ACHIEVING KNOWLEDGE AMBIDEXTERITY IN SMALL AND MEDIUM ENTERPRISES USING CLOUD COMPUTING

A thesis submitted by

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ABSTRACT

Knowledge ambidexterity (K-AMB) is a simultaneous process of knowledge exploration and exploitation that can be adopted by organisations for effective knowledge management. Compared with larger organisations, small and medium enterprises (SMEs) have limited K-AMB capability. Cloud computing has emerged as an effective solution for knowledge management in SMEs. Cloud computing can also help SMEs to achieve K-AMB. However, there is a research gap to understand how can cloud computing help SMEs achieve K-AMB. To this end, the primary research questions for this study are:

RQ1: What is the role of cloud computing in knowledge management for SMEs?

RQ2: How is K-AMB achieved by SMEs from technology-driven innovation using cloud computing?

RQ3: How does cloud computing support transformation of SMEs into ambidextrous learning organisations?

To answer these research questions, a design science research (DSR) study was executed. A preliminary research artefact, referred to as the knowledge ambidexterity framework (KAF), was developed based on the findings of a systematic literature review (SLR) (***Paper 1***) and pre-intervention interviews with key stakeholders from seven case study SMEs in India and the United Arab Emirates (UAE). The KAF was then demonstrated using IBM Watson cloud services in 2019. This was followed by artefact evaluation at the seven case studies with two rounds of post-intervention semi-structured interviews in 2020 and 2021, that captured longitudinal data on the impact of the artefact on the case study SMEs. Qualitative data

captured from interview transcripts were analysed using NVivo to identify emerging themes that were used to discuss the findings to answer RQ2 and RQ3.

This study found that SMEs initially operated on a compromised K-AMB state where cloud computing is under-utilised, thereby missing out on ambidextrous opportunities. However, after KAF was implemented in SMEs for one year, it was found that SMEs were able to achieve K-AMB supported by technology-driven innovation using cloud computing (***Paper 2***). This was possible since cloud computing provided a platform for SMEs to simultaneously execute knowledge exploration and exploitation. Furthermore, because of continued collaboration with the case study SMEs, it was found that K-AMB created a continuous learning environment that helped SMEs transform into an ambidextrous learning organisation (***Paper 3***).

In terms of theoretical contribution, this study examined the role of cloud computing on K-AMB capability and associated K-AMB with technology-driven innovation within the SME sector. It was also identified that SMEs that can continuously follow K-AMB processes supported by cloud computing can transform into ambidextrous learning organisations. This study contributes to practice by offering guidelines for SMEs on achieving K-AMB using cloud computing to promote technology-driven innovation and develop a continuous learning culture.

Keywords: *knowledge ambidexterity; cloud computing; SMEs; technology-driven innovation; ambidextrous learning organisation; knowledge management; design science research*

CERTIFICATION OF THESIS

I, Minu Saratchandra, declare that this PhD thesis entitled 'Achieving Knowledge Ambidexterity in Small and Medium Enterprises Using Cloud Computing' is not more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references, and footnotes.

This thesis is the work of Minu Saratchandra except where otherwise acknowledged, with much of the contribution to the papers presented as a Thesis by Publication undertaken by the student. The work is original and has not previously been submitted for any other award, except where acknowledged.

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Dr. Anup Shrestha
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The student and supervisors' signatures of endorsement are held at the university.

STATEMENT OF CONTRIBUTION

This section provides details of the agreed share of contributions of the PhD candidate and respective co-authors (Supervisors) in the journal publications presented in this Thesis.

Article 1: Chapter 3 (Systematic Literature Review; Answering RQ1)

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The percentage contribution for this paper is (Minu Saratchandra: 70%, Anup Shrestha: 30%)

Author	**Task performed**
Minu Saratchandra PhD Candidate	Establishing methodology, compiling, and analysing data, preparing tables, graphs, and figures, and writing the manuscript.
Dr Anup Shrestha Principal Supervisor	Supervising and assisting in finalising the methodology, technical inputs, editing and co-authoring the manuscript

Article 2: Chapter 5 (Artefact Evaluation – Technology Driven Innovation; answering RQ2)

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Author	**Task Performed**
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Dr Anup Shrestha Principal Supervisor & Professor Peter Murray Associate Supervisor	Supervising and assisting in finalising the methodology, technical inputs, editing and co-authoring the manuscript

Article 3: Chapter 6 (Artefact Evaluation – Ambidextrous Learning Organisation; answering RQ3)

Minu Saratchandra, Anup Shrestha and Peter Murray.

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Author	**Task Performed**
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Minu Saratchandra, Anup Shrestha and Peter Murray. Can Cloud-Based Knowledge Management Systems Enable Small and Medium Enterprises to Achieve Knowledge Ambidexterity? Paper presented in Doctoral Consortium at the Australasian Conference on Information Systems, held at Sydney, Australia on 6-1 December 2021.

Minu Saratchandra, Anup Shrestha. Is Knowledge Ambidexterity the Answer to Economic Sustainability for SMEs? Lessons Learned from Digitalisation Efforts During the COVID-19 Pandemic. Paper presented at the Small Enterprise Association of Australia and New Zealand (SEAANZ) 2021 Symposium. Held in Australia, on 11 Nov 2021

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ABBREVIATIONS

SMEs	Small and medium enterprises
KM	Knowledge Management
K-AMB	Knowledge ambidexterity
SLR	Systematic literature review
KMS	Knowledge management system
C-KMS	Cloud based knowledge management system
IS	Information systems
IT	Information Technology
LO	Learning organisation
ALO	Ambidextrous learning organisation
EDI	Employee-driven innovation
TDI	Technology-driven innovation
NLP	Natural language processor
AI	Artificial Intelligence
DT	Digital Transformation
DSR	Design Science Research

CHAPTER 1: INTRODUCTION

This chapter outlines the background context on small and medium enterprises (SMEs) to explain the research problem on the opportunity towards knowledge ambidexterity for SMEs using cloud computing. The three research questions (RQs) are also presented that provide the underpinning theoretical foundation to produce the three research outputs as journal articles for this thesis by publication document.

1.1 Background

Small and medium enterprises (SMEs) are non-subsidiary, independent firms which employ fewer than a given number of employees. In most countries, 90% of the organisations are SMEs and they play a pivotal role in instigating economic growth, employment and wealth creation (Lin, 2014). The definition of SMEs varies in different countries. For instance, as per the Organisation for Economic Co-operation and Development (OECD, 2017) and Commonwealth of Australia (Gilfillan, 2015), SMEs are classified according to the number of employees and maximum annual turnover which is also the case in the United Arab Emirates (UAE; Middle East). Whereas in India, SMEs are classified according to investment, machinery and equipment and not on the number of employees (MSMEs, 2020). A survey conducted on the SMEs sector in 2020 reveals that job satisfaction, workers relations and company communication, and stability of employment were positively assessed by the employees of various SMEs around the world and these factors are higher in the SME sector compared to larger organisation (Smolarek and Sułkowski, 2020).

As the business processes vary in each organisation, the knowledge requirement for the firm also varies. In today's dynamic

business environment, organisations need up-to-date knowledge to execute their business in the best possible way (Paschek *et al.*, 2018). The success of a firm depends on how well they manage their knowledge (Chua and Wee, 2013). While considering SMEs, they lack knowledge resources and capabilities (Abebe and Angriawan, 2014; Lee *et al.*, 2019), hence it is more challenging for SMEs to efficiently allocate their scarce knowledge resources towards competing for their business objectives (Abebe and Angriawan, 2014; Lee *et al.*, 2019).

Majority of knowledge lays outside the boundary of SMEs (Lee and Kim, 2019). Hence SMEs are forced to continuously update their knowledge base, making sense of environmental changes and creating new knowledge out of external knowledge sources (Hock-Doepgen *et al.*, 2021). Consequently, the task of knowledge management (KM) is daunting in SMEs (Dixon *et al.*, 2013). KM is the systematic process of creating, storing, sharing and applying knowledge in the firm (Alavi and Leidner, 2001). SMEs always utilise more traditional KM tools and practices rather than more innovative and contemporary tools (Cerchione and Esposito, 2017). Therefore, SMEs are generally considered as the entities without a strategy of their own for addressing the knowledge and KM processes.

Another concern with SMEs is their low external knowledge acquisition. To demonstrate the major source of knowledge in SMEs, this study followed an approach by Lefebvre *et al.* (2015), who categorised external knowledge sources for SMEs as market based sources, science based sources and digital-technology-based sources. The market-based sources include suppliers, customers, partners, competitors and other stakeholders. The science-based sources include universities and public research institutes, private research institutes, training institutes and third-party knowledge coordinators. Finally, in the third category digital-technology-based sources include social media or other networking web applications. The market-based sources and science-based sources are

people-centric knowledge sources; and they are the major source for knowledge in SMEs. Likewise, the technology-based sources such as social media eliminate the need for the documentation of shared knowledge (Irum and Pandey, 2019). Moreover, information is scattered in the platforms used by SMEs, hindering the systematic processes of KM. There are many other challenges of using social media data including being highly unstructured, abundance of data noise, and uncertain data sources (Wang and Wang, 2020). This implies that the inflow of latest knowledge for improving competitive advantage and innovation for SMEs is limited.

Further, organisations should adapt their behaviour to emerging circumstances (Osiyevskyy *et al.*, 2020) such as the current outbreak of the coronavirus disease (COVID)-19 pandemic. Here, SMEs were the most affected segments across countries due to stringent government policies and shutdown of factories (Papadopoulos *et al.*, 2020). This led SMEs to rethink, redefine, and redevelop their capabilities to allow for increased flexibility for coping and adapting to change and crises, by creating robust responses to economic uncertainty (Iborra *et al.*, 2020). Lack of resources and underdeveloped institutional and network support compared with large firms suggest that SMEs are vulnerable to crisis and rapid change (Heras *et al.*, 2020). Based on extant research, this research acknowledges that SMEs can efficiently respond to any uncertainty through the dual capacity offered by 'knowledge ambidexterity' (K-AMB). Hence, in order to augment the knowledge resources inside the firm, improve capabilities and efficiently respond to any crisis, SMEs can consider the dual capacity of K-AMB inside the firm with the support of information systems (IS) – for example, cloud computing since digitalisation improves ambidextrous approach (Scuotto *et al.*, 2019).

K-AMB is defined as the ability of firms to simultaneously exploit and explore knowledge, to use internal systems to adapt and exploit existing knowledge, and to identify novel ideas for innovation and experimentation

that explores new knowledge (March, 1991; Benitez *et al.*, 2018; Rialti *et al.*, 2018). Here, knowledge exploration entails process of searching, experimentation, and discovery of new knowledge whereas knowledge exploitation entails process of refinement, production, implementation, and execution of existing knowledge. Therefore, K-AMB plays a crucial role, as it generates a streamlined flow of knowledge for SMEs (Soto-Acosta *et al.*, 2018) and an ambidextrous organisation can perform in a superior way (Tushman and O'Reilly, 1996). When knowledge augments in the organisation it should be saved, managed and reused. An enormous volume of knowledge is generally stored in IS tools such as the knowledge management systems (KMS) so that it can be managed and used readily by anyone in the organisation (Santoro and Usai, 2018). However, most of the current enterprise KMS are generally confined to large organisations with exorbitant costs for purchasing and handling their maintenance and operations (Sultan, 2013), limiting SMEs access to manage knowledge.

Both exploration and exploitation encourages knowledge endowment and innovation for organisational success and survival (Randall *et al.*, 2017). Prior studies suggest that ambidextrous organisation can perform in a superior way (Raisch *et al.*, 2009; O'Reilly III and Tushman, 2013), improving managerial decisions (Torres *et al.*, 2015), firm survival rate (O'Reilly III and Tushman, 2013; Sinha, 2015; Dolz *et al.*, 2019), the overall rate of innovation (Soto-Acosta *et al.*, 2018) and other organisational capabilities. However, it is difficult for SMEs to achieve ambidexterity (Adler and Heckscher, 2013; Chen and Liu, 2018), because exploration and exploitation demand different management activities (Lorentz *et al.*, 2019). Moreover, the exploration and exploitation activities compete for the same scarce resources; the more individuals or organisations devote resources to exploitation, fewer are left for exploration (March, 1991). Therefore, it is difficult for SMEs to implement ambidexterity as they do not have resources and capabilities to achieve it.

Although K-AMB is critical in all contexts, scholars often examine knowledge exploration and exploitation quantitatively as a representation of organisational capabilities, emphasising their interaction with various organisational factors (Al-Atwi *et al.*, 2021; Wenke *et al.*, 2021). Extant research suggests that SMEs might be better off in focusing on either exploration or exploitation given that limited resources make an ambidextrous approach less beneficial (Wenke *et al.*, 2021). Some qualitative studies have adopted a case study methodology by examining the K-AMB interactions by evaluating a particular functional unit or individuals' perceptions on what actual behaviours are required for developing K-AMB capability (Bonesso *et al.*, 2014; Senaratne and Wang, 2018). Mostly however, studies have stopped short of understanding how SMEs expand their knowledge base via technological intervention such as cloud computing for achieving K-AMB. SMEs consider the implementation of new technology as a cost rather than a benefit (Barcelo-Valenzuela *et al.*, 2016). In this context, cloud computing is a model of delivering a range of IT services remotely through the Internet. Various applications hosted in the cloud platform act as services that meet the IT needs of the organisations and people (Lin and Chen, 2012). The reason for choosing cloud computing as the enabling technology is because cloud services can directly support knowledge exploration and facilitate knowledge for knowledge exploitation in a cost-effective way (Gonzalez, 2019).

In this context, understanding the role of K-AMB in SMEs and how K-AMB is implemented for the capability enhancement of SMEs using cloud computing is a crucial segue into this research.

1.2 Problem Statement

K-AMB is widely adopted especially by many large organisations to improve their performance and innovation and to undertake more informed decisions. Prior studies have confirmed that digital systems plays a vital

role in achieving organisational ambidexterity (Ardito, Besson*, et al.*, 2018). In fact, IS can act as an enabler of organisational KM irrespective of its industry (Kapoor and Aggarwal, 2021). This implies that digitalisation can play two key roles - it supports managing the generated knowledge and it can facilitate K-AMB in SMEs. However, various studies emphasised that it is difficult for SMEs to become knowledge ambidextrous compared to larger organisations (Dolz *et al.*, 2019).

1.2.1 Why Are SMEs Not Knowledge Ambidextrous?

SMEs have certain unique characteristics such as simplicity in their internal structures, the porosity of their organisational boundary and less bureaucracy in decision-making (Chua and Wee, 2013). While considering the applicability of K-AMB in SMEs, it is found that the major hindering factor in implementing K-AMB is the knowledge availability. SMEs mainly depend on internal knowledge sources for routine activities, knowledge exploration and exploitation processes (Wenke *et al.*, 2021). So, they encourage their employees to develop new knowledge, skills and competencies to adapt and respond to changing environments (Greco *et al.*, 2019). However, due to limited financial and human resources (Niewöhner *et al.*, 2019), it is difficult for SMEs to acquire new capabilities or update existing ones. In this circumstance, SMEs are forced to rely on external knowledge sources for knowledge exploration and exploitation processes as most knowledge stays external to the firm (Lee and Kim, 2019). External knowledge acquisition and application serve as a 'game changer' for SMEs (Kilpi *et al.*, 2018), by improving SMEs' internal knowledge and processes, business opportunities and competitiveness (Del Giudice *et al.*, 2014; Scuotto *et al.*, 2019). Since external stakeholders are the main source of knowledge and the role of IS are limited in knowledge exploration, it is difficult for SMEs to explore large amounts of knowledge and exploit it for the firm. Moreover, K-AMB in SMEs is reported to be in a

'*compromised'* state (Randall *et al.* (2017), showing a stronger inclination towards knowledge exploitation. Consequently, knowledge exploration processes are limited due to high costs, uncertain business environments and operational risks.

It is also analysed from the literature that top management teams (TMTs) are primarily engaging with handling knowledge exploration and exploitation activities in SMEs (Felício et al., 2019; Ahmadi et al., 2020; Wenke et al., 2021). When considering the hierarchical structure of SMEs, the TMT plays a crucial role in finding solutions to the organisational problems, as they are closer to operating levels and can acquire first-hand information (Dasí et al., 2015). Thus, TMTs serve as gatekeepers of SME's information processing and strategy making (Cao et al., 2009) as they possess most of the internal knowledge that organisations require and the specific knowledge about the industry in which they work (Ardito, Petruzzelli, et al., 2018). Moreover, TMTs have a stronger influence on achieving K-AMB in SMEs which is widely acknowledged in the literature (Senaratne and Wang, 2018). Several scholars have proposed a contextual model of organisational ambidexterity for SMEs, where organisations permit individuals to divide their time and effort between exploratory and exploitative activities (Birkinshaw and Gibson, 2004; Ko and Liu, 2019b; Sahi et al., 2020). While the TMT may not encourage exploration activities of subordinates, top-down knowledge inflows without enabling bottom-up or horizontal inflows is likely to increase subordinate's exploitation activities. In this circumstance, exploitation, according to scholars, can drive out exploration without increasing the overall level of exploration occurring (Mom, 2006; Mom et al., 2007; Mammassis and Kostopoulos, 2019) leading to the compromised ambidexterity state. However, according to the upper echelons theory (Hambrick and Mason, 1984), a manager, or even TMT members, cannot scan every aspect of the organisation and its environment.

Digitalisation entails a fundamental reinvention of doing things in an innovative way (Lee and Trimi, 2021). The prevalence of digital infrastructure has enabled worldwide access to open knowledge in a more convenient and easier manner facilitating knowledge exploration and exploitation processes simultaneously, thereby achieving K-AMB. Digitisation efforts can reconfigure and manage SME's knowledge or competencies to be more agile in adapting to an uncertain environment (Papadopoulos *et al.*, 2020). Thus, it can be argued that digitalisation plays a vital role in achieving K-AMB in SMEs and Scuotto *et al.* (2019) posit that ambidextrous approach is improved with the use of digital technologies. However, there is a lack of studies that shows how to effectively utilise IS platforms such as cloud computing to achieve K-AMB for SMEs.

