Social Media, Mobile, Analytics, and Cloud: Integration and Value Creation

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Abstract

This study examined how integrating two or more SMAC technologies (social media, mobile, analytics and cloud) add business value to organisations. Data was collected from fourteen business and technology stakeholders using semi-structured interviews to investigate critical success factors and barriers of adoption and integration of SMAC technologies. The data was analysed using a conceptual framework using the technology-organisation-environment (TOE) model integrated with value creation theories: value chains, value shops, and value networks. The findings show that relative advantage, compatibility, management support, technology competence, and competitive pressure were critical success factors for the integration of two or more SMAC technologies. Complexity, security, and government regulations were barriers to the integration of two or more SMAC technologies. Firm size was both a critical success factor and a barrier. The findings show that the integration of two or more SMAC technologies improve efficiency, resource optimisation, speed, business agility, competitive advantage, and enhanced customer experience.

One possible limitation of this study was that only organisations in Australia were included. The results may be different in other countries. A second limitation was that the limited number of value chain organisations compared to value shops and value networks.

Future research into value creation from the integration of various interrelated digital technologies integration (e.g., analytics & Internet of Things, cloud & artificial intelligence). The conceptual framework could be used in future studies to examine emerging and new applications of existing technologies to examine the integration of technologies and how these technologies add value in value chains, value shops, and value networks.

1 Introduction

Information technology (IT) has evolved from data processing in the 1970s to information systems in the 1980s to a strategic business partner in the 1990s (Henderson & Venkatraman, 1999). Since the 2000s, IT is perceived as a business strategy enabler (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013) that contributes to value creation (Morakanyane, Grace, & O'Reilly, 2017; Woodard, Ramasubbu, Tschang, & Sambamurthy, 2012). However, how IT contributes to value creation in organisations is debated. For example, it is unclear to what extent IT contributes to increased productivity in organisations (Ark, 2016; Brown, 2015; Goldfinch, 2007; Thatcher, Brower, & Mason, 2006). The technology itself does not create business value in isolation. Value creation should be considered as part of an overall business strategy (Kohli & Grover, 2008; Melville, Kraemer & Gurbaxani, 2004). As an example, the implementation of enterprise systems (e.g., enterprise resource planning) is a strategic endeavour that requires organisations to think about how to adopt and integrate these technologies to create business value and achieve competitive advantage (Ruivo, Oliveira, & Neto, 2014).

Organisations should consider how to adopt and integrate new technologies as they evolve, such as social media, mobile, analytics, and cloud to achieve their strategic objectives. These four technologies are referred to in the literature as SMAC (Jayaraman & Mahajan, 2015; Linnes, 2017; Mocker, Ross, & Kagan, 2016). Previous research has examined each of these technologies from different lenses. For example, social media has been studied from marketing, collaboration, and customer services perspectives (Culnan, McHugh, & Zubillaga, 2010; Majchrzak, Cherbakov, & Ives, 2009; Siamagka, Christodoulides, Michaelidou, & Valvi, 2015; Trusov, Bucklin, & Pauwels, 2009). Mobile has been studied in the contexts of mobile commerce, mobile learning, and mobile websites adoption (Cochrane, 2014; Ngai & Gunasekaran, 2007; Zhou, 2011). Analytics has been studied from industry-specific angles such as healthcare (Wang, Kung, & Byrd, 2018) and logistics and supply chain (Lai, Sun, & Ren, 2018). Cloud has also been studied from industry-specific perspectives such as healthcare (Lian, Yen, & Wang, 2014) and manufacturing and services (Oliveira, Thomas, & Espadanal, 2014). However, we have little understanding of how the integration of two or more SMAC technologies may be able to support organisations to create business value.

1.1 Problem Statement

SMAC technologies (social media, mobile, analytics, and cloud) are mostly adopted in isolation, that is, in a siloed-way (Ross, Beath, & Sebastian, 2015). In silo-based technology adoption, different teams inside the organisation adopt and manage individual technologies with isolated business objectives (e.g., improved productivity, increased operational efficiency). A siloed adoption approach may be beneficial for specific technologies and business units; however, this approach is potentially more costly and may result in less business value for organisations (Kambhampaty & Kambhampaty, 2016) than if the integrated approach was used. Organisations need to build a broader strategy around value creation and the use of valuable resources to stay competitive (Porter, 1996). The integration of SMAC technologies has the potential to help organisations achieve their business objectives. For example, the adoption of SMAC technologies through integrated digitalization lenses helped Lego group use the technologies successfully to create more business value (El Sawy, Kræmmergaard, Amsinck, & Vinther, 2016). Nordstrom incorporated built integrated digital capabilities to serve customers better (Ross et al., 2015). Schneider Electric increased its revenue by integrating SMAC technologies into its business strategy (Sebastian et al., 2017).

We need to understand how organisations create more value from an integrated approach of SMAC technologies. Therefore, this study explored how the integration of two or more SMAC technologies adds more business value to organisations. This study used insights from business and technology stakeholders in different industries in Australia.

1.2 Research Aim and Research Questions

The aim of this study was two-fold. The first was to examine the critical success factors (CSFs) and barriers of integrating two or more SMAC technologies in organisations. The second aim was to investigate how the integration of two or more SMAC technologies adds business value to organisations.

Therefore, the research questions are:

1. What are the critical success factors of integrating two or more SMAC technologies?
2. What are the barriers for integrating two or more SMAC technologies?
3. How can the integration of two or more SMAC technologies add business value to an organisation?

1.3 Significance of the Study

The study provides new insights into the CSFs, barriers, and value creation of the integration of two or more SMAC technologies in organisations. This study contributes to theory by integrating two frameworks; technology-organisation-environment (TOE) framework and value creation models; value chains, value shops, and value networks. The combination of the two frameworks provides an explanatory model to interpret and understand how organisations integrate two or more SMAC technologies to create business value. This explanatory model informs researchers that integrated technology adoption in organisations are impacted by technological, organisational, and environmental aspects to create business value in value chains, shops, and networks.

This study contributes to practitioners' understanding of SMAC business value creation. Practitioners may find the study useful for obtaining a better understanding of CSFs and barriers for adopting and integrating new and emerging technologies. Organisations create value in different ways; therefore, the integration of two or more SMAC technologies should be tailored depending on the value creation model of the organisation. That is, value chains (e.g., manufacturing), value shops (e.g., consulting firms), and value networks (e.g., telecommunications).

The literature shows that we have a good understanding of individual SMAC technologies and how they could potentially add business value. However, we have little understanding of how the integration of two or more SMAC technologies can add business value. This understanding is important because organisations invest in SMAC technologies to help them achieve business strategy (El Sawy et al., 2016; Raman, 2016; Ross et al., 2015).

1.4 Thesis Outline

The thesis is structured as follows: section two is the literature review, section three explains the conceptual framework, section four introduces the research design and methodology, section five details the findings, section six is the discussion followed by the conclusion in section seven.

1.5 Conclusion

The first chapter introduced the topic of SMAC technologies, their siloed adoption in organisations today, and the need for a holistic adoption approach for increased value creation. The chapter also highlighted the problem statement and why it is important for organisations to consider an integrated adoption approach to achieve business value. The research aim and questions were developed and presented, followed by the significance of the study.

2 Literature Review

2.1 Introduction

The previous chapter introduced SMAC technologies and their siloed adoption in organisations. The chapter also detailed the research problem, aim and questions, and the significance of this study.

The purpose of this chapter is to examine the literature that informs our understanding of the adoption of social media, mobile, analytics, and cloud (SMAC) technologies in organisations. Specifically, this chapter discusses SMAC technologies, their CSFs, barriers, and value creation. This chapter is divided into five subsections. First, scope of the literature search. Second, SMAC technologies. Third, critical success factors and barriers. Fourth, value creation. Fifth the conclusion.

2.2 Scope of the literature search

To identify themes and gaps in the literature, this study used the library databases and Google scholar to search for keywords related to SMAC adoption, value creation, and technology adoption theories.

The keywords used include social media adoption, mobile adoption, analytics adoption, cloud adoption, critical success factors, SMAC, barriers to adoption, value creation logic, value chains, value shops, value networks, digital technologies, digital business strategies, TOE, TAM, UTAUT, RBT, and technology adoption theories.

This study used high quality IS journals to find peer-reviewed articles. The journals include MIS quarterly, Information systems research, Journal of Business Research, Journal of Systems and Software. Journal of Enterprise Information Management, Information & management, International Journal of Information Management, and MIT sloan management review.

The next section explains SMAC technologies and their importance in organisations.

2.3 SMAC Technologies

SMAC technologies have utilised the capabilities of the Internet to build globally robust solutions (Shelton, 2013) that help organisations create business value (Mithas & Lucas, 2010). SMAC technologies support IT-business alignment strategies for the creation of new business models and enhanced customer experience (Dyché, 2015; Shelton, 2013; Worthy, 2018). SMAC technologies enable organisations to work in a more connected and collaborative environment (Faruqui, Agarwal, Chauhan, & Iyer, 2015) to serve customers at scale and to meet customers' increasing demands of organisations' products and services (Kambhampaty & Kambhampaty, 2016).

Nevertheless, the adoption of SMAC technologies has challenges and risks. SMAC technologies are Internet-enabled, which leads to potential security, privacy, compliance and governance risks. The following section expands on each of the SMAC technologies including benefits and potential risks.

2.3.1 Social Media

Organisations use social media and particularly social network sites (SNS) such as Facebook and Twitter to reach, listen to, and interact with customers (Weinberg & Pehlivan, 2011) and to engage customers in online discussions, company news, and product updates to build brand loyalty and reputation (Dijkmans, Kerkhof, & Beukeboom, 2015). Social media helps organisations nurture customer relationships as well as attract new customers (Michaelidou, Siamagka, & Christodoulides, 2011). Social media can provide business leaders with visibility on how their products are doing in the market and can gauge how satisfied or dissatisfied their customers are (Bennis, 2013).

Social media outperforms traditional digital media by generating more brand awareness and buying intentions (Colliander, & Dahlén, 2011). Word-of-mouth (WOM) marketing via SNS has more influence on a customer's decision to purchase compared to traditional marketing (Colliander, & Dahlén, 2011; Trusov et al., 2009). The effect of social media has transformed the Internet from a platform for information to a platform for influence (Hanna, Rohm, & Crittenden, 2011). Therefore, adoption of social media is key to influencing buyer behaviour and connecting with customers.

Despite the benefits, social media has also introduced the risks of information credibility, confidentiality, and privacy (Moorhead et al., 2013; Picazo-Vela, Gutiérrez-Martínez, & Luna-Reyes, 2012). These potential risks may harm organisations and therefore the organisations should adopt a governance framework and a strategy to manage the risks of social media (Kaplan & Haenlein, 2010; Kietzmann, Hermkens, McCarthy, & Silvestre, 2011). In addition, Social media may not be appropriate for all types of organisations. Michaelidou et al. (2011) found that some SMEs in the UK do not perceive social media as relevant to their industries and is far from supporting their brands.

2.3.2 Mobile

Organisations leverage customers' pervasive use of mobile devices (smartphones and tablets) to build mobile applications and mobile websites to connect with customers in convenient and productive ways (Dewan & Jena, 2014). For example, mobile payments, transport, government services, and gaming applications offer flexibility and ease of access for customers while providing organisations with broader reach and better engagement with their customers. As a result, mobile applications help organisations acquire new and retain existing customers (Yen & Wu, 2016), improve organisational productivity and profitability (Alalwan, Dwivedi, Rana, & Williams, 2016; Liang, Huang, Yeh, & Lin, 2007), and increase employee productivity and operational efficiency (e.g., reducing bottlenecks and improving task processing) (Gebauer & Shaw, 2004; Maduku, Mpinganjira, & Duh, 2016; Yueh, Lu, & Lin, 2016).

However, the use of mobile devices introduces financial, security, and performance risks (Hubert, Blut, Brock, Backhaus, & Eberhardt, 2017). Security measures should be adopted to mitigate the risks of data security, mobile device security, data privacy, identity privacy, and location privacy (Mollah, Azad, & Vasilakos, 2017).

2.3.3 Data Analytics

Big data underpins data analytics. Big data is characterised by the large amounts of data that come from different sources in different formats, and at an unprecedented fast pace (Abbasi, Sarker, & Chiang, 2016). Data analytics enables evidence-based business decisions (Seddon, Constantinidis, & Dod, 2012) to help organisations understand their customers better (Westerman, Bonnet, & Mcafee, 2014) and predict customer behaviour for improved customer services and targeted marketing (Simon, 2013).

Furthermore, data analytics helps organisations build future strategies and innovative operations to differentiate and outperform their competition (LaValle, Lesser, Shockley, Hopkins, & Kruschwitz, 2011), so that organisations can improve the customer experience and generate more profits (Gangotra & Shankar, 2016) and increase operational, managerial, and strategic benefits (Wang et al., 2018).

Notwithstanding these benefits, organisations are faced with challenges from the adoption and implementation of data analytics, including IT competence, information security, and governance (Kache & Seuring, 2017). Organisations can address these challenges by building reliable infrastructure and hiring skilled data scientists (Fuchs & Otto, 2015).

2.3.4 Cloud

Through a shared pool of computing resources, cloud computing enables on-demand, ubiquitous, and convenient network access to computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal efforts (Mell & Grance, 2011). Cloud computing allows organisations to lease scalable and elastic IT resources with clear cost advantages (Gangwar, Date, & Ramaswamy, 2015) to perform tasks quicker, improve operations, and increase productivity (Oliveria et al., 2014). Additionally, cloud computing delivers business agility, cost efficiency, scalability, and high performance of computing resources (Garrison, Kim, & Wakefield, 2012). Cloud computing has led to a shift in how IT resources are procured, deployed, managed, and decommissioned (Marston, Li, Bandyopadhyay, Zhang, & Ghalsasi, 2011). As a result, cloud computing is empowering organisations to implement innovative business and technology solutions more rapidly. To build such solutions, organisations can leverage infrastructure as a services (IaaS), platform as a service (PaaS), and software as a service (SaaS) offerings from cloud vendors (Marinescu, 2017).

However, the very nature of cloud computing, where business assets (e.g., data, identity, & applications) are hosted outside the control of in-house IT, potentially increases information security threats (Ali, Khan, & Vasilakos, 2015). These security risks are introduced from the use of virtualisation and service-oriented architecture (SOA), which are key components of cloud computing (Almorsy, Grundy, & Müller, 2016). A breach of security can cause loss of value to organisations, leading to financial and reputational damage. To mitigate these risks, organisations need to implement security measures and risk management practices (Singh, Jeong, & Park, 2016).

In summary, SMAC technologies enable organisations to connect with customers in innovative ways, learn more about customers and understand them better, generate valuable business insights, and build reliable solutions to provide value for customers and support operational efficiency. However, organisations need to mitigate the risks of information security, data privacy, IT competence, and governance when adopting SMAC technologies.

While the studies to date have examined the CSFs and barriers of the adoption of individual SMAC technologies, this siloed approach lacks a holistic perspective of how the integration of two or more SMAC technologies in an organisation can add business value. We need a more comprehensive understanding of SMAC technology integration. We need to study the CSFs and barriers as well as how two or more SMAC technologies can add value to an organisation.

The next section explains the CSFs of the adoption of individual SMAC technologies adoption and the barriers.

2.4 Critical Success Factors and Barriers

This section examines the CSFs and barriers of individual SMAC technologies adoption including common theoretical perspectives and methods used in the literature. Critical success factors refer to key areas of activities where business results are needed for managers and organisations to reach their goals (Osei-Kyei, & Chan, 2015; Rockart, 1980). Critical success factors have been used for more than three decades for management measures (Mohr & Spekman, 1994) to measure success in major areas (Boynton & Zmud 1984; Osei-Kyei, & Chan, 2015).

This section is divided into six subsections. First, critical success factors explain the CSFs of individual SMAC technologies adoption followed by a summary table. Second, common CSFs of individual SMAC technologies adoption followed by a summary table. Third, barriers to adoption of individual SMAC technologies followed by a summary table. Fourth, common barriers to adoption of individual SMAC technologies followed by a summary table. Fifth, examination of technology adoption theories used in the literature, Sixth, the conclusion.

2.4.1 Critical success factors

2.4.1.1 Social media

Technology competence, external pressure, characteristics of the mobile environment, interactivity, compatibility, cost-effectiveness, perceived usefulness, image enhancements, and organisational strategies, capacities, governance, and innovativeness are CSFs that have been examined in the literature for the successful adoption of social media (Ainin, Parveen, Moghavvemi, Jaafar, & Mohd Shuib, 2015; Siamagka et al., 2015).

Several theories have been used in the literature to investigate the CSFs and barriers for social media adoption. For example, Schaupp and Bélanger (2013) integrated the technology-organisation-environment (TOE) model with the resource-based theory (RBT) to examine the adoption of social media in small businesses. The study found that technology competence, pressure from clients, and the characteristics of the mobile environment were the key CSFs for social media adoption in small businesses. These findings were supported by Ainin et al. (2015) who found that interactivity, compatibility, and cost-effectiveness were the CSFs for small businesses to adopt SNS (e.g., Facebook). Ainin et al. (2015) used an integrated conceptual model based on the diffusion of innovation (DOI) theory and concluded that social media is a cost-effective two-way communications channel that is accessible for SMEs to engage with customers.

In a study that examined the adoption of social media in business to business (B2B) settings, Siamagka et al. (2015) developed a conceptual framework that integrated technology adoption model (TAM) and RBT. The study used qualitative, semi-structured interviews with marketing managers and social media experts to validate the original survey findings. Siamagka et al. (2015) found that perceived usefulness (e.g., enhanced competitiveness, cost-effectiveness, customer engagement, business exposure, and real-time feedback), organisational innovativeness (e.g., openness to new ideas and solutions in the context of technological adoption), perceived pressure from stakeholders (i.e. buyers & competitors), and image enhancements were the CSFs for the adoption of social media in organisations.

Like business organisations, non-profits use social media to connect and interact with customers. In a study that examined social media in non-profits, Nah and Saxton (2013) used a multi-disciplinary theoretical perspective built around four key factors: strategy, capacity, governance, and environment. They found that organisational strategies (e.g., market-based funding programs), capacities (e.g., internal teams & resources), governance (e.g., resources are effectively employed, and strategies properly implemented), and external pressures (e.g., stakeholders) were the CSFs for the adoption of social media in nonprofit organisations.

Technology competence and external pressure determine the success of social media adoption in organisations. These two CSFs are key to the integration of social media with other SMAC technologies, and therefore, technology competence and external pressure will be examined in this study.

2.4.1.2 Mobile

Perceived usefulness, perceived ease of use, perceived credibility, the amount of information, normative pressure, perceived enjoyment, innovativeness, compatibility, subjective norms, trust, facilitating conditions, perceived mobility, personal habit, firm size, technology competence, critical mass, relative advantage, management support, and customer pressure are CSFs that have been examined in the literature for the successful adoption of mobile technology (Dai & Palvi, 2009; Lee, Park, Chung, & Blakeney, 2012; Wang, Li, Li, & Zhang, 2016).

In studies that examined the adoption of mobile technology in financial services, perceived usefulness and perceived ease of use were found to be CSFs for customers to adopt mobile devices for banking and commerce transactions. These CSFs are constructs that are derived from TAM. Amin, Hamid, Lada, and Anis (2008) extended TAM to include perceived credibility, amount of information, and normative pressure constructs to examine the adoption of mobile banking in Malaysia. The study found that perceived usefulness, perceived ease of use, perceived credibility, the amount of information on mobile banking (i.e., the ability to access more banking-related information on mobile devices), and normative pressure (e.g., social influence) were the CSFs for customers to adopt mobile banking.

Similar results were found by Dai and Palvi (2009) who examined mobile commerce adoption in China and the USA. The study showed that perceived usefulness, perceived ease of use, perceived enjoyment, innovativeness, compatibility, and subjective norms were CSFs for customers in China and the USA to adopt mobile commerce. Dai and Palvi (2009) developed an integrated research framework predominantly using TAM and theory of reasoned actions (TRA). The constructs used in the study from the TAM and TRA theories were perceived value added, innovativeness, security perceptions, privacy perceptions, perceived usefulness, perceived ease of use, perceived cost, compatibility, perceived enjoyment, and subjective norms.

Perceived usefulness and perceived ease of use were also found to be CSFs for customers to adopt mobile financial services (MFS). For example, Lee et al. (2012) used TAM to develop a conceptual model based on general technology perceptions, technology-specific perceptions, user characteristics, and task-user characteristics of the service. Lee et al. (2012) found that perceived usefulness (e.g., task fit and monetary value) and perceived ease of use (e.g., connectivity and personal innovativeness) were CSFs for customers to adopt MFS. Likewise, Yen and Wu (2016) extended TAM to include perceived enjoyment, perceived mobility, and personal habit constructs and found that perceived usefulness, perceived ease of use, perceived mobility, and personal habit were CSFs for customers to adopt MFS.

Comparable results were found in the adoption of mobile learning in developing countries. Iqbal and Qureshi (2012) developed a theoretical framework based on the integration of the unified theory of acceptance and use of technology (UTAUT) with TAM to examine the adoption of mobile learning in developing countries. The study found that perceived usefulness, perceived ease of use, and facilitating conditions (e.g. internet speed, hardware, & software support) were CSFs for the adoption of mobile learning in Pakistan (Iqbal & Qureshi, 2012).

Technology competence and compatibility were found to be CSFs factors for the adoption of mobile reservation systems and mobile marketing. For example, Wang et al. (2016) used the TOE model to examine the adoption of mobile reservation systems in hotels and found that technology competence, compatibility, firm size, and critical mass were CSFs for organisations to adopt mobile reservation systems. Similarly, Maduku et al. (2016) found that technology competence, customer pressure, relative advantage, and management support were CSFs for organisations to adopt mobile marketing. Maduku et al. (2016) used the TOE model to examine the adoption of mobile marketing in small and medium-sized enterprises (SMEs) in South Africa.

Relative advantage, management support, technology competence, and firm size determine the success of mobile adoption in organisations. These four CSFs are key to the integration of mobile with other SMAC technologies, and therefore, will be examined in this study.

2.4.1.3 Data analytics

System quality, information quality, service quality, competitive pressure, government regulations, management support, strategic fit, data, effort, technology, data-driven culture, and relative advantage are CSFs that have been examined in the literature for the successful adoption of data analytics (Gupta & George, 2016; Lai et al., 2018; Venkatraman, Sundarraj, & Seethamraju, 2015).

Venkatraman et al. (2015) found that system quality, information quality, service quality, competitive pressure, regulations, management support, and strategic fit were CSFs for the adoption of analytics in organisations. In another study, Gupta and George (2016) found that tangible, intangible, and human resources help organisations create analytics capabilities that improve firm performance. Tangible resources include data, effort, and technology, intangible resources include a data-driven culture and organisational learning, and human resources comprise managerial and technical skills (Gupta & George, 2016).

In another study that examined the adoption of analytics in supply chain management, Lai et al. (2018) developed a conceptual framework based on DOI theory and TOE model and found that relative advantage is the strongest driver for organisations to adopt data analytics followed by management support. The study found that competitive pressure and government regulations can moderate the relationship between relative advantage and management support from one side and the and the organisation’s intention to adopt the technology from the other.

Relative advantage, management support, competitive pressure, and government regulations determine the success of analytics adoption in organisations. These four CSFs are common across other SMAC technologies (refer to table 2). These four CSFs are key for the integration of analytics with other SMAC technologies, and therefore, will be examined in this study.

2.4.1.4 Cloud

Management support, technology competence, vendor trust, relative advantage, compatibility, trialability, increased collaboration, increased traceability, auditability, competitive pressure, and firm size are CSFs that have been examined in the literature for the successful adoption of cloud computing (Gangwar et al., 2015; Lian et al., 2014; Oliveria et al., 2014).

Garrison et al. (2012) used RBT to examine the adoption of cloud computing in organisations and found that organisations can achieve IT economies of scale based on management support, technology competence, and vendor trust relationship. These three CSFs can help organisations build unique, valuable, inimitable, and not-readily available resources (Barney, Wright, & Ketchen, 2001; Palmatier, Dant, & Grewal, 2007) to achieve and sustain competitive advantage (Garrison et al., 2012).

Similar results were found by Lian et al. (2014) who developed a conceptual framework based on the integration of human-organisation-technology fit (HOT-fit) with TOE models to examine the adoption of cloud computing in Taiwanese hospitals. The study found that management support and technology competence were CSFs for the successful adoption of cloud computing in hospitals.

Comparable results were also found in two studies that examined the adoption of cloud computing in various organisations. The results showed that management support, technology competence, and relative advantage were CSFs for the adoption of cloud computing in manufacturing, services, IT, and financial organisations (Gangwar et al., 2015; Oliveria et al., 2014).

In the first study, Oliveria et al. (2014) developed a theoretical framework based on DOI and TOE models and found management support, technology competence, relative advantage (e.g., improved operations and increased productivity), compatibility, and firm size were CSFs for the manufacturing and IT services organisations to adopt cloud computing.

In the second study, Gangwar et al. (2015) integrated TOE with TAM models to examine cloud computing adoption in manufacturing, IT, and financial organisations in India. They found that relative advantage, compatibility, organisational readiness, management support, competitive pressure, training, and vendor support were CSFs for organisations to adopt cloud computing. Relative advantage (e.g., scalability, mobility, and user-based costing) can lead to efficiency, employee productivity, and improved customer service and therefore positively impact perceived usefulness and perceived ease of use of cloud computing in organisations (Gangwar et al., 2015).

Relative advantage was also found to be a CSF for organisations to adopt cloud computing. Morgan and Conboy (2013) used the TOE model to examine the adoption of cloud computing in organisations. The study found that relative advantage, compatibility, trialability, increased collaboration, increased traceability, and auditability were CSFs for organisations to adopt cloud computing. Organisations reduce capital expenditure, save on IT costs, increase scalability, and improve implementation efficiency when they adopt cloud computing (Morgan & Conboy, 2013).

Relative advantage, management support, technology competence, compatibility, competitive pressure, and firm size determine the success of cloud computing adoption in organisations. These four CSFs are key for the integration of cloud computing with other SMAC technologies, and therefore, will be examined in this study.

Table 1 shows the CSFs and theories used to understand the adoption of social media, mobile, analytics, and cloud technologies in diverse organisations and industries.

Technology	CSFs	Theory	Industry/Sector	Reference
Social Media	Technology competence, pressure from clients, features of the mobile environment	TOE + RBT	SMEs	Schaupp & Bélanger (2013)
	Interactivity, compatibility, cost-effectiveness	DOI-based integrated model	SMEs	Ainin et al. (2015)
	Org strategy, technology competence, governance, external pressure	Multi-disciplinary organisational model	Non-profits	Nah & Saxton (2013)
	Perceived usefulness, perceived pressure from stakeholders, internal innovation climate, image enhancements	TAM + RBT	B2B	Siamagka et al. (2015)
Mobile	Perceived usefulness, perceived ease of use, perceived credibility, information, normative pressure	TAM + perceived credibility, information, normative pressure	Mobile banking	Amin et al. (2008)
	Perceived usefulness, perceived ease of use, innovativeness, compatibility, perceived enjoyment, subjective norm.	Integrative research framework (TRA, TAM, & others)	Mobile commerce	Dai & Palvi (2009)
	Perceived usefulness, perceived ease of use	TAM-based integrated model	MFS	Lee et al. (2012)
	Perceived usefulness, perceived ease of use, perceived mobility, personal habit	TAM + perceived enjoyment, perceived mobility, personal habits	MFS	Yen & Wu (2016)
	Perceived usefulness, perceived ease of use, facilitating conditions	TAM + UTAUT	Education	Iqbal & Qureshi (2012)
	Compatibility, firm size, technology competence, critical mass	TOE	Hospitality	Wang et al. (2016)
	Relative advantage, management support, technology competence, customer pressure	TOE	SMEs	Maduku et al. (2016)
Analytics	System quality, information quality, service quality, competitive pressure,	TOE + IS Success	General	Venkatraman et al. (2015)

	regulations, management support, strategic fit			
	Data, technology, effort, managerial skills, technical skills, culture, learning	RBT	General	Gupta & George (2016)
	Relative advantage, management support, competitive pressure, government regulations	DOI + TOE	Supply chain	Lai et al. (2018)
Cloud	Management support, technology competence, vendor trust relationship	RBT	General	Garrison et al. (2012)
	Relative advantage, compatibility, trialability, increased collaboration, increased traceability, auditability	TOE	General	Morgan & Conboy (2013)
	Management support, technology competence	TOE+ HOT-Fit	Healthcare	Lian et al. (2014)
	Relative advantage, compatibility, technology competence, management support, firm size	DOI + TOE	Manufacturing, IT	Oliveria et al. (2014)
	Relative advantage, compatibility, management support, competitive pressure, org readiness, training, vendor support	TAM + TOE	Manufacturing, IT, Financial	Gangwar et al. (2015)

Table 1: CSFs of SMAC adoption in various industries and with relevant theories

The common CSFs across the individual SMAC technologies were management support, relative advantage, technology competence, compatibility, competitive pressure, and perceived usefulness and perceived ease of use. These common factors suggest that SMAC technologies can be interconnected and adopted in an integrated way for organisations to realise more value from their IT investment.

The common CSFs are discussed below.

2.4.1.5 Management support

Management support refers to the extent that senior managers understand the importance of technology adoption for achieving organisational goals (Ragu-Nathan, Apigian, Ragu-Nathan, & Tu, 2004). Management support was identified as important CSF for the adoption of mobile (Maduku et al., 2016), analytics (Gupta & George, 2016; Lai et al., 2018; Venkatraman et al., 2015), and cloud technologies (Gangwar et al., 2015; Garrison et al., 2012; Lian et al., 2014; Oliveria et al., 2014). Managers drive the successful adoption of individual SMAC technologies by providing the required support for the organisations. For example, managers facilitate resources and provide funding support (Maduku et al., 2016). Managers foster innovative environments within their organisations whereby they provide strategic innovation directions, sponsor technology adoption projects, and promote and encourage users to adopt technologies (Gangwar et al., 2015; Lai et al., 2018; Venkatraman et al., 2015). Therefore, management support is crucial for the success of SMAC adoption.

2.4.1.6 Relative advantage

Relative advantage refers to the degree to which technology benefits the organisation (Rogers, 2010). Relative advantage was identified as a common CSF for the adoption of mobile, (Maduku et al., 2016), analytics (Lai et al., 2018; Venkatraman et al., 2015), and cloud technologies (Gangwar et al., 2015; Morgan & Conboy, 2013; Oliveria et al., 2014). Relative advantage can be measured in economic terms, satisfaction, or convenience (Rogers, 2010) and is therefore, critical for the success of SMAC adoption.

2.4.1.7 Technology competence

Technology competence encompasses organisations' IT staff, infrastructure, and internal systems (Kuan & Chau, 2001). These capabilities are used to support technology implementations and drive business outcomes (Lian et al., 2014). Technology competence was identified as one of the primary drivers for organisations to adopt social media (Nah & Saxton, 2013; Schaupp & Bélanger, 2013), mobile (Maduku et al., 2016; Wang et al., 2016), analytics (Gupta & George, 2016), and cloud technologies (Lian et al., 2014; Garrison et al., 2012;

Oliveria et al., 2014). Therefore, it is essential for organisations to have competent teams and supportive infrastructure to successfully adopt and implement SMAC technologies.

2.4.1.8 Compatibility

Compatibility refers to the conformance of adopted technology with existing expertise, values, and needs (Rogers, 2010). Compatibility was identified as a CSF for the adoption of social media, mobile, and cloud technologies. For example, Ainin et al. (2015) found that the adoption of social media is compatible with an organisations' infrastructure due to simplicity and ease of use. Comparable results were observed with mobile (Dai & Palvi, 2009; Wang et al., 2016) and cloud computing adoption (Gangwar et al., 2015; Morgan & Conboy, 2013; Oliveria et al., 2014). Therefore, it is imperative for organisations to consider existing expertise, values, and needs to successfully adopt and implement SMAC technologies.

2.4.1.9 Competitive pressure

Competitive pressure forces organisations to adopt new technologies to maintain their place in the market (Lai et al., 2018). Advancements in technology usually bring about new and innovative ways of doing business and engaging with customers. These new technologies may also mean reduced cost of operations and increased productivity. Competitive pressure was identified as a CSF for the adoption of social media (Nah & Saxton, 2013; Siamagka et al. (2015), analytics (Lai et al., 2018; Venkatraman et al., 2015) and cloud technologies (Gangwar et al., 2015). Therefore, it is crucial for organisations to study the competitive landscape to successfully adopt and implement SMAC technologies.

2.4.1.10 Perceived usefulness and perceived ease of use

Perceived usefulness refers to the enhancements in performance because of using the technology and perceived ease of use refers to the simplicity of using the technology (Davis, 1989). Perceived usefulness was identified as an important CSF for the adoption of social media (Siamagka et al., 2015) and mobile technologies (Amin et al., 2008; Dai & Palvi, 2009; Iqbal & Qureshi, 2012; Lee et al., 2012; Yen & Wu, 2016). Perceived ease of use was identified as an important CSF for the adoption of mobile technology (Amin et al., 2008; Dai & Palvi, 2009; Iqbal & Qureshi, 2012; Lee et al., 2012; Yen & Wu, 2016). Therefore, it is imperative for organisations to adopt useful and easy to use technologies.

Table 2 shows the common CSFs of the adoption of the individual SMAC technologies. In the table, S is used for social media, M is used for mobile, A is used for analytics, C is used for cloud, and N is used for the number of studies.

CSFs	S	M	A	C	N
Perceived usefulness	x	xxxxx			6
Perceived ease of use		xxxxx			5
Image enhancement	x				1
Perceived pressure from customers	x	x			4
Internal innovation climate	x	x			2
Org strategy	x				1
Org capacity	x			x	2
Org governance	x				1
Technology competence	xx	xx	x	xxx	8
Environment mobility	x				1
Interactivity	x				1
Compatibility	x	xx		xxx	6
Cost effectiveness	x				1
Perceived enjoyment		x			1
Subjective norm		x			1
Facilitating conditions		x			1
Trust		x			1
Perceived mobility		x			1
Personal habits		x			1
Management support		x	xxx	xxxx	8
Competitive pressure	xx		xx	x	5
Gov. policy/regulations			xx		2
System quality			x		1
Information quality			x		1
Service quality			x		1
Usage			x		1
Strategic fit			x		1
Data			x		1
Effort			x		1
Technical skills			x	x	2
Culture			x		1
Learning/training			x	x	2
Relative advantage		x	xx	xxx	6
Trialability				x	1
Increased collaboration				x	1
Increased traceability and auditability				x	1
Vendor trust relationship				x	1
Firm size		x		x	2
Vendor support				x	1
Critical mass		x			1

Table 2: Common CSFs of individual SMAC adoption

In summary, previous research has examined the CSFs for the adoption of individual SMAC technologies. The studies used one or more theoretical models, yet the focus was on a single SMAC technology. Among the CSFs of SMAC adoption, management support, relative advantage, technology competence, compatibility, competitive pressure, and perceived usefulness and perceived ease of use were identified as common across all SMAC technologies. These common CSFs suggest that organisations could benefit from a holistic approach to SMAC adoption rather than a siloed one by considering the adoption and integration of two or more SMAC technologies leading to increase business value.

Notwithstanding the business benefits of adopting social media, mobile, analytics, and cloud technologies, there are barriers and risks. The next section examines the potential barriers to individual SMAC technology adoption.

2.4.2 Barriers to SMAC adoption

2.4.2.1 Social media

Industry irrelevance, brand support uncertainty, staff unfamiliarity with social network sites (SNS), lack of training (Michaelidou et al., 2011), project priorities, lack of understanding of the business benefits, lack of case studies, lack of resources, information security (Jussila, Kärkkäinen, & Aramo-Immonen, 2014), privacy concerns, unreliability of information, and inefficiency of the public social media (Antheunis, Tates, & Nieboer, 2013) were found to be barriers to the adoption of social media

Michaelidou et al. (2011) surveyed 92 organisations in the UK to examine usage, barriers, and measurement of social media marketing in B2B SMEs. The study found that lack of perceived relevance, brand support uncertainty, staff unfamiliarity with SNS, and lack of training were the barriers for SMEs to adopt social media for marketing.

In another study that examined the barriers of social media adoption in B2B, Jussila et al. (2014) found that in Finland, project priorities, lack of understanding of the business benefits of social media, lack of case studies, lack of resources, and potential information security problems were limiting Finnish B2B organisations to adopt social media.

Antheunis et al. (2013) also found that privacy concerns, the unreliability of information, the inefficiency of public social media, and lack of skills were blocking patients and professionals from using Facebook, Twitter, and LinkedIn sites

Security is a key barrier for organisations to adopt social media. Security could represent a barrier for the integration of social media with other SMAC technologies, and therefore will be will be examined in this study.

2.4.2.2 Mobile

Cost, perceived risk, lack of literacy, lack of trust, conflict of interest between organisations, lack of knowledge, inefficiency of devices, lack of perceived value, deficiency in the desired convenience, tradition and culture, complexity, self-efficacy, anxiety, and lack of relative advantage are barriers to the adoption of mobile technology (Gupta & Arora, 2017; Hongxia, Xianhao, & Weidan, 2011; Rahman, 2013).

Hongxia et al. (2011) found that cost and perceived risk hinder customers from adopting mobile payments. The study used a conceptual model based on integrating UTAUT with two other constructs; perceived risk and cost to examine the barriers to mobile payments adoption in China.

In another study that examined the barriers to mobile commerce adoption in developing countries, Rahman (2013) found that lack of literacy, lack of trust, and conflict of interest between telecommunications companies and banks in Bangladesh blocked mobile commerce adoption. Different results were found in a study that examined the barriers to mobile commerce adoption in Malaysia. Moorthy et al. (2017) extended innovation resistance theory (IRT) to include perceived cost and found that functional barriers (lack of knowledge, inefficiency of devices, lack of perceived value, deficiency in the desired convenience, & perceived risk) and psychological barriers (tradition and culture) were the barriers to mobile commerce adoption.

In a study that examined the barriers to mobile marketing adoption in SMEs in South Africa, Maduku et al. (2016) used the TOE model and found the cost and complexity blocked SMEs from adopting mobile marketing.

In another study that examined the barriers to mobile shopping adoption in India, Gupta and Arora (2017) used behavioural reasoning theory (BRT) and found that self-efficacy, anxiety, and lack of relative advantage were the obstacles for customers to adopt mobile shopping. Customers lack confidence in using mobile devices for shopping, which generates fear, and therefore, negatively impacts the perceived value of using mobile devices for shopping (Gupta & Arora, 2017).

Complexity is a key barrier for organisations to adopt mobile technology. Complexity could represent a barrier for integrating mobile with other SMAC technologies, and therefore, will be examined in this study.

2.4.2.3 Data analytics

Lack of knowledge, complexity, security, cost, and lack of technical skills were found to be the obstacles that prevented organisations from adopting analytics. Chen, Kazman, and Matthes (2015) used grounded theory and conducted multiple interviews to develop a big data adoption model around "whether", "why", and "how" questions regarding big data adoption. Chen et al. (2015) discovered a deployment gap where organisations experiment with analytics for a long time and not proceed to deployment despite the intention to adopt the technology. Complexity is one of the reasons why organisations do not move to implementation (Chen et al., 2015).

Complexity appears to be linked to other organisational elements. For example, Tole (2013) established that big data analytics could be complex for organisations because of the high cost of infrastructure and the professional skills required to build software programs that deal with the vast amounts of structured and unstructured data. These results were also supported by Katal, Wazid, and Goudar (2013) who established that organisations are faced with security and lack of technical skills challenges to be able to get useful business insights and customer sentiments from social media and other data sources effectively.

Complexity and security are key barriers for organisations to adopt analytics. These barriers could hinder organisations from integrating analytics with other SMAC technologies, and therefore, will be examined in this study.

2.4.2.4 Cloud

Security, fear of loss of control, data privacy regulations, lack of trust, cost, and complexity were found to be the barriers for organisations to adopt cloud computing (Avram, 2014; Gangwar et al., 2015; Trigueros-Preciado, Pérez-González, & Solana-González, 2013).

Morgan and Conboy (2013) used the TOE model to examine the barriers to the adoption of cloud computing in organisations and found that security, fear of loss of control, and legal issues were key barriers for organisations to adopt cloud computing. The study also found that IT managers and employees are challenged with the potential loss of jobs and uncertainty of the impact of cloud computing on their future work tasks.

Two other studies found similar results. Avram (2014) found that security & privacy, connectivity & open access, reliability, interoperability, IT organisational changes, economic value, and political issues were obstacles for cloud computing adoption. Trigueros-Preciado et al. (2013) found that security, trust, and data protection regulations were clear barriers for organisations to adopt cloud computing. The study found that SMEs lack the required knowledge about cloud computing and what business value the technology brings about.

In another study that examined the barriers to cloud computing adoption in Taiwanese hospitals, Lian et al. (2014) integrated TOE with HOT-Fit models and found that complexity, security, and cost barriers were intimidating healthcare organisations from moving to the cloud. Complexity was also found to be a barrier to cloud computing adoption in a study by Gangwar et al. (2015) who developed a conceptual framework based on integrating TAM with TOE models.

Security, regulations, and complexity are key barriers for organisations to adopt cloud computing. These three barriers could hinder organisations from integrating cloud computing with other SMAC technologies, and therefore, will be examined in this study.

Table 3 summarizes the barriers to SMAC adoption along with theories, methods, and industries used in the literature.

Technology	Barriers	Theory/Method	Industry/Sector	Reference
Social Media	Irrelevance to industry, staff unfamiliarity with SNS, brand support uncertainty, lack of training	Survey, 92 respondents	B2B SMEs	Michaelidou et al. (2011)
	Project priorities, lack of understanding of business benefits, lack of case studies, lack of resources, potential information security problems	Survey, 125 respondents	B2B	Jussila et al. (2014)
	Privacy concerns Unreliability of information Inefficiency Lack of skills.	Survey, 292 respondents	Healthcare	Antheunis et al. (2013)
Mobile	Cost Perceived risk	UTAUT + Cost + Risk Survey, 186 respondents	Mobile payments	Hongxia et al. (2011)
	Lack of literacy Trust Conflict of interest Risk	Case study, 27 interviews	Mobile commerce	Rahman (2013)
	Lack of knowledge Inefficiency of device Lack of perceived value Deficiency in desired convenience Perceived risk Tradition and culture	IRT and perceived cost Survey, 227 respondents	Mobile commerce	Moorthy et al. (2017)
	Cost Complexity	TOE	SMEs	Maduku et al. (2016)
	Self-efficacy Consumer anxiety Lack of relative advantage	BRT	General	Gupta & Arora (2017)
Analytics	Paradigm shift- lack of knowledge Complexity	Grounded Theory Case study, 25 interviews	General	Chen et al. (2015)
	Cost, lack of technical skills	General	General	Tole (2013)

	Security, lack of technical skills	General	General	Katal et al. (2013)
Cloud	Security Fear of loss of control Legal issues	TOE Case study, 3 interviews	General	Morgan & Conboy (2013)
	Lack of knowledge Security Trust Deficiency in understanding value Compliance with legal data protection	Qualitative (two group meetings, 17 IT managers) + quantitative (survey, 94 SMEs)	SMEs	Trigueros-Preciado et al. (2013)
	Complexity Security Cost	TOE + HOT-Fit Survey, 106 respondents	Healthcare	Lian et al. (2014)
	Complexity	TAM + TOE Survey, 280 respondents	General	Gangwar et al. (2015)
	Security & privacy Connectivity & open access Interoperability IT organisational changes Economic value Political issues		General	Avram (2014)

Table 3:Barriers of SMAC adoption in various industries and with relevant theories & methods

The common barriers to SMAC adoption across the individual SMAC technologies were security, cost, lack of knowledge, lack of perceived value, complexity, and lack of trust. These common barriers suggest that SMAC technologies can be interconnected and if adopted in an integrated way, organisations will be more likely to address these barriers using a holistic approach that is likely to realise more value than a siloed approach.

These common barriers for SMAC adoption are discussed below.

2.4.2.5 Security

Security was identified as a barrier that hinders organisations to adopt SMAC technologies. This barrier was common across social media, analytics, and cloud technologies adoption (Avram, 2014; Jussila et al., 2014; Katal et al., 2013; Lian et al., 2014; Morgan & Conboy, 2013; Trigueros-Preciado et al., 2013). Security represents significant concerns for organisations, especially in cloud environments (Luxton, Kayl, & Mishkind, 2012) where data are hosted externally. There are also data privacy laws (e.g. general data protection regulation, GDPR) and government regulations that are applicable to some industries (e.g., banking, healthcare) in many countries. These laws and regulations govern what, where, and how data can be stored and accessed.

2.4.2.6 Cost

The affordability of technologies plays a vital role in the decision-making process of technology adoption. The cost of adopting SMAC technologies was identified as a barrier for consumers adopting mobile payments (Hongxia et al., 2011) and organisations adopting mobile, analytics, and cloud technologies (Avram, 2014; Lian et al., 2014; Maduku et al., 2016; Tole, 2013). The cost of adopting technologies includes development, maintenance, network links, software, hardware, and human resources (Ramayah, Ling, Taghizadeh, & Rahman, 2016). Understanding the costs involved and the benefits is important in deciding whether to adopt SMAC technologies.

2.4.2.7 Lack of knowledge

Lack of knowledge was identified as a critical barrier that hinders organisations to adopt SMAC technologies. This barrier was common across all four SMAC technologies (Antheunis et al., 2013; Chen et al., 2015; Moorthy et al., 2017; Rahman, 2013; Trigueros-Preciado et al., 2013) and demonstrates a gap in business and technical skills for some organisations. This barrier shows that managers do not always have enough knowledge to successfully deploy new technologies (Chen et al., 2015) and if they do, they are more likely to be interested in adopting and implementing SMAC technologies (Trigueros-Preciado et al., 2013).

2.4.2.8 Lack of perceived value

Lack of perceived value was identified as a critical barrier that hinders organisations to adopt SMAC technologies. This barrier was common across social media, mobile, and cloud technologies adoption (Gupta & Arora, 2017; Jussila et al., 2014; Moorthy et al., 2017; Trigueros-Preciado et al., 2013). Organisations that do not perceive business value in adopting social media may claim that social media is irrelevant to their industry (Michaelidou et al., 2011) and therefore its value can be difficult to measure. For example, Gupta and Arora (2017) found that shoppers do not see any value in adopting mobile shopping apps because they lack confidence using the technology. These findings were supported by Trigueros-Preciado et al. (2013) who concluded that cultural barriers prevented organisations from adopting cloud computing and therefore it was hard for managers to understand and measure the perceived business value.

2.4.2.9 Complexity

Complexity was identified as a critical barrier that hinders organisations to adopt SMAC technologies. This barrier was common across mobile, analytics, and cloud technology adoption (Gangwar et al., 2015; Chen et al., 2015; Lian et al., 2014; Maduku et al., 2016). Technology implementation and process development around management and integration of adopted technologies into daily operations can be complex for some organisations (Wang et al., 2016). This complexity could also be associated with a lack of technology knowledge (Oliveria et al., 2014).

2.4.2.10 Lack of trust

Lack of trust was identified as a critical barrier that hinders organisations to adopt SMAC technologies. This barrier was common across mobile and cloud technologies adoption (Rahman, 2013; Trigueros-Preciado et al., 2013). Organisations that are concerned with data privacy and service availability may not trust cloud providers. For example, organisations are concerned with where data is stored and who has access rights to their data (Alharbi, 2014), services performance, speed, availability, and resiliency of cloud services (Kett, Kasper, Falkner, & Weisbecker, 2012), and network quality of service (QoS) (Abdelmaboud, Jawawi, Ghani, Elsafi, & Kitchenham, 2015).

Table 4 shows the common barriers to SMAC technology adoption. In the table, S is used for social media, M is used for mobile, A is used for analytics, C is used for cloud, and N is used for the number of studies.

Barriers	**S**	**M**	**A**	**C**	**N**
Irrelevance to industry	x				1
Staff unfamiliarity with SNS	x				1
Uncertainty of brand support	x				1
Lack of training/skills	x		xx		3
Project priorities	x				1
Lack of perceived value	x	xx		x	4
Lack of case studies	x				1
Security	x		x	xxxx	6
Privacy concerns	x				1
Unreliability of information	x				1
Inefficiency of social media	x				1
Cost		xx	x	xx	5
Perceived risk		x			1
Lack of literacy		x			1
Lack of trust		x		x	2
Conflict of interest		x			1
Lack of knowledge	x	x	x	xx	4
Risk		xx			2
Inefficiency of devices		x			1
Deficiency in desired convenience		x			1
Tradition and culture		x			1
Complexity		x		xxx	4
Self-efficacy		x			1
Customer anxiety		x			1
Fear of loss of control				x	1
Data privacy				xx	2
Connectivity & open access				x	1
Interoperability				x	1
IT organisational changes				x	1
Politics				x	1

Table 4: Common barriers of individual SMAC adoption

In summary, studies have examined the barriers to adoption of social media, mobile, analytics, and cloud technologies. These studies used one or more theoretical models, yet the focus was on a single technology. Among the barriers, security, cost, lack of knowledge, lack of perceived value, complexity, and lack of trust were identified as common across SMAC technologies. These common barriers suggest that organisations could benefit from a holistic approach to SMAC adoption rather than a siloed one. This approach could help organisations address potential barriers to adopt and integrate two or more SMAC technologies to add value to their organisations.

2.4.3 Technology adoption theories

The literature on the adoption of technologies such as SMAC have used different and diverse theories such as the technology acceptance model (TAM), resource-based theory (RBT), diffusion of innovation (DOI), theory of reasoned actions (TRA), and the unified theory of acceptance and use of technology (UTAUT). These theories are examined below.

2.4.3.1 TAM

The first theory, the technology acceptance model (TAM) was developed by Davis (1989) and theorised that two psychological factors that influence people to adopt technology are perceived usefulness and perceived ease of use. Perceived usefulness refers to the enhancements in performance as a result of using the technology, whereas perceived ease of use refers to the simplicity of using the technology (Davis, 1989, Siamagka et al., 2015).

TAM is a useful model to examine the adoption of different technologies including SMAC (Teo & Noyes, 2011; Park, 2009). In a few studies (e.g., Dai & Palvi, 2009; Yen & Wu, 2016) TAM was extended to include interrelated constructs to understand the adoption of individual SMAC technologies better. However, TAM is criticized by being affected by cross-cultural biases (McCoy, Everard, & Jones, 2005; Tarhini, Hassouna, Abbasi, & Orozco, 2015). TAM is used at the individual level (Oliveira & Martins, 2011; Samaradiwakara & Gunawardena, 2014) and therefore lacks the organisational aspects of technology adoption (Bagozzi, 2007). These organisational aspects are essential to study SMAC adoption in a more holistic and integrated approach.

2.4.3.2 RBT

The second theory, resource-based theory (RBT) is posited around organisational resources that are rare, valuable, inimitable, and non-substitutable and therefore these resources provide organisations with the ability to achieve and sustain competitive advantage (Barney et al., 2001; Palmatier et al., 2007).

In linking firm performance to superior organisational resources, RBT explains how organisations compete and create value. However, RBT lacks clear definitions of resources and value (Kraaijenbrink, Spender, & Groen, 2010). Another criticism is that RBT does not address resource developments and thus provide static perspective of resources (Hitt, Carnes, & Xu, 2016; Priem & Butler, 2001). These shortcomings limit the use of RBT to study SMAC adoption in a more holistic and integrated approach.

2.4.3.3 DOI

The fourth theory diffusion of innovation (DOI) theorises how, why and how fast technology innovations spread. Rogers (2010) argues that technology adoption can be ascribed to relative advantage, compatibility, complexity, trialability, and observability.

DOI is consistent with TOE framework, where individuals and organisational characteristics drive technology adoption (Hsu, Kraemer, & Dunkle, 2006; Oliveira & Martins, 2011). The two theories complement each other and therefore most IT adoption studies at the firm level are derived from DOI and TOE (Chong, Lin, Ooi, & Raman, 2009). The evolution of social media, mobile, analytics, and cloud technologies received enormous adoption from organisations as well as individuals. These adoptions, especially at the firm level, can be understood if investigated from the aspects of innovation diffusion, and technology, organisation, and the surrounding environment.

2.4.3.4 TRA

The fifth theory is the theory of reasoned action (TRA) that uses the factors of attitude, subjective norms, behaviour intentions, and actual behaviour to study the relationship between attitude and actual behaviour (Fishbein & Ajzen, 1975; Mishra, Akman & Mishra, 2014). The underlying premise of TRA is that behavioural intentions are the crucial element of the behaviour, and these intentions are fuelled by the individual's attitude and subjective norms (Montano & Kasprzyk, 2015).

TRA assumes no blockers between intentions and actions (Samaradiwakara & Gunawardena, 2014) and is therefore limited in identifying all aspects of SMAC technology adoption. Moreover, intentions do not always lead to behaviours (Crossler et al., 2013; Straub, 2009).

2.4.3.5 UTAUT

A sixth theory used in the literature is the unified theory of acceptance and use of technology (UTAUT). UTAUT was developed by Venkatesh, Morris, Davis, and Davis (2003) and theorises that performance expectancy, effort expectancy, social influence, and facilitating conditions are the bases of technology adoption and usage. In addition, UTAUT also posits the role of four key moderator variables: gender, age, experience, and voluntariness of use.

Despite its merit in explaining 70% of the variance in usage intention and thus regarded as the most complete model to predict technology adoption (Martins, Oliveira, & Popovič, 2014), UTAUT is used at the individual level and not organisation's (Oliveira & Martins, 2011).

TAM, RBT, DOI, TRA, and UTAUT have been examined to study the adoption and integration of two or more SMAC technologies. These theories were found to be limited for the study. TOE was found to be the best fit to develop the conceptual model discussed in Section 3 Conceptual Framework.

The next section explains how individual SMAC adoption contributes to value creation in organisations.

2.5 Value Creation

Organisations exist for the sole purpose of value creation (Kim, Trimi, & Chung, 2014). While they differ in how they capture and create value, all organisations (corporates, government, and non-profits) share this objective and employ resources (e.g., technology resources) to enhance their value creation rationality. Organisations that offer superior goods and services to the market encourage their customers to return to buy more, and hence these organisations make profits and deliver value to their shareholders (Lindgreen & Wynstra, 2005). Organisations create value through one or more value creation models; value chains, value shops, and value networks (Gray, El Sawy, Asper, & Thordarson, 2015; Stabell & Fjeldstad, 1998). These models represent firm-level value creation logics across various industries.

The value chains model is used by industries that transform raw materials into products over a chain of sequential processes (Porter & Miller, 1985). In this model, organisations create value if the cost of making products is lower than the price of selling these products to buyers (Porter, 1996). This value creation logic requires organisations to invest in resources to lower the cost of production or invest in resources that can make superior products and thus them sell at higher prices (Porter & Millar,1985).

However, the value chains model is less suited for service organisations (Armistead & Clark, 1993). In these organisations, it is difficult to assign the five generic primary and support activities to value chain analysis (Stabell & Fjeldstad, 1998). Additionally, the social era changes how customers buy and organisations manufacture and create value (Merchant, 2012).

The pervasive use of social media and mobile devices makes the scale of producing products less relevant for organisations to create value and compete (Merchant, 2012). Therefore, the primary and support activities may not play a pivotal role in value creation. The value creation logic for service and network organisations are addressed by value shops and value networks models.

The value shops use resources and expertise to solve customers' problems. The problem-solving process creates value for organisations through changing the existing state of the problem to a more desired state (Stabell & Fjeldstad, 1998). Examples of value shops include law firms, medical services, and professional services. Customers go to value shops to get their problems solved and consequently pay for the service. For example, a patient suffering from illness goes to the hospital to get treated. The doctor examines, diagnoses, treats, and monitors the patient, and hence creates value for the business (the hospital) as the result of this problem-solving practice (Stabell & Fjeldstad, 1998). Furthermore, interdependence between the primary activities of value shops are reciprocal and therefore enables the value shops to create more value through repeated learnings and feedback (Gray et al., 2015).

In the third model, the value networks, organisations create value by using a mediating technology that enables interactions between customers and partners on the network (Stabell & Fjeldstad, 1998). Telecommunications companies are good examples of the value network model (Li & Whalley. 2002) as well as banks and insurance companies (Gray et al., 2015). In the example of telecommunications companies, the group of customers, who are connected to the network, denote a critical component of the value creation logic. The more extensive the network, the more value it creates (Stabell & Fjeldstad, 1998). Customers join the network to use the service (e.g., make phone calls), and they are charged a regular fee (e.g., monthly subscription) and a per-call fee. These charges represent the value creation for value network organisations.

Table 5 shows the different configurations of value creation models.

Characteristics	**Value chains**	**Value shops**	**Value networks**
Value creation logic	Transformation of inputs into products	Solving customer problems	Linking customers
Main interactivity relationship logic	Sequential	Cyclical	Parallel
Primary activity interdependence	Pooled, sequential	Pooled, sequential, reciprocal	Pooled, reciprocal
Cost drivers	Scale, capacity utilization		Scale, capacity utilization

Business value system structure		Reputation	Scale, capacity utilization
Industry examples	Manufacturing	Professional services	Telecommunications, banks, insurance

Table 5: Characteristics of value chains, value shops, and value networks- adopted from Stabell and Fjeldstad (1998)

Value chain, value shop, and value network organisations can leverage SMAC technologies to enhance their value creation. For example, value chains can leverage cloud computing and analytics for resource optimisation and cost efficiency in the value activity processes. Value shops can use mobile and social media to improve their services and provide integrated problem-solving experience to their customers. Value networks can leverage cloud, analytics, social media, and mobile technologies to scale and provide a collaborative environment for their customers.

The three value creation models; chains, shops, and networks are discussed in more detail in section 3.2 Value Creation Models.

The following section discusses value creation of individual SMAC technologies.

2.5.1 Value creation of SMAC technologies

2.5.1.1 Social media

The adoption of social media has the potential to create value by improving internal operations, distributing content, and increasing sales (Culnan et al., 2010). Social media also builds effective relationships and enhances citizen satisfaction, transparency, and trustworthiness of government services (Porumbescu, 2016). Social media helps organisations co-create value through fostering collaborative interactions with customers and partners and using the platform to encourage customers to promote the organisation’s message to influence others to buy (Hanna et al., 2011; Laroche, Habibi, Richard, & Sankaranarayanan, 2012; Sashi, 2012).

2.5.1.2 Mobile

The adoption of mobile technology has the potential to create value by saving time and money and increasing self-innovativeness (Lee et al., 2012). Mobile devices help with time-critical needs and arrangements, natural needs and decisions, and mobility needs and ambitions (Anckar & D'incau, 2002). The deployment of mobile apps increases customer satisfaction and brand loyalty (Alalwan et al., 2016). Moreover, mobile devices are personalised, ubiquitous, and provide anywhere and anytime access to business apps (Akturan & Tezcan, 2012; Yadav, Sharma, & Tarhini, 2016).

2.5.1.3 Data analytics

The adoption of analytics has the potential to create value by enabling organisations to work with vast amounts of data to support evidence-based decision making and action taking (Wang et al., 2018; Watson, 2014). This analysis could generate novel business insights (Murdoch & Detsky, 2013) and allow for business process transformation (Wamba, Akter, Edwards, Chopin, & Gnanzou, 2015).

Analytics can be a source of growth and competitive advantage (Gupta & George, 2016; Seddon et al., 2012). Perrey, Spillecke, and Umblijs (2013) demonstrate that retailers can grow by 15-20% if they deploy analytics.

2.5.1.4 Cloud

The adoption of cloud computing has the potential to create value by helping relax the barriers of entry for SMEs (Marston et al., 2011). Cloud computing increases productivity, improves reliability, and offers flexibility and elasticity (Aljabre, 2012; Chou, 2015). Furthermore, cloud computing provides organisations with business agility, scalability, and environmental sustainability (Aljabre, 2012; Chou, 2015; Marston et al., 2011; Thethi, 2009).

Table 6 shows the potential business value of SMAC technologies.

SMAC technology	Business value	Reference
Social Media	Value cocreation through collaborative interactions with customers & partners	Sashi (2012)
	Improve internal operations, distribute content, increase sales	Culnan et al. (2010)
	Effective relationship building tool. Improves customer satisfaction & promotes transparency	Porumbescu (2016)
	Positive effects on community markers & value creation	Laroche et al. (2012)
	Customer play active roles in co-creating products, promoting vendor messages, & influencing others to buy.	Hanna et al. (2011)
Mobile	Monetary value including time & costs savings for people using mobile financial services.	Lee (2012)
	Mobile value includes time-critical needs & arrangements, spontaneous needs & decisions, entertainment needs, efficiency needs & ambitions, and mobility needs	Anckar & D'incau (2002)
	Personalised, ubiquitous, anytime access, & rapid use of mobile devices for personal & business use	Akturan & Tezcan (2012) Yadav et al. (2016)
	Increased customer satisfaction and brand loyalty	Alalwan et al. (2016)
Analytics	Enables organisations to support evidence-based decision making and action taking	Wang et al. (2018) Watson (2014)
	Novel business insights to help organisations achieve performance by meeting customer needs and expanding into future markets	Murdoch & Detsky (2013)

	Ability to transform the entire business process, empowers organisations to compete, & enhances productivity	Wamba et al. (2015)
	Retailers can achieve up to 15-20% return on investments (ROI) from analytics	Perrey et al. (2013)
	Sources of effectiveness, growth, competitive advantage, and superior firm performance	Gupta & George (2016) Seddon et al. (2012)
Cloud	Scale, IT efficiency, low cost of entry for SMBs	Marston et al. (2011)
	Increases productivity, elasticity, flexibility, decreased costs, and reliability	Aljabre (2012)
	Ease-of-use, on-demand access, flexibility, efficient management, cost saving, & scalability	Chou (2015)
	Reduced total cost of ownership (TCO), improved business agility, & global scale	Thethi (2009)

Table 6: Value creation of individual SMAC technologies

In summary, the adoption of social media, mobile, analytics, and cloud technologies has the potential to enable organisations to achieve the business benefits of collaboration, productivity, increased customer satisfaction, business insights, and business agility (Alalwan et al., 2016; Marston et al., 2011; Murdoch & Detsky, 2013; Porumbescu, 2016; Sashi, 2012). These business values can support the value creation logic of value chains, value shops, and value networks. For example, the business value of social media of improving internal operations, distributing content, and increasing sales (Culnan et al., 2010) can support the value creation logic of value chains. The business value of analytics being the sources of effectiveness, growth, competitive advantage, and superior firm performance (Gupta & George, 2016) can support the value creation logic of value shops. The business value of mobile devices saving time and efforts for people using mobile financial services (Lee et al., 2012) can support the value creation logic of value networks.

These business benefits can be maximised if, rather than thinking about the individual technologies in a siloed manner, organisations consider a more holistic and integrated approach to SMAC adoption. This is important because integration of SMAC technologies have the potential to create more value internally and externally and therefore enables organisations to rethink the role of IT as a business strategy enabler that drives value creation (Bharadwaj et al., 2013; Kohli & Grover, 2008).

2.6 Conclusion

Social media, mobile, analytics, and cloud are Internet-enabled technologies that allow organisations to generate business value through customers interactions, information exchange, and improved operational efficiency. Nevertheless, these technologies introduce information security and data privacy risks that organisations should mitigate.

Several theories and frameworks were used to study the adoption of individual SMAC technologies. These theories include TAM, RBT, DOI, TOE, TRA, UTAUT, IRT, BRT, and Hot-Fit. Several CSFs and barriers were identified for the adoption of individual SMAC technologies. Management support, relative advantage, technology competence, compatibility, competitive pressure, and perceived usefulness and perceived ease of use were identified as common CSFs across all SMAC technologies. Security, cost, lack of knowledge, lack of perceived value, complexity, and lack of trust were identified as common barriers across all SMAC technologies.

These common CSFs and barriers suggest that organisations could benefit from a holistic approach to SMAC adoption rather than a siloed one by considering the adoption and integration of two or more SMAC technologies leading to increased business value.

Value chains, value shops, and value networks are value creation logic that organisations use to create business value. Individual SMAC technology adoption can help value chains, value shops, and value networks with collaboration, productivity, increased customer satisfaction, and business agility benefits. However, these business benefits can be maximised if, rather than thinking about the individual technologies in a siloed manner, organisations consider a more holistic and integrated approach to SMAC adoption.

The next section explains the conceptual framework of the study.

3 Conceptual Framework

3.1 Introduction

The previous chapter provided detailed insight into SMAC technologies, their adoption, barriers, and value creation. The chapter also highlighted the technology adoption theories, common CSFs, and common barriers to SMAC adoption. To study value creation logic in organisations, the previous chapter explored value chains, value shops, and value networks models. These value models are used by different organisations to create value from SMAC.

This chapter explains the conceptual framework this study has used to answer the research questions. This chapter details the various components of the adopted TOE model and the value creation logic of value chains, value shops, and value networks.

3.2 Research gap

This study aimed to examine the CSFs and barriers for integrating two or more SMAC technologies to create business value. This study aimed to fill a gap in the literature to have a better understanding of how organisations create more value from an integrated approach of SMAC technologies. Therefore, it is imperative to use an appropriate conceptual framework to study technology adoption and value creation in organisations.

The conceptual framework for this study used the technological, organisational, and environmental (TOE) framework and value creation models; value chains, value shops, and value networks. This conceptual framework

This chapter explains the conceptual framework and shows the model in Figure 4 in Section 3.2.3

3.3 Conceptual frameworks

There are many theoretical frameworks used in the IS literature such as the technology acceptance model (TAM), technology-organisation-environment (TOE), theory of reasoned action (TRA), unified technology acceptance and use of theory (UTAUT), and theory of planed behaviour (TPB). Despite their strengths in identifying the CSFs and barriers to technology adoption, these frameworks have some weaknesses. For example, TAM, TRA, UTAUT, and TPB do not integrate human and non-human elements into their theories (Awa, Ukoha, & Emecheta, 2016). TRA, TPB, and UTAUT examine technology adoption at the individual level while TAM and TOE frameworks study technology adoption at the organisational level (King & He, 2006; Oliveira & Martins, 2011). However, TAM overlooks the environmental and technological contexts (Awa et al., 2016). Therefore, TAM, TRA, UTAUT, and TPB frameworks were unsuitable for examining the integration of two or more SMAC technologies and how these technologies add value to an organisation.

3.4 TOE

DePietro et al. (1990) established that the three elements influencing the adoption of technology in organisations are technological, organisational, and environmental contexts (the TOE model). The technological context comprises all relevant technologies- both adopted and implemented internally, as well as, external technologies to the organisation. The organisational context refers to the scope, size, slack (amount of slack resources), and communication process of the organisation. The environmental context describes the industry, competition, and government regulations in which the organisation operates (DePietro et al., 1990).

TOE provides a logical framework with a solid theoretical basis and reliable empirical support (Oliveira & Martins, 2011) to study internal and external aspects of technology adoption in organisations (Gangwar et al., 2015; Lai et al., 2018). More specifically, TOE differentiates between technological capabilities, organisational structure, and environmental effects on technology adoption in organisations (Sharif, Troshani, & Davidson, 2015). TOE is industry-agnostic and does not have firm-size restrictions (Wen & Chen, 2010) and therefore has been used to examine the adoption of social media (Schaupp & Bélanger, 2013; Sharif et al., 2015), mobile (Maduku et al., 2016; Wang et al., 2016), analytics (Lai et al., 2018; Venkatraman et al., 2015), and cloud technologies (Gangwar et al., 2015; Oliveria et al., 2014) in SMEs as well as large enterprises. A summary is shown in Table 7.

Technology	Technological	Organisational	Environmental	Reference
Social media	Technology competence	Customer pressure	Competitive pressure Mobile environment	Schaupp & Bélanger, 2013
	Perceived benefits Perceived risks Compatibility	Management drive Social media policies Degree of formalisation	Community demand Bandwagon effect Faddishness	Sharif et al. (2015)
Mobile	Relative advantage Complexity Compatibility	Management support Firm size Technology competence	Competitive pressure Critical mass Information intensity	Wang et al. (2016)
	Relative advantage Complexity Perceived cost	Management support Financial resources IT capabilities	Vendor support Competitive pressure Customer pressure	Maduku et al. (2016)
Analytics	Perceived benefits Complexity Data quality	Management support IT capabilities Financial readiness	Competitive pressure Gov. regulation	Lai et al. (2018)

	Technology availability Technology competence Technology benefits	Strategic fitness Management support Firm size	Competitive pressure Healthcare regulation on data sharing	Venkatraman et al. (2015)
Cloud	Relative advantage Compatibility Complexity	Organisational competency Training and education Top management support	Competitive pressure Vendor support	Gangwar et al. (2015)
	Technology readiness	Management support Firm size	Competitive pressure Regularity support	Oliveria et al. (2014)

Table 7: TOE factors for individual SMAC technologies adoption

Relative advantage, compatibility, complexity, and security were the most commonly identified technological factors in the literature, and were, therefore, used in this study to examine the technological context of integrating two or more SMAC technologies. Management support, technology competence, and firm size were the most identified organisational factors in the literature, and were, therefore, used to examine the organisational context. Competitive pressure and governmental regulations were the most commonly identified environmental factors in the literature, and were, therefore, were used in this study to examine the environmental context.

These technological, organisational, and environmental contexts are discussed in the next section.

3.4.1 Technological context

The technological context focuses on the technology itself and the positive or negative impacts the technology may have on organisations (DePietro et al., 1990; Maduku et al., 2016). Previous literature focused on relative advantage, compatibility, complexity, and security to study the critical success factors (CSFs) and barriers for the adoption of SMAC technologies (Avram, 2014; Gangwar et al., 2015; Lai et al., 2018; Maduku et al., 2016; Sharif et al., 2015). These factors are discussed in more depth in the next sections.

3.4.1.1 Relative advantage

As discussed in section 2.2.1.6, relative advantage is a CSF for technology adoption. The benefits of technology adoption may include tangible and intangible gains (Wang et al., 2016). For example, profits and sales growth are tangible gains that organisations may get from integrating social media and analytics (Culnan et al., 2010; Perrey et al., 2013). Reduced cost is another example of a tangible benefit that organisations can realise if they deploy cloud computing (Marston et al., 2011). Enhanced customer experience is an intangible business benefit that organisations may achieve when they adopt mobile technology (Porumbescu, 2016). Cloud computing has the potential to provide tangible gains such as increased productivity, improved reliability, and better flexibility (Aljabre, 2012; Chou, 2015).

The literature shows that individual SMAC technologies have the potential to achieve a relative advantage. Therefore, the integration of two or more SMAC technologies is likely to increase the relative advantages for organisations.

3.4.1.2 Compatibility

As discussed in section 2.2.1.8, compatibility is a CSF for technology adoption. Technologies that are compatible with organisational values, experience, and infrastructure are more likely to be adopted (Grover, 1993; Wang et al., 2016) because this conformity reduces risks and uncertainty for organisations to adopt and implement new technologies. For example, compatibility with job roles and work style was found to be important for organisations to adopt cloud computing (Gangwar et al., 2015). Compatibility has been identified as important for the adoption of social media (Sharif et al., 2015), mobile (Peng, Xiong, & Yang, 2012; Wang et al., 2016), and cloud technologies (Gangwar et al., 2015).

Therefore, organisations are more likely to integrate two or more SMAC technologies when they perceive that the integrated SMAC technologies are compatible with their values, expertise, infrastructure, and organisational structure.

3.4.1.3 Complexity

As discussed in section 2.2.2.9, complexity is a barrier to technology adoption. Complexity refers to the perceived difficulty in understanding and using technology (Rogers, 2010). Complexity hinders organisations from adopting new technologies (Lewis, 2013; Tsai, Lee, & Wu, 2010) because of the required time, effort, and investment in resources to perform specific system and integration tasks (Gangwar et al., 2015; Rezaei, Chiew, Lee, & Aliee, 2014). Examples of technology complexity include incompatibility of the adopted technology with existing IT systems (Akter, Wamba, Gunasekaran, Dubey, & Childe, 2016), the difficulty of data processing (Wang & Hajli, 2017), and the high maintenance and costs of implementing data analytics (Tsai et al., 2010; Lai et al., 2018). Complexity has been identified as a barrier to the adoption of mobile (Maduku et al., 2016; Wang et al.,2016), analytics (Lai et al., 2018), and cloud technologies (Gangwar et al., 2015).

Therefore, technology complexity is more likely to limit organisations from integrating two or more SMAC technologies if they perceive that the adopted SMAC technologies are complex to understand and use.

3.4.1.4 Security

As discussed in section 2.2.2.5, information security is a barrier for technology adoption. The fear of data breaches, identity thefts, and cyber attacks concern all organisations that do business online (Soomro, Shah, & Ahmed, 2016). A data breach is damaging for an organisation. For example, data breaches cost a US organisation $61 million in less than one year of the violation for damages and recovery (Riley, Elgin, Lawrence, Matlack, 2014). Information security was a common barrier across social media and cloud technologies adoption (Avram, 2014; Jussila et al., 2014; Lian et al., 2014; Morgan & Conboy, 2013; Trigueros-Preciado et al., 2013).

Therefore, the risk of information security is more likely to prevent organisations from integrating two or more SMAC technologies. Consequently, security in the TOE model is listed under the technological context.

The CSFs of relative advantage, compatibility, complexity, and information security were used to examine the technological context of the TOE model.

The next section discusses the CSFs used in the organisational context.

3.4.2 Organisational context

The organisational context encompasses internal structure, communication processes, firm size, and the amount of slack resources (Baker, 2012; DePietro et al., 1990; Schaupp & Bélanger, 2013). The three most cited organisational aspects of the individual SMAC adoption are management support, technology competence, and firm size (Gangwar et al., 2015; Lai et al., 2018; Maduku et al., 2016; Oliveria et al., 2014; Schaupp & Bélanger, 2013, 2013; Sharif et al., 2015; Venkatraman et al., 2015; Wang et al., 2016).

3.4.2.1 Management support'

As discussed in section 2.2.1.5, management support is a CSF for technology adoption. Managers play a pivotal role to provide the required support for SMAC adoption projects such as actively encouraging staff to use social media (Sharif et al., 2015). Management support was found to be important for the successful adoption of mobile (Maduku et al., 2016), analytics (Lai et al., 2018; Venkatraman et al., 2015) and cloud technologies (Oliveria et al., 2014). Management support is a success factor associated with the organisational component of the TOE model.

Therefore, the integration of two or more SMAC technologies is more likely to be successfully adopted if supported by an organisation's top managers.

3.4.2.2 Technology competence

As discussed in section 2.2.1.7, technology competence is a CSF for technology adoption. Technology competence helps organisations integrate new technologies to create business value. The lack of qualified internal IT resources may lead organisations to compromise its IT system satisfaction and pay more for external resources to implement and manage the technology (Ghobakhloo, Hong, Sabouri, & Zulkifli, 2012). Technology competence was found to be important for the successful adoption of social media (Schaupp & Bélanger, 2013), mobile (Maduku et al., 2016; Wang et al., 2016), analytics (Lai et al., 2018), and cloud technologies (Gangwar et al., 2015). Technology competence is a success factor associated with the organisational component of the TOE model.

Therefore, organisations with a high level of technology competence are likely to be better equipped to integrate two or more SMAC technologies leading to value creation.

3.4.2.3 Firm size

Firm size is a predictor of mobile and cloud technology adoption (Oliveira et al., 2014; Wang et al., 2016). Large organisations have more resources (e.g., financial, staff) and may be prepared to take more risks associated with technology adoption than smaller organisations (Chong & Chan, 2012; Thiesse, Staake, Schmitt, & Fleisch, 2011; Zhu, Kraemer, & Xu, 2006). In contrast, small organisations, although agile, may not voluntarily adopt new technologies because of resource constraints or risks (Lippert & Govindarajulu, 2006; Oliveira et al., 2014).

Firm size is a CSF associated with the organisational component of the TOE model. Therefore, it is more likely that larger organisations will have the capability to integrate two or more SMAC technologies.

The CSFs factors of management support, technology competence, and firm size were used to examine the organisational component of the TOE model.

The next section discusses the CSFs used in the environmental context.

3.4.3 Environmental context

The environmental context describes the external factors in which the organisation operates (Maduku et al., 2016). The external factors that affect organisations' business activities include competitive pressure, government regulations, and the structure of the industry in which they operate (Lai et al., 2018; Venkatraman et al., 2015).

The two most cited environmental aspects of the individual SMAC adoption are competitive pressure and government regulations (Gangwar et al., 2015; Lai et al., 2018; Maduku et al., 2016; Oliveria et al., 2014; Schaupp & Bélanger, 2013; Venkatraman et al., 2015; Wang et al., 2016).

3.4.3.1 Competitive pressure

As discussed in section 2.2.1.9, competitive pressure is a CSF for technology adoption. Competitive pressure forces organisations to adopt new technologies to maintain their place in the market (Lai et al., 2018). Advancements in technology usually bring about new and innovative ways of doing business and engaging with customers. Therefore, the competitive pressure component was examined in the adoption of social media (Schaupp & Bélanger, 2013), mobile (Maduku et al., 2016; Wang et al., 2016), analytics (Lai et al., 2018; Venkatraman et al., 2015), and cloud technologies (Gangwar et al., 2015; Oliveria et al., 2014). Competitive pressure is a success factor associated with the environmental component of the TOE model.

Therefore, competitive pressure is likely to drive organisations to integrate two or more SMAC technologies.

3.4.3.2 Government regulations

Government regulations may be a barrier to technology adoption. Government policies regulate technology adoption and encourage or discourage the adoption of SMAC technologies (Oliveria et al., 2014). Restrictive government laws around data privacy, information security, and data sovereignty may obstruct technology adoption (Zhu & Kraemer, 2005) and therefore impact how organisations adopt technologies (Lai et al., 2018). Zhu et al. (2006) established that supportive regulatory environments influence and improve technology adoption. Regulatory environments are believed to play a more significant role in developing countries than in developed countries.

The aspect of government regulations on SMAC adoption was examined in analytics (Lai et al., 2018; Venkatraman et al., 2015) and cloud adoption (Oliveria et al., 2014). Government regulations are a barrier in the environmental context of the TOE model.

Therefore, the Australian government regulations are likely to influence the integration of two or more SMAC technologies.

In summary, the TOE model was used in this study to examine the CSFs and barriers of integrating two or more SMAC technologies. The CSFs examined in this study were relative advantage, compatibility, management support, technology competence, and competitive pressure. The barriers examined in this study were complexity, security, firm size, and government regulations.

The next section explains the value creation models used to theorize business value creation.

3.5 Value Creation Models

Various theories and models have been used to explain how organisations create value and the role that IT plays in the value creation logic (Kohli & Grover, 2008). The three most commonly used models are: value chains, value shops, and value networks. These value creation models and discussed in the next section.

3.5.1 Value chains

As discussed in section 2.3, value chain organisations transform inputs into products over sequential activities that are interlinked to create value (Porter & Millar,1985). These value activities are divided into primary and support activities. Primary activities are those involved directly in the production process such as inbound logistics, operations, outbound logistics, marketing and sales, and services. Support activities include infrastructure, human resources, technology, and procurement (Porter & Millar,1985).

The value creation logic of value chains is related to the profit margins organisations make from selling their products to customers. Organisations create value if customers pay more than the cost of production. Conversely, if customers do not pay more than the cost of production, organisations do not create value. Therefore, organisations are required to invest in resources (e.g., human, physical, technical resources) to lower the cost of value activities or perform them in better ways to differentiate and sell at higher prices (Porter & Millar,1985).

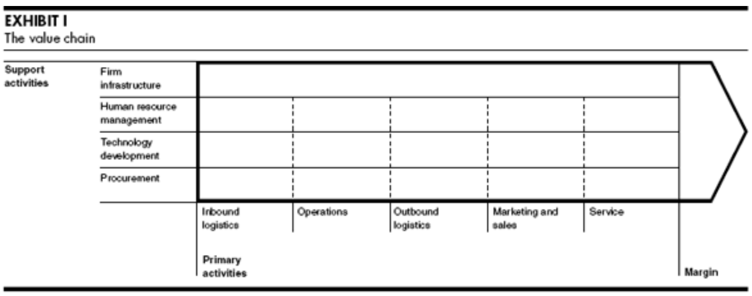

Figure 1: The value chains diagram (Porter & Millar, 1985)

The integration of two or more SMAC technologies is likely to support value chain organisations to lower the cost of production or perform value activities in better ways. The integration of two or more SMAC technologies is, therefore, likely to support value chain organisations to create more business value.

3.5.2 Value shops

As discussed in section 2.3, value shops are organisations that are designed to solve customer problems. The primary activities of the value shops include problem finding, problem-solving, choice, execution, control and monitoring (Stabell & Fjeldstad, 1998). A classic example of value shops are management consulting firms where clients seek business advice. The consulting firm forms a special team of experts to find the problem, suggest solutions, choose the best solution to solve the problem, execute the solution, and finally control and monitor the resolution.

Like value chains, the support activities of the value shops include infrastructure, human resources, technology, and procurement (Stabell & Fjeldstad, 1998). The value creation logic of value shops relies on creative solutions, reputation, skilled professionals, and effectiveness (Harris & Burgman, 2005; Stabell & Fjeldstad, 1998). These pillars of the value creation can be found in analytics (Gupta & George, 2016; Seddon et al., 2012) and mobile technologies (Alalwan et al., 2016).

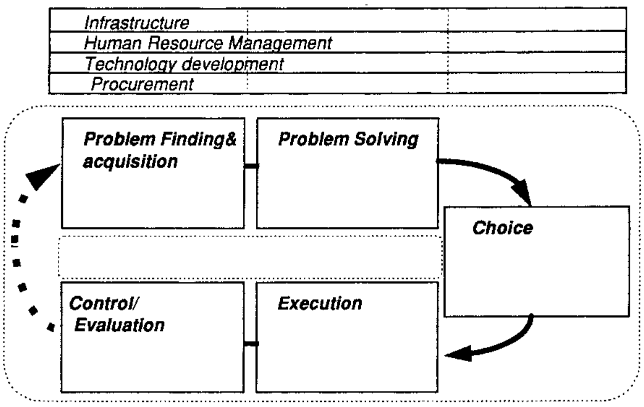

Figure 2: The value shops diagram (Stabell & Fjeldstad, 1998)

The integration of two or more SMAC technologies is likely to help organisations be creative with solutions finding and execution, building a reputation around technology usage and skilled professional which leads to effectiveness. The integration of two or more SMAC technologies is, therefore, likely to support value shop organisations to create more business value.

3.5.3 Value networks

Value chains create value by utilising sequential activities to create value. Value shops are organisations that are designed to solve customer problems. However, value networks are a more appropriate model for some service organisations such as telecommunications, banks, and insurance companies, who build and maintain large networks to facilitate customer exchanges and thus create value (Gray to al., 2015; Leimeister, Böhm, Riedl, & Krcmar, 2010). These organisations create business value when they have more customers joining the network, and therefore, it is imperative for value network organisations to build and manage its network through relationship management, service operations, and operational infrastructure (Harris & Burgman, 2005; Stabell & Fjeldstad, 1998).

The primary activities of value networks include network promotion and contract management, service provisioning, and infrastructure operations (Stabell & Fjeldstad, 1998). These activities represent the core actions to build scalable networks, formulate and manage binding agreements with customers, create value for customers, and operate and maintain the infrastructure.

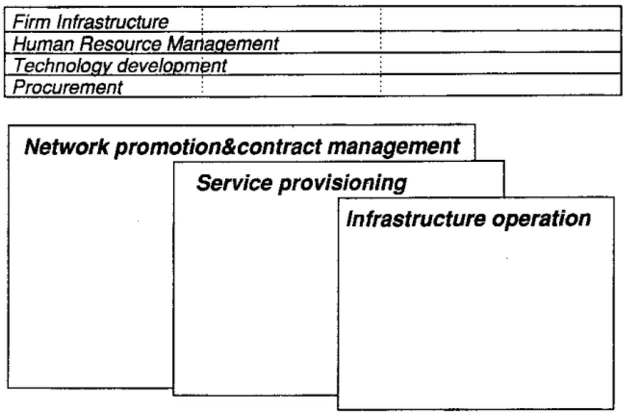

Figure 3: The value networks diagram (Stabell & Fjeldstad, 1998)

The integration of two or more SMAC technologies is likely to help value networks with network promotion and contract management, service provisioning, and operations optimisation. These activities are likely to support value network organisations create more business value.

The conceptual framework for this study used TOE and value creation models.

The TOE model shows the technological contexts (relative advantage, compatibility, complexity, and security), organisational context (management support, technology competence, and firm size), and environmental context (competitive pressure and government regulations). These contexts influence organisations' decisions to integrate two or more SMAC technologies to create business value. Business value is underpinned by using one or more value creation models; value chains, value shops, or value networks.

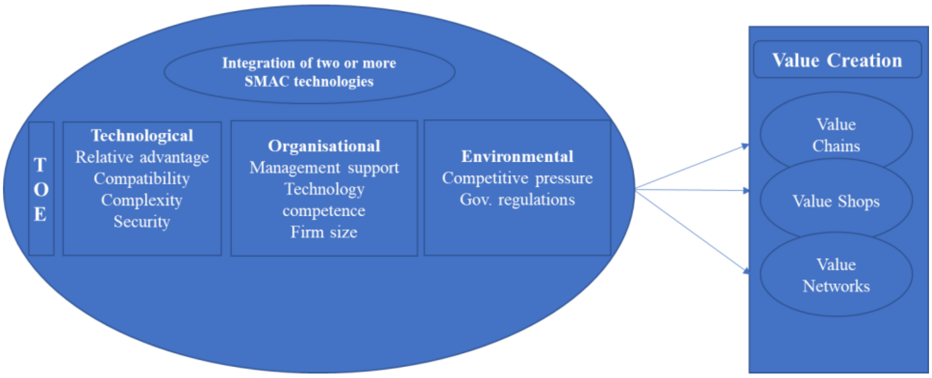

Figure 4:The conceptual framework

3.6 Conclusion

The conceptual framework for this study used the technological, organisational, and environmental (TOE) framework and value creation models; value chains, value shops, and value networks. In the technological context, relative advantage, compatibility, complexity, and security have been examined to investigate value creation of integrated SMAC technologies. In the organisational context, management support, technology competence, and firm size have been examined to investigate value creation of integrated SMAC technologies. In the environmental context, competitive pressure and government regulations have been examined to investigate value creation of integrated SMAC technologies.

The next section outlines the research design and methodology.

4 Research Design and Methodology

4.1 Introduction

The previous chapter explained the conceptual framework of the study and discussed the various components of the TOE model and value creation logic. The previous chapter provided insight into integrating TOE with value chains, value shops, and value networks to examine integrated SMAC technologies in organisations.

This chapter explains the research design and methodology. This chapter details the qualitative semi-structured interviews method, interviewed organisations, data collection, data analysis, reliability and validity of the study, and finally delves into the interpretive research paradigm.

4.2 Method

This study aimed to examine the CSFs and barriers for the integration of two or more SMAC technologies to create business value for organisations. The adoption and integration of social media, mobile, analytics, and cloud technologies in a holistic way is an under-researched topic that requires investigation to help organisations create more value, streamline resources, and stay competitive. A qualitative research method was used to examine the integration of two or more SMAC technologies in real-life contexts (Yin, 2002). Qualitative research uses social actors' meanings to understand various aspects of a phenomenon (Denzin & Lincoln, 1994; Gephart, 2004) and hence allows for in-depth insights.

The qualitative semi-structured interviews data collection method was appropriate for this study because it enabled the researcher to gather more in-depth insights and understanding of the SMAC technology integration contexts by drawing on the experience of key informants (Palinkas et al., 2015). The inductive and exploratory type of the research question of how the integration of two or more SMAC technologies can add business value to an organisation warrants a qualitative research design to analyse and understand the social phenomenon of SMAC technology integration in organisational settings (Yin, 2003).

Various organisations in different industries in Australia were selected for the study. These organisations were chosen because of their diversity, level of technical maturity, and the perceived value of digital technologies specific to their industry (Flick, 2014; Guest, Bunce, & Johnson, 2006). Friends and colleagues helped nominate the organisations. These organisations were recruited via emails sent to the participants followed by phone calls to organise an interview if there was a response to the email. The targeted industries included telecommunications, financial, consulting, education, public sector, non-profit, media, B2B distribution, and manufacturing. The targeted organisations were categorised into SMEs and large enterprises. SMEs are smaller-sized organisations with less than 200 employees whereas large enterprises employ more than 200 people (Australian Bureau of Statistics, 2001). The data were collected from two SMEs and ten large enterprises. The SME organisations were different in terms of SMAC integration and value creation and therefore a decision was made to keep each case separate rather than group them. Appendix A shows a brief description of each organisation.

4.2.1 Data collection

Primary data were collected through semi-structured interviews with 14 key informants from 12 organisations. A purposive selection technique (Devers & Frankel, 2000; Guest et al., 2006) was used to select business and technology stakeholders that are responsible for the adoption and implementation of one or more SMAC technologies in their respective organisations A snowballing technique (Patton, 2002) was used to aim for 15 interviews originally. This number was targeted because of theoretical saturation, which refers to the stage when the researcher continues to collect data from participants until no new insights are gathered (Baker, Edwards, & Doidge, 2012). Studies show that theoretical saturation can be achieved with 12, 13, or 15 interviews (Baker et al., 2012; Guest et al., 2006). Table 8 shows the demographic profile of the organisations and interviewees.

Org Name	Industry	Org Size	Interviewee Name	Interviewee Title	Interviewee Gender	Interviewee Age Group
T1	Telecommunications	Large	T1I1	Chief technology officer	Male	35-45
T1	Telecommunications	Large	T1I2	Chief automation architect	Male	35-45
T1	Telecommunications	Large	T1I3	General manager- Big data	Male	40-50
T2	Telecommunications	Large	T2I1	Chief information officer	Male	40-50
T3	Telecommunications	Large	T3I1	Head of IT	Male	45-55

C1	Consulting	Large	C1I1	Head of digital services	Male	45-55
B1	Banking	Large	B1I1	Head of IT	Female	40-50
E1	Education	Large	E1I1	Cloud program manager	Male	45-55
P1	Public sector	Large	P1I1	Chief digital officer	Male	35-45
C2	Consulting	SME	C2I1	Head of marketing	Male	45-55
C3	Consulting	Large	C3I1	Head of capabilities	Male	40-50
MS1	Media services	SME	MS1I1	Chief executive officer	Male	35-45
M1	Manufacturing	Large	M1I1	Head of IT	Male	35-45
D1	B2B distribution	Large	D1I1	General manager-analytics	Male	35-45

Table 8: Demographic profile of organisations and interviewees

The average interview lasted around 30 minutes and was conducted in person or over the phone. Of the 14 interviews, ten were conducted face-to-face at the interviewee’s workplace, and four were done over the phone. All interviews were conducted in Sydney, Australia.

Of the 14 key informants, only one female was interviewed. This observation supports the recent findings of KPMG that female IT leadership is very low and is less than 12 percent (Harvey Nash/KPMG, 2018).

13 of the 14 interviews were audio-taped and transcribed using online transcription services. The interview with the manufacturing organisation was not recorded because of a technical problem with the tape recorder. Hand-written notes were taken instead.

4.2.2 Data analysis

NVivo for Windows software was used for data analysis. In NVivo, all transcripts were imported, and nodes were created based on the conceptual framework, literature review, and iteratively as the analysis developed. Three nodes were created; SMAC CSF, value models, and unexpected findings. Three child nodes were created underneath SMAC CSF. They are technological, organisational, and environmental. Furthermore, four child nodes were created underneath technological, three child nodes underneath organisational, and two child nodes underneath environmental.

Relative advantage, compatibility, complexity, and security child nodes were created underneath the technological child node. Management support, technology competence, and firm size child nodes were created underneath the organisational child node. Competitive pressure and government regulations child nodes were created underneath the environmental child node.

Three child nodes were created beneath the value models child node. These child nodes were chains, shops, and networks. The unexpected findings child node was used to report results that were not directly related to the TOE model but linked to other CSFs (e.g., cost, culture). Six child nodes were created beneath unexpected findings. They were cost, lack of knowledge, industry irrelevance, lack of resources, culture and mindset, and integration examples.

Respective texts from interview transcripts were copied to their specific child codes for data analysis. Figure 5 shows the NVivo diagram of nodes and child nodes.

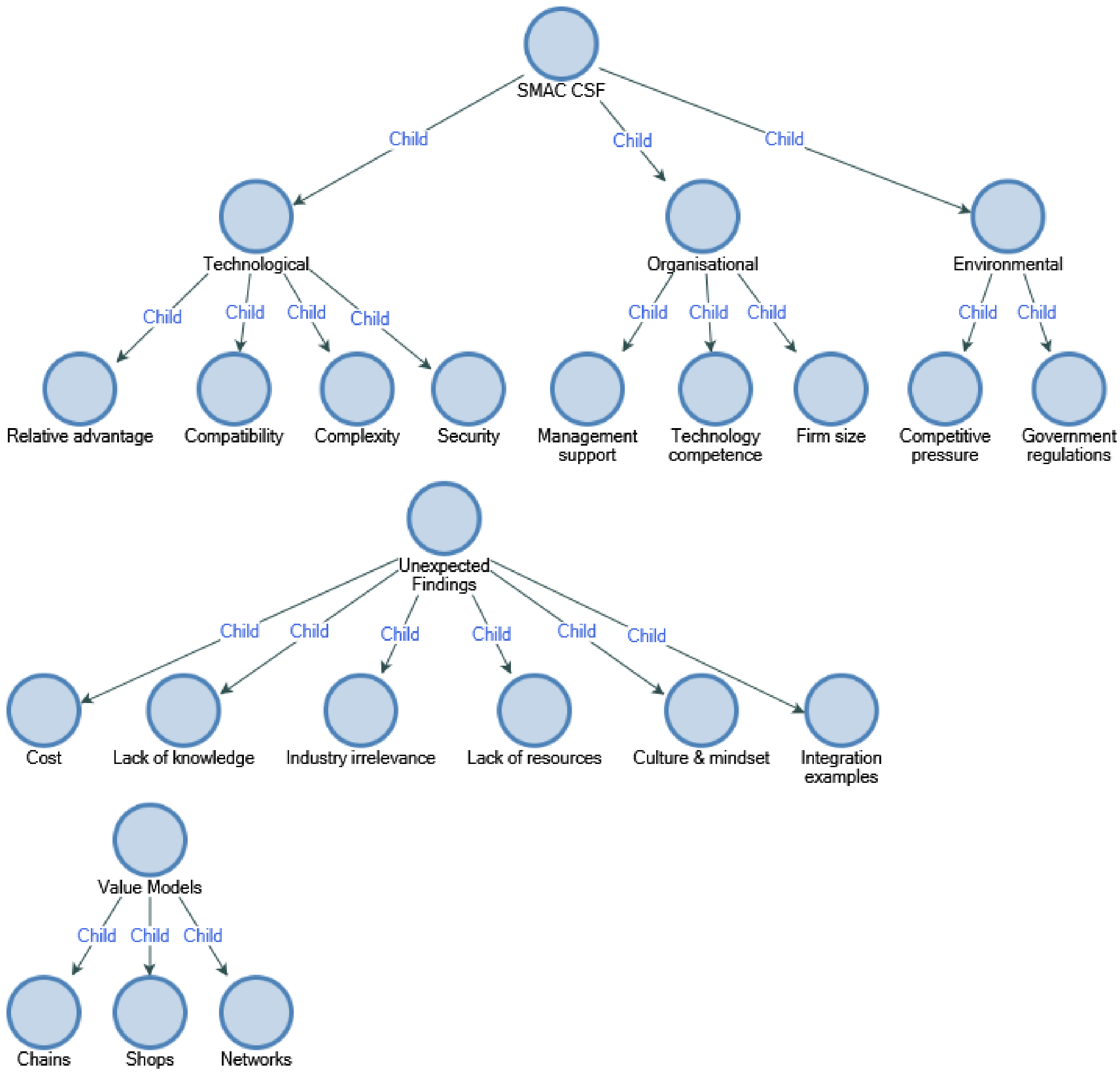

Figure 5: NVivo nodes diagram

4.3 Reliability and Validity

In qualitative studies, reliability refers to the researchers being thorough, careful, and honest in conducting the research (Robson, 2002). Interview techniques often help in achieving the required qualitative research reliability. For example, researchers should be careful with the wording of the interview questions and also establish rapport with interviewees (Breakwell, 2000; Cohen et al., 2007) to strengthen the reliability of their studies.

Validity, on the other hands, refers to potential threats of the study and commonly deals with research bias, reactivity, and respondent bias (Lincoln & Guba, 1985).

To address reliability and validity of this study, the following strategies were employed including the wording of interview questions, establishing rapport with interviewees, peer debriefing, and audit trail. These strategies are explained below.

1. The wording of interview questions: The interview questions (see Appendix B) were worded clearly to address the research questions and gather the required insights. The questions were unbiased, open-ended, and explained in details to interviewees.
2. Establishing rapport with interviewees: Interviewees were initially introduced through friends and colleagues. The snow bowling technique was then used to get more participants. These two approaches along with welcoming emails, polite conversations, flexibility with timing and place of interview, open discussions, respect for time, and follow up thank you emails helped built rapport with interviewees.
3. Prolong involvement: Being part of the IT community in Sydney, Australia, the researcher has studied a familiar contemporary phenomenon and interviewed colleagues from different organisations. This prolong involvement has increased the level of trust between the researcher and participants and reduced the threats of reactivity and respondent bias.
4. Peer debriefing: The study was discussed with peers on several occasions. The first was at the University's presentation day, where students present their studies to get feedback from lecturers. The second at the University's writing workshops, where peers provide their feedback. Third, one-to-one with one of the linguistic lecturers for language, literature review, and coherence and flow feedback.
5. Audit trail: Audio-recording data, transcripts, and related reports are saved and kept.

4.4 Interview Themes

This study aimed to answer the research questions: what are the critical success factors and barriers for integrating two or more SMAC technologies? How can the integration of two or more SMAC technologies add business value to an organisation? Two themes were developed to assist with answering the research questions and analysing the data. These themes were technology integration and value creation. The technology integration theme aimed to answer the first research question. There were two questions in the technology integration theme; first, how ready is the organisation (people, technology, & financial) to integrate new digital technologies such as SMAC? And what are the barriers, if any? Second, how are the corporate IT dimensions of security, complexity, compatibility, industry regulations, and business understanding positioned to support the integration of SMAC technologies? These questions were underpinned by the TOE model and the data analysis used the TOE analysis.

The value creation theme aimed to answer the second research question of how can the integration of two or more SMAC technologies add business value to an organisation? There were two questions in this theme; first, which value creation lens does/did your organisation use to leverage the integrated SMAC technologies? Second, what does it take to build an integrated digital capabilities platform based on SMAC to make the right data accessible and simplify processes? The two questions emphasize business benefits, perceived value, and resource requirements for the integration of SMAC technologies. Appendix B shows the interview questions and themes.

4.5 Paradigm

This study uses the interpretive paradigm. Interpretative researchers assume objective and subjective reality and attempt to understand a phenomenon by translating texts and meanings used by people in real-life settings (Gephart, 2004). Interpretive researchers view the world through the perceptions and experiences of the participants (Thanh, & Thanh, 2015) and believe that reality is socially constructed (Willis, Jost, & Nilakanta, 2007). Interpretive researchers may use hermeneutics or phenomenology methodologies to translate and understand meanings (Myers, 1997).

A qualitative research method can be positivist, interpretive, or critical (Myers, 1997; Yin, 2003). Several factors play a role in determining which research paradigm a study should use. This research adopted the interpretive research paradigm for the following reasons. First, the interpretive approach helped the researcher to understand the meanings of SMAC integration and value creation in specific organisational settings by drawing on key informant experiences, information, and insights. Second, the analysis and interpretation of the secondary data sources provided additional insights into SMAC technology integration and value creation.

4.6 Conclusion

This study used qualitative, semi-structured interviews to gather insights from 14 business and technology stakeholders in different organisations across various industries in Australia. The data were collected from two SMEs and ten large enterprises. The data were analysed using NVivo software. Several interview and research techniques were used to ensure the reliability and validity of the study. This study used the interpretive paradigm.

The key findings are presented in the next section.

5 Findings

5.1 Introduction

The previous chapter explained the research design and methodology. This study used qualitative, semi-structured interviews to gather insights from business and technology stakeholders in Australia. This chapter discusses the findings and explains the various answers and viewpoints from the interviewees. This chapter provides the answers to research questions. In the interviews, some themes emerged that did not address the research questions. These themes included cost, culture and mindset barriers that will be examined in future research. Moreover, the examined technological, organisational, and environmental (TOE) contexts of the integration of two or more SMAC technologies in value chains, value shops, and value networks are explained in this chapter.

5.2 Overview

The organisations were diverse in their value creation models. The manufacturing and B2B distribution organisations had a business model that transforms raw materials into products and created value using the value chain model. Consulting, education, and public sector organisations were classified as value shops because their business model was to resolve customers' problems using experts and technology. Telecommunications, banks, and media services organisations had similar business models that managed large networks to facilitate customer transactions. Therefore, the organisations in this study were categorized into the following value creation models: two value chains (M1 & D1), five value shops (C1, C2, C3, E1, & P1), and five value networks (T1, T2, T3, B1, & MS1).

In the following sections, value chains refer to value chain organisations of this study (i.e., M1 & D1). Value shops refer to the value shop organisations of this study (i.e., C1, C2, C3, E1, & P1). Value networks refer to the value network organisations of this study (i.e., T1, T2, T3, B1, & MS1).

5.3 Critical Success Factors, Barriers and Value Creation

The first research question of this study was:

1. What are the critical success factors and barriers for integrating two or more SMAC technologies?

The findings showed that the CSFs for integrating two or more SMAC technologies are relative advantage, compatibility, management support, technology competence, and competitive pressure.

The most significant CSFs that emerged from this study for integrating two or more SMAC technologies where relative advantage, management support, and technology competence. These CSFs were the most frequently cited by interviewees from value chains (M1 & D1), value shops (C1, C3, E1, & P1), and value networks (T1, T3, B1, & Ms1).
The second research question of this study was:

2. What are the barriers for integrating two or more SMAC technologies?

The findings showed that the barriers are complexity, security, and government regulations. Firm size was found to be both a critical success factor and a barrier.

The third research question of this study was:

3. How can the integration of two or more SMAC technologies add business value to an organisation?

The integration of two or more SMAC technologies adds business value to an organisation by improving operational efficiency, resource optimisation, speed, business agility, competitive advantage, and enhanced customer experience. These benefits were found in value chain, value shop, and value network organisations.

The next section discusses the examined technological, organisational, and environmental (TOE) contexts of the integration of two or more SMAC technologies in value chains, value shops, and value networks.

5.4 Technological context

As discussed in section 3.1.1, the technological context components examined in this study were relative advantage. compatibility, complexity, and security.

5.4.1 Relative advantage

The integration of two or more SMAC technologies helped value chains, value shops, and value networks achieve tangible and intangible business benefits.

In value chains, the integration of analytics and cloud technologies helped organisations scale, reduce operational costs, and improve sales. For example, M1, a manufacturing company, was able to scale and mobilize their workforce to lower the production and operations costs as a result of running advanced analytics in the cloud. The Head of IT of M1 noted that:

> "*For us, analytics in the cloud provide improved efficiency and automated, customised reporting for fast decision making and cost optimisation" (M1I1).*

Another value chain organisation, D1, a B2B distribution company, improved their sales force effectiveness by integrating analytics and cloud technologies. Because of this integration, D1 was able to introduce perspective analytics to the sales and marketing departments. D1 utilized the scale of cloud computing to run advanced analytics and machine learning to build application programming interfaces (APIs) that are used by mobile apps, websites, and other systems. The General Manager of Analytics explained that:

> "*Cloud computing allowed us to run advanced analytics on high volume unstructured data to build APIs and mobile solutions that empower our employees and in turn enhance customer experiences. It would take ten times longer to create these solutions on-premises"(D1I1).*

In value shops, the integration of social media, analytics, mobile, and cloud technologies helped organisations increase profitability and improve operational efficiency. For example, C1, a consulting firm, integrated social media, analytics, and cloud technologies to provide effective marketing services to their customers. C1 uses Facebook, Twitter, LinkedIn, and YouTube to run marketing campaigns for SMEs in Australia. The integration of social media, analytics, and cloud technologies helped C1 reach more customers, save time, and be more efficient with marketing campaigns. That is, the integration of these three SMAC technologies helped C1 optimise their resources to add value.

The Head of Digital Services stated that:

> "*Social media, analytics, and cloud helped with reach, time saving, and efficiency. It would mean you could increase the number of campaigns per customer or indeed increase the number of customers without increasing necessarily your manpower*" *(C1I1)*

C2, another consulting firm, integrated mobile and cloud technologies. The integration of mobile and cloud technologies provided C2 with ubiquitous access to information and improved their operational efficiency. Anywhere access to information is important for C2 to run their business. The availability, cost-effectiveness, and scalability of cloud computing encouraged C2 to host and develop mobile solutions in the cloud. The Head of Marketing noted that:

> "*I don't think our business could be as efficient or as agile without access to cloud and mobile services. Ubiquitous access to information is important for us. We don't maintain servers on-premises" (C2I1).*

In a third value shop example, E1, an educational institute in Sydney, integrated social media, analytics, and cloud technologies to provide their customers, the students, with secure access to the curriculum in a collaborative environment from anywhere. E1's identity management (IDAM), mobile device management (MDM), internal social media, and analytics solutions are all hosted in the cloud. These solutions are secure, highly available, and scalable. Accordingly, E1 built a bring your own device (BYOD) policy around IDAM and MDM, delivered collaborative environment built on social media and ran analytics to learn more about their students. As a value shop, E1 resolved customers problems (i.e., anywhere secure access to content) in effective ways and therefore created more value for the business by integrating three SMAC technologies: social media, analytics, and cloud technologies.

The Cloud Program Manager explained that:

> "T*he value for us is what makes access easy for students- our customers. BYOD is possible here because of the hosted identity and security services in the cloud. We analyse the data and we also use internal social media application for collaboration- that's also hosted in the cloud" (E1I1).*

In value networks, the integration of social media, analytics, mobile, and cloud technologies helped organisations build business agility, achieve competitive advantage, and enhance products and services. For example, MS1, a media services organisation, integrated all four SMAC technologies: social media, mobile, analytics, and cloud. The integration supported MS1's business objectives to be agile and competitive. MS1 hosts all their technology solutions in the cloud for cost-efficiency, elasticity, and availability benefits. MS1 relies heavily on social media, specifically Facebook and YouTube channels, and mobile to distribute content. Analytics runs on top on MS1's channels to provide advanced, real-time reporting on who watched the content, on which device, and for how long. These analytics help MS1 improve services and content quality. MS1, as a result of the integration of all four SMAC technologies, was able to be agile as competition and technology changes.

The Chief Executive Officer (CEO) noted that:

"Cloud is cost-effective and it's a managed service. Analytics helps with measuring and managing the business. Mobile is our platform for content distribution. And social media, the biggest content on earth as I call it, is a content distribution platform for us. Integrating all of these makes my business agile, lean, and ahead of my competitors" (MS1I1).

T1, a telecommunications company, integrated three SMAC technologies: social media, analytics, and cloud. The integration of these SMAC technologies achieved two business benefits. First, response to customers was faster using the channel of their preference (e.g., Facebook, Twitter, YouTube, etc.). Second, T1 could tailor products and services based on customers' requirements.

The Chief Technology Officer (CTO) believed that:

"The integration of SMAC technologies helped our organisation respond to customers faster and on the channel that customers want. Analytics for example, helps with feedback to the products team to build products that are more useful to our customers. Also, if customers are talking to you on Facebook, they expect a response then and there" (T1I1).

T3, another telecommunications company, integrated mobile and analytics technologies. T3 was able to improve customer services and enhance their products and services by integrating these SMAC technologies. T3 has around six million customers in Australia and these customers use their mobile devices daily for personal and business use. T3 developed business-centric mobile apps and promoted its network subscribers to use these apps. These apps are intended mainly to improve customer experience through ease of use and pervasive device accessibility. Also, the use of mobile apps by customers reduced T3's operational cost through self-service and speed, and finally, it generated valuable insights for T3 to enhance its products and services.

The Chief Information Officer (CIO) stated that:

"In our view, customer experience drives the integration of SMAC technologies. And this is both internal and external. Internal being our employees and external our customers we sell services to. If you improve that, you should be able to do it in a way that drives the efficiency, cost savings, better customer experience engagements scores etc. So, they go hand in hand" (T3I1).

Table 9 summarizes the relative advantages of the integrated SMAC technologies for value chains, shops, and networks. In the table, S is used for social media, M is used for mobile, A is used for analytics, C is used for cloud.

CSF	Value creation model	Business benefits	Integrated SMAC technologies	Organisation
Relative advantage	Value chains	Scale Workforce mobility Reduced cost of production Reduced cost of operation	A & C	M1 (Manufacturing)
		Sales force effectiveness Employees empowerment Enhanced customer experience	A & C	D1 (B2B Distribution)
	Value shops	Reach Time saving Effective marketing campaigns	S, A, & C	C1 (Consulting)
		Access Operational efficiency	M & C	C2 (Consulting)
		Access Enhanced customer experience	S, A, & C	E1 (Education)
	Value networks	Leanness Agility Competitive advantage	S, M, A, & C	MS1 (Media Services)
		Rapid response to customers Enhanced products & services	S, A, & C	T1 (Telecommunications)
		Enhanced products & services	M & A	T3 (Telecommunications)

Table 9: Relative advantages of integrated SMAC technologies for value chains, shops, and networks

5.4.2 Compatibility

In value chains, value shops, and value networks, organisations integrated two or more SMAC technologies that were compatible with organisational values, people experiences, and business needs. For example, the analytics team at D1 is experienced with analytics and cloud technologies. This technology experience along with the understanding of business needs encouraged D1 to integrate analytics and cloud technologies for sales force effectiveness and enhanced customer experience. The General Manager of Analytics noted that:

> *"My team is well-versed into data analytics. They always learn and do trials with new technologies. We gained the trust of the management because of this competency" (D1I1).*

C2, a consulting firm, integrated mobile and cloud technologies due to work style conformance to support employees who work flexibly. The Head of Marketing stated that:

> *"We allow our staff to work from anywhere. Mobile and cloud technologies enabled us to do this easily" (C2I1).*

E1, an educational institute, deployed a cloud-based middleware solution to facilitate the integration of social media, mobile, and analytics technologies. The middleware solution is mainly used to integrate E1's legacy systems (e.g., payroll, HR) with mobile and analytics technologies in the cloud. This integration layer enabled E1 to build more innovative solutions around mobile and analytics. The Cloud Program Manager explained that:

> *"Dell Boomi is our integration layer in the cloud. It's a smart solution that interconnects legacy and new technologies to allow us build innovative solutions" (E1I1).*

5.4.3 Complexity

In value chains, value shops, and value networks, complexity hindered organisations from integrating two or more SMAC technologies. For example, B1, a bank, acknowledged that the integration of social media, mobile, analytics, and cloud technologies was a complex undertaking requiring technological expertise. The complexity lies in two areas; solution development (e.g., mobile apps that connect to the backend systems and work across different platforms) and interface design (e.g., analytics dashboard that pulls data in real time from various systems). The bank did not have the expertise to carry out these tasks and therefore, decided not to adopt and integrate SMAC technologies.

The Head of IT believed that:

> *"It's not easy to manage all SMAC technologies without specialized teams in these areas. We also need to work around some legacy applications complexities to make it work" (B1I1).*

In a second example, C3, a consulting firm, found integrating analytics and cloud technologies to be complex. C3 realized that solution architecture in the cloud is different than that of on-premises. The differences are in solution provisioning, security, networks, and data transfers. These differences represented complexity for C3 and as a result, delayed their adoption of cloud computing. To address the complexity challenge, C3 trained their staff and engaged in technical workshops with vendors before moving to cloud computing and running analytics in the cloud. C3's Head of Capabilities described that:

"The move to the cloud looked complex for us at the beginning. We had to train our staff and get external help. Also, analytics in the cloud is meant to be easier but was complex for us until we got our head around it" (C3I1).

5.4.4 Security

In value chains, value shops, and value networks, information security was a barrier that prevented organisations from integrating two or more SMAC technologies. Though information security covers the confidentiality, integrity, and availability of the systems (Guttman, & Roback, 1995), the interviewed organisations focused on the aspect of data protection and the fears of data breaches. The data protection concerns were more serious for regulated industries specifically, telecommunications and banks. These organisations hold and process sensitive and confidential data and are required by law to secure access to and protect the data. Therefore, telecommunications and banks were more hesitant to integrate two or more SMAC technologies that are cloud-enabled (e.g., analytics, mobile). The Head of IT at B1 explained that:

"We have a very low tolerance for security breaches. Therefore, we have not been able to identify, at this stage, cloud providers who can provide us with the relevant level of security that satisfies our risk appetite" (B1I1).

On the other hand, other organisations (e.g., consulting, distribution) were less concerned with information security. These organisations go through standard security measures and practices and integrate two or more cloud-enabled SMAC technologies accordingly.

5.5 Organisational context

As discussed in section 3.1.2, the organisational context components for this study were management support, technology competence, and firm size.

5.5.1 Management support

Management support is vital for value chains, value shops, and value networks to be able to integrate two or more SMAC technologies. Management helped the three value creation models with strategic directions, engagement, and funding support.

In value chains, strategic management directions were important for the integration of two or more SMAC technologies. These strategic management directions reflected senior managers understanding of integrated technology adoption to achieve M1's organisational goals (Ragu-Nathan, Apigian, Ragu-Nathan, & Tu, 2004).

For example, M1, a manufacturing company, is a value chain organisation that is taking a strategic management approach towards the integration of digital technologies, such as SMAC, for business benefits. M1 uses a pyramid with IT at the bottom as a utility, the middle section of the pyramid has IT as a business enabler, and finally, to the top of the pyramid as IT is a source of competitive advantage

IT as a utility delivers low-cost cloud services that are secure and accessible from anywhere. As a business enabler, IT integrates analytics and mobile technologies to provide value, efficiency, and self-service. IT becomes a source of competitive advantage when it uses cloud services to interact with customers and suppliers, neutralise competitive disadvantages, and continually improve productivity and business processes.

The Head of IT explained that:

> *"We adopted an IT delivery pyramid that allows us to envision IT as a source of competitive advantage. Cloud sets at the bottom. The second layer integrates analytics with other systems for improved decision making and agility. At the top sets Internet of Things and artificial intelligence" (M1I1).*

In value shops, management engagement and funding support were crucial for the integration of two or more SMAC technologies. For example, P1, a government city council, utilized social media specifically, Facebook, Twitter, LinkedIn, YouTube, and Instagram social media platforms to engage with customers in real time to provide better services. P1 built a cloud-based incident management solution that allowed citizens to snap pictures and report incidents using their mobile devices. The decision around the integration of these three SMAC technologies was supported by the managers who engaged in business and technology discussions, project tests, and pilots. P1's managers provided the required funding for the project after they understood the business value it brings to the business.

The Chief Digital Officer (CDO) explained that:

> *"There are many areas today that you can use digital technologies like SMAC to help transform for better services. But management approves only if technology creates business value and funding is available" (P1I1).*

The CDO explained that they work with limited budgets and therefore it should only be spent on high-value projects. He further added, organisations always work with two constraints, budget and people. Good management utilise these to the best of the organisation.

C3, a consulting firm, which emphasized managers engagement and understanding of the business value to secure the required funding for the integration of two or more SMAC technologies. Management engagement entails direct sponsorship of the SMAC integration projects. The direct sponsorship further involves communications, follow-ups, and steering decisions. Understanding business value embraces technology and business workshops and vendor support. The Head of Capabilities at C3 pointed out that:

> *"I think management support, engagement, and understanding from the executives as to the value of the integrated tools kind of give you that space to try and move into new digital technologies. I believe it's definitely one of the key aspects. You're not going to get the funding to be able to do that without management support" (C3I1)*

In value networks, management directions were key for the successful integration of two or more SMAC technologies. Value networks showed that lack of these directions, previously, meant less integration of SMAC technologies. For example, MS1, a media services organisation, integrated all four SMAC technologies to run their business in nimble and agile ways. MS1's SMAC integration strategy was built around utilizing technology for business growth. MS1 calls this forward-thinking management. The CEO stated that:

> *"Forward-thinking and strategic management focus on one thing; how we can utilize whatever is available at our disposal for the growth and competition. Because we are nimble, we have been shifting strategies based on what technologies are doing. And therefore, we are successful" (MS1I1).*

In another example, B1, a bank, confirmed that the integration of two or more SMAC technologies will only be funded if they are able to meet strategic objectives. This acknowledgment implies that managers will only support the technology that fits where the business is heading and therefore, drives value. The Head of IT explained that:

> *"Technology adoption at the bank is driven by strategy. IT facilitates what managers see fit for the business" (B1I1).*

In a third example, T1, a telecommunications company, agreed that the integration of two or more SMAC technologies was only possible if they aligned with strategic objectives that streamline customer experiences and drive more value for the business. According to T1I2, the chief automation architect, this was not the case in the past, but things are now changing and the organisation envisions a business value in integrating analytics, mobile, and cloud technologies to provide better customer services. This approach is likely to retain existing customers and acquire new ones, and therefore, create business value for value network organisations.

The Chief Automation Architect believed that:

> *"The strategy of the company is to simplify and streamline dealings with customers. It's very complex today. SMAC technologies are essential in this journey. For years, this wasn't possible because of lack of executive directions & support. Today we have that, and we are moving in that direction" (T1I2).*

5.5.2 Technology competence

Technology competence was found to be imperative for value chains, value shops, and value networks to be able to integrate two or more SMAC technologies. Organisations invested in building internal capabilities including human resources (hiring and training data scientists), technology (infrastructure and network upgrades), and methodology (project management practices) to integrate SMAC technologies.

In value chains, experienced analytics and infrastructure teams influenced the integration of analytics and cloud technologies. For example, the IT team at D1, a B2B distribution, built a robust data analytics infrastructure on-premises and worked with related systems for a long period. As a result, the team developed the expertise and competence to argue for advanced analytics in the cloud. The team persuaded management to invest in tools to build prescriptive analytics for D1 in the cloud to help increase sales and provide enhanced customer experience. The General Manager of Analytics noted that:

> *"I have a competent team that worked with different technologies and built confidence. We will utilize cloud computing to analyse tons of unstructured data that we have today. I believe we will get a wealth of information from text and image analytics in the cloud. No one did it before at D1" (D1I1).*

In another value chain example, M1, a manufacturing company, employed a team of data scientists and cloud architects to harness big data to generate actionable business insights. M1's internal systems and data scientists influenced the organisation to integrate analytics and cloud technologies for rapid decision making and improved productivity. The Head of IT stated that:

"Our team is experienced with BI, analytics, big data, and machine learning. We know we can do more in the cloud. We will now show more advanced analytics in the cloud- in less time" (M1I1).

In value shops, organisations built internal capabilities to integrate two or more SMAC technologies. These internal capabilities included IT teams, infrastructure and network upgrades, and policies and project management practices. For example, C3 upgraded their legacy infrastructure and networks before integrating analytics and cloud computing. C3 managed people's resistance to adopting SMAC technologies by providing training. The Head of Capabilities affirmed that:

"We built a number of internal capabilities for analytics and cloud technologies to be able to manage our business. We also worked on people's mindset" (C3I1).

In another value shop example, E1 hired domain experts and laid the infrastructure and networks foundations to integrate three SMAC technologies: mobile, analytics, and cloud. E1 also employed agile project management methodologies to govern the integration project.

The Cloud Program Manager at E1 explained that:

"We have started laying down the foundation in terms of the network and infrastructure. We use agile methodology to move mobile development and analytics to the cloud" (E1I1).

Value network organisations were similar to value chains and shops. This was evident in the telecommunications organisation T1, which invested resources such as data scientists, testers, digital technology pioneers, and business analysts. T1 also encouraged internal teams to test and trial SMAC and other digital technologies for business value discovery. T1 is also continuously skilling up their teams (e.g., providing training to social media and cloud teams).

The CTO advised that:

"We have about 250 people and their full-time job is to look at new digital technologies and early trial them to see what value they can bring back to the business. We have employed 160 people that are data scientists and are skilling up our social media team to utilize the platforms better. We also have small pockets of people in different parts of our organization that do trials of cloud solutions" (T1I1).

Training and technology trials were important for building technology competence. These tools were used in value network organisations MS1, a media services organisation, and T3, a telecommunications company. The two organisations invested in training and trials to integrate social media, mobile, analytics, and cloud technologies.

The CEO at MS1 revealed that:

> "*Our strategy is fail fast. We are agile in our approach. We trial and pilot mobile apps, analytics, and all social media features. Our resources are limited and doing all things cloud works for our business" (MS1I1).*

The CIO at T3 stated that:

> *"We have a general manager of digital in the business and I have a digital team in IT. We are aligned. We invest in training and get encourage our teams to trial new digital technologies" (T3I1).*

5.5.3 Firm size

In value chains, value shops, and value networks, firm size impacts the integration of two or more SMAC technologies. Large organisations were hesitant to integrate two or more SMAC technologies. SMEs, on the other hand, were more agile to integrate two or more SMAC technologies.

Large organisations have more resources (e.g., human & financial resources) to trial SMAC technologies and build capabilities. However, more resources did not lead to the integration of two or more SMAC technologies. The averseness is related to organisational structure and the necessary change management. In some cases, the averseness is associated with the legacy infrastructure that is in place. For example, T2, a telecommunications company, T3, a telecommunications company, and D1, a B2B distribution organisation, use legacy infrastructure for transaction processing systems. Therefore, the integration of two or more SMAC technologies with existing enterprise and legacy systems may be costly and complex. Some of these systems were built two decades ago (e.g., D1's Cobol-based Focus ERP solution). The General Manager of Analytics explained that:

The General Manager of Analytics explained that:

> *"We have been waiting for two years for this. D1 is a big organisation and I had to work with different stakeholders to get analytics and cloud adopted & integrated here" (D1I1).*

SMEs were able to integrate two or more SMAC technologies without having to deal with the complexities of enterprise and legacy systems. Presumably, their legacy systems are easier to manage, and change if needed, compared to large organisations. For example, MS1, a media services organisation, and C2, a consulting firm, are SMEs that have integrated two or more SMAC technologies. The firm size of these organisations (MS1 employs around 20 people and C2 employs approximately 80 people) helped build shifting strategies around technology integration. MS1 and C2 were able to integrate two or more SMAC technologies faster.

The CEO of MS1 affirmed that:

> *"The size of our firm helped move faster with SMAC integration. I don't have many employees and I rely completely on cloud computing, which also means social media, mobile, and analytics" (MS1I1).*

5.6 Environmental context

As discussed in section 3.1.3, the environmental context components examined are competitive pressure and government regulations.

5.6.1 Competitive pressure

Competitive pressure was a driving force for value chains, value shops, and value networks to integrate two or more SMAC technologies. In value chains, organisations compete for profits and SMAC integration is one of the ways to compete. For example, M1, a manufacturing company, integrated analytics and cloud technologies to compete in the Australian and South African markets. In Australia, M1 is ranked second in the mining manufacturing industry and tenth in South Africa. Tight margins in the industry make a move from tenth to ninth position in South Africa, for example, hard. M1 is strategically investing in analytics and cloud technologies to enable IT to become a source of competitive advantage.

The Head of IT stated that:

> *"Tight margins in the industry forces us to turn to technology to find ways to compete. AI is key for us. But also, a step before that, analytics and cloud computing" (M1I1).*

In value shops, the integration of two or more SMAC technologies provided a way to better engage with customers to provide services and build a reputation. This was evident with C3, a consulting firm, that integrated three SMAC technologies: social media, analytics, and cloud to win market share. The integration of these three SMAC technologies helped C3 compete in two ways. First, the organisation used social media to connect with their customers via

Facebook, Twitter, and LinkedIn which allowed C3 to promote their brand and engage with customers. At the same time, C3 hosted a cloud-based blog to talk to the technical community and build expertise reputation. C3 were able to use advanced analytics to uncover hidden patterns, expedite problem resolutions, and generate business insights for the company to better serve the customer and achieve competitive advantage.

The Head of Capabilities reported that:

> *"I think our business would struggle to survive or be competitive without social media, analytics, and cloud. We try to leverage these and other digital technologies to win customers" (C3I1).*

In value networks, external pressure influenced organisations to integrate the SMAC technologies social media and analytics. These integrated SMAC technologies helped value networks build community and enhance products and services to compete. For example, T1, a telecommunications organisation, was pressured externally (from competitors) and socially (from customers) to integrate social media and analytics. T1 built an online wiki to provide rapid technical support for customers. This cloud-based social media platform allowed other network members (T1's subscribers) to respond to customers and suggest solutions to their problems. T1 used this platform to empower network members to participate and be part of the organisation and to build a knowledge base that can be used for future support incidents. Analytics was used to discover useful information to help improve products and enhance services.

The CTO stated that:

> *"The social & external pressure of social media is one of the drivers to adopt the technology. I can say social media is enforced from outside. We have leveraged that and integrated big data analytics to improve our business" (T1I1).*

MS1, a media services organisation, is another value network example that integrated social media, mobile, analytics, and cloud technologies to stay competitive. MS1 utilized the capabilities of all SMAC technologies to enhance its operational infrastructure, which in turn, helped MS1 compete on cost and quality. MS1 adopted all-cloud solutions strategy for cost-effectiveness. MS1 used advanced mobile and social media features for voice and video quality solutions.

The CEO explained that:

> *"Integration is the only way for us to survive in the digital world and also stay ahead of competition" (MS1I1).*

5.6.2 Government regulations

In value chains, value shops, and value networks, government regulations play a role in decisions to integrate two or more SMAC technologies specifically, the handling of data in the cloud. For example, the integration of analytics and cloud technologies, the integration of mobile and cloud technologies, and the integration of social media and cloud technologies are less likely to take place in heavily regulated industries such as telecommunications and banks.

The reason for the reluctance is the tightened restrictions on how customer data is stored as well as mandatory data breach regulations. The Australian government regulations restrict cloud providers to move sensitive information such as individuals' personal information and store it outside of Australia (Office of the Australian Information Commission, 1988).

The Head of IT at B1 stated that:

> *"The banking industry is highly regulated. Protection of customer data is imperative and there's a lot at risk for customers. But over and above that, if you were to compare this organization to any other banking institution, we have an even more conservative risk appetite" (B1I1).*

The CTO of T1 explained that:

> *"Moving analytics and mobility to the cloud is technically possible, but it's something we will get into trouble! Telco is highly regulated, and we have to abide by government regulations to keep customer data internal" (T1I1).*

The Head of IT at T2 noted that:

> *"We have lots of government customers, we have lots of banks, we have department of defense, ATOs, department of immigration. So, data sensitivity is full front for us. Moving to the cloud for things like analytics is almost impossible because we find it difficult to segregate sensitive and non-sensitive data to move into the cloud." (T2I1).*

5.7 Summary of interview research method

This study has interviewed 14 key informants from different business in Australia. The interview research method provided useful insights into how organisations view SMAC technologies and what are the CSFs and barriers to adoption and integration of SMAC technologies. The study showed that organisations perceive SMAC technologies as business value tools to improve operational efficiency and speed and achieve competitive advantage. The findings supported previous research and highlighted the importance of relative advantage, management support, technology competence, and pressure from competition for organisations to integrate SMAC technologies. Also, complexity of integration, information security concerns, and restrictive government regulations block organisations from integrating SMAC technologies. Firm size was found to be a CSF and a barrier.

5.8 Conclusion

The findings from two value chain, five value shop, and five value network organisations in Australia showed that the integration of two or more SMAC technologies is impacted by the technological, organisational, and environmental contexts. These organisations integrated two or more SMAC technologies to achieve increased business value. The findings showed that relative advantage, compatibility, management support, technology competence, and competitive pressure are critical success factors for organisations to integrate two or more SMAC technologies. The findings showed that complexity, security, and government regulations are barriers for organisations to integrating two or more SMAC technologies. Firm size was found to be both a critical success factor and a barrier.

The integration of two or more SMAC technologies adds business value to an organisation by improving operational efficiency, resource optimisation, speed, business agility, competitive advantage, and enhanced customer experience. These benefits were found in value chain, value shop, and value network organisations.

6 Discussion

6.1 Introduction

The previous chapter presented the findings and answered the research questions. The study found that relative advantage, management support, technology competence, and competitive pressure are CSFs for organisations to integrate two or more SMAC technologies. The study found that complexity, security, and government regulations are barriers to the integration of two or more SMAC technologies. Firm size was found to be both, a CSF and a barrier.

These findings are discussed in more details in this chapter. This chapter reflects on the main findings of the research and explains the relation to both research questions and existing knowledge.

6.2 Overview

The purpose of this study was two-fold. The first was to examine the CSFs and barriers to the integration of two or more SMAC technologies. The second was to investigate how the integration of two or more SMAC technologies add business value to an organisation. This study used a qualitative method to answer the research questions by interviewing 14 key informants from various industries in Australia. This study used TOE and value creation models to develop an explanatory conceptual framework.

The study found that the CSFs of relative advantage, compatibility, management support, technology competence, and competitive pressure were the most important for the successful integration of two or more SMAC technologies. The barriers found in the study that held back an organisation’s ability to successfully integrate two or more SMAC technologies were complexity, security, and government regulations. The study found that firm size was both a critical success factor and a barrier for the successful integration of two or more SMAC technologies.

These findings were similar to previous research that examined each of the SMAC technologies in a siloed way (e.g., Gangotra & Shankar, 2016; Gangwar et al., 2015; Lai et al., 2018; Maduku et al., 2016; Oliveira et al., 2014; Schaupp & Bélanger, 2013). Understanding CSFs and barriers for the integration of two or SMAC technologies provides a better understanding of how organisations create more business value from SMAC.

This study agreed with and provided support for previous research that found organisations adopted SMAC technologies in a siloed way without thinking about how the integration of SMAC technologies can help them achieve business value and competitive advantage (Ross et al., 2015). Organisations adopt new technologies with rational expectations of creating business value (Au & Kauffman, 2003) and gaining competitive advantage (Ruivo et al., 2014). The findings showed that there are clear business benefits of integrating two or more SMAC technologies. These benefits include improved operational efficiency, increased resource optimisation, and enhanced customer experience.

The CSF of relative advantage factor in the technological context of the TOE model showed that the business benefits were evident in value chains, value shops, and value networks. The CSFs of management support and technology competence in the organisational context of the TOE model showed that the integration of two or more SMAC technologies requires top management and the resources to build capable and skilled teams. A high level of management support and skilled teams mitigate the integration barriers such as complexity and security.

The study found that team collaboration was enhanced when two or more SMAC technologies were integrated. In a siloed adoption, teams are disconnected and less focused on the organisation’s business strategy. Using an integrated approach, team efforts are focused on exploiting all technological possibilities to create more value out of SMAC because they are aware of business strategy.

6.3 Added business value from SMAC integration

This study showed that the integration of two or more SMAC technologies provided more business value for organisations than siloed adoption of individual SMAC technologies. The next section discusses the integrated SMAC technologies found in value chains, value shops, and value networks and how business value is created.

6.3.1 Social media & analytics

The integration of social media with analytics supported organisations with improved resource optimisation, more effective marketing, and enhanced customer experience. This was more evident in value shops. The study showed that in value shops, organisations integrated big data analytics with Facebook, LinkedIn, YouTube, and Pinterest social media platforms to learn more about customers’ buying behaviours. The generated insights from social media and analytics helped organisations run effective marketing campaigns and utilise resources more efficiently. These business benefits have been achieved when organisations adopted an integrated approach to social media. However, social media on its own helped organisations co-create products, improve internal operations, increase sales, promote the brand, and build relationships with customers and partners (Culnan et al., 2010; Dijkmans et al., 2015; Hanna et al., 2011; Laroche et al., 2012; Porumbescu, 2016; Sashi, 2012).

6.3.2 Mobile & cloud

The integration of mobile with cloud computing helped organisations provide ubiquitous and secure access to information while delivering operational efficiency. This was more evident in value shops. The study showed that in value shops, organisations leveraged the cloud's infrastructure to build flexible and reliable mobile solutions that can be deployed quickly to customers who were able to access the information from anywhere. The cost advantage of cloud computing helped value shop organisations reduce overall operational overhead.

6.3.3 Mobile & analytics

The integration of mobile with analytics provided organisations with the ability to enhance their products and services. Value chains and value shops did not emphasise the integration of mobile with cloud technologies. However, in value networks, the study showed that organisations used analytics to gather business insights from mobile users. One particular organisation (T3) used the data to derive innovative ways to introduce tailored products and integrated services to customers.

6.3.4 Mobile, social media, analytics, & cloud

Only one organisation (MS1) was found to have integrated all four SMAC technologies. The integration provided this value network organisation with a lean business model, business agility, and competitive advantage. The study showed that the organisation was able to shift strategies according to where technology is heading. This is important because it allowed the organisation to leverage SMAC technological advancements to serve customers better and stay ahead of competition.

These business benefits can be achieved if organisations adopted an integrated approach of mobile technology. Yet, adoption of an isolated mobile technology helped organisations connect with customers in efficient ways and improve organisational productivity and profitability (Alalwan et al., 2016; Dewan & Jena, 2014).

6.3.5 Analytics & cloud

The integration of analytics with cloud computing provided organisations with scale, workforce mobility, reduced cost of production, reduced cost of operation, sales force effectiveness, employees empowerment, and enhanced customer experience. The study showed that in value chains, the integration of analytics with cloud computing helped manufacturing organisations build predictive manufacturing to support the capability of intelligent machines (Lee, Lapira, Bagheri, & Kao, 2013). The study also showed that analytics and cloud computing helped B2B distribution organisations build prescriptive analytics to empower the sales and marketing teams to deliver innovative services to customers.

In value shops, the study showed that the integration of analytics with cloud computing helped education organisations provide improved services to students. These services include facilities enhancements and added services on campus (e.g., mobile parking).

In value networks, the study showed that the integration of analytics with cloud computing helped media services organisations learn more about customers preferences and therefore produce targeted quality content.

These business benefits can be achieved if organisations adopted an integrated approach to analytics technology. Nevertheless, analytics on its own helped organisations generate business insights to understand their customers better, create more profits, support the decision making process, compete, and grow (Gangotra & Shankar, 2016; Gupta & George, 2016; Seddon et al., 2012; Simon, 2013; Wang et al., 2018; Westerman et al., 2014).

The study found that analytics and cloud technologies were the two technologies most organisations adopted together. The integration of analytics and cloud technologies was common for all value creation models because these technologies provided value chains, value shops, and value networks with efficient and effective real-time business insights that helped organisations make informed decisions to improve products and services and therefore enhance customer experience.

This finding aligns with other studies that have shown the business value of data analytics and cloud computing (e.g., Assunção, Calheiros, Bianchi, Netto, & Buyya, 2015; Hashem et al., 2015; Hirsch, 2013). Additionally, previous studies have exhibited the importance of big data analytics and its potential big impact (Chen, Chiang, & Storey, 2012; Dubey, Gunasekaran, Childe, Wamba, & Papadopoulos, 2016; Wamba et al., 2015). Also, cloud computing provides scalable and cost-effective storage, powerful computer processing, and reliable infrastructure to help organisations run advanced analytics and generate business insights effectively.

6.3.6 Cloud & social media

The integration of cloud computing with social media helped organisations reach more customers, respond to customers faster, and build brand loyalty. This was more evident in value networks. The study showed that in value networks, organisations used the public social media platforms (e.g., Facebook, Twitter, YouTube, LinkedIn) to broadly interact with customers and provide enhanced customer services. In addition, organisations used the cloud infrastructure to build proprietary social media solutions (e.g., wikis, blogs) to connect with the community and promote the brand.

These business benefits can be achieved if organisations adopted an integrated approach of cloud computing. However, a siloed adoption of cloud computing helped organisations achieve IT and cost efficiency, scalability, on-demand access, elasticity, and flexibility (Aljabre, 2012; Chou, 2015; Marston et al., 2011; Thethi, 2009).

In summary, the integrated approach of SMAC adoption added more business benefits to organisations than the siloed approach. These business benefits helped value chains, value shops, and value networks create more value from SMAC. The three value creation models integrated different SMAC technologies and gained various business benefits.

6.4 Achieving competitive advantage from SMAC integration

Social media, mobile, analytics, and cloud technologies are available to all organisations, and therefore their sole adoption does not create competitive advantage; rather, their integration does (Ross et al., 2015). IT is a strategic asset that creates business value for organisations, but the more the technology becomes accessible, the less it generates competitive advantage (Carr, 2003). This study has found that technology integration enabled organisations to achieve competitive advantage. Organisations should maximise their IT investment to use the technology to build unique, valuable, inimitable, and non-substitutable resources to create and sustain competitive advantage (Barney, 1991). Taking a holistic and integrated approach to technology adoption maximises the value an organisation can achieve from the IT investment.

A digital business strategy (Bharadwaj et al., 2013; Lerner, 2015; Mithas & Lucas, 2010; Pagani, 2013) allows organisations to align IT and business strategies to integrate digital technologies to create business value and compete. The formation of such a strategy is essential for organisations to adopt and integrate SMAC and other digital technologies (e.g., blockchain, Internet of Things, artificial intelligence) to achieve business value.

6.5 Conclusion

The integration of two or more SMAC technologies added more business value to organisations. Social media and analytics supported organisations with improved resource optimisation, more effective marketing, and enhanced customer experience. Mobile and cloud helped organisations provide ubiquitous and secure access to information while delivering operational efficiency. Mobile and analytics provided organisations with the ability to enhance their products and services. Social media, mobile, analytics, and cloud supported organisations achieve lean business model, business agility, and competitive advantage. These business benefits helped value chains, value shops, and value networks,

7 Conclusion

This study developed a conceptual framework to examine how the integration of two or more SMAC technologies add business value to an organisation. The literature to date had investigated each of the SMAC technologies in a siloed way that limited the potential of these technologies to add business value. The TOE model was used to examine the technological, organisational, and environmental contexts of integrating two or more SMAC technologies. The value creation models of value chains, value shops, and value networks were used to examine value creation logic for organisations.

This study found that the integration of two or more SMAC technologies provides more value than a siloed approach to the adoption of SMAC technologies. Individual SMAC technologies share common CSFs, barriers, and business value creation. The integration of two or more SMAC technologies provides more value for organisations by improving efficiency, resource optimisation, speed, business agility, competitive advantage, and enhanced customer experience.

These benefits support value chain, value shop, and value network organisations. Value chains create business value when integrated SMAC technologies help produce products efficiently. Value shops create business value when integrated SMAC technologies help build creative and effective solutions for customers. Value networks create business value when integrated SMAC technologies help develop and manage the network.

This study offers valuable insights into an integrated SMAC approach that organisations can adopt to maximise their IT investment, technology use, and people skills for increased business value.

This study has found that relative advantage, compatibility, management support, technology competence, and competitive pressure were CSFs for the integration of two or more SMAC technologies. Complexity, security, and government regulations were barriers to the integration of two or more SMAC technologies. Firm size was both a CSF and a barrier.

The TOE model with the value creation models is a useful conceptual framework to inform researchers that integrated technology adoption in organisations is impacted by technological, organisational, and environmental aspects. The study of these aspects provides more understanding of how organisations approach technology adoption and integration.

Practitioners may find the study useful for obtaining a better understanding of CSFs and barriers for adopting and integrating new and emerging technologies.

This study contributes to knowledge by developing a conceptual framework that can be used in future research to study the integration of digital technologies for increased value creation. Besides, the study provides more insights into critical success factors and barriers to the adoption and integration of SMAC technologies. These insights fit into information systems value creation and technology adoption and integration.

Future research into value creation from the integration of various interrelated digital technologies integration (e.g., analytics & Internet of Things, cloud & artificial intelligence). The conceptual framework could be used in future studies to examine emerging and new applications of existing technologies to examine integration of technologies and how these technologies add value in value chains, value shops, and value networks.

One possible limitation of this study was that only organisations in Australia were included. The results may be different in other countries. A second limitation was that the limited number of value chain organisations compared to value shops and value networks.

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9 Appendix A- Interviewed organisations

T1

T1 is one of Australia's leading telecommunications and technology companies offering a full range of communications services and competing in all telecommunications markets. The company provides 17.7 million retail mobile services, 4.9 million retail fixed voice services, and 3.6 million retail fixed broadband services. The company employs around 30,000 people, operates in 22 countries, and is publicly listed on the Australian securities exchange.

T2

T2 is one of Australia's leading telecommunications companies offering a full range of information and communications technology solutions. Org2 is a subsidiary of a global group operating in multiple countries and serving over 685 million mobile customers around the world. The group is publicly listed on the Singapore exchange.

T3

T3 is one of Australia's leading telecommunications companies providing mobile and fixed broadband services with approximately 6 million subscribers, A$3.5 billion in annual revenue and a 19 per cent market share. Org3 is a subsidiary of a global group operating in multiple countries and is publicly listed on the London stock exchange.

C1

C1is a privately-owned consulting company that provides accounting, training, coaching, and digital services to clients in Australia, New Zealand, Europe, and North America. The company employs 2,000 people and is headquartered in Sydney, Australia.

B1

B1is a multinational bank operating in Australia with a global network of over 600 branches spanning five continents. The bank provides a wide range of financial products and services for individuals, corporations, and other financial institutions. The Bank's products and services cover consumer banking, corporate and institutional banking, and treasury services. The bank is publicly listed on the Amman stock exchange.

E1

E1is a public research university based in Sydney, Australia. The university is ranked in the top two per cent of universities in the world and within the top 10 in Australia. The university currently comprises 35 departments within five faculties.

P1

P1is a local government council that is responsible for 30 suburbs in Sydney, Australia. The council provides services for more than 200,000 residents and 20,000 businesses. The services provided include a network of libraries, street cleansing, maintaining roads, assessing development applications, collecting waste and recycling, maintaining parks, and playgrounds.

C2

C2 is a consulting firm that provides technology, advisory services and, education to help local and global businesses of all sizes, design, deliver, and optimise highly successful corporate giving programs. The company also supports the charitable sector by building capacity and assisting with effective, efficient, and sustainable management. The company is headquartered in Sydney, Australia.

C3

C3 is a professional services company specializes in software design, delivery, and integration. The company employs more than 5000 people and operates in 14 countries, including Australia. The company is headquartered in Chicago, USA.

MS1

MS1is a film production studio based in Sydney, Australia. The company streams live content on Facebook and mobile apps. The network aims to enable all people to develop in all aspects of their spiritual, educational, and social lives.

M1

M1is a network of manufacturing companies with a national footprint in Australia and overseas providing engineering, mining, and capital equipment solutions. The company has capabilities to deliver innovative and sustainable solutions for the mining, construction, manufacturing, automotive, infrastructure, aerospace, defence and transport companies. The company employs 700 people in Australia.

D1

D1 is one of the largest Australian distributors of industrial, engineering and safety workplace needs. The company has recently introduced an innovative shutdown and inventory management solution for customers. D1 employs around 3000 people and operates in Australia, New Zealand, the Philippines, and China.

10 Appendix B- Interview themes and questions

Theme	Questions	Reference
Technology integration	How ready is your IT (people, technology, financial) to accommodate new digital technologies such as SMAC? What are the barriers, if any? How are the corporate IT dimensions of security, complexity, compatibility, industry regulations, and business understanding positioned to support the integration of SMAC technologies	Hess et al. (2016)
Value creation	Which value creation lenses does/did your organisation use to leverage integrated SMAC technologies? What does it take to build an integrated digital capabilities platform based on SMAC to make the right data accessible and simplify processes?	El Sawy et al. (2016); Ross et al. (2015); Sebastian et al. (2017)

11 Appendix C- P1I1 Interview

P1I1: Hello?

Rafat: Hey Rafat, how are you?

P1I1: I'm good thank you.

Rafat: Thanks, thanks P1I1, thanks for all your time. Thanks for helping. I really appreciate it.

P1I1: Oh that's all right. I did the same for my research, so that's why I [inaudible 00:00:13].

Rafat: That's right. that's okay. Okay great, great. So you're out on the train now? Back to your place and do you have some free time?

P1I1: Yeah, no I'm just driving home.

Rafat: Oh right okay.

P1I1: So [inaudible 00:00:25] gone somewhere.

Rafat: That's okay, that's all right. So hopefully we can quickly just go through this. But basically P1I1 I'm doing a research at MacQuire University for social media, mobile analytics and cloud, what we call smac technologies. And I thought someone like you with a digital responsibility and the new role which is CDO's and all of that, so you might be able to help with answering those questions, from your experience, from your organization, or any insights for the stuff.

P1I1: Yeah.

Rafat: For the digital technologies.

P1I1: Sure.

Rafat: So the first thing I have P1I1, your role in your organization. Like you are a chief digital officer at the moment and looking after the digital technologies in your organization, is that right?

P1I1: I'm the chief technology and digital services officer.

Rafat: Right.

P1I1: [inaudible 00:01:29] right.

Rafat: Sorry?

P1I1: You know I changed, I moved on from [inaudible 00:01:33].

Rafat: Oh yeah, yeah, no I know that. That's fine.

P1I1: Yeah.

Rafat: Okay so the first questions I have, what level of authority, responsibility and involvement do you have for the adoption and successful implementation of social media, mobile analytics and cloud computing technologies in your organization?

P1I1: Sorry just repeat that question. What sort of responsibilities I have?

Rafat: Like authority, responsibility and involvement.

P1I1: Authority.

Rafat: Yeah.

P1I1: Well I have all authority and all responsibility.

Rafat: Okay for that option of these technologies and the implementation?

P1I1: Yes.

Rafat: Okay that's good, that's all right. Okay. So how ready, this is the second question which talks about digital maturity, so how ready is your IT and this is your technology, people, financials to accommodate new digital technologies such as smac which is social mobile analytics and cloud? And what are the barriers if there is any barriers? So how ready they are and if there are barriers you can share with us some insights on that one.

P1I1: Yeah. Sure. I think the fact that question to be honest, is too high level too generic. I don't know what sort of answer you're looking for. So, I mean, if you ask that question most people would say, yes we're ready. But if you go down to the specifics, the reality is most organizations are not ready, in terms of technology, in terms of capability, also from a financial point of view, it also depends on the organizational outcome you're trying to drive, because with a social media piece, it's not just putting contents on Facebook, on ... pictures and so on. People use social media to drive lead generation. So to do lead generation you need to have sufficient money for social media marketing. So again, that's another piece.

I think you need to ... I think that question to be honest, is very high level.

Rafat: Okay.

P1I1: You need to go down to the next level.

Rafat: If I were to ask about the critical success factors of adopting, or basically integrating those technologies, so, like in your organization, is social media by itself probably has a value. Like cloud by itself has a value. Mobile technology, and apps, all that, they have value. And then you have analytics. But if I want to look at the integration of two or more technologies of those, which ones you would say, based on your organization, like two or more, so it could be four of them. It could be ... it depends on your organization. So again, the integration of those technologies which ones you would think ...

P1I1: Oh okay. Sorry what is the question again?

Rafat: So if we're to look at integrating two or more of those technologies, which one ...

P1I1: Two or more?

Rafat: Yeah, of-

P1I1: So two or more technologies. So, is your question framed at the technology for integration?

Rafat: Yes. My ... okay.

P1I1: Or, is it [inaudible 00:04:42] of the social media integration into the enterprise environment?

Rafat: No, well actually, I'm looking at the integration of two or more of those technologies, right.

P1I1: So, again, so is the question, apologies Rafat. I don't mean to be difficult-

Rafat: No, no that's all right.

P1I1: But again clarify, integrating multiple technology platform, you can do it multiple ways, with services, point to point SIS and so on, or use ESP.

Rafat: Okay.

P1I1: So is the question, is the organization mature enough to do integration through multitude of methods? Or is the question phrased at, are you doing integration at all?

Rafat: No, well actually let me just ... sorry maybe I'm not clear with that. Okay, let me just take a step back. So, I'm looking at four technologies to start with. So social, mobile, analytics and cloud, what we call smac. That's what it's called okay so that's the start.

P1I1: Okay.

Rafat: So this is like a theme, digital maturity. When I talk about how ready your IT, like I have technology, people and financials, to accommodate new digital technologies like smac, I just want to take it, so as you said this is high level, just to talk about thing, but if I want to talk about two or more of those technologies, so social, mobile, analytics or cloud, I want to look at just integrating two or more. I asked which ones you think in your organization, that makes more sense for your organization to integrate? If you were getting those four digital technologies, which ones do you think will make more sense for your business to integrate, if you see any value in integration? That's basically what I'm after.

P1I1: Yeah. Okay. So again, just that social mobile analytic, what's the other one?

Rafat: Cloud.

P1I1: Cloud. I actually don't see integrate ... probably I'll say social and analytics would be important.

Rafat: Right.

P1I1: But actually, analytics are important for everything. It's important for socia because you need to measure, and it's important to cloud, because you need to understand our cloud consumption.

Rafat: Right okay, sure.

P1I1: So I'm a bit confused about the question.

Rafat: Okay so social and analytics and cloud probably. Let's just focus on those ones. I mean looking at your business. So let's just focus on social, analytics and cloud for now. So, lets get mobile out of the equation for now, just talk about those three technologies. The question is here, like I'm looking at the integration and value creation. So if you were to implement each of those technologies on it's own, versus the integration. So do you see value in integrating those technologies, more than if they were deployed in isolation?

P1I1: It depends on the business case for integration because we spend a lot of money on integration, but people don't really understand why we're integrating things. So I have to look at the case required for integration.

Rafat: What about for your business? I mean if you were to, again, move your organization, like digital transformation aware?

P1I1: Yeah, we have this conversation all the time.

Rafat: Okay all right.

P1I1: And most people say yes, you need to do this, but if I was to put my business hat on, whatever work we do there's a cost associated with it.

Rafat: That's right.

P1I1: So what is efficiency gained from digital transformation as opposed to ... most people driving digital transformation are technologists. Spend hundreds of thousands and millions of dollars doing digital transformation, but they might be transforming the wrong area, or the efficiency gained is not ... the return on investment doesn't justify the investment for digital transformation. So I have to be very careful and very specific about where we focus our time and energy.

Rafat: Oh okay. Yeah sure.

P1I1: So I would say, [inaudible 00:09:15] maximum return. But again it comes down to the case for digital transformation. And there's so much technology available now, you can transform everything. But what is the right area to focus on? Because you're limited in capability, you're limited in capacity and most organizations are limited financially.

Rafat: Right.

P1I1: Does that make sense?

Rafat: Yeah it does. No, no, it does. Again if you were to look at ...

P1I1: But it's just not a straight forward yes or no, unfortunately with this [crosstalk 00:09:45]/

Rafat: No, no look, this is great, and I take some insights, and when I do these interviews with different people and stuff. And this [inaudible 00:09:53] actually comes all the time to be honest with you. Like this is my sixth interview and financial things, like I talked to people from Tesla and Vodafone and now ... it's only the financial which is really great insight for us just to understand the financials is really big and it drives lots of things. Whereas when I look-

P1I1: Because ultimately it's driven by the business. So this is all about financials.

Rafat: That's right, what value ... but the question is, P1I1, can you imagine any business today running without social? Running without mobile apps? Running without let's say cloud? Is that?

P1I1: Yes, yes I can.

Rafat: Okay.

P1I1: If you remember, I used to run a digital services business that went global, and there's plenty of businesses that I have seen that don't require digital.

Rafat: Oh okay good.

P1I1: Now everybody jumps up and down saying, "you've got to go digital, you've got to go digital" but it really depends on the cusP1I1ers that you've got. And I have seen some businesses that have cusP1I1ers, their cusP1I1er base in the manufacturing space, or in the 50's, in their 60's, they're not text happy, they're not mobile, so doing digital work actually doesn't make sense. So it's really based on your cusP1I1er base and what it is you're trying to do.

Rafat: Okay if I want to just shift this a bit, in your organization, because again this is confidential and stuff, I'm not going to ... organization which is whatever it is, in your organization do you see any value in integrating, again those technologies we're talking about, or ... just for your organization, your business that you are in currently? Is there any need? Is there any sort of integration requirements?

P1I1: Again it comes to the costs of the integration and the benefit we're looking to gain. The importance in getting insights into the work we do, so analytics components are important, but I question the integration effort required. Quite often there will be analytics associated with your social work that you're doing, same as mobile and cloud, but those things are just not integrated. What is a case for integrating? I think that needs to be looked at.

Rafat: But with analytics are you doing any analysis? Or again is there a value to do analysis on your social media? Like if you are on Facebook, Twitter and Instagram and all of that, do you guys see a requirement to have analytics on top of that to understand your cusP1I1ers more, or to provide more services or?

P1I1: Yeah. We're currently not there yet. We're definitely interested in getting better understanding. But again, it comes down to the costs of implementing and what sort of value we're going to be getting.

Rafat: Okay.

P1I1: Most businesses Rafat will have account managers, and probably not the case for us because we are city, but for example UBT, if your cusP1I1er has a problem you will hear about it from your support team, you will hear about it from your account managers, you actually don't need analytics.

Rafat: Okay. All right.

P1I1: Does that make sense?

Rafat: No, no, it does.

P1I1: Most small businesses operate that way.

Rafat: Oh okay.

P1I1: You don't need to spend hundreds of thousands of dollars to do integration and analytics. People go out, they see their cusP1I1ers, they understand the challenges, the pains.

Rafat: Sure, sure. What about cloud? Is it something you see value in going to the cloud, or having some stuff in the cloud or you can still do things on-?

P1I1: Cloud is actually very expensive for us.

Rafat: Oh okay. That's interesting yeah.

P1I1: For example, at UBT we house applications in cloud. The cost of that is quite extensive as opposed to processing hardware and sweating the assets. So I see a benefit in cloud in the ability to scale, if there's a need for that. But if you're just running corporate applications and applications that possibly is actually network heavy, then probably putting in the cloud is not necessarily a great option.

Rafat: Yeah, yeah, so P1I1 from your talk and stuff, I think financials and cost is sort of the biggest barrier to integration and cloud, like talking about cloud that's-

P1I1: No, it's actually not a barrier. I have no problem getting money to do the work, but for someone in my position there's responsibility to say is the work that we're doing best for the organization? I have no problem in getting money but I need to stop the work. One, I have limited capacity within my team. Limited number of projects that can execute concurrently, so I need to be more critical in challenging the work coming through to me. Whatever work that we're doing yields a massive value for the organization. Does that make sense?

Rafat: No, no it does. So you'd say, so people in capacity, still say probably maybe, around people's culture and things around people just to take that. Cost yes, but you need to justify that. But people their capabilities and their-

P1I1: People are a challenge yeah, absolutely. Capability, capacity, you're right, the culture, work ethics, all of those are challenges to any organization today.

Rafat: Right, right, right. Okay no that's good to know. That's really great insight actually. Look, okay I think I covered, also I have question, what does it take to build an integrated digital ... you've answered that. Value creation [inaudible 00:16:12]. We talked about that. And I have some stuff about digital business strategy which I'm not covering actually, but no, look, that's okay, that's great actually. It's really great to get those insights from you, like this is your role actually. And this is the first time I talk to a chief digital officer. I mean I talk to like IT managers and I talked to some business people from marketing, again because of social and mobile but it's great yo have those sort of thinkings and insights. So thanks for that, this is great P1I1.

P1I1: No problem Rafat, if you have any questions let me know.

Rafat: Thank you very much.

P1I1: Always happy to help.

Rafat: Thanks a lot, thank you, bye.

P1I1: Okay, bye. Bye.

Rafat: Bye.