ii) introduces a multi-dimensional scale to measure firm SST readiness. This scale includes four dimensions: managerial acquiescence, customer alignment, employee engagement, and channel integration. By their very nature these underlying dimensions reflect the significance of the firm

to engage management and employees with customers and channel partners to enable firm SST readiness.

Elements within the customer alignment dimension reflect the firm's readiness to configure SST to match their customer needs. This particular aspect of the construct could help firms respond to critical service aspects such as complaint behavior, service failures, articulating the role customers play in co-creating the service, as well as help research customer needs and concerns (e.g., Dabholkar and Spaid, 2012; Collier and Sherrell, 2010; Cunningham *et al.*, 2009; Roberston and Shaw, 2009; Zhu *et al.*, 2013). From this, we believe that being SST ready enables firms to be more engaged with their customers which in turn, could help firms overcome these and other challenges. In relation to channel partners, we observe how the underlying elements within this facet of the construct help firms integrate their offerings into the value chain. This is important given that channel integration helps firms synchronise their operations with channel partners to transfer knowledge within the value chain (Knudsen, 2007) and optimise the configuration of partner operations (Meester *et al.*, 2010). Furthermore, an effective employee management system is a central aspect of the firm's service operation (Frei, 2008). At the very heart of marketing is the capacity of the firm's employees to deliver quality services to customers, however the nature of SST means customers can create value in the absence of employees (Meuter *et al.*, 2000). This implies many of the roles within the firm may have to be reconfigured to respond to the many changes that SST brings to the firm. For instance, employees should be present to assist the customer should there be an SST service failure that they cannot fix (Zhu *et al.*, 2013). Our research reveals that the employee engagement dimension of our construct highlights the important role of employees in firm SST readiness. Ultimately, it

is the firm's managers who decide upon bringing SST into the firm. Without managerial involvement the full benefits of technology are not attainable (Rapp *et al.*, 2008) thus the extent of management support towards and recognition of the importance of SST in the value proposition, as embodied within the managerial acquiescence dimension, is critical to ensure the firm's SST readiness.

Considering that firm SST readiness is not an end in itself, rather it is a means to help firms improve their performance, we have examined the predictive power of our firm SST readiness scale on two key performance outcomes: customer value and firm performance. Our results show that usage of SST by firms that are SST ready yields significant benefits in customer value and firm performance. Thus, firms intending to maximise value through the use of SST can assess their firm's SST readiness through our multidimensional scale.

### **Managerial implications**

The past decade has witnessed an exponential growth in technology-based products and services, which has left firms with no choice but to adopt such technologies into their service delivery and operations. In their eagerness to achieve cost savings, service improvements, and automation, firms are embracing SST in their service delivery operations. For example, HSBC has recently introduced deposit self-service technology to reduce customer waiting lines. HSBC customers have readily embraced the new self-service systems, with preference to use the SST over traditional counter service. Additionally, most of the large retailers have now introduced self-service checkout systems to speed up the service delivery process and thus avoid losing

customers from over-long queues during the peak hours. However, many firms have potentially jumped on the band wagon without understanding their own readiness with regards to effective SST adoption. Firms should be strategic in their approach and resist adopting SST for short term and/or spurious reasons. Simply being in step with the latest innovation or adopting SST blindly in response to perceived market need and/or competition without foresight will be ineffective, and may prove to be costly in the long-run.

Firms cannot use technology on an ad hoc basis as this potentially exposes the firm to high risk of failure and has serious consequences upon a number of levels. Such failures damage the technology-customer interface (Reinartz *et al.*, 2004) and could be costly in terms of non-redeemable technology investments and substantial reputational costs in the marketplace. Therefore, getting it right is tantamount as technological failures could have a considerable adverse impact on the firm (Kim *et al.*, 2006; Forbes *et al.*, 2005). To be SST ready, our research has shown that SST related decisions must have purpose and therefore must be congruent with the strategic intent of the firm. Against this background, the use of the firm SST readiness scale will enable managers to make an objective assessment of management support, customer alignment, employee engagement, and channel partner integration, which together will help them effectively design and manage SST into their business operations.

The proposed multiple-item firm SST readiness scale with its sound psychometric properties can be used by managers to gain an in-depth understanding of their firms' readiness to embrace and interact with SST. In that regard, the scale could be used as a strategic tool that would help firms' better plan and implement SST. In particular, managers or decision makers could even tailor

each of the dimensions we identified as critical aspects for their firms readiness to use SST. Specifically, this scale could serve as a diagnostic tool for organizations to determine SST readiness, and to identify areas for continuous improvement in the use of SST.

### **Limitations and future research**

While this research addresses some important conceptual and empirical aspects relating to firm SST readiness, it is only one of the emergent efforts in this area. Future research may improve this work in several ways. First, we have focused upon capturing the views of key informants within firms that currently use SST within their operations. Thus, our firm SST readiness scale does not account for firms that currently do not, but have intentions to implement SST in the future. On this basis, future research could focus on firms that are considering embarking on implementing SST into their operations.

Secondly, our study was conducted in a western context (i.e., United States and Australia) therefore future research could explore the applicability of the firm SST readiness scale in a range of other cross-national and cross-cultural contexts. The earlier work of Nilsson (2005) reveals different consumer needs and motives for using SST exists across cultures. Businesses now operate within global contexts and SSTs can transcend a wide variety of markets without any geographic constraints (Bitner *et al.*, 2002). Cross-cultural research on SST readiness will broaden the current knowledge in this domain and contribute to international marketing theory and practice.

Thirdly, considering that business markets operate in a significantly different manner to consumer markets in terms of customer needs, products and price (Narayandas, 2005), another potentially fruitful avenue for research could be to examine the firm SST readiness scale within the B2B context. To date there is a paucity of SST research within B2B settings despite the fear of diminishing relationships between firms due to the potential reduction in social bonding (Bhappu and Schultze, 2006). Therefore, it would be fruitful for future research to consider the applicability of the firm SST readiness scale in B2B contexts.

Fourthly, this study employed a single questionnaire to measure all constructs in the model, which has the potential to inflate the strength of the relationships among the constructs. Thus, there exists the possibility of common method bias in this study. Future research could devise methods to capture data from different sources to minimise the potential for such bias.

Finally, this paper uses two well established constructs, customer value and firm performance to test the predictive validity of our firm SST readiness scale. To date the literature has explored the consequences of SST usage on customer satisfaction and trust (Collier and Kimes, 2012), SST failures on voice behaviours (Robertson and Shaw, 2009) and SST attributes upon SST satisfaction (Beatson *et al.*, 2006; Johnson *et al.*, 2008). In light of these important consequences of using SST, the impact of firm SST readiness upon them and other pertinent outcome variables could be empirically explored more thoroughly. It will be useful for researchers to explore the influence of firm SST readiness on other important outcome variables such as customer attitudes (e.g., customer service evaluations, customer loyalty and customer satisfaction) and actual transaction metrics (e.g., sales, profits, cost reduction, and customer retention). Understanding



firm SST readiness and its impact on key attitudinal and behavioural outcomes is clearly an evolving field. We hope our proposed firm SST readiness scale will facilitate greater conceptual and empirical rigor, as well as stimulate future research in this important area.

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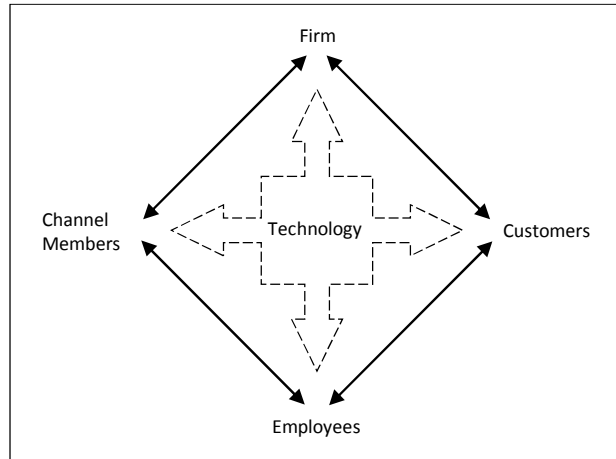
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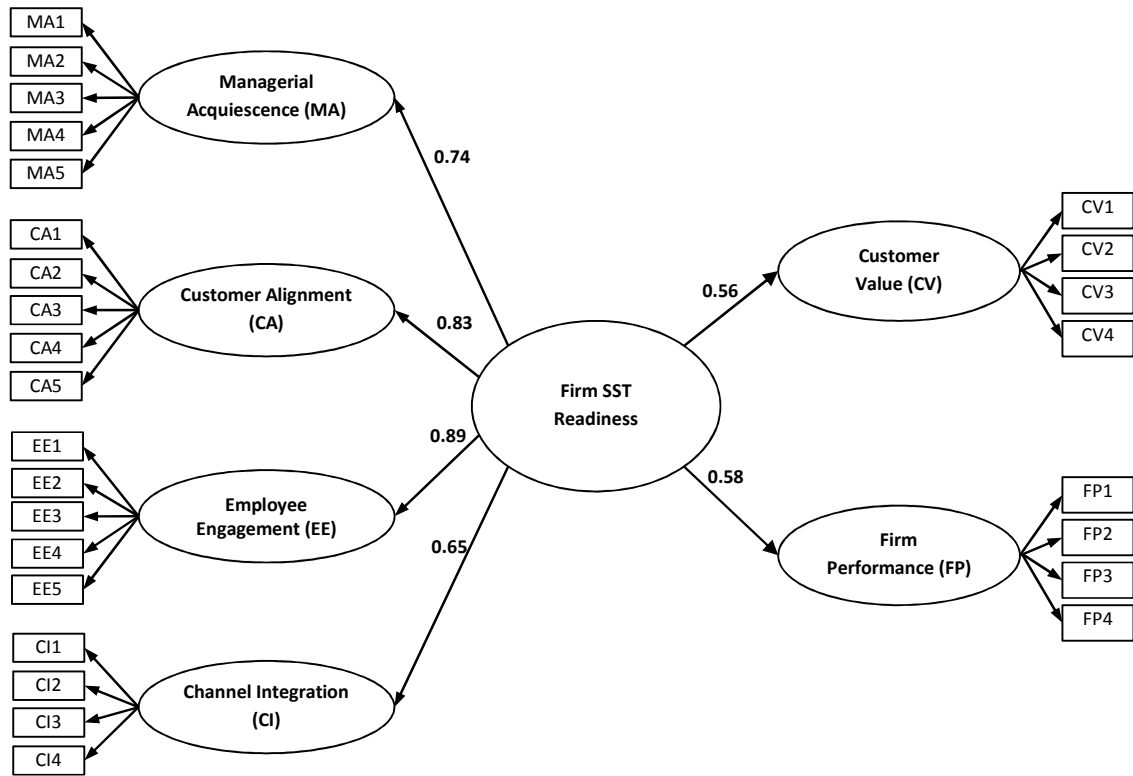
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**Figure 1: Diamond model of technology and the organisational environment**



**Figure 2: Conceptual Model of Firm SST Readiness Dimensions**



**Table 1: EFA and CFA Factor Loadings for Firm SST Readiness**

Scale Items	EFA				CFA
	1	2	3	4	
<b>1. Managerial Acquiescence (<math>\alpha = .922</math>) [20.46%]</b>					
1. Management understand the need for the firm to know how to use new technologies.	.85				.88
2. Our firm is proactive in responding to a constantly changing technological environment.	.82				.85
3. Management in our firm are always willing to consider the latest technology and innovations.	.81				.84
4. Management in our firm are always committed to engaging new technologies.	.77				.83
5. Management are always open to new ideas and suggestions related to technology.	.74				.78
<b>2. Customer Alignment (<math>\alpha = .904</math>) [40.66%]</b>					
6. SST gives our customers faster and more efficient interaction with our firm.		.78			.85
7. Our SST enables customers to be more engaged with our firm.		.77			.85
8. Our firm uses appropriate procedures to deal with SST related failures.		.76			.79
9. Our firm has the capabilities to respond to our customers demand for continual improvements and innovations in SST.		.75			.78
10. Support is readily provided to customers who need help with SST.		.73			.75
11. <i>SST gives our customers benefits that cannot be provided by our employees.</i>		.51			.59
<b>3. Employee Engagement (<math>\alpha = .927</math>) [60.24%]</b>					
12. Front-line employees are actively involved with problem solving issues related to our SST.			.83		.90
13. Front-line employees are involved in integrating new technology into our processes.			.80		.88
14. Front-line employees are actively involved with implementing SST into the firm's operations.			.80		.87
15. We devote adequate resources to ensure our employees have well-developed SST competencies.			.69		.84
16. We conduct in-house employee training to gain necessary operational SST knowledge.			.61		.73
17. <i>Our employees are very willing to use SST.</i>			.29		.55
<b>4. Channel Integration (<math>\alpha = .898</math>) [76.79%]</b>					
18. The SST we acquire needs to be integrated with our channel partners' operations.				.86	.86
19. We need to work closely with our channel partners to ensure that our SST operations are compatible.				.84	.86
20. Our SST needs to be compatible with that of our channel partners.				.80	.79
21. Our channel partners need to be informed and knowledgeable about our SST.				.68	.78
22. <i>We consider it important to involve other channel partners in developing new SST.</i>				.47	.67

**EFA:** [Italicised percentage in parenthesis is cumulative variance explained for each of the factors extracted]

**CFA:**  $\chi^2(205) = 638.472$ ;  $p < .000$ ;  $\chi^2/df = 3.114$ ; TLI = .891; CFI = .903; RMSEA = .091

**Table 2: CFA Factor Structure Loadings for Firm SST Readiness**

Item	1	2	3	4
<b>1. Managerial Acquiescence (MA) [MA → Firm SST Readiness = .74] [proposed]</b>				
1. Management understand the need for the firm to know how to use new technologies.	.81			
2. Our firm is proactive in responding to a constantly changing technological environment.	.79			
3. Management in our firm are always willing to consider the latest technology and innovations.	.85			
4. Management in our firm are always committed to engaging new technologies.	.89			
5. Management are always open to new ideas and suggestions related to technology.	.83			
<b>2. Customer Alignment (CA) [CA → Firm SST Readiness = .83] [proposed]</b>				
6. SST gives our customers faster and more efficient interaction with our firm.		.75		
7. Our SST enables customers to be more engaged with our firm.		.81		
8. Our firm uses appropriate procedures to deal with SST related failures.		.87		
9. Our firm has the capabilities to respond to our customers demand for continual improvements and innovations in SST.		.77		
10. Support is readily provided to customers who need help with SST.		.80		
<b>3. Employee Engagement (EE) [EE → Firm SST Readiness = .89] [proposed]</b>				
11. Front-line employees are actively involved with problem solving issues related to our SST.			.89	
12. Front-line employees are involved in integrating new technology into our processes.			.88	
13. Front-line employees are actively involved with implementing SST into the firm's operations.			.85	
14. We devote adequate resources to ensure our employees have well-developed SST competencies.			.86	
15. We conduct in-house employee training to gain necessary operational SST knowledge.			.72	
<b>4. Channel Integration (CI) [CI → Firm SST Readiness = .65] [proposed]</b>				
16. The SST we acquire needs to be integrated with our channel partners' operations.				.83
17. We need to work closely with our channel partners to ensure that our SST operations are compatible.				.93
18. Our SST needs to be compatible with that of our channel partners.				.82
19. Our channel partners need to be informed and knowledgeable about our SST.				.71

$\chi^2(142) = 325.018$ ;  $p < .001$ ;  $\chi^2/df = 2.289$ ; TLI = .945; CFI = .955; RMSEA = .071



**Table 3: Model Comparison**

Model	$\chi^2$	<i>df</i>	<i>p</i>	$\chi^2/df$	Fit statistics
Model 1: Null	859.620	152	.000	5.655	TLI =.803; CFI = .825; RMSEA = .135
Model 2: Single Factor	252.212	123	.000	2.051	TLI =.955; CFI = .968; RMSEA = .064
Model 3: Four-Factor	441.991	146	.000	3.027	TLI =.914; CFI = .927; RMSEA = .089
Model 4: Proposed Higher Order	325.018	142	.001	2.289	TLI =.945; CFI = .955; RMSEA = .071

**Table 4: Factor Correlation Matrix**

Factor	CR	AVE	MSV	ASV	1	2	3	4	5	6
1. Managerial Acquiescence	0.919	0.695	0.493	0.345	(0.833)					
2. Customer Alignment	0.899	0.642	0.548	0.419	0.556	(0.801)				
3. Employee Engagement	0.924	0.708	0.548	0.435	0.702	0.740	(0.841)			
4. Channel Integration	0.893	0.679	0.399	0.299	0.483	0.632	0.514	(0.824)		
5. Customer Value	0.894	0.712	0.476	0.324	0.448	0.619	0.459	0.463	(0.844)	
6. Firm Performance	0.901	0.691	0.402	0.344	0.461	0.468	0.451	0.522	0.676	(0.831)

(Data in parenthesis on diagonal is the square root of the AVE)

**Table 5: Predictive Validity of Firm SST Readiness**

Item	Path loadings
<b>1. Managerial Acquiescence</b>	
MA1: Management understand the need for the firm to know how to use new technologies.	.81
MA2: Our firm is proactive in responding to a constantly changing technological environment.	.80
MA3: Management in our firm are always willing to consider the latest technology and innovations.	.85
MA4: Management in our firm are always committed to engaging new technologies.	.89
MA5: Management are always open to new ideas and suggestions related to technology.	.83
<b>2. Customer Alignment</b>	
CA1: SST gives our customers faster and more efficient interaction with our firm.	.76
CA2: Our SST enables customers to be more engaged with our firm.	.82
CA3: Our firm uses appropriate procedures to deal with SST related failures.	.86
CA4: Our firm has the capabilities to respond to our customers demand for continual improvements and innovations in SST.	.78
CA5: Support is readily provided to customers who need help with SST.	.79
<b>3. Employee Engagement</b>	
EE1: Front-line employees are actively involved with problem solving issues related to our SST.	.87
EE2: Front-line employees are involved in integrating new technology into our processes.	.89
EE3: Front-line employees are actively involved with implementing SST into the firm's operations.	.83
EE4: We devote adequate resources to ensure our employees have well-developed SST competencies.	.85
EE5: We conduct in-house employee training to gain necessary operational SST knowledge.	.72
<b>4. Channel Integration</b>	
CI1: The SST we acquire needs to be integrated with our channel partners' operations.	.83
CI2: We need to work closely with our channel partners to ensure that our SST operations are compatible.	.91
CI3: Our SST needs to be compatible with that of our channel partners.	.83
CI4: Our channel partners need to be informed and knowledgeable about our SST.	.72
<b>5. Customer Value [<math>\eta_1</math>] (firm SST readiness <math>\rightarrow</math> customer value: <math>\gamma_{11} = .56</math>)</b>	
CV1: Our SST creates superior value for our customers.	.71
CV2: Our SST is beneficial to our customers.	.80
CV3: The customer gains through our SST far outweigh the costs.	.60
CV4: Our firm provides significant customer value through our SST.	.80
<b>6. Firm Performance [<math>\eta_2</math>] (firm SST readiness <math>\rightarrow</math> firm performance: <math>\gamma_{21} = .58</math>)</b>	
FP1: Our SST ensures the success of our firm.	.89
FP2: Our SST ensures quality customer outcomes.	.82
FP3: Our SST helps improve our firm's performance.	.82
FP4: Our SST ensures our competitive advantage.	.76
$\chi^2(312) = 744.981$ ; $p < .001$ ; $\chi^2/df = 2.388$ ; TLI = .915; CFI = .924; RMSEA = .074	