According to scholars, the task of KM is daunting for SMEs (Dixon *et al.*, 2013). SMEs do not systematically manage knowledge in their organisation (Chua and Wee, 2013) resulting in a loss of vital important knowledge, repetition of previous efforts and employees' inability to interpret or use available information (Yap and Lock, 2017). SMEs adopt and use traditional tools and practices rather than novel and updated ones for managing knowledge (Cerchione and Esposito, 2017). This is mostly due to the limited access to technological knowledge and qualified staff (Calvo-Mora *et al.*, 2016). Most studies emphasise however that SMEs tie their operations knowledge sharing processes yet neglect knowledge creation (Centobelli *et al.*, 2019). There is less evidence that SMEs have a well-maintained database for storing knowledge for future usage (Batista *et al.*, 2019). Knowledge storage allows firms to re-use knowledge when required, which implies cost and time savings that may contribute to improved performance (Obeso *et al.*, 2020). When knowledge creation, storage and application processes are not properly handled, it indicates that even if new knowledge is explored, SMEs have no capability to manage it. Since, the web has become a channel for people to exchange knowledge and experiences through the Internet (Pérez-González *et al.*, 2017), some

SMEs depend on social media for knowledge creation (Caione *et al.*, 2015; Crammond *et al.*, 2018; Mamorobela and Buckley, 2018). A study by Benitez *et al.* (2018) suggested that social media plays a moderator role in building K-AMB capability. However, the drawbacks of social media (Irum and Pandey, 2019; Wang and Wang, 2020) hinders the implementation of K-AMB in SMEs.

A review of the available extant research indicates that the development of K-AMB is in a compromised state for SMEs, which implies a compromised exploration in favour of exploitation (Randall et al. (2017). Operational-level employees are often restricted in the knowledge exploration processes and a top-down knowledge inflow is always promoted in SMEs. Generally, the role of IS is not properly utilised for achieving K-AMB leading to knowledge unavailability as knowledge creation and storage remain in an early stage (Yap and Lock, 2017; Al-Emran et al., 2018; Dezi et al., 2019). Studies have empirically shown that better KM processes can improve ambidexterity resulting from a stronger exploration and exploitation approach (Filippini et al., 2012).However, KM is not properly supported in SMEs. To reflect the discussions, the current state of SMEs is illustrated in Figure 1-1.

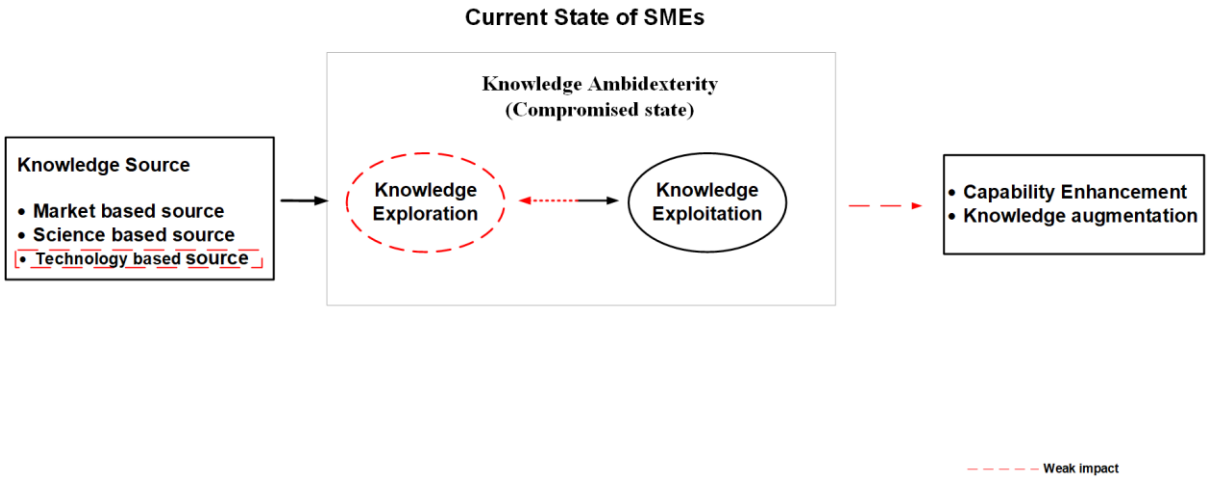

Figure 1-1: Current state of SMEs

Therefore, the aim of this research is to provide a new insight into the literature on how SMEs can achieve K-AMB in an efficient way and bring breakthrough capabilities and knowledge augmentation in SMEs by focusing on simultaneous execution of knowledge exploration and knowledge exploitation with the support of IS and KM strategies.

1.3 Aims and objectives

The purpose of this research is to develop a framework for K-AMB, implement this framework using cloud computing services and evaluate its impact on the capabilities of SMEs and analyse whether capabilities have increased, and knowledge is augmented in the organisation. Unless mentioned otherwise, the scope of this study is limited to SMEs in various industrial sectors in India and UAE. Based on a literature review exercise, it was identified that SMEs are vulnerable due to the lack of implementation of K-AMB and the lack of effective KM in IS. This proposition was verified through a systematic literature review (SLR) of the evidence on the adoption of KM in SMEs. In order to implement K-AMB and analyse its impact, this study followed a design science research (DSR) methodology to utilise a revelatory approach (Benbasat *et al.*, 1987). DSR methodology focuses on the development and evaluation of a new artefact (Barafort *et al.*, 2018) to serve human problems (March and Smith, 1995).

On that note, there are three specific objectives for this research:

1.3.1 Understanding the Role of Cloud Computing for KM in SMEs

The first objective was to conduct a systematic literature review (SLR) to understand the role of cloud computing for managing knowledge in SMEs and analyse the gaps in the literature. Based on the arguments in the initial literature review and expert guidance by the supervisory team,

the first objective was achieved by conducting an SLR that identified 157 articles published between the years 2010 to 2021. The main research question that was answered in the SLR was

*RQ1: What is the role of cloud computing in knowledge management for SMEs? (C*hapter 3)

Output: The SLR is published in the Journal of Knowledge Management, a Quartile 1 (Q1) journal.

1.3.2 Achieving K-AMB in SMEs from Technology-Driven Innovation using Cloud Computing

This objective is achieved though the development of a preliminary research artefact: knowledge ambidexterity framework (KAF) for SMEs and implementation of the artefact in SMEs using cloud services. This study followed a DSR methodology. The artefact is developed from the analysis of SLR and pre-intervention interviews with key stakeholders from seven case study SMEs in India and UAE. The research artefact was evaluated in the seven SMEs using a case study approach. The output was analysed to check the evidence of K-AMB emerging in the SMEs using semi-structured interviews. The following research question is proposed for achieving this objective:

RQ2: How is K-AMB achieved by SMEs promoting technology-driven innovation using cloud computing? (Chapter 5)

Output: The case study is published in the International Journal of Information Management, a Quartile 1 (Q1) journal.

1.3.3 Transforming SMEs to Ambidextrous Learning Organisations

The objective was achieved through expanding the preliminary research artefact by incorporating the organisational learning aspect of

ambidexterity. A new research artefact was developed for ambidextrous learning organisations (ALO). This artefact was developed because of continued collaboration with the case study SMEs, where the initial KAF was used to achieve a degree of K-AMB. The artefact was evaluated for the second time after one year using case study approach to capture longitudinal data and analyse how the seven SMEs are being transformed to ambidextrous learning organisations. The following research question is proposed for achieving this objective:

RQ3: How does cloud computing support transformation of SMEs into ambidextrous learning organisations? (Chapter 6)

Output: The article for transformation of ambidextrous learning organisations by SME is in a ready-to-submit stage, which is targeted for submission in the Journal of Management Information Systems, a Quartile 1 (Q1) journal.

1.4 Significance of the research

SMEs have their own importance in each country as they contribute 90% of the share of organisations in most countries. As per OECD (OECD, 2020), more than 50% of SMEs fail within a span of ten years mostly attributed to the lack of digital resources and knowledge capabilities. The SMEs is considered as an 'entity without strategy' (Cerchione and Esposito, 2017) and lacking flexibility to adopt to the economic uncertainty. The demand for latest knowledge will continuously occur because existing knowledge may not be sufficient for solving new problems for SMEs (Papadopoulos *et al.*, 2020). Likewise, knowledge is currently managed using ad-hoc and traditional methods. These constraints have worsened the business situation for SMEs. During major economic disruptions such as the COVID-19 pandemic, unfortunately many SMEs do not survive. One of the most important trends found for solving these issues in current

literature is re-adjusting business strategies by incorporating knowledge inflows and business continuity plans to enhance sustainable development (Viswanathan and Telukdarie, 2021). In this context, this research suggests that SMEs follow a strategy of implementing K-AMB using cloud computing through exploring new knowledge and exploiting existing knowledge to address any unpredictable environments (Hanifah *et al.*, 2019). Cloud computing supports the K-AMB processes and has been proven to manage knowledge effectively.

Even though prior studies emphasise that digitalisation can improve ambidexterity capacity of the firm (Scuotto *et al.*, 2019) leading to capability enhancement, there is a lack of intervention-based study in literature incorporating cloud services towards implementing K-AMB. This study aids SMEs understand the importance of the role of K-AMB in their firm and practically understand how relevant and useful knowledge can be explored and exploited in their firm through K-AMB using cloud services. This study also aids SMEs in managing knowledge effectively using cloud services.

Since one of the major concerns for SMEs is knowledge unavailability (Al-Emran *et al.*, 2018), this research posits a solution to augment knowledge in SMEs while adopting K-AMB. This study shows that how knowledge can be explored effectively using cloud services thereby facilitating latest knowledge acquisition and creation as well as storing relevant knowledge. Once knowledge is stored in the cloud, it can be exploited for refining/modifying existing knowledge (Lavie *et al.*, 2010). This research builds on previous research by Gonzalez (2019) who found that IS acts as a facilitator for knowledge exploitation and provide significant impact as well as support concerning knowledge exploration. This study extracted the gist of the previous works and further build up by incorporating cloud services and efficiently implementing K-AMB in SMEs.

It is a well-established paradigm that IS and KM play vital roles in ambidexterity (Soto-Acosta *et al.*, 2018) and KM strategy in an organisation is supported by the three pillars of process, people, and technology (Chan 2017; Rot & Sobinska 2017; Schniederjans et al. 2019). From the case studies conducted in this study as part of the artefact evaluation, the benefits of cloud computing over K-AMB in SMEs are manifested, which was not previously covered in the literature.

The benefits that cloud computing can bring to SMEs in the K-AMB context are illustrated in **Figure 1-2**. In the context of *knowledge coordinators*, cloud services facilitate improving personal knowledge of staff and offer easy availability of knowledge artefacts (explicit form of knowledge) for knowledge utilisation and sharing among co-workers. In the context of '*K-AMB processes'*, knowledge exploration is automated and knowledge exploitation is facilitated by providing knowledge for refinement, implementation and problem-solving. In the context of '*KM processes'*, knowledge workers can create more knowledge artefacts, stored and shared in the cloud platform to make KM more robust in SMEs. Finally, in the context of '*SMEs'*, cloud computing-initiated K-AMB aids SMEs to become knowledge ambidextrous to boost innovation and ultimately an ambidextrous learning organisation. As both tacit knowledge and explored knowledge are codified and stored in cloud services, knowledge loss in SMEs is reduced.

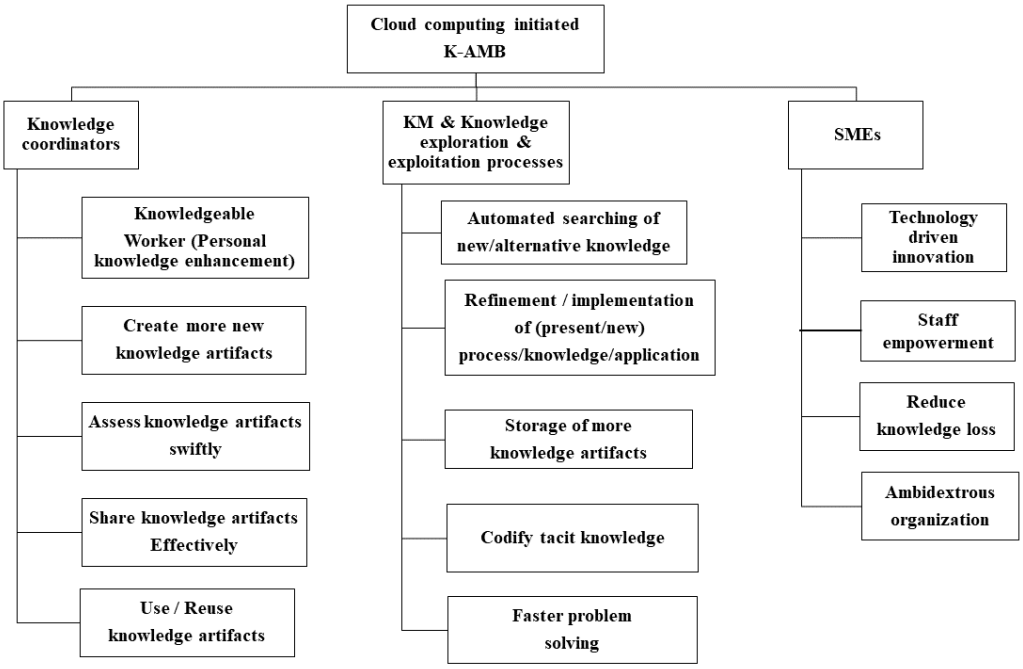

Figure 1-2: The benefits of Cloud based K-AMB in SMEs

1.5 Structure of the Thesis

The articles that are published, under review and in the ready to submit stage in internationally reputed peer-reviewed journals within the scope of this research are presented in different chapters, given that this thesis is prepared following a 'Thesis by Publication' protocol based on University of Southern Queensland (USQ) guidelines. More specifically, the thesis has been organised in seven different chapters as follows:

Chapter 1: This chapter provides an overall context and background of the research including the problem statement, aim and objectives of the study, significance of the research and the structure of the thesis.

Chapter 2: This chapter is a review of the literature relevant to this research topic. This section elaborately discusses the theoretical constructs used in this study including knowledge management, knowledge ambidexterity, cloud computing, technology-driven innovation and ambidextrous learning organisation.

Chapter 3: This chapter briefly discuss the SLR conducted as a part of this study to answer RQ1 and understand the major research gaps leading to RQ2 and RQ3. This chapter embeds the ***Paper 1*** which is the SLR paper published in the Journal of Knowledge Management.

Chapter 4: This chapter details an overview of the philosophical positioning and research design, and then the methodological approach of Design Science Research (DSR) with artefact design, demonstration and evaluation with further details on the methods used for data collection and analysis. The elaborated details of artefact evaluation are presented in two subsequent chapters (Chapter 5 and Chapter 6).

Chapter 5: This chapter is the first logical continuation of chapter 4, which covers how the initial research artefact was evaluated. This includes a longitudinal research study demonstrating how cloud computing facilitates knowledge ambidexterity across SMEs. The study in this chapter queries whether SMEs prefer knowledge exploitation by not assimilating cloud computing and missing out on ambidextrous opportunities. The study also explores how cloud computing enables K-AMB exploratory capability that promotes technology-driven innovation (TDI) in SMEs, thereby answering RQ2. This chapter embeds the ***Paper 2*** which is the Artefact Evaluation – TDI paper, currently published in the International Journal of Information Management.

Chapter 6: This chapter is the second logical continuation from chapter 5. Using the results of data analysis and findings from Chapter 5 (collected in the year of 2020) and extending another year of implementing K-AMB in SMEs (the year of 2021), this chapter looks at the organisational learning aspect of ambidexterity and describes how SME can be transformed to ambidextrous learning organisation (ALO), thereby answering RQ3. This chapter embeds the ***Paper 3*** which is the Artefact Evaluation – ALO paper,

currently in a ready-to-submit stage, targeting *Journal of Management Information Systems*.

Chapter 7: This chapter summarises the key findings and discussion of the research and presents the contributions to theory and practice so that SMEs can be supported towards K-AMB using cloud computing. The limitations of the study and areas for further research are also discussed in this chapter.

Figure 1-3 illustrates the overview of thesis exhibiting how the chapters are logically connected with the three Journal articles that answer the RQs.

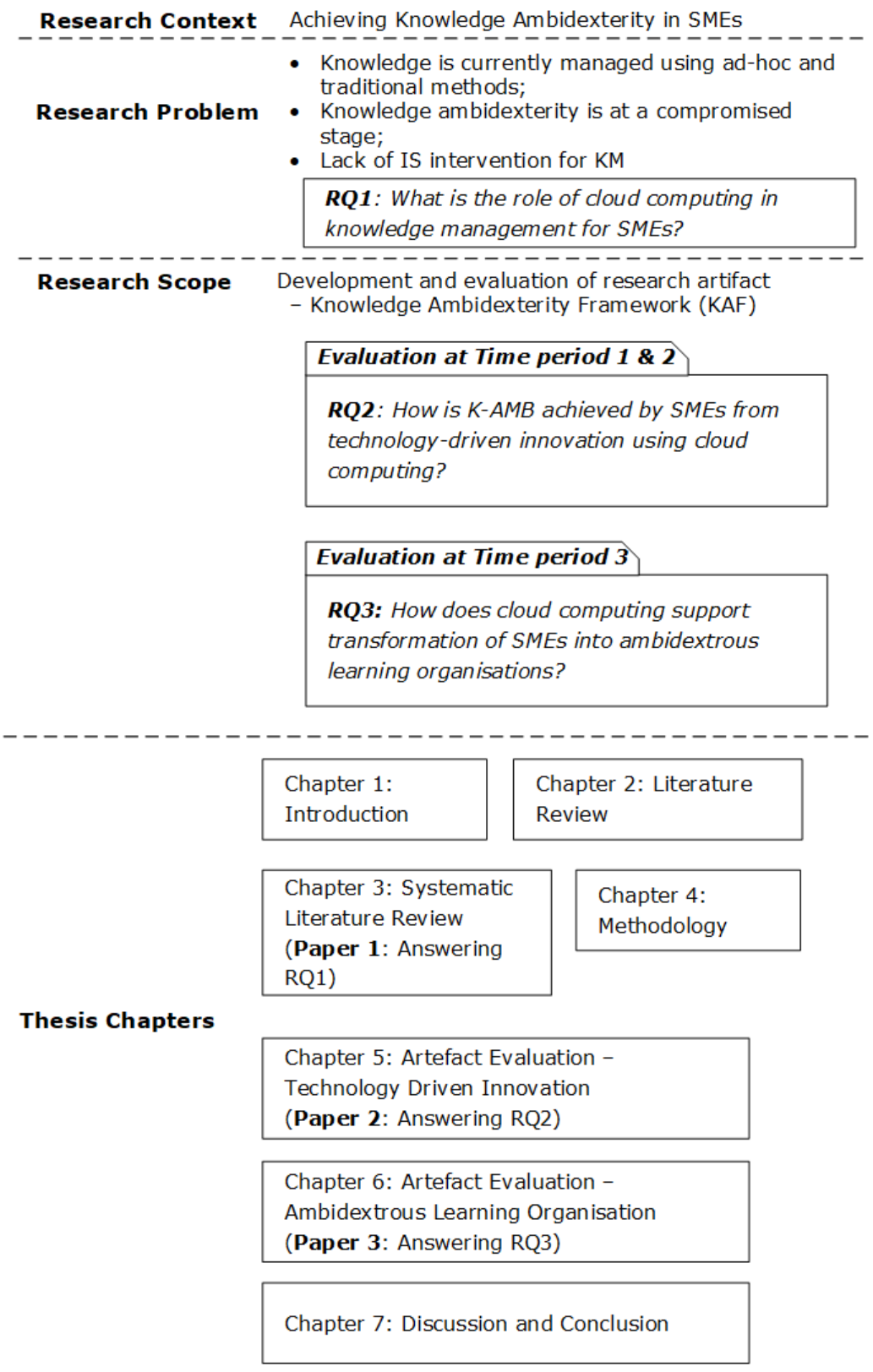

Figure 1-3: Overview of the Thesis

1.6 Chapter Summary

This introduction chapter provided a background on the SMEs context to articulate the research problem statement on why SMEs are not knowledge ambidextrous. Next, the aims and objectives of this study are outlined with the introduction of the three Research Questions (RQs) and their corresponding targeted research outputs as a thesis by publication degree. Then, the significance of this research is positioned. Finally, the structure of the thesis is outlined. The next chapter provides literature review on key theoretical constructs that are fundamental in this study.

CHAPTER 2: LITERATURE REVIEW

This chapter covers discussion about all major literature topics and theoretical constructs that are fundamental in this study. This initial review provides a background that was used to undergo a full systematic literature review, which is detailed in the next chapter (Paper 1).

2.1 Knowledge Management and Knowledge Ambidexterity

Managing knowledge is critical to organisations since knowledge is considered as one of the most strategically important resources (Grant, 1996; Zack *et al.*, 2009). Knowledge management is the continuous process of creation, acquisition, sharing, storage, and proper usage of knowledge (Le Dinh *et al.*, 2013). Previous studies depict that knowledge creation/acquisition generally occurs through organisational stakeholders (Del Giudice *et al.*, 2014), inter-organisational ties (Xie *et al.*, 2019) or the use of different information systems (Le Dinh *et al.*, 2013; Irum and Pandey, 2019). While considering knowledge storage (Lee and Huang, 2012; Ko and Liu, 2019a), *knowledge stock* is a space of knowledge elements that a firm has accumulated over time to capture the firm's external and internal knowledge. Jain and Gupta (2019) stress the point that most organisational knowledge resides in tacit form, hence creation of formal structure for knowledge storage is a challenge especially for SMEs. Some studies (Caniëls *et al.*, 2017; Singh *et al.*, 2019) described that knowledge sharing culture and practices can improve organisational performance. Knowledge sharing and acquisition are the most widely studied KM processes (Al-Emran *et al.*, 2018). Generally, knowledge utilisation facilitates the creation of organisational capital; however, it is also the most challenging and under-researched KM process.

KM increases the efficiency of decision making as well as operational processes in the organisation (Rot and Sobinska, 2017). However, most organisations cannot possess all the knowledge that they need and to meet customers' demand (Jurksiene and Pundziene, 2016). Apart from that, the knowledge of an industry and its market is changing rapidly, hence the organisation must create new collection of knowledge in diverse areas to stay competitive (Popadiuk, 2012). Since most knowledge resides beyond the boundaries of a firm, external knowledge acquisition is required, which also supports innovation (Enkel *et al.*, 2017; Lee and Kim, 2019). To overcome these challenges, knowledge ambidexterity plays a crucial role, as it generates a streamlined flow of knowledge (Soto-Acosta *et al.*, 2018) that should be saved, managed and reused for organisations. The term ambidexterity was coined by (Duncan, 1976) who argued that organisations need to shift structures to initiate and enable innovation. March (1991) and Tushman and O'Reilly (1996) have used this concept to present the theory of knowledge ambidexterity, where organisations need to explore and exploit knowledge simultaneously to become ambidextrous.

Knowledge ambidexterity is a simultaneous process of knowledge exploration and knowledge exploitation. It improves the organisational capabilities in terms of performance, innovation, and competition (Tushman and O'Reilly, 1996). When the concept of ambidexterity was applied in various domains, researchers have found out the benefits such as better managerial decisions (Torres *et al.*, 2015), new product development, complementary dynamic capability and improving absorptive capacity. While an ambidextrous organisation is undoubtedly desirable, achievement of ambidexterity is extremely challenging (Adler and Heckscher, 2013); and it may become harder when it comes to knowledge ambidexterity. This is because ambidexterity is a *'simultaneous'* act of exploring and exploiting (Scuotto *et al.*, 2019) of knowledge originating from both inside and outside of the organisation (Úbeda-García *et al.*, 2019). Ambidexterity requires organisations to synchronise their activities considering factors external to

them, for example, environmental dynamism (Katou *et al.*, 2020). Generally, organisations have used either inter-organisational collaboration or ties with stakeholders such as customers, suppliers and so forth, to implement knowledge ambidexterity. The role of stakeholders is important as they help an organisation to identify local opportunities (Tang *et al.*, 2020) and to assimilate new external knowledge. The use of IS remains unexplored in this area even though IS has changed the way organisations operate.

Achievement of ambidexterity is typically categorised into three categories: (a) *sequential ambidexterity*: exploration and exploitation should be shifted over time (Duncan, 1976); (b) *structural ambidexterity*: exploration and exploitation work simultaneously, however, the exploration and exploitation subunits may be structurally separated, each with its own alignment of people, structure, processes, and cultures. In such a case, there is a targeted integration to ensure effective use of resources. This view was proposed by Tushman and O'Reilly (1996); and (c) *contextual ambidexterity*: Birkinshaw and Gibson (2004) argued that organisations could be ambidextrous by designing features of the organisations to permit individuals to decide how to divide their time between exploration and exploitation activities.

2.2 Knowledge Exploration & Knowledge Exploitation

Drawing upon the organisational learning theory, March (1991) detailed two types of learning behaviours: knowledge exploration and knowledge exploitation. Knowledge exploration means pursuit of learning outside one's current knowledge domain that can refer to a relatively broad and generalised search to expand one's knowledge into unfamiliar or novel areas. Knowledge exploitation, on the other hand, means the refinement/deepening of one's existing knowledge stock for immediate needs focusing on the task at hand and is consistent with a desire to get

current work assignments done without prioritising broad knowledge acquisition (Greco *et al.*, 2019). Through simultaneous approach of knowledge exploration and exploitation, that is, implementing knowledge ambidexterity, organisations can be mindful of their current and changing business trends to support capability enhancement. Prior studies have indicated that successful organisations can simultaneously manage knowledge exploration and exploitation (March, 1991; Tushman and O'Reilly III, 1996).

Although these processes include separate activities and require different organisational routines (Lee and Kim, 2019), researchers have the liberty to apply the concepts of exploration and exploitation based on their research areas (Choi and Lee (2015). Regarding innovative strategic goals, knowledge exploitation focuses on improving the competitiveness of current market/industries and knowledge exploration looks for the transformation or development of new markets. This implies that these processes will support firms to pursue innovation in the short-term and generate the required capabilities to be innovative in the long-term (Heras *et al.*, 2020). Using the KM taxonomy, exploitation is defined as "building on the organisation's existing knowledge base" whereas exploration is defined as "experimentation with new knowledge" (Lavie *et al.*, 2010). Generally, this research refers that exploration includes searching and finding new knowledge for better alternatives, whereas exploitation happens only after the knowledge is acquired and stored in the organisational databases (Le Dinh *et al.*, 2013). Therefore, exploration and exploitation of knowledge are seen as key processes of organisational learning (Bonesso *et al.*, 2014), innovation (Enkel and Heil, 2014) and KM (Filippini *et al.*, 2012).

However, if an organisation prioritises exploration activities, consequences can be a *'failure trap'* (Lee and Kim, 2019), which may include firms being less likely to gain benefits (Chong *et al.*, 2019); losing efficiency (Benitez *et al.*, 2018), increasing risks of failure due to costly

knowledge search (Cao *et al.*, 2009) and failed trials and unsatisfied consumers (Cho *et al.*, 2019). An example is the failure of the technology giant '*Ericsson'* who led the technological development of mobile telephony in the 1980s. The excessive focus on exploration activities with limited exploitation activities reduced its ability to adapt to the increasingly commoditised markets, forcing the company to lay off around 6,000 employees and close most of its technology centres in the 1990s (Birkinshaw and Gibson, 2004; Lee and Huang, 2012). On the other hand, if an organisation prioritises exploitation activities, consequences can be called the '*competency trap'* (Lee and Kim, 2019), which may include limited knowledge discovery (Chong *et al.*, 2019), difficulty in adapting to changes (Benitez *et al.*, 2018), risks of obsolescence (Cao *et al.*, 2009), and long-term success challenges (Cho *et al.*, 2019). For example, a leading bank in the United Kingdom *Lloyds TSB Bank* lost 60% of its market share and undermined its performance due to the lack of attention towards understanding changing needs of customers and staff (i.e. limited exploration efforts) (Birkinshaw and Gibson, 2004; Lee and Huang, 2012). The outlined challenges and examples describe the importance of obtaining a 'sweet spot' of simultaneous use of exploration and exploitation, i.e., ambidextrous outcomes. Technologies such as cloud computing provide an underpinning platform to enable ambidextrous outcomes. This concept is explored in the next section.

2.3 Cloud Computing for Knowledge Ambidexterity

A KMS is a class of information systems applied to managing organisational knowledge in order to support knowledge creation, storage, transfer and application (Alavi and Leidner, 2001). KMS constitutes enabling technologies for an effective and efficient KM as it involves structuring, categorising, filtering and organising valid knowledge for easy access by organisational members using a suitable storage channel (Lee

and Lan, 2011). Cloud computing is known to increase SME chances of survival (Kamal and Panebianco, 2015). Cloud services deliver everything as a service from resources to personal interactions (Banerjee *et al.*, 2011). Cloud Services have matured over the recent decades (Grüne, 2016) and become popular across various sectors such as education (Yadav, 2014), health care (Dessì *et al.*, 2016), KM (Wang, C. *et al.*, 2014) and business intelligence (Ferro and Martins, 2019).

While considering the impact of IS on KM in SMEs, low-cost technologies such as Excel spreadsheets (Glavas *et al.*, 2019) for managing knowledge are prevalent (Júnior *et al.*, 2020). In most SMEs, different professionals have developed their own simple approach to knowledge creation and are familiar with cloud services such as using social media (e.g., Facebook) and cloud storage services (e.g., Google Drive). Extant research (Arpaci, 2017) indicates that the perceived potential of cloud services can support knowledge sharing, storage, and creation. Sultan (2013) reports that exploring the use of cloud-based KMS in SMEs are few. This is despite the reality that IS can enhance the speed of knowledge exploration and exploitation (Ardito, Besson*, et al.*, 2018) and increase ambidextrous performance (Gonzalez and de Melo, 2018).

There are three major cloud service models: software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS). Each cloud service model provides a level of abstraction that reduces the efforts required by the service consumer to build and deploy systems (Kavis, 2014). The SaaS model provides users direct access to any software applications (Costache *et al.*, 2017). It typically hosts and manages a given application in their own data centre and makes it available to multiple tenants and users over the web (Bhardwaj *et al.*, 2010) . This ensures that management need to configure some application-specific parameters and manage users (Kavis, 2014). In this research, a cloud-based KMS (C-KMS) for achieving K-AMB in SMEs is used in real-world case

study organisations. The C-KMS serves as an application to make knowledge available on demand to its customers (Rafiq et al. 2014), suggesting that C-KMS is a subtype of SaaS (Balco and Drahoová, 2016). Despite the emerging research trend linking cloud computing and knowledge management, extant studies have not examined the role of the entire KMS in cloud platforms (Depeige and Doyencourt, 2015). In this context, a cloud stack model can be a useful solution, and the cloud stack model for C-KMS is illustrated in **Figure 2-1**. The model is adopted from studies of Kavis (2014), who argued that the right service model selection is a critical success factor for delivering cloud-based solutions. The authors provide a robust cloud service model, so that cloud service consumers spend less time managing infrastructure.

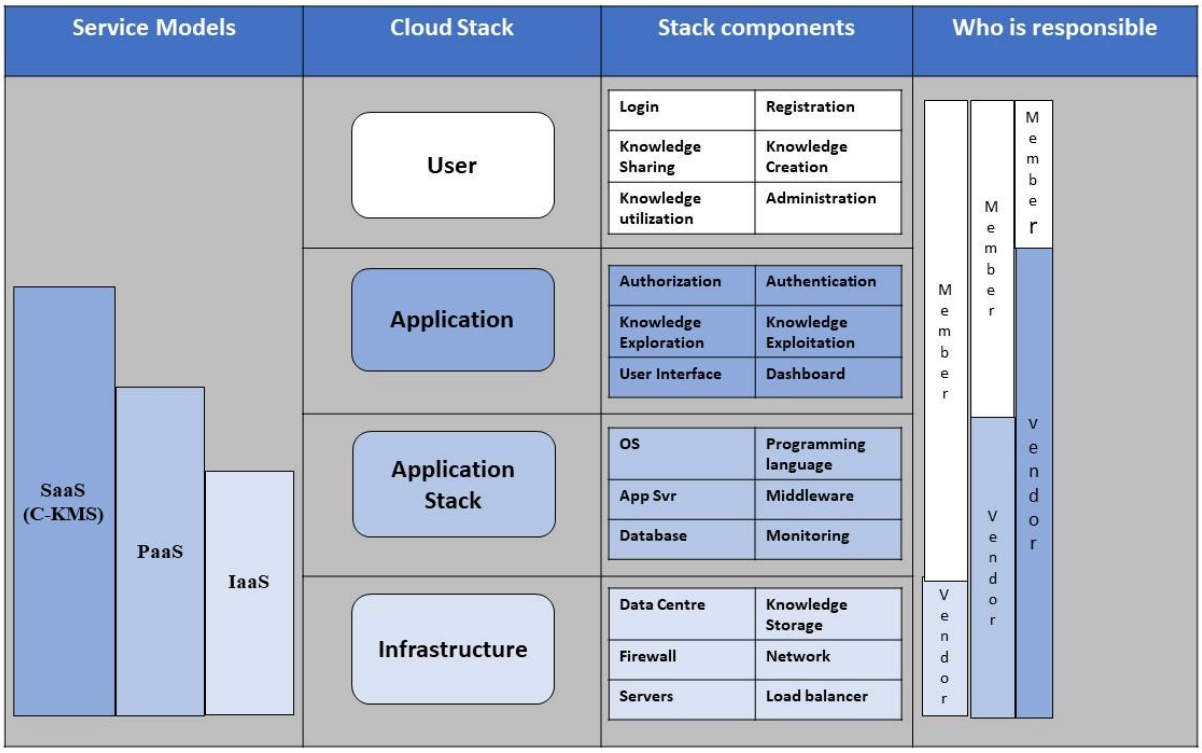

Figure 2-1: Cloud Stack- KMS model adopted from Kavis (2014)

Similarly, PaaS offers services to automate the deployment and management of applications (Costache *et al.*, 2017). Moreover, PaaS usually provides an Integrated Development Environment (IDE) offering a

wide variety of libraries and tools for modelling, implementing, as well as testing, and it can integrate external data sources (Beimborn *et al.*, 2011). Since exploration and exploitation require an automated application to retrieve and facilitate knowledge, such ambidextrous aspirations fit within PaaS. Likewise, IaaS is a form of hosting, which includes network access, routing services and storage (Bhardwaj *et al.*, 2010). Hence the knowledge artefact storage (explicit form of knowledge is called as knowledge artefacts, a term coined by Davenport and Prusak (1998)) is handled by IaaS in C-KMS. The overall cloud service model, cloud stack interface and stack components including who is primarily responsible is presented in **Figure 2-1**.

Studies suggest that KM in the cloud involves the retrieval and enrichment of knowledge artefacts in the organisation (Depeige and Doyencourt, 2015). This implies that cloud services can support knowledge augmentation in the organisation. Cloud services can also support and process large volumes of data in a highly scalable and streaming fashion. According to Dalkir (2013), KMS technology has emerged as a new generation of information management systems, aimed at supporting the management of knowledge. Cloud services supporting K-AMB include key enabling characteristics such as:

- Knowledge sharing among various users.
- Creation, annotation, modification, and dissemination of knowledge artefacts.
- Acquiring and indexing, capturing, and archiving various knowledge artefacts.
- Searching, finding and accessing knowledge artefacts easily.
- Allowing multiple individuals to organise meaningful activities around shared and reusable artefacts to achieve specific goals.

This study poised the potential of C-KMS as an effective IS intervention that can support K-AMB in organisations. In fact, C-KMS can

be a driver for technology-driven innovation (TDI) which is another major construct in this study that will be discussed next.

2.4 Technology Driven Innovation (TDI)

Innovation is defined as the generation, acceptance, and implementation of new ideas, processes, products or services (Thompson, 1965). Scholars follow various techniques to foster innovation in an organisation such as design driven (Dell'Era et al., 2010), market driven (Zortea-Johnston et al., 2012), technology driven (Chege and Wang, 2020), social or employee driven (Chen et al., 2016; Gupta et al., 2019; Khan and Khan, 2019) and open innovation (Santoro et al., 2020), among others. Thus far in SMEs, open innovation has been a central focus (Lee et al., 2010; Santoro et al., 2018). Open innovation provides a practice for accessing external knowledge from a diverse typology of sources and actors for enabling innovation inside the firm (Colombo et al., 2021; Hervas-Oliver et al., 2021). Out of the different kinds of innovation, technology-driven and employee-driven innovation are contextual factors that influence the relationship between knowledge integration – how organisations effectively integrate the acquired knowledge – and the rate of innovation achieved (Amankwah-Amoah and Adomako, 2021). This study examines how to integrate K-AMB capability inside SMEs using cloud computing to promote technology-driven innovation.

While recent research acknowledges the importance of concurrently pursuing exploration and exploitation within a business unit either as distinct subsets (Wenke *et al.*, 2021), or in combination (Benitez *et al.*, 2018; Amankwah-Amoah and Adomako, 2021), researchers are much less cognizant of how other contexts influence this ambidextrous process. Similarly, although higher ambidextrous capability enhances a firm's long-term survival (Rafiq *et al.*, 2014), different contexts for innovation are

expected to play a significant role within the K-AMB/innovation process. The routines and processes that mobilise and integrate dispersed activities will be particularly germane across both technology-driven and employee-driven innovation because both contexts are expected to influence the necessary knowledge and skill to enable K-AMB capability over time.

Employee-driven innovation (EDI) refers to the ability of employees to produce something new, that is, doing things in different or new ways (Khan and Khan, 2019). Consistent with prior research, employees' knowledge and skills would increase relative to how well an SME could reallocate and recombine their existing resources from receiving new information about different knowledge artefacts. SME's capacity to remain innovative and competitive depends largely on the extent to which their employees are able and willing to innovate (Yildiz *et al.*, 2021). However, EDI will not be achieved effectively without the technical competence and the knowledge and skills requirements that individuals need before they can adopt and use a cloud-based platform (Fu and Chang, 2016; Lynn *et al.*, 2018). For instance, digital competencies focus on the cognitive and social effects of working within a digital environment (Lynn *et al.*, 2018), however, SMEs hardly utilise this.

Recent research for instance illustrates that *technology-driven innovation* (TDI) entails all types of innovations that involve a technical process to create a new product, process, and business model (Habtay, 2012). SMEs are expected to be more competitive with digital technologies as it improves access to resources, strengthen social capital as well as networked relationships, and enhance growth and sustainability outcomes (Gupta *et al.*, 2019; Korauš *et al.*, 2020). In respect of the slow rate of innovation, SMEs however lag behind digitalisation adoption (Eller *et al.*, 2020). As a result, SMEs often compensate for technology weaknesses by sourcing existing knowledge activities for acquiring external knowledge

(Ardito, Petruzzelli*, et al.*, 2018), bringing in to question the ability to use advanced technologies to update current knowledge.

However, while contextual ambidexterity is possible, SMEs instead might favour the exploitation of existing knowledge by using simplistic technological solutions while foregoing the assimilation of new technologies e.g., cloud computing, thus missing the ambidextrous opportunity. Adopting a TDI approach may well represent a context that is simply too hard and beyond SMEs' current knowledge and skillset. Accordingly, this is the first significant gap to be explored and this research answers this gap through RQ2.

The results from this study support that cloud computing can promote K-AMB in the SMEs promoting TDI. With the continuous execution of K-AMB, SMEs can potentially transform towards organisational learning (Kumar *et al.*, 2021) and become ambidextrous learning organisations, which is the next major construct in this study that will be discussed next.

2.5 Ambidextrous learning organisation (ALO)

A learning organisation (LO) is an organisation that facilitates learning for all its members. LO have an integrated learning system which utilises continual learning processes supported by organisational leaders (Lau *et al.*, 2020). There exist some similarities but also huge differences between organisational learning and learning organisation. While discussing about the differences, organisational learning can be defined as changes in organisational behaviour visible in organisational routines based on the new knowledge that has been acquired individually and used collectively by the firm (Rupčić, 2018). Organisational learning may not be a continually followed process and it is not necessary that every employee should be part of it. It focuses on organisational wide change only.

On the other hand, LO focuses on employee level change by promoting continual learning where every employee should be part of it (Senge, 2006). However, both concepts are linked to the learning aspect of an organisation and learning processes are defined by focusing on organisational learning (Kumar *et al.*, 2021). Prior studies (Bratianu *et al.*, 2020) consider organisational learning and the collaborative knowledge building as the fundamental criteria for a LO paving a way forward to the KM as well as ambidextrous learning process to transform into an ambidextrous learning organisation (ALO).

As published in their seminal work, Argyris and Schön (1978) have declared that every LO will also be ambidextrous by nature. This is because one of the ways to facilitate continual learning inside a LO (Senge, 2006) is by practicing simultaneous learning process of explorative learning and exploitative learning (March, 1991; Raisch and Birkinshaw, 2008; Lee *et al.*, 2021). However, we realise that many organisations especially SMEs have a misconception in understanding the principles of an ALO. It is noted that various SMEs predominantly focus on the appeal of exploitative learning for refining and deepening existing knowledge while discarding explorative learning to adapt new learning opportunities outside their current knowledge domains. This will lead to espoused collaborative values of the organisation and the emergence of siloed functions (Patterson, 2021). Therefore, SMEs should firstly be aware of the principles of an ALO whereby they recognise to build a *continual learning environment* where each employee could simultaneously engage in explorative learning and exploitative learning processes (Argyris and Schön, 1978; Tushman and O'Reilly, 1996; Lam, 2019; Patterson, 2021).

Explorative learning utilises external knowledge sources whereas exploitative learning employs existing knowledge for continual learning and improvement in SMEs (Lee *et al.*, 2021), and these concepts are similar to

the expected outcomes of knowledge ambidexterity (Benitez *et al.*, 2018) albeit in a learning context. Therefore, according to Senge (2006), the possibility of an organisation to evolve into a LO is dependent on the traditional KM processes, i.e. knowledge acquisition, creation, storage, sharing and application, which offers a widely accepted KM cycle (Dalkir, 2013). Prior studies also suggested that organisational learning in an organisation can be highly supported by IS (Kang *et al.*, 2021). However, there is a lack of studies utilising IS for implementing ALO in the SMEs sector and this is a key aspect that was researched in this study to answer RQ3.

2.6 Chapter Summary

This literature review chapter provided an overview of the key literature topics that are associated with this research. The topics were: Knowledge Management, Knowledge Ambidexterity, Cloud Computing, Technology-driven Innovation and Ambidextrous Learning Organisation. These topics are also the key theoretical constructs used in the research questions. Therefore, a background on these topics provided an overall understanding and justification of the research gaps. Finally, this chapter provided literature support and a context for this study to proceed. The next chapter further provides details of a comprehensive systematic literature review that supported this study.

CHAPTER 3: SYSTEMATIC LITERATURE REVIEW

This chapter presents an exact copy of the systematic literature review (SLR) article entitled "The role of cloud computing in knowledge management for small and medium enterprises: a systematic literature review". This SLR examined 133 journal articles and 24 conference papers from 2010 to 2021.

This paper was published in an international peer reviewed journal, Journal of Knowledge management: https://doi.10.1108/jkm-06-2021-0421.

3.1 Synopsis

This study conducted a systematic literature review by examining 157 articles from 2010 to 2021 on the role of cloud computing in knowledge management (KM) for small and medium-sized enterprise (SMEs). KM is widely adopted by organisations to improve their performance, innovations, and undertake more informed decisions. Prior research has confirmed that Information Systems (IS) play a critical role in effective KM. In SMEs, the KM processes are in their nascent stage with limited IS intervention. The purpose of this study is to examine the existing literature on the role of cloud-based knowledge management systems (C-KMS) in SMEs by understanding its impact on the five KM processes: knowledge acquisition, creation, storage, sharing, and usage. This study revealed that there are numerous empirical analyses on KM processes and tools in SMEs, however, only few studies demonstrate how the whole gamut of KM processes can adopt cloud computing in SMEs. Therefore, SMEs are ineffective at KM with limited IS intervention. This study analysed the benefits of C-KMS that brings to SMEs in terms of availability, scalability, reliability, security and cost. This study adds value to the understanding of the role of KM in SMEs

and it reinforces the role of cloud computing in effectively managing knowledge in SMEs.

3.2 Paper 1 - SLR

(Published paper copy attached next)

3.3 Chapter Summary

This SLR chapter presented the fully published paper in the *Journal of Knowledge Management* that outlined the role of cloud computing in KM for SMEs. One of the future research directions proposed in this paper was to investigate the use of cloud services to effectively utilise all five KM processes and suggested that looking through the lens of knowledge ambidexterity is a credible option. This study followed this suggestion, and the next chapter outlines the research methodology adopted in this research.

CHAPTER 4: METHODOLOGY

This chapter presents an overview of the philosophical positioning and research design; and then the methodological approach of Design Science Research (DSR) with artefact design, demonstration and evaluation with further details on the methods used for data collection and analysis. While this chapter summarises the overall methodological approach adopted during the entire research, the two subsequent chapters (Chapter 5 and Chapter 6) are presented as articles developed for international peer-reviewed journals and they also contain detailed research methods used in this research.

4.1 Philosophical Position and Research Methods

Critical realism (Bhaskar, 1978) is positioned as the underpinning research philosophy for this study, that supports a particular form of realism where researchers believe that the world exists independently from their knowledge and the world can be observed partially (Wynn Jr and Williams, 2012; Aaltonen and Tempini, 2015). Critical realists advocate flexibility to choose a methodology that fits the research requirements (Saunders, Lewis & Thornhill 2009).

This study is an *exploratory* research which is conducted for a problem that has not been studied more clearly, and are intended to improve the final research design (Nunamaker Jr *et al.*, 1990). Exploratory research can be conducted in two ways: by applying well-defined theories to the area of research; or by developing own design theory from scratch. This research follows the first path since the theory of ambidexterity and knowledge-based theory offer initial support to the KM processes that lay

the foundations for the research into K-AMB. In a nutshell, philosophical assumptions for this research are outlined in **Table 4-1**.

Research Philosophy	Critical Realism
Ontology	A realist view of world exists which is independent of our knowledge
Epistemology	Different forms of knowledge exist; hence, the research methodology must help in validating and finding correct knowledge and examine the reality with help of artefacts.
Research Type	Exploratory Research
Methodology	Design Science Research Methodology
Data collection	Artefact Evaluation with Case Study approach and Semi-structured Interviews

Table 4-1: Philosophical Position of Research Perspective

This research adopts an DSR methodology. DSR is considered as a problem-solving paradigm, where researchers answer questions relevant to human problems via the creation of innovative artefacts, thereby contributing new knowledge to the body of scientific evidence (Cassidy and Hamilton, 2016). Since the primary goals of this research are to develop a new artefact for knowledge ambidexterity and ambidextrous learning outcomes for SMEs, DSR is a good fit. The IS researchers belong to multi-paradigmatic communities, where means to conduct research and develop knowledge are widespread. DSR relies on novel artefacts and ontological and epistemological viewpoints shift as the research moves through the design cycles (Vaishnavi, 2004/19).

There are two fundamental activities in DSR, building an artefact and evaluation to solve identified organisational problems (Hevner, 2004). DSR builds on the engineering tradition of research in which the driving idea is to invent new technologies or artefacts that can be used to change or improve the world (Myers and Venable, 2014). Moreover, research knowledge is produced from the artefact, emerging from the intervention and building upon the theory. The artefact may embody the knowledge

such that it is reusable or transferable to other contexts (Papas *et al.*, 2012).

This study follows Hevner (2004) guidelines for conducting the DSR research including problem relevance and artefact design, artefact demonstration, artefact evaluation and artefact's contribution to theory and practice.

4.2 Problem Relevance and Artefact Design

The SLR executed during this research and presented in Chapter 3 confirmed three major research gaps in SMEs:

- Scarcity of knowledge sources in SMEs for routine activities.
- KM is ad-hoc in SMEs. Knowledge creation and storage were still in early stages. The failure of appropriate knowledge creation processes implies that SMEs are not effectively managing their knowledge.
- Although numerous empirical analyses on KM processes and tools in SMEs exist, only a few studies demonstrate how the whole gamut of KM processes can adopt cloud computing in SMEs.

The problem relevance for this study was justified based on the research gaps outlined from the SLR study. To address these problems, cloud computing was considered as the IS intervention to support managing knowledge. This study considered the benefits of cloud services to SMEs by discussing through the lens of the Quality of Service (QoS) dimensions (Bouzary & Chen 2020). The QoS dimensions considered were availability, reliability, cost, scalability, and security. Since theory of ambidexterity is the second most studied theory noted in the SLR and external knowledge acquisition as well as sustainability were the major concerns for SMEs, this research included ambidexterity as the sixth dimension of QoS that were considered to measure the effectiveness of cloud computing for SMEs.

One of the main reasons for high failure rate for SMEs is resource scarcity, hence, acquiring knowledge from external resources always play

a crucial role and serves as a 'game changer' in SMEs (Kilpi et al. 2018). Cloud service platform can gather knowledge from different sources (Balco & Drahoová 2016; Ochs & Riemann 2016) and supports SMEs to explore external knowledge via multiple data sources. including big data (Depeige & Doyencourt 2015). The explored knowledge can then facilitate creation, storage, sharing and utilisation of knowledge in SMEs. These created knowledge artefacts can be used to improve the present knowledge base of SMEs or improve present knowledge of employees thereby facilitating knowledge exploitation (Lavie et al. 2010) and eradication of resource scarcity. SMEs that implement the knowledge exploration and exploitation process simultaneously can become ambidextrous (O'Reilly III & Tushman 2013; Benitez et al. 2018), which promotes superior performance. This is the premise for the artefact design.

This study emphasises that cloud computing can offer an efficient and useful way to implement KM processes in a systematic manner for SMEs. In this light, a conceptual framework (**Figure 4-1**) was proposed to demonstrate how cloud computing supports KM and ambidexterity theory towards technology-driven innovation and SMEs transformation into ambidextrous learning organisation. This framework is referred to as the knowledge ambidexterity framework (KAF). The KAF acts as the preliminary artefact design in this research, that was used for artefact evaluation.

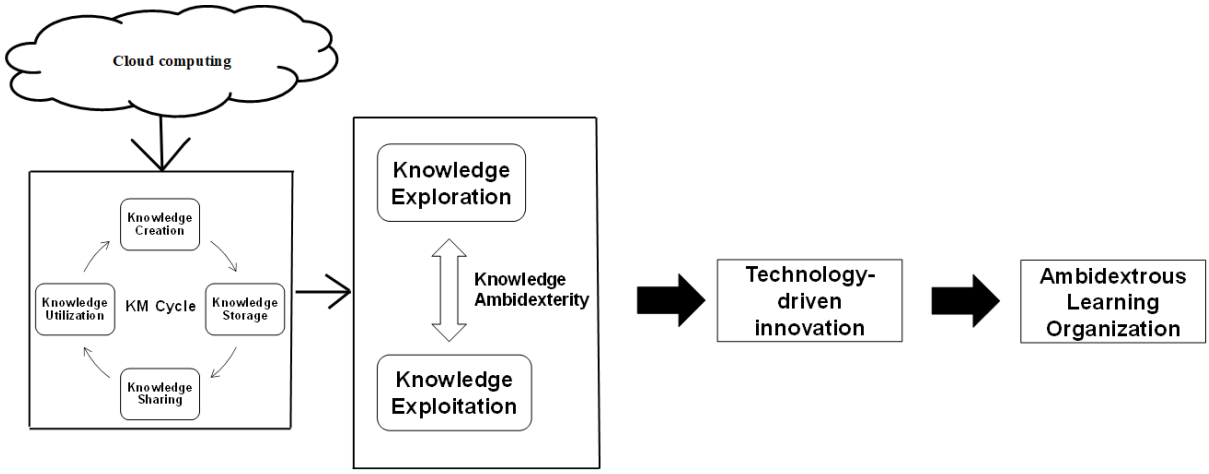

Figure 4-1: Knowledge Ambidexterity Framework (KAF)

4.2.1 Operational Model of the artefact design

Knowledge can be explored from internal or external sources. Valuable selected knowledge is forwarded to the KM cycle. As per SMEs' criteria, knowledge artefacts are created by the employees which are stored, shared and utilised in the organisation. Explored knowledge can be simultaneously used for exploitation process that helps to improve the present knowledge of employees or knowledge stock in an organisation. If a new knowledge has emerged as a part of exploitation in terms of refinement or execution and sharing among co-workers, the knowledge artefact is modified or a new knowledge artefact is created, thereby continuing the KM cyclic process. Every KM process here can be supported by the cloud services, which is detailed in Artefact Demonstration. The KAF in this research improves SMEs capabilities as well as augment knowledge resources of SMEs. Previous studies have empirically proved that if an organisation has become ambidextrous, these capabilities have improved (O'Reilly III and Tushman, 2013; Derbyshire, 2014), leading to innovation and ambidextrous learning outcomes.

4.3 Artefact Demonstration

In the DSR paradigm, kernel theories can be used to guide requirements for the KAF, and both the theory and requirements can be used to inform design (Walls et al. 1992). The major theoretical support for creating the KAF is the ambidexterity theory (Tushman and O'Reilly, 1996). Since the main constructs of this study include cloud computing and KM, a cloud-based technology platform, IBM Watson cloud services, was selected as a world-leading KMS solution (O'Leary, 2016) for developing the cloud services that demonstrates the KAF. IBM Watson provides a reliable environment and services to work collaboratively with data in the quest to transform them into relevant knowledge. IBM Watson

services have been used in different areas such as drug discovery to rank all human genes (Hatz *et al.*, 2019) , cognitive idea generation (Elnagar and Osei-Bryson, 2019) and task automation in the accounting industry (Marshall and Lambert, 2018) to name a few. IBM Watson uses sophisticated artificial intelligence and cloud technologies and contains Natural Language Processing (NLP) Tool with AI elements. Cloud technology in this context mainly acts as a delivery platform. IBM Watson uses sophisticated artificial intelligence and cloud technologies. The dashboard sample of the IBM Watson cloud service is presented in **Figure 4-2**.

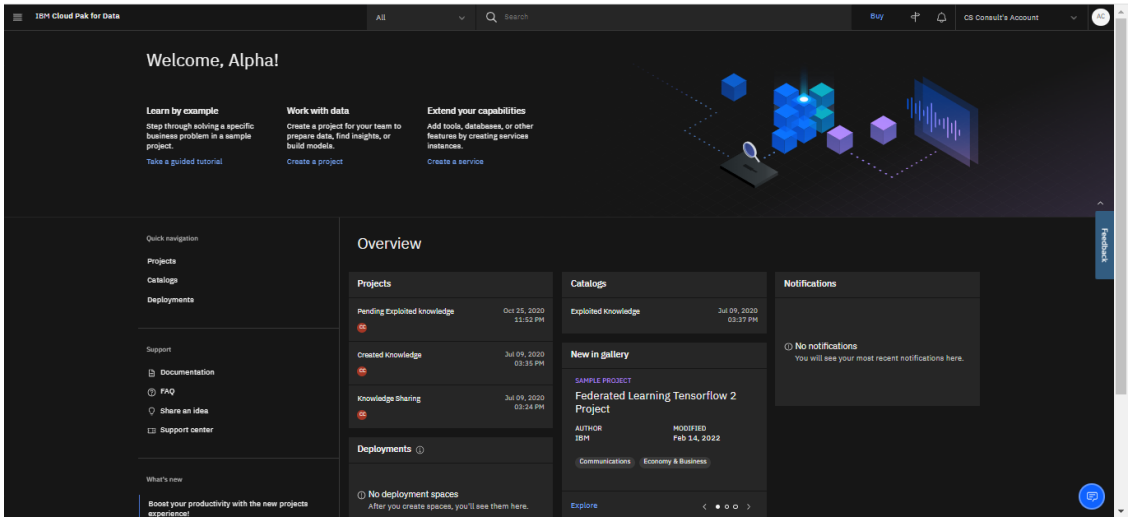

Figure 4-2: Dashboard of IBM Watson cloud services

4.3.1 Why IBM Watson?

Watson service is presently one of the foremost powerful and capable Artificial Intelligence (AI) services available in the cloud that is used to construct various applications including KMS. While considering SMEs, they are aware of the cloud services for managing knowledge as they mostly use freeware cloud services such as Dropbox, Google drive and many more. Even though studies indicated that perceived usefulness of cloud services is significantly affected by knowledge sharing, knowledge storage, and knowledge creation & discovery in SMEs (Arpaci 2017), managing

knowledge using cloud-based KMS in SMEs is sparsely studied in the literature.

While comparing various cloud solutions used in SMEs with Watson, Watson is considered one of the most relevant technology platforms for SMEs in achieving K-AMB and managing knowledge (Saratchandra & Shrestha 2021). On-premise systems generally do not get the direct support from AI/NLP and even knowledge is poorly managed using such systems. Knowledge is explored with the support of stakeholders (Randall et al. 2017). Therefore, K-AMB is occurring at a compromised state. Explicit Knowledge can be classified and stored in every cloud service; KM has partial support from cloud in most SMEs. However, cloud services such as Google Drive, Dropbox may not receive direct support from AI and NLP services whereas SharePoint has partial support from NLP. This implies that knowledge exploration and exploitation can be severely limited in Google Drive and Dropbox and partially limited in SharePoint. In the case of the content management system (CMS), the direct support of AI is lacking but partial support from NLP and KM is possible so that knowledge can be explored and facilitated through the creation and dissemination of knowledge in CMS (Leung 2022). The explored knowledge can also be exploited in SMEs. IBM Watson gets direct support from AI and NLP thereby making knowledge exploration and exploitation efficient. Watson also aids the process of KM. This implies that K-AMB can be achieved efficiently using Watson (Watson 2021). The comparison of various solutions are included in **Table 4-2.**

Solutions	**Knowledge Classification**	**AI**	**NLP**	**KM**	**Knowledge Exploration**	**Knowledge Exploitation**
On-Premises Applications	Partial	No	No	Partial	Low	Low
Google Drive	Yes	No	No	Partial	Limited	Limited
Dropbox	Yes	No	No	Partial	Limited	Limited
SharePoint	Yes	No	Partial	Yes	Partial	Partial

CMS	Yes	No	Partial	Partial	Partial	Limited
IBM Watson	Yes	Yes	Yes	Yes	Efficient	Efficient

Table 4-2: Comparison of various cloud solutions in SMEs for K-AMB

4.3.2 Elaborating selected cloud services of IBM Watson

One of the IBM Watson services used in this research is *Watson Discovery Service (WDS)*, which work with the support of natural language processor (NLP). NLP helps to build queries using simple English that can be used to demonstrate knowledge exploration process and facilitates knowledge for exploitation. WDS makes it possible to rapidly build cognitive, cloud-based exploration applications that unlock actionable insights hidden in unstructured data including SMEs own proprietary data, as well as public and third-party data (Watson, 2021).

One of the major benefits of using IBM Watson is employees can learn from own unexplored data set such as emails, blogs, forums, manuals and social networks as well as free and licensed public content published around the world. Employees can also codify the tacit knowledge as knowledge artefacts that are stored in Watson. Apart from this, Watson Discovery News module is included, which is an indexed dataset, updated continuously with new articles of every industry sector daily (Watson, 2021). When both tacit and explicit knowledge is codified in a structured and formalised way in the organisation, the complete organisational knowledge will be in explicit and ready-to-consume format (Dalkir, 2013; Dagenais *et al.*, 2020). Such state of knowledge is ready to be applied to relevant yet diverse experiences or issues within organisations. **Figure 4-3** shows the screenshot of the WDS used by one of the research participants.

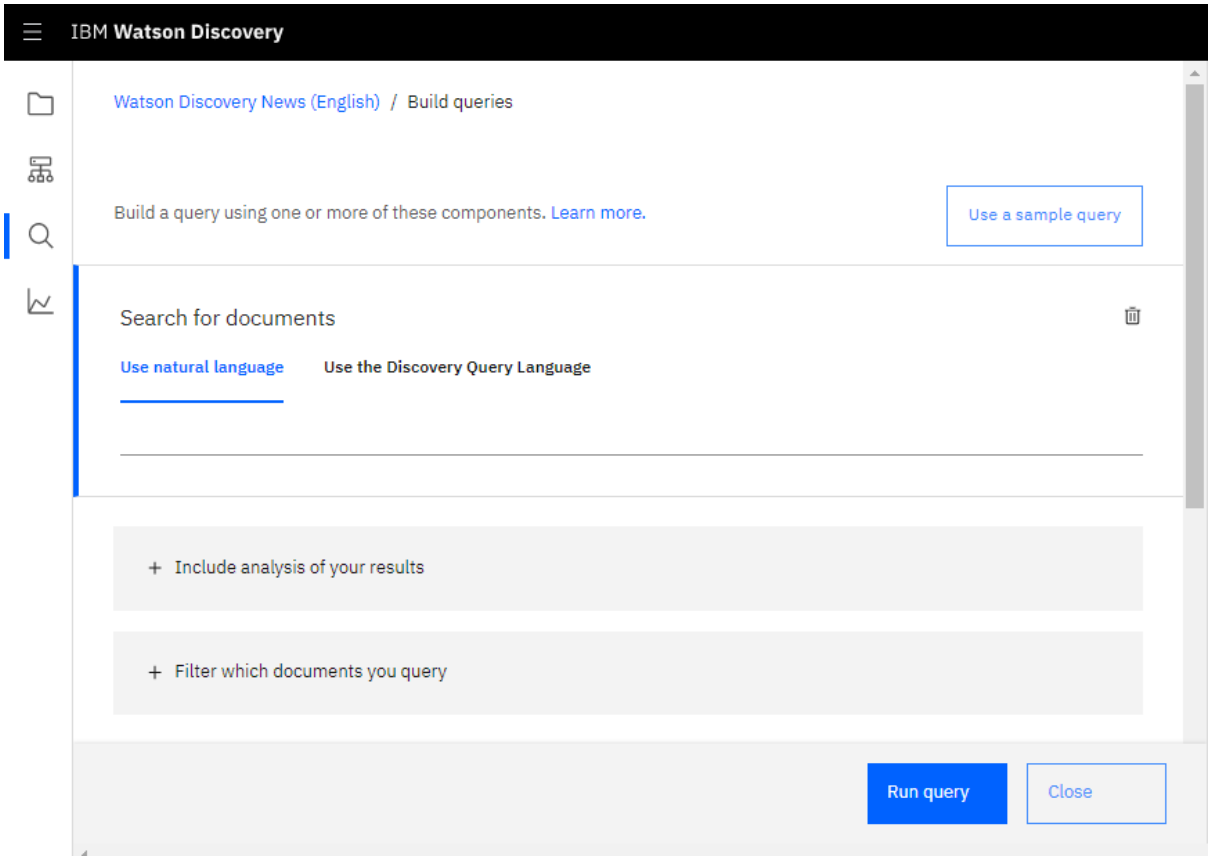

Figure 4-3: Watson discovery services

The explored knowledge is acquired by the employees to build knowledge artefacts. These knowledge artefacts are then stored and shared under *Watson knowledge catalogue (WKC)* service from IBM Watson. The WKC connects employees to the knowledge that they need. WKC provides various services, wherein this study has selected the storage and sharing services. It is also important to note that WKC provides a separate platform for employee collaboration which can be utilised for sharing knowledge artefacts and employees can have access to knowledge artefacts without needing separate credentials or being able to see the credentials (IBM, 2022). Only those employees can access who are added to the collaborative platform. The employees can utilise any knowledge artefacts uploaded in the system. As the artefacts are stored in the Watson cloud services, employees can easily access knowledge artefacts using any devices such as smartphones or tablets (Gupta *et al.*, 2013) at anytime and anywhere (Khayer *et al.*, 2020) facilitating swift exploitative learning. Regarding

WKC, **Figure 4-4** demonstrates the list of knowledge resources created by one of the SME participants. Similarly, **Figure 4-5** illustrate a sample knowledge document; **Figure 4-6** illustrate the knowledge sharing platform within WKC. Finally, **Figure 4-7** shows the details of exploited knowledge by the participants.

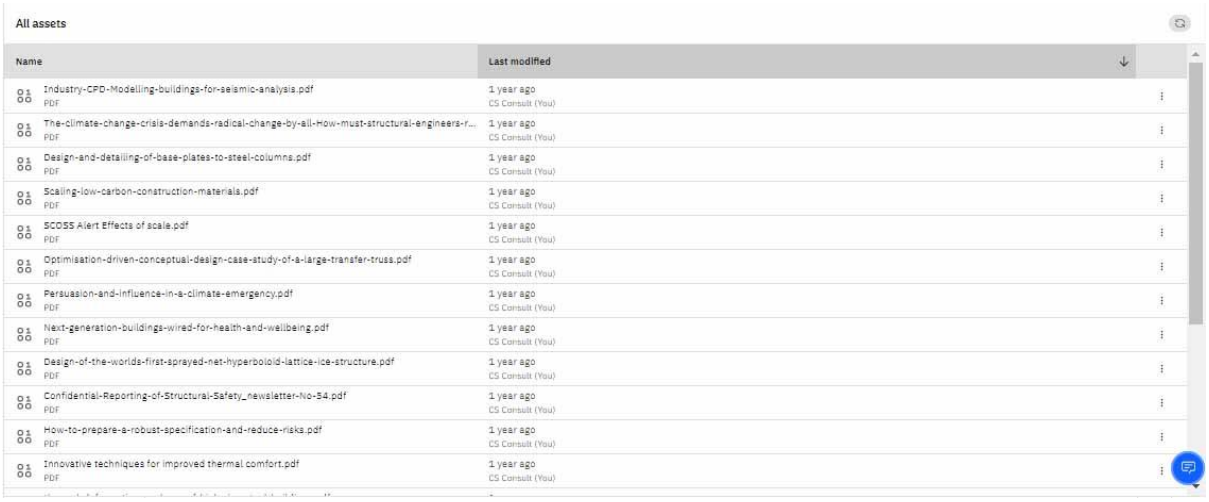

Figure 4-4: A list of knowledge resources created by the participants

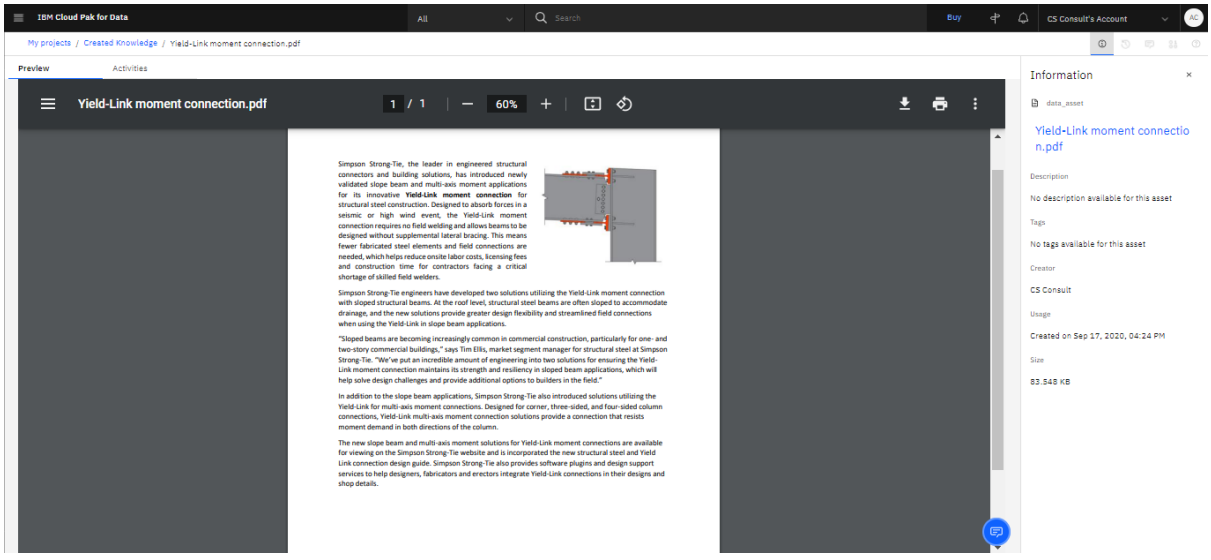

Figure 4-5: A sample knowledge document created by the participants

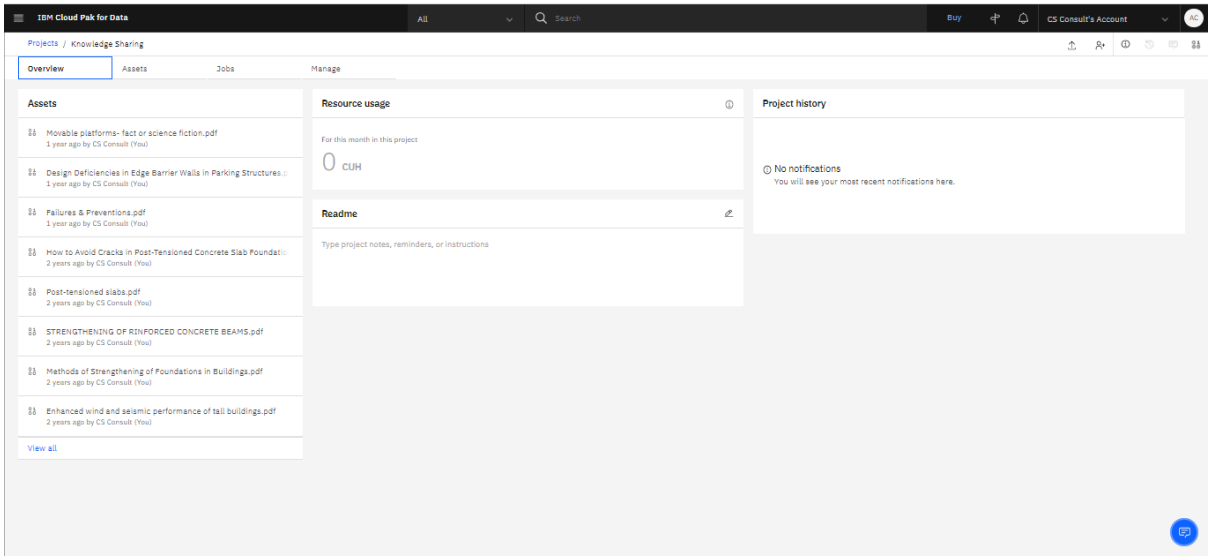

Figure 4-6: Knowledge sharing platform

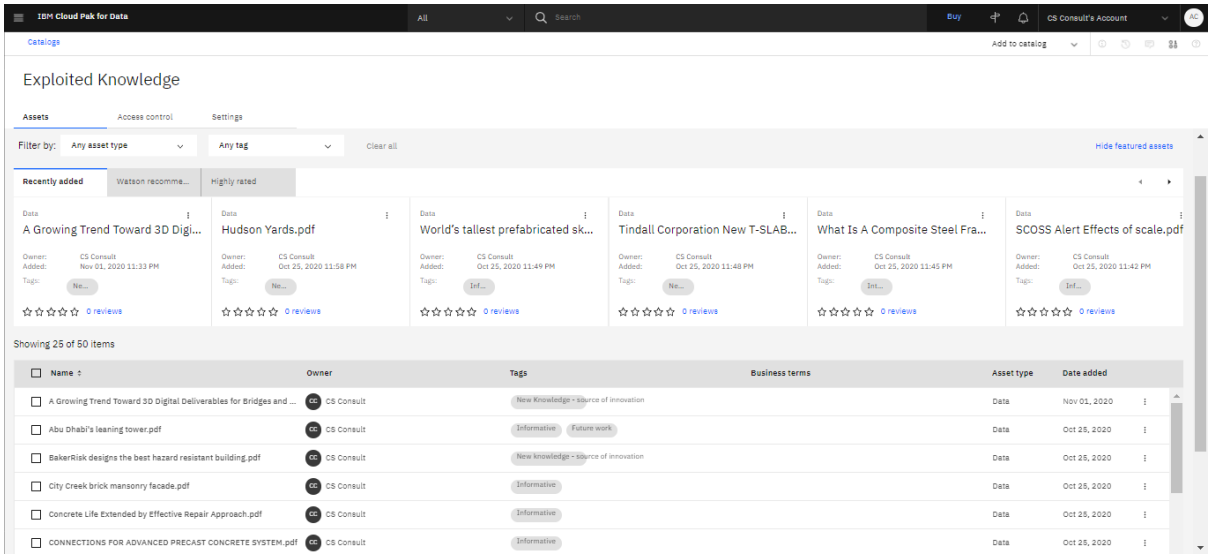

Figure 4-7: A list of knowledge resources shown to have been exploited by the participants

This research argues that the KAF as the research artefact can be demonstrated using WDS and WKC and this is the proposed technology platform to demonstrate that knowledge ambidexterity can be achieved in SMEs. This study uses the IBM Watson services that is freely available in its Lite version. It was agreed this version is sufficient to demonstrate the operational model of the framework. Moreover, there is an option to easily and cost-effectively upgrade Watson services to the paid version if the case

study SMEs want them, thanks to the scalability features of cloud computing.

4.4 Case Study Organisations (SMEs)

The participants involved in this research are SMEs from India and United Arab Emirates (UAE). The peculiarity of the site selection is that India is emerging as a global manufacturing hub due to such factors as the availability of abundant skilled labour and cost competitiveness (Sahi *et al.*, 2020) whereas UAE exhibits a growing economy and is developing into a financial and commercial hub for its region (Al-Gamrh *et al.*, 2020). The Expo 2020 hosted in UAE created enormous opportunities and showcased new technology trends and this event highlighted UAE is poised to be a global leader in technology innovation (Bocanet *et al.*, 2022). The categorisation of SMEs in the two jurisdictions are detailed in **Figure 4-8 & Figure 4-9.**

Classification of Micro, Small and Medium Enterprises (MSME) sector			
Composite criteria: Investment in plant & machinery/equipment and annual turnover (Calculated exchange rate: 1 USD =73.3 Indian Rupees as of 16 June 2021)			
Classification	**Micro**	**Small**	**Medium**
Manufacturing and Service Sector	Investment in plant and machinery or equipment up to USD 0.14 million and annual turnover does not exceed USD 0.68 million	Investment in plant and machinery or equipment up to USD 1.36 million and annual turnover does not exceed USD 6.82 million	Investment in plant and machinery or equipment up to USD 6.82 million and annual turnover does not exceed USD 34.09 million

Figure 4-8: Classification of SMEs in India (MSMEs, 2020)

Classification of Micro, Small and Medium Enterprises (MSME) sector			
Composite criteria: Number of employees and annual turnover (Calculated exchange rate: 1 USD =3.67 Emirati Dirham as of 16 June 2021)			
Classification	**Micro**	**Small**	**Medium**
Manufacturing and Service sector	Have less than 20 employees with annual turnover does not exceed USD 0.68 million	Have less than 100 employees with annual turnover does not exceed USD 0.68 million	Have less than 250 employees with annual turnover does not exceed USD 0.68 million

Figure 4-9: Classification of SMEs in UAE (Dubai, 2013)

The research sample group of this research consists of four SMEs based in India and three SMEs from United Arab Emirates (UAE), as illustrated in **Table 4-3**.

#	Firm	Type – Sector	Participants – ID [KW=Knowledge worker]	Country of Operation	Details
1	Company A	Medium – Construction Established in 2003	Senior Manager – KW1 Manager – KW2 Designer – KW3 Detailer – KW4	India	An engineering SME specialising in delivering technology enabled engineering designs including detailing, drafting and conversion solutions across the globe for residential, commercial, and other buildings.
2	Company B	Medium – Food manufacturing Established in 1996	Manager – KW1 Op. Exec – KW2 Prod Head – KW3 Packaging Head – KW4	India	An SME that manufactures, trades, and exports non-adulterated wheat and rice products of the highest quality both nationally and internationally.
3	Company C	Small – Transportation Established in 2018	Manager – KW1 Ops. Head– KW2 Customer service executive – KW3 Documentation officer – KW4	India	A logistics SME that offers specialist supply chain delivery services with their own fleet of trucks and leased warehouses.
4	Company D	Small – Transportation & Logistics Established in 2015	Manager – KW1 Ops. Head – KW2 Logistic officer – KW3 Shipping Coordinator – KW4	India	An SME that focuses on sea freight forwarding, customs clearance, local logistics solutions, and land transportation.
5	Company E	Medium – Transportation & Logistics	Manager – KW1 Ops. Head– KW2	UAE	A local transportation

			Line Coordinator – KW3 Documentation officer – KW4		and warehousing services provider. Regional presence within in the Middle Eastern and Indian Sub-Continent
6	Company F	Small – Freight forwarding and Supply chain	Manager – KW1 Ops. Head– KW2 Customer service executive – KW3 Documentation officer – KW4	UAE	SME specialising in 3rd party logistics (3PL) with less than container load (LCL) consolidation and extending services to documentation and financial support in trade.
7	Company G	Small – Health sector	Senior Dr – KW1 Junior. Dr– KW2 Service assistant – KW3 Front office Desk assistant – KW4	UAE	An Innovative health care solution provider in the Gulf region, pioneering the introduction of Ayurvedic treatment with facility for short-term in-patient services.

Table 4-3: Research Case Study Organisations

4.5 Artefact Evaluation

The KAF as the research artefact was evaluated as intervention-based case study from four SMEs in India and three SMEs in UAE after artefact demonstration. The artefact evaluation at the seven case studies were executed with two rounds of post-intervention semi-structured interviews in 2020 and 2021. Two yearly data collection cycles in a three-year collaboration period with the case study organisations captured longitudinal data on the impact of the artefact in SMEs. Qualitative data captured from interview transcripts were analysed using NVivo to identify emerging themes that were used to discuss the findings to answer RQ2 and RQ3.

An initial time-period in late 2019, referred to as ***T1***, was considered when the KAF was demonstrated at the case study organisations. For a period of one year throughout 2020, the KAF demonstration via IBM Watson services was facilitated and supported at all case study SMEs. During late 2020, the first phase of artefact evaluation was conducted via

semi-structured interviews at the time-period ***T2***. This evaluation is focused on understanding how K-AMB was achieved by SMEs from technology-driven innovation (TDI) using cloud computing, i.e., RQ2 of this study. The entire research process of this artefact evaluation is presented as the second research output (Paper 2) in Chapter 5.

Similarly, because of continued collaboration with the case study SMEs for an additional year, the second phase of artefact evaluation was conducted via semi-structured interviews at the time-period ***T3*** during late 2021. This evaluation is focused on understanding how cloud computing support transformation of SMEs into ambidextrous learning organisation (ALO), i.e., RQ3 of this study. The entire research process of this artefact evaluation is presented as the third research output (Paper 3) in Chapter 6.

4.6 Artefact Contribution

As the outcome of artefact evaluation, the KAF presented significant contribution to the SMEs towards TDI and becoming ALO. It was found that SMEs initially operated on a compromised K-AMB state where cloud computing is under-utilised, thereby missing out on ambidextrous opportunities. However, after KAF was implemented in SMEs for one year, it was found that SMEs were able to achieve K-AMB supported by technology-driven innovation using cloud computing. This was possible since cloud computing provided a platform for SMEs to simultaneously execute knowledge exploration and exploitation. Furthermore, after two years of artefact demonstration, i.e., using IBM Watson from late 2019 to late 2021 in SMEs, the KAF was evaluated again in terms of the learning aspect of ambidexterity to determine pathways for SMEs to become ALOs. It was found that K-AMB created a continuous learning environment with the support of cloud services that helped SMEs transform into an ALO.

4.7 Chapter Summary

This chapter presented the philosophical assumptions for this research leading to the justification and demonstration of DSR methodology. As a part of DSR, this chapter detailed the preliminary artefact design used in this study followed by the demonstration of the artefact using IBM Watson cloud services. This chapter also introduced the case study SMEs selected in this research followed by the summary of evaluation of the artefact at three time periods T1, T2 and T3, which is detailed elaborately on the next two chapters -chapters 5 and 6.

CHAPTER 5: ARTEFACT EVALUATION – TECHNOLOGY DRIVEN INNOVATION

This chapter is presented as an exact copy of an original research article entitled "Building Knowledge Ambidexterity using Cloud Computing: Longitudinal Case Studies of SMEs experiences". This study emphasises the implementation of K-AMB in SMEs leading to technology-driven innovation using cloud computing.

This paper is published in an international peer reviewed journal, International Journal of Information Management: https://doi.org/10.1016/j.ijinfomgt.2022.102551

5.1 Synopsis

This study demonstrates how cloud computing facilitates knowledge ambidexterity (K-AMB) across small- and medium-sized enterprises (SMEs) with the support of a longitudinal multisite case study research design. The study is the first of its kind to investigate how cloud computing can offer access to knowledge that can promote technology-driven innovation in SMEs. A cross-theory approach is used to highlight the connections between ambidexterity and knowledge management theories as a basis to explore the benefits of K-AMB capabilities for SMEs. The study initially queries whether SMEs concentrate on knowledge exploitation and under-utilising cloud computing, thereby missing out on ambidextrous opportunities. The study subsequently explores how cloud computing enables K-AMB exploratory capability such that knowledge can grow over time. Initial data suggested that the knowledge workers only favoured existing knowledge while a temporal lag was a proxy for causal change for ambidexterity once knowledge workers had greater experience using cloud computing. The results significantly shift mindsets about the revelatory value of cloud computing to promote K-AMB in SMEs. We draw novel insights to the theory of ambidexterity by proposing that digital

technologies and employee innovation contexts lie side-by-side and play an important role in building K-AMB capabilities in SMEs.

5.2 Paper 2 - Technology driven innovation

(Published paper copy attached next)

5.3 Chapter Summary

This chapter presents a journal article that is published in *International Journal of Information Management*. One of the future research directions proposed in this paper was to investigate the continual learning aspect of K-AMB which can aid SMEs to become ambidextrous learning organisations. The next chapter demonstrates how this study expanded this evaluation to research on how SMEs can be transformed to ALO.

CHAPTER 6: ARTEFACT EVALUATION – AMBIDEXTROUS LEARNING ORGANISATION

This chapter is presented as an exact copy of an original research article entitled "Transforming SMEs towards Ambidextrous Learning Organisation: A Design Science Approach" (currently in a 'ready-to-submit" stage and target journal: *Journal of Management Information Systems*). This study emphasises the role of K-AMB in transforming SMEs into ALO using cloud computing.

6.1 Synopsis

Learning organisation (LO) arose from the notion that continual learning should be encouraged where every employee transforms itself into a learning unit and learning becomes a core organisational strategy inside the organisation. Organisations achieve many benefits while it transforms to LO including continual state of improvement and learning. The main requirement for becoming LO is creation of a learning environment, which however is the least structured for most organisations. In the case of Small and Medium Enterprises (SMEs), the path towards becoming an LO is increasingly difficult because they lack an effective learning environment and capabilities. One of the aspects followed in this study for making SMEs a LO is incorporating the concepts of ambidexterity and learning organisation together and we define it as ambidextrous learning organisation (ALO), which is the ability of an organisation where each employee could simultaneously engage in explorative learning and exploitative learning processes to create a continual learning environment. Adopting the design science paradigm, we propose a research artefact as a framework for ALO. The proposed framework is specifically intended to address two challenges in SMEs, entailing creation of continual learning environment and transforming SMEs to ALO. For create a continual learning platform incorporating

explorative and exploitative learning processes, we adopt cloud computing technology in this study. We rigorously evaluate IBM Watson cloud services that is developed based on the framework. The evaluation followed a case study approach in seven SMEs in India and United Arab Emirates (UAE). The results demonstrated that creating a continual learning environment using explorative and exploitative learning with the support of cloud computing is possible for ALO transformation in SMEs.

6.2 Paper 3 – Ambidextrous Learning Organisation

(Draft paper copy attached next)

Transforming SMEs into Ambidextrous Learning Organisation: A Design Science Approach

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Abstract

Learning organisation (LO) arose from the notion that continual learning should be encouraged where every employee transforms itself into a learning unit and learning becomes a core organisational strategy inside the organisation. Organisations achieve many benefits while it transforms to LO including continual state of improvement and learning. The main requirement for becoming LO is creation of a learning environment, which however is the least structured for most organisations. In the case of Small and Medium Enterprises (SMEs), the path towards becoming an LO is increasingly difficult because they lack an effective learning environment and capabilities. One of the aspects followed in this study for making SMEs a LO is incorporating the concepts of ambidexterity and learning organisation together and we define it as ambidextrous learning organisation (ALO), which is the ability of an organisation where each employee could simultaneously engage in explorative learning and exploitative learning processes to create a continual learning environment. Adopting the design science paradigm, we propose a research artefact as a framework for ALO. The proposed framework is specifically intended to address two challenges in SMEs, entailing creation of a continual learning environment and transforming SMEs to ALO. To create a continual learning platform incorporating explorative and exploitative learning processes, we adopt cloud computing technology in this study. We rigorously evaluate IBM Watson cloud services that are developed based on the framework. The evaluation followed a case study approach in seven SMEs in India and the United Arab Emirates (UAE). The results demonstrated that creating a continual learning environment using explorative and exploitative learning with the support of cloud computing is possible for ALO transformation in SMEs.

Key Words: ambidextrous learning, cloud computing, knowledge management, learning organisation, ambidextrous learning organisation, continual learning, design science, small and medium sized enterprise

1. Introduction

A successful organisation is one that learns effectively, because learning entails tomorrow's capital, allowing organisations to accept and thrive in changing environments (Lee et al. 2021a). The concept of a learning organisation (LO) arose from the notion that continual

learning should be encouraged, where every employee transforms into a learning unit and learning becomes a core organisational strategy (Senge 1990b). When a company becomes an LO, there are two major benefits. At the employee level, it brings permanent change in employees' character and personalities, and fosters self-commitment to boost participation (Akella 2020). In an LO, staff thrive on collaboration and experimentation and have opportunities to be aspirational (Korn et al. 2021). At the organisational level, LO performs better than others (Lau et al. 2020) as the organisational system adapts to a continual state of improvement and learning (Korn et al. 2021). For an organisation to become an LO, a learning environment must be created. In this study, we consider a learning environment as a digital platform that supports organisational members' coordination by acquiring knowledge, allowing them to complete their tasks more efficiently (WAnG 2009; Hwang et al. 2021).

Despite several benefits, the learning environment is the least structured for most organisations (Hartstein & Yackel 2021) aspiring to be LO. In the process of creating a learning environment, an organisation should rely on a broad and diverse knowledge base and the utilisation of advanced digital technologies. A broad and diverse knowledge base helps organisations learn from experience and internalise new knowledge (Duchek 2020), thereby enhancing efficiency in recognising and evaluating external information (Tuomisalo & Leppäaho 2019). Exploring this diverse and broad knowledge for the employees to exploit is critical in enabling an organisation to become an LO. Digital technologies can help organisations explore and exploit this knowledge efficiently. In the current uncertain and dynamic operating environment, learning has changed in every organisation owing to the introduction of digitalisation, which aids organisations in performing their processes in simple and effective ways. While creating an LO, individual-level learning is determined by the learning orientation of employees (Wong et al. 2022) and it explores and exploits diverse knowledge artefacts (explicit form of knowledge) for effective learning (Duchek 2020). In the case of small and medium enterprises (SMEs), the path toward becoming an LO is becoming increasingly difficult because they lack these basic functions (Kapetaniou & Lee 2019; Kergroach 2020). Moreover, the focus on creating a learning environment for SMEs is not always part of their vision and strategy (Borge et al. 2018).

Today, an incredible amount of information is generated by every digitally enabled entity that can be combined with the organisation's existing resources to lead an organisation towards an

LO (Bhimani & Willcocks 2014). However, in most SMEs, employees refer to the internal knowledge available in the organisation and have less consideration for external knowledge acquisition (Rupčić 2018), despite the fact that the majority of knowledge is outside the boundaries of SMEs (Lee & Kim 2019). This environment limits the learning capacity of SMEs because a strong learning orientation relies on the internal mindset of employees, which requires an understanding of different external boundary conditions to ensure mastery of a variety of knowledge and skills (Wong et al. 2022). Therefore, becoming an LO seems more difficult for SMEs because it requires the support of a learning environment focused on learning processes (Borge et al. 2018). To address these chronic challenges faced by SMEs, they must consider being transformed into *ambidextrous learning organisations (ALO)*. Based on the aforementioned arguments, we use the definition of an LO as an organisation ***" where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together"*** (Senge 1990b). Similarly, the concept of ambidexterity, coined by (Duncan 1976), which was later elaborated by (Tushman & O'Reilly 1996) defined ambidexterity as the simultaneous execution of knowledge exploration and exploitation, which is required for making an organisation an LO.

Incorporating the concepts of ambidexterity and LO, we define an **ambidextrous learning organisation (ALO) as "the ability of an organisation where each employee can simultaneously engage in explorative learning and exploitative learning processes to create a continual learning environment."** To develop an ALO, we follow the studies of (Argyris & Schön 1978; March 1991; Lam 2019; Patterson 2021), which emphasise that knowledge explorative learning and knowledge exploitative learning are essential learning factors in an organisation. We conceptualise these two processes together as "ambidextrous learning," which is a prolusion to develop a continual learning environment for organisations. A balance between the simultaneous execution of these processes is a central theme for an organisation to create a continual learning environment that is a precursor to ALO. To create a continual learning platform that incorporates explorative and exploitative learning processes, we adopted cloud computing technology in this study. Cloud computing is a model for delivering a range of IT services remotely over the internet. Various applications hosted on cloud platforms, called cloud services, act as tools for meeting the IT needs of people (Lin & Chen 2012). Cloud-based learning services deliver

learning as a service, allowing organisations to access various learning resources on-demand without investing heavily in setting up the IT infrastructure (Lal 2015). Thus, this study aims to propose a pathway to transform SMEs into ALO with the support of ambidextrous learning processes and cloud computing by supporting the continual learning of their employees.

SMEs are the focus of this study that need to get transformed to ALO. This is because larger organisations maintain clear definitions for specific tasks for explorative and exploitative learning in each functional department (Poon & Mohamad 2020) and also adopt the support of cutting-edge technologies to manage various processes including ambidextrous learning processes (Sultan 2013a). Whereas in the case of SMEs, they solely depend on the employees' efficiency to execute ambidextrous learning behaviours. Moreover, SMEs always face difficulty in pursuing ambidextrous learning as they have resource constraint issues. rigid nature and traditional leadership behaviours (Oluwafemi et al. 2020). Organizational learning capabilities could provide SMEs with knowledge resources that are difficult to imitate by competitors in the industry and even the academia has also been contributing its quota, by conducting research into the various determinants for enhancing SMEs' learning capabilities (Tian et al. 2020). However, the majority of SMEs are not aware of this fact.

While analysing the literature, we identified some major challenges that inhibit SMEs' transformation into ALO.

- Learning is generally the least structured in SMEs because there are no resources to support a shared learning environment; additionally, the inherent nature of SMEs may hide learning inside the organisation (Short 2019). Unstructured learning limits SMEs' ability to adapt to changes, jeopardising the generation of novel knowledge for firm development. This implies that such SMEs are not ill-equipped to handle an uncertain future because they may be misled by legacy knowledge and experience (Kaiser & Peschl 2020). Previous studies (Lee et al. 2021a) have supported single-and double-loop learning to transform SMEs into LOs. However, there is a general belief that explorative and exploitative learning are more explicit (Brix 2019) and compatible with single-and double-loop learning (Levinthal & March 1993).
- SMEs can be considered a J-form type of organisation. J-form organisations focus on nurturing exploitative learning while inhibiting explorative learning (Lam 2019). J-form

organisations derive their capabilities from knowledge embedded in the organisation, and the key actors involved in the learning process are different stakeholders. Previous studies have already mentioned that SMEs handle KM processes by diverting resources away from exploration and onto exploitation activities, implying that exploration is compromised in favour of exploitation (Randall et al. (2017). Knowledge workers are often restricted in knowledge exploration processes, and top-down knowledge flow is culturally promoted in SMEs. This implies that knowledge explorative learning is often insufficient, and this state hampers effective learning as SMEs focus on utilising existing embedded knowledge.

- Because top management teams and senior management stakeholders play a vital role in supporting learning in SMEs, leadership practices are important for generating a learning culture within organisations at the individual, team, and organisational levels (Dirani et al. 2021). With the help of cloud computing, employees can easily access work-related knowledge and engage in real-time learning (Shao et al. 2021). Therefore, we can suggest that cloud computing can be a promising technology to shape SMEs digital transformation into ALO; however, the potential of cloud computing is still to be explored in the literature.

Based on these challenges, we identified three major research gaps. First, previous studies have shown the benefits of transforming SMEs into an LO (Bratianu et al. 2020; Xie et al. 2021), however there is little literature support or practical advice for SMEs to enable ALO transformation. This implies that previous studies have omitted the simultaneous approach of explorative and exploitative learning toward SMEs transformation into an ALO. Second, although cloud computing is ubiquitous in offering individual learning platforms (Benson & Morgan 2013), there is a lack of studies promoting cloud computing as a common learning platform for employees that help transform SMEs into ALO. Finally, no overarching framework or model exists in the literature to guide SMEs in their transformation processes toward becoming an ALO. To address these gaps, we followed a design science research (DSR) methodology following the studies of (Hevner et al. 2004). We propose a framework for ALO by including three constructs: cloud computing, ambidextrous learning processes, and KM processes. To create a robust learning environment inside an organisation, we incorporated two ambidextrous learning processes as antecedents: knowledge explorative learning and knowledge exploitative learning. From the KM perspective, to manage new and existing knowledge, we also included the widely adopted KM

process flow of knowledge acquisition, creation, storage, sharing, and utilisation (Dalkir 2013). We posit that both knowledge and learning workflow are aided by cloud computing in the SME sector. We then positioned this framework as our research artefact for the DSR study. As part of the DSR guidelines, after the design of the research artefact, we followed the research design comprising demonstration using a cloud-based KM system (powered by IBM Watson cloud services) as an information system that supports both learning processes and efficiently manages knowledge inside SMEs. This is followed by artefact evaluation as case study research, where SMEs were involved for three years to implement the cloud instances of the artefacts and provided longitudinal data to report their unique journeys of transformation into an ALO.

The remainder of this paper is organised as follows. First, the literature review is outlined by exploring the details of ambidextrous learning organisations, the role of cloud computing, and ambidextrous learning processes, leading to research questions related to the transformation of SMEs to ALO. The research methodology is then explained, including details of the research artefact, demonstration and evaluation of artefacts. The artefact was evaluated using a case study approach by selecting SMEs from India and the UAE. The findings related to artefact evaluation are outlined, followed by a discussion on the key aspects of our findings and a detailed contribution to theory.

2. Literature Review

2.1 Knowledge Management and Organisational Ambidexterity

Knowledge management is the continuous process of creation, acquisition, sharing, storage, and utilisation of knowledge (Le Dinh et al. 2013), where knowledge sharing and acquisition are the most widely studied KM processes (Al-Emran et al. 2018). Previous studies depict that knowledge creation/acquisition generally occurs through organisational stakeholders (Del Giudice et al. 2014) or with the use of different Information Systems (Le Dinh et al. 2013; Irum & Pandey 2019). (Jain & Gupta 2019) emphasise that the majority of organisational knowledge resides in tacit form, hence codification of knowledge in a formal structure for

knowledge storage is a challenging task especially for SMEs. Managing knowledge is critical to organisations as KM increases the efficiency of decision making as well as operational processes in the organisation (Rot & Sobinska 2017). However, most organisations cannot possess all the knowledge that they require to meet customers' demand (Jurksiene & Pundziene 2016). Apart from that, the knowledge of an industry and its market is changing rapidly, hence the organisation must create a new collection of knowledge in diverse areas to stay competitive (Popadiuk 2012). To overcome these challenges, knowledge ambidexterity plays a crucial role, as it generates a streamlined flow of knowledge (Soto-Acosta et al. 2018) for organisations. When knowledge augments in the organisation it should be saved, managed and reused with the support of IS. The enormous volume of knowledge is generally stored in knowledge databases where it can be managed and used readily by anyone in the organisation (Santoro & Usai 2018).

For implementing organisational ambidexterity, organisations explore and exploit resources simultaneously, to become ambidextrous. This theory demonstrates that organisation's long-term success depends on its ability to exploit its existing knowledge while simultaneously exploring fundamentally new knowledge leading to continual learning in organisation (Raisch et al. 2009). While linking knowledge exploitation and exploration with *organisational learning*, March (1991) has defined that learning through exploitative activities (exploitative learning) encompass the performance of refinement, production, implementation, and execution of knowledge. Learning through exploration activities (explorative learning) imply search, experimentation, discovery and innovation of knowledge. Simultaneous approach of executing these learning processes will aid organisations to achieve ambidextrous learning.

However, the learning requirements necessary for ambidextrous learning processes are different (Gupta et al. 2006), hence, there is no guarantee that explorative learning works well if exploitative learning works well. Since SMEs lack resources, it always faces challenges in following ambidextrous learning processes. Since prior studies advocated that information system is mainly known to be more suitable for ambidextrous learning processes as well as managing knowledge (Sultan 2013a; Santoro & Usai 2018), we are investigating through this study how cloud services provide sufficient resources for explorative learning and exploitative learning and manage knowledge efficiently in the SMEs so that SMEs can become an ambidextrous learning

organisation.

2.2 Ambidextrous Learning Organisation (ALO)

A learning organisation is an organisation that facilitates learning for all its members. LO have an integrated learning system which utilises continual learning processes supported by organisational leaders (Lau et al. 2020). There exists some similarities and huge differences between organisational learning and learning organisation. While discussing the difference, organisational learning can be defined as changes in organisational behaviour visible in organisational routines based on the new knowledge that has been acquired individually and used collectively by the firm (Rupčić 2018). Organisational learning may not be a continually followed process and it is not necessary that every employee should be part of it. It focuses on organisational wide change only. Whereas learning organisations focus on employee level change by promoting continual learning where every employee should be part of it (Senge 2006). However, both concepts are linked to the learning aspect of an organisation and learning processes are defined by focusing on organisational learning (Kumar et al. 2021). Prior studies (Bratianu et al. 2020) consider organisational learning and the collaborative knowledge building as the fundamental criteria for a learning organisation paving a way forward to the KM as well as an ambidextrous learning process to transform to ALO.

As published in their seminal work, Argyris and Schön (1978) have declared that every learning organisation will also be ambidextrous by nature. This is because one of the ways to facilitate continual learning inside a learning organisation (Senge 2006) is through the simultaneous learning process of explorative learning and exploitative learning (March 1991; Raisch & Birkinshaw 2008; Lee et al. 2021a). However, we realise that many organisations especially SMEs have a misconception in understanding the principles of an ALO. It is noted that various SMEs predominantly focus on the appealing exploitative learning for refining and deepening existing knowledge while discarding explorative learning to adapt new learning opportunities outside their current knowledge domains. This will lead to espoused collaborative values of the organisation and the emergence of siloed functions (Patterson 2021). Therefore, SMEs should firstly be aware of the principles of an ALO whereby they recognise to build a

continual learning environment where each employee could simultaneously engage in explorative learning and exploitative learning processes (Argyris & Schön 1978; Tushman & O'Reilly 1996; Lam 2019; Patterson 2021).

Explorative learning utilises external knowledge sources whereas exploitative learning employs existing knowledge for continual learning and improvement in SMEs (Lee et al. 2021a). According to Senge (2006), the possibility of an organisation to evolve into a learning organisation is dependent on the traditional Knowledge Management (KM) processes, i.e. knowledge acquisition, creation, storage, sharing and application which is a widely accepted KM cycle (Dalkir 2013). Prior studies suggest that organisational learning can be supported by information systems (IS) (Kang et al. 2021). Next, we review the role of IS to transform SMEs into an ALO.

2.3 Digital transformation and role of Information systems (IS) to digitally transform SMEs into an ALO

Digital transformation (DT) has been defined as an iterative organisational process, comprising incremental and disruptive changes enabled by IS through automating business processes to make the current day-to-day operations more efficient (Barann et al. 2019; Lombardi 2019). Since KM and ambidextrous learning processes are the two major constructs in this study, we need to analyse how these processes are transformed digitally by utilising the cutting-edge technology cloud computing. Primarily, while considering KM in SMEs, we found that DT plays a key role in enhancing KM-based practices that involve the inflow and outflow of knowledge of the SMEs (Petruzzelli & Rotolo 2015). As the majority of knowledge is in tacit form in SMEs (Jain & Gupta 2019) , the major task that SMEs expect from digital transformation is proper structuring and management of knowledge inside the firm for effective learning. Prior studies supported that IS supports effective KM through knowledge management systems (Tsang et al. 2018), social media platform (Kane 2017) etc. However, the majority of studies have not explained how major processes of KM such as knowledge creation and storage are effectively managed using IS. We follow the studies of (Saratchandra & Shrestha 2022) who emphasise that SMEs are ineffective at KM with limited IS intervention and the authors suggested a cloud-based KMS as a solution to manage knowledge systematically. However, the study lacks explaining how cloud based solutions facilitates effective learning through systematic management of organisational knowledge in SMEs.

While considering the learning aspect in SMEs, we found that SMEs must continuously promote ambidextrous learning for anticipating, reacting and responding to disruptive markets to remain competitive (Hutasuhut et al. 2021) through adapting and aligning their IS capabilities (McLaren et al. 2011). There are a number of internal and external factors that affect the digital transformation of ambidextrous learning processes in SMEs where IS plays a crucial role (Kang et al. 2021). IS capabilities have been reported to enhance learning inside an organisation by allowing for self-paced learning, data-driven instructions, and automation of pedagogic activities (Nguyen et al. 2021). SMEs generally require unique and specialised knowledge about market needs and competitors' activities to strongly position themselves in the market. However, this knowledge is not readily available for the SMEs (Shah 2022). Here, IS tools that are accessible to SMEs to acquire these knowledge are critical as a catalyst for improving organisational learning leading to desirable outcomes such as enhancing knowledge processing, gathering and performance improvement (Wairimu et al. 2021).

For all (n=49) selected papers on organisational learning, we reviewed how the IS tools improved organisational learning and based on our findings, we have analysed four categories of IS-supported organisational learning covered in literature. The first category is organisational learning supported by social media platforms. Social media applications that support mobile instant messaging are used to support explorative and exploitative learning as they meet immediate needs and demands of learners who are already immersed in their jobs (Pimmer et al. 2021). Social media platforms act as an important tool for exploring knowledge and competitive information thereby supporting explorative learning (Pérez-González et al. 2017). They also allow employees to exchange two-way knowledge that motivates employees to enhance exploitative learning (Khan & Khan 2019). However, the downside of social media is that it limits the need for documentation that can be detrimental to new knowledge creation (Irum & Pandey 2019) . There are other challenges since social media data are often highly unstructured with lots of noise and uncertain data sources and do not support systematic processes of KM (Wang & Wang 2020). Organisations may use text mining methods to identify and acquire relevant knowledge from the information in social media platforms but this has proven to impede effective learning (Bohlouli et al. 2015).

The second category is learning from knowledge management systems (KMS). KMS contain knowledge in the explicit form, stored as documents that may be acquired by any employee

and KMS differ from other types of IS in fundamental ways, making their usage conducive to ambidextrous learning (Iyengar et al. 2021). KMS makes knowledge articles readily available to employees which support enhanced organisational learning (Cha et al. 2015; Cerchione et al. 2020). Prior studies have also emphasised that KMS presents an avenue for the employees to facilitate learning as it supports cognitive engagement which is the most relevant dimension of engagement pertinent to the acquisition of knowledge for in-depth learning (Iyengar & Montealegre 2021). However, there are limited studies that demonstrate the adoption of cloud based KMS in SMEs (Saratchandra & Shrestha, 2022) which limits explorative and exploitative learning in the SME sector.

The third category is learning in organisational clusters or via inter-firm collaborative networking**.** The firms embedded in the clusters can acquire more valuable knowledge through effective organisational learning activities paving the way for clusters to become knowledge hubs that provide their members with access to a wide range of advanced knowledge content (Zhou et al. 2021). The employees can increasingly perform their tasks in an interconnected environment, as they not only learn through personal experiences (exploitative learning), but also benefit from knowledge accumulated by others (explorative learning). Inter-firm collaborative networking can bring opportunities and outcomes that single organisations cannot achieve on their own (Peronard & Brix 2019). Study by Dirani et al. (2021) empirically support that such networks are good at bringing together different/diverse employees to work together on solving complex problems and should have an embedded system for filtering, organising and managing important information. This implies that IS plays a vital role to facilitate the acquisition and dissemination of knowledge among inter-organisational networks, thereby promoting explorative and exploitative learning (Nooshinfard & Nemati-Anaraki 2014). However, the majority of studies has discarded the role of IS and emphasised other organisational factors such as leadership and trust on learning processes (Borge et al. 2018).

The final category is learning promoted by big data analytics (BDA). BDA facilitates continual learning in an organisation since business insights can be generated from big data as a source of enormous data generated from various sources such as web clicks and mobile transactions. BDA is a tool for searching and identifying knowledge for the organisation (Bag et al. 2021), therefore leveraging explorative learning among employees. Prior studies have

supported that cloud computing with BDA capabilities such as data mining, machine-learning algorithms and Natural Language Processing (NLP) techniques support knowledge exploration using big data sources (Shrestha & Chandra 2020; Sathishkumar & Karthika 2021) that enables IS to visualize big data sets in intuitive ways (Müller et al. 2016). This explored knowledge can be acquired by employees towards the enhancement of existing products or creating new products (Mikalef et al. 2020). However, the use of big data for SMEs is still at a nascent stage (Wang & Wang 2020) and the process of effective learning utilising big data sources is complex for SMEs leading them to forgo innovative uses of cloud computing.

2.4 Cloud Computing and continual learning environment

There has been other major advancement in learning technologies such as simulation tools, productivity and communication tools and AI-powered advancements in gamification strategies, virtual reality and mobile technologies (Erdem & Şeker 2022). One of the key technology enablers in these learning tools is cloud computing. Cloud computing delivers wide-scale learning technologies by offering flexibility and scalability and broadening the reach of the services offered by learning technologies to mainstream business use which would otherwise have been inaccessible for SMEs. Organisations using cloud technologies engage people for learning through providing an innovative learning environment that promotes collaborative learning experience (Ratten 2012) by facilitating knowledge articles on request. Since, SMEs face difficulty to devote resources for responding to business changes and sensing learning opportunities (Czakon et al. 2020), cloud services provide SMEs more flexibility in scheduling and deploying IT applications to rapidly respond to changes and address changes in customers' demand resulting in increasing learning opportunities by integrating new assets and knowledge (Sheng & Chien 2016).

Cloud services support big data (Depeige & Doyencourt 2015), which contains a high variety of structured, unstructured, multimedia data (Chan 2014). Cloud services such as Alchemy and Zemanta can extract the knowledge from these big data sources with the support of natural language processing (NLP), a process for the automatic analysis of information (Caione et al. 2015). Therefore, cloud services directly support explorative learning. Dezi et al. (2018) in their study stated that if knowledge is efficiently explored from big data, it contributes to relevant knowledge acquisition. The acquired knowledge can be codified and stored as knowledge artefacts in the cloud services, which can be later shared/used/reused in the organisation supporting efficient

KM processes. Cloud services also facilitate knowledge to employees so that they can use it to improve or refine existing knowledge leading to exploitative learning (Ardito et al. 2018) . In this context, we can argue that cloud computing can play a major role towards these two learning processes, and thereby, in the emergence of ALO (Caputo et al. 2019), particularly for SMEs. However, prior studies have not studied the cloud capabilities to implement effective learning in SMEs. We emphasise cloud computing as an enabler for transforming SMEs into an ALO.

2.5 The role of explorative learning, exploitative learning and KM processes in ALO

March (1991) detailed two types of learning processes inside an organisation: explorative learning and exploitative learning. Explorative learning in this study entails learning from new knowledge or experimentation with new alternatives while exploitative learning implies strengthening or refinement of existing knowledge inside the firm. SMEs need to simultaneously practice these two learning modes to achieve ambidextrous learning (March 1991; Levinthal & March 1993; Filippini et al. 2012). Moreover, the organisational learning literature has suggested knowledge exploration and exploitation as two primary approaches for firms to develop organisational knowledge in a specific domain through continually integrating new knowledge into organisation's knowledge bases (Tang et al. 2020), thus supporting continual learning. A broad area that underpins organisational learning and learning organisations are the KM processes (Kumar et al. 2021). Prior studies have identified five sub-processes of organisational learning: knowledge acquisition, distribution, interpretation, application and creation of organisational memory (Huber 1991; Flores et al. 2012; Kumar et al. 2021). When these processes are followed, it is generally agreed that a learning organisation is skilled at creating, acquiring, interpreting, transferring and retaining knowledge (Santa & Nurcan 2016). Therefore, it is imperative that ambidextrous learning can be bound with the five KM processes (acquisition, creation, storage, sharing and utilisation) so that a simultaneous interplay between two cohesive clusters: knowledge explorative learning and knowledge exploitation learning; can occur. The binding of the two clusters can allow SMEs employees to implement ambidextrous learning processes as a cohesive practice rather than individual processes and create a learning environment inside SMEs where employees can engage in continual learning. Ambidextrous learning is expected to result in

providing a better outcome to SMEs in terms of enhanced innovation, competitive advantage and other benefits (Jurksiene & Pundziene 2016; Scuotto et al. 2019).

It can be implied that both people and technology (in this context: cloud computing) can play critical roles in simultaneous execution of the knowledge exploration and exploitation learning activities. When an organisation strives to achieve more ambidextrous learning, it can be more effective in implementing cloud computing in these learning contexts. This is because cloud services create new business opportunities that did not exist before and can be operated with less requirements for infrastructural expenses (Sultan 2013b). For example, cloud services can provide AI-supported learning environment with cognitive computing techniques to evaluate massive amount of unstructured data sets generated from data sources (Chen et al. 2020) and empower SMEs to have more potential to easily acquire and process knowledge out of these data sets (Vuori et al. 2012).

2.6 The role of people and technology in ALO

While considering explorative learning, cloud services support exploring relevant knowledge for SMEs from outside boundaries of the firm. Explorative learning starts with knowledge acquisition, which is defined as the organisational learning process through experience, observation or searching new knowledge for the firm by the employees (Huber 1991). The acquired knowledge is codified by employees and stored in the knowledge base for a combined continual learning process inside SMEs. In this study we consider the knowledge creation process as the process for creating new explicit knowledge (knowledge articles) (Le Dinh et al. 2013) as the creation of knowledge takes places where novel data is transformed to human readable format (Schaefer & Makatsaria 2021). There are two types of knowledge creation process with the support of cloud services inside any organisation. First method is where employees work together on current knowledge artefacts and exchange files and ideas using cloud services. The output can be a new knowledge article or modified form of the same. The second method is where the cloud supports big data (Schaefer & Makatsaria 2021). The output of most big data systems is knowledge. Thus, with the support of BDA, employees can identify knowledge for creating new knowledge articles (Bag et al. 2021). Knowledge storage is concerned with storing of the newly

created knowledge for future learning in SMEs. The newly created knowledge articles are used for continual explorative learning among employees.

Exploitative learning entails building on the SMEs existing knowledge base (Lavie et al. 2010) and it only occurs after the knowledge is stored in the organisational database (Le Dinh et al. 2013). As exploitative learning builds on existing knowledge, it broadens a firm's existing knowledge base and improves established products without changing the basic nature of current skills, processes, and structures (Enkel & Heil 2014) as well as facilitates effective learning. Similarly, knowledge sharing involves disseminating knowledge among co-workers and relevant stakeholders, which aids them to learn continually. Knowledge sharing for any organisation can utilise cloud computing to support a virtual environment for effective knowledge sharing and learning (Filippini et al. 2012). Knowledge sharing also supports generation of new knowledge for effective learning (Maravilhas & Martins 2019; Cabeza-Pullés et al. 2020). The lack of quality in interpersonal relationship and knowledge sharing process may cause a major barrier for employee's learning capacity inside SMEs (Lau et al. 2020). The knowledge sharing process and knowledge storage process are directly supported by cloud services (Arpaci 2017). However, knowledge utilisation refers to the actual use of knowledge that has been captured and the effectiveness of this process is dependent on how people use it (Dalkir 2013). People who learn about particular relevant knowledge should utilize it to solve operational problems and increase competitiveness (Alavi & Leidner 2001) unlike in the case of knowledge storage and knowledge sharing where cloud services provide direct support in the learning process. Therefore, in the context of exploitative learning, we can argue that people play a critical role in the knowledge utilisation process and cloud services act as facilitators. Similarly, cloud services play a critical role in knowledge storage and sharing, and people act as the implementer.

In this research, we posit our main research question:

RQ: How can cloud computing transform SMEs to become an ambidextrous learning organisation?

To transform SMEs into an ALO, a continual learning environment must be created, and this is possible only with an ambidextrous approach to both explorative and exploitative learning. To investigate these learning processes, we create first sub-question from our research question:

SQ1: How can cloud services support knowledge explorative and exploitative learning for SMEs to promote continual learning?

Then a second sub-question is investigated to understand the formation of continual learning environment to fully answer our research question:

SQ2: In what ways does a continual learning environment support SMEs transformation into an ALO?

3. Methodology

The methodology followed in this study is design science research (DSR) methodology. While DSR offers a workflow-type methodology, it is also considered as a problem-solving paradigm (Cassidy & Hamilton 2016). DSR is a long-standing research tradition in IS that has recently gained renewed momentum (Gregor, 2020). According to (Hevner 2007) there are three inherent research cycles as the basic foundation for DSR methodology. The first cycle is the *Relevance Cycle* that bridges the contextual environment of the research and introduces the research artefacts into environmental field testing. The second cycle is the *Rigor Cycle* that provides grounding theories and methods along with domain experience and expertise from the foundation's knowledge base into the research. Finally, the *Design Cycle* that iterates between the core activities of building and evaluating the artefacts of the research. Following (Hevner 2007) study in this research, we demonstrated our research model in Figure 1 detailing how our research is both relevant and rigorous and contribute to the IS knowledge base by presenting how cloud computing can transform SMEs into an ambidextrous learning organisation.

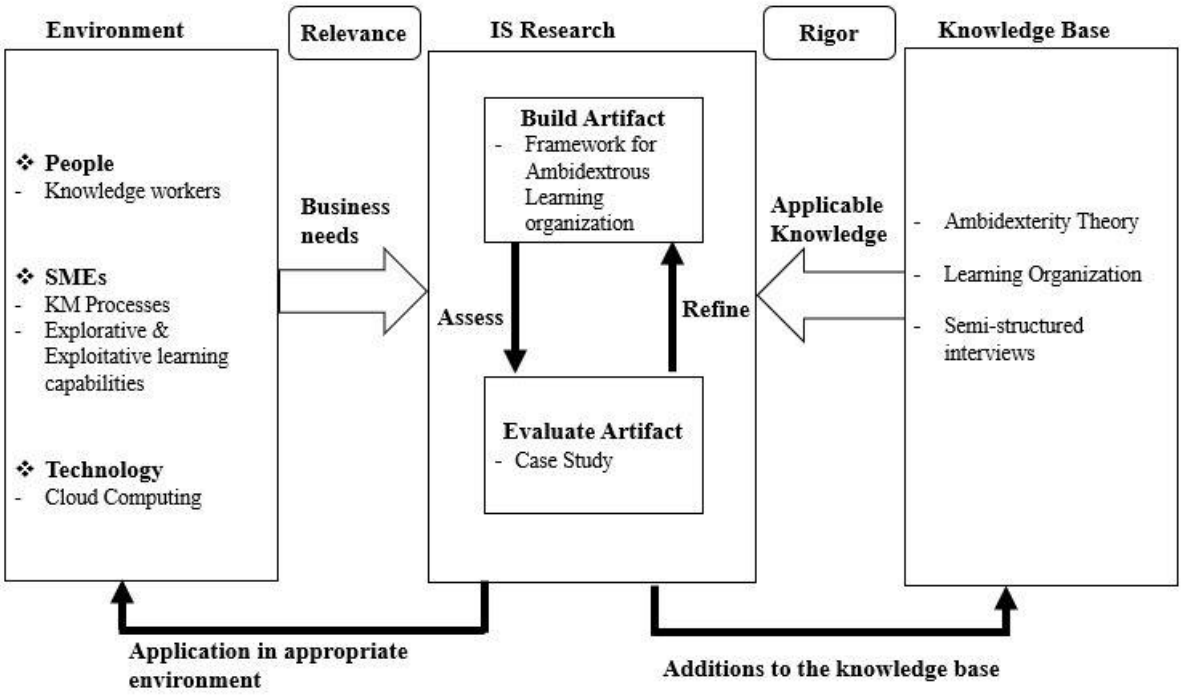

Figure 1: Research model adopted from DSR cycle by (Hevner, 1994)

In our research model, the ALO framework is considered a research artefact. As part of the relevance cycle for introducing our research artefact, we first recruited four case study organisational SMEs from India and three SMEs from the UAE. Even though SMEs are considered the backbone in both countries, there is no common learning platform for these SMEs to be transformed into an ALO, and the adoption of cloud technology is an unexplored opportunity. The multitude of challenges SMEs encounter in managing their knowledge is higher than those faced by large organisations (Al-Jabri & Al-Busaidi 2018). Larger corporations have advanced opportunities to promote effective learning through well-established practices and regulations (Gast et al. 2019). Larger organisations typically have centralised research and development (R&D) hubs for innovation, learning, and knowledge sharing. For example, the Hyundai Motor Central Research Centre has operated as a central knowledge-sharing hub for creating group-wide explorative technologies and integrated R&D learning activities for Hyundai and Kia vehicles (Lee et al. 2019). A recent analysis in Poland suggests that larger companies achieved a significantly higher rate of saturation with IT tools, and the implementation of modern IT and computer technologies (e.g., cloud services and big data) enabled effective learning and KM in these enterprises (Cupial et al. 2017).

We selected five KM and ambidextrous learning processes as the processes involved. Furthermore, we selected top managers and operational employees with IT backgrounds as participants. We refer to the selected employees as knowledge workers. In the rigor cycle, we identify ambidexterity theory (Tushman & O'Reilly 1996) and LO (Senge 1990b) as the main foundations. To evaluate the artefact, we chose the case study approach to understand whether our artefact has transformed the participant SMEs into ALO.

3.1 Design & Development of the research artefact

To transform SMEs into ALO, we integrated the knowledge acquisition and creation processes into a knowledge explorative learning cluster. In this cluster, we adopted new KM strategies and discovered new knowledge (Benitez et al. 2018) that can be stored in the knowledge base for future usage. The main purpose of this cluster is to explore new values, methods, and knowledge for continual learning within SMEs (Lee et al. 2021b). The newly explored and acquired knowledge is codified by employees into an explicit form as knowledge articles and stored in the knowledge base of SMEs. Similarly, we also grouped the knowledge sharing and utilisation processes into the knowledge exploitative learning cluster because these KM processes collectively work on leveraging an organisation's existing knowledge base (Benitez et al. 2018). The main purpose of this cluster is to utilise available collective knowledge and to restore the existing status quo of the operating conditions within the existing parameters and policy of the organisation for continual learning inside SMEs (Lee et al. 2021b). Knowledge storage acts as a common KM process to support ambidextrous learning processes.

Exploitative learning refers to a process of strengthening and refining an SME's existing knowledge base, whereas knowledge explorative learning supports SMEs in effectively acquiring, integrating, and reconfiguring new knowledge and seeking novel ideas (March 1991; Yi et al. 2022). These studies justify our selection of KM processes as explorative or exploitative clusters. When exploitative learning is high, cognitive inertia increases. When exploratory learning is high, organisations are more inclined to experiment and take risks. This explains the need for a simultaneous approach to ambidextrous learning.

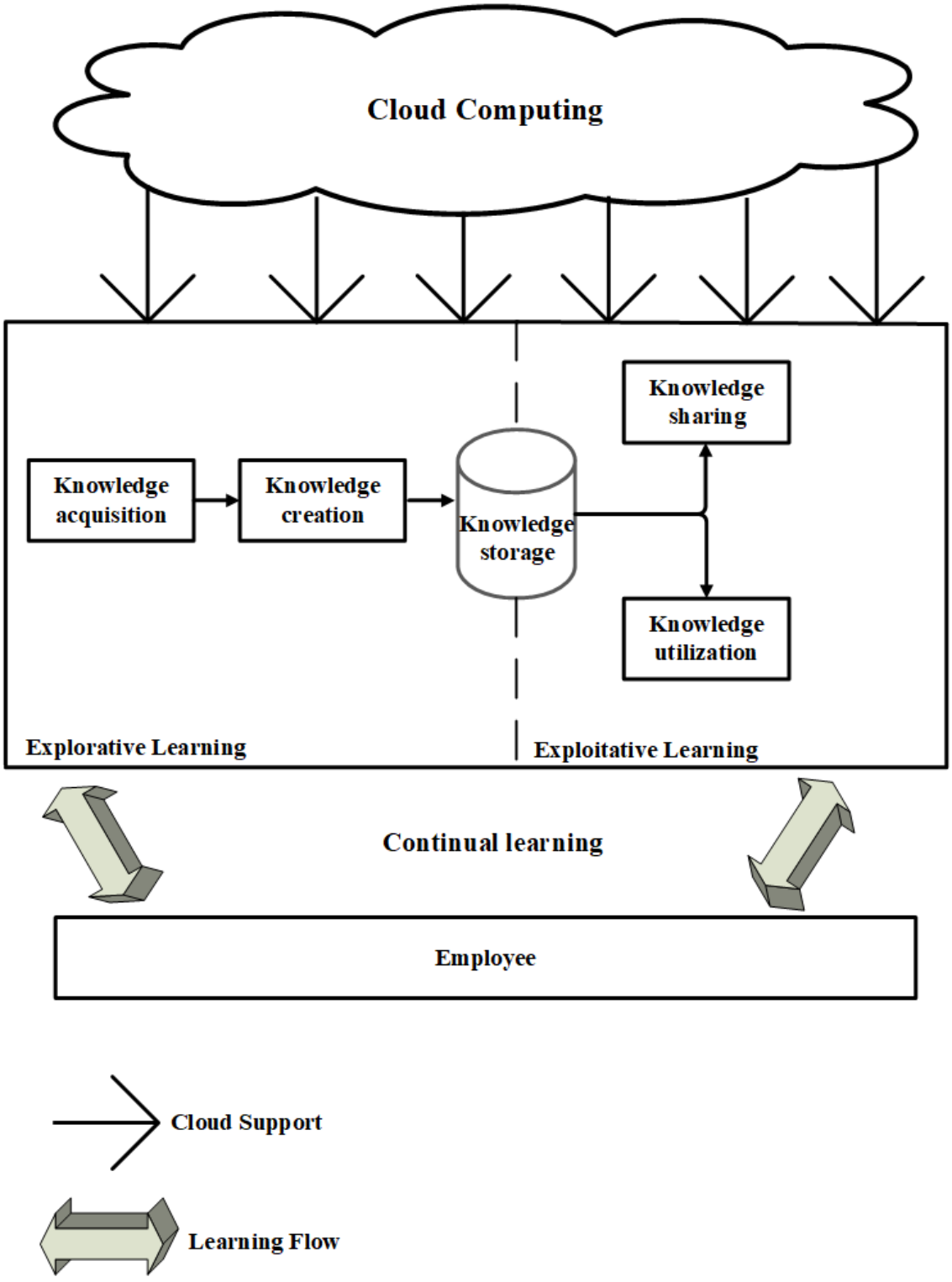

Figure 2: Research Artefact: Framework for Ambidextrous learning organisation in SMEs

This conceptual framework encompasses both knowledge explorative and exploitative learning approaches and describes the role of cloud services toward providing a learning platform inside SMEs, thereby representing a holistic approach that transforms SMEs into ALO. A lack of IT skills and awareness of cloud benefits inhibits SMEs from using cloud-based applications for effective organisational learning (Bhat 2013). Therefore, we propose a conceptual framework that demonstrates how cloud computing can play an effective role in ambidextrous learning for SMEs. Digital technologies can offer efficient and useful ways to implement explorative and exploitative learning and manage knowledge in a systematic manner. The framework promotes the idea of using cloud computing to holistically transform SMEs toward ALO, beyond the transformation of existing services and processes into a digital platform.

It is a well-established paradigm that a KM strategy in an organisation is supported by three pillars of process, people, and technology (Chan 2017; Rot & Sobinska 2017; Schniederjans et al. 2019). According to the nature and context of these studies, several scholars have deviated from these three pillars to determine other foundations for KM. For example, studies of (Petrov et al. 2019) considered KM pillars as strategy, marketing, and human resource management. Another study by (Stankosky 2005) considered people, learning, technology, and organisations as the main KM pillars. Because our study focuses on cloud computing and ambidextrous learning, we adopt the study by Stankosky (2005) where people refer to SMEs' employees, technology is represented by cloud computing, learning is represented by exploitative learning and explorative learning, and the scope of the organisation is SMEs, as shown in Figure 2.

3.2 Demonstration of the research artefact

In the design science paradigm, kernel theories can be used to guide requirements for research artefacts, and both theories and requirements can be used to guide design (Walls *et al.* 1992). The theories supporting the creation of our research artefact are ambidexterity theory (Tushman & O'Reilly 1996) and the principles of a LO (Senge 1990b). The major requirement analysed from the literature is that SMEs lack an IS-based common learning platform within the organisation that enables a simultaneous approach for executing exploitative and explorative learning. In this section, we demonstrate the IS of our research artefact for enhanced continual

learning in SMEs. Because the main requirement of this study is a cloud-based IS platform and knowledge management, we selected IBM Watson cloud services, which is a world-leading KMS solution (O'Leary 2016). The dashboard sample of the IBM Watson cloud service is illustrated in Appendix A. IBM Watson services have been used in different areas, such as drug discovery to rank all human genes (Hatz et al. 2019), cognitive idea generation (Elnagar & Osei-Bryson 2019), and task automation in the accounting industry (Marshall & Lambert 2018). In our framework, we follow the contextual ambidexterity model (Birkinshaw & Gibson 2004) to transform SMEs into ALO, where learning synergies between exploration and exploitation are driven by employees who decide how to divide their time between these learning activities. The environment for learning resides in the cloud platform, where employees utilise it and act as key agents engaged in bilateral learning (Örtenblad 2019).

Two IBM Watson cloud services are used to demonstrate our research artefacts. The first service is Watson Discovery Services (WDS) facilitated by AI technology and functions with the support of a natural language processor (NLP) to build queries using simple English for knowledge explorative learning. WDS enables the rapid build of cognitive, cloud-based exploration applications that unlock actionable insights hidden in unstructured data, including SMEs' proprietary data as well as public and third-party data. In addition, AI-enabled WDS combines a functionally rich set of integrated and automated Watson APIs (Watson 2021) to

- Crawl, convert, enrich, and normalise data.
- Securely explore SMEs own proprietary content as well as free and licensed public content.
- Apply additional enrichments such as concepts, relations, and sentiments through NLPs.

These functionalities aid in exploring relevant knowledge from queries entered into the Watson platform with powerful content search capabilities. The explored knowledge can be acquired by employees and used to build knowledge articles, which are then stored in Watson's knowledgebase. One of the major benefits of using Watson is that employees can learn from their own unexplored datasets, such as emails, blogs, forums, manuals, and social networks, as well as free and licensed public content published worldwide. In addition, the Watson Discovery News module is included with WDS, which is an indexed dataset updated continuously with new articles of every industry sector daily (Watson 2021). These activities support explorative learning

(Shrestha & Chandra 2020) as employees can obtain relevant knowledge articles for their queries, facilitating efficient learning. An AI-enabled Watson discovery is illustrated in Appendix A.

Newly acquired knowledge is codified with explicit knowledge articles. Codification is one of the major features of KM (Torraco 2000) and if knowledge is not properly codified, SMEs cannot access it (Bołkunow 2019). The codification approach is mainly to document the knowledge and then collect it in a central location that allows it to be accessed without needing to contact the provider of the knowledge (Obeidat et al. 2016). In a wider context, codification promotes the standardisation and formalisation of knowledge (Janicot & Mignon 2012). Because we endorse Watson cloud services that are accessible to all employees of the firm, the codification strategy can easily be applied, which is also supported by Mohamed and Pillutla (2014). Our research highlights the fact that KM tools in the cloud can facilitate codification. Codification can be accomplished in a number of ways, such as encoding formulas, codes, budget information, word documents, patents, and expressions in natural language formats (e.g., manuals, reports, memos, or policies) or embedding knowledge in physical objects (e.g., best practices in electronic repositories, prototypes, or technologies) (Schulz & Jobe 2001; Meroño-Cerdan et al. 2007; Júnior et al. 2020). Employees can also codify tacit knowledge as knowledge articles are stored in Watson.

Polanyi (1962) stated that tacit knowledge cannot be articulated. However, recent studies (Dalkir 2013; Paraponaris et al. 2015) support that tacit knowledge can be potentially translated into explicit knowledge, with appropriate resources (Schulz & Jobe 2001) or with the support of networks and technological tools (Obeidat et al. 2016). Watson also plays a decisive role in the application of the codification strategy (Janicot & Mignon 2012) in transforming tacit knowledge into explicit knowledge (Ali et al. 2019). When both tacit and explicit knowledge are codified in a structured and formalised way in the organisation, complete organisational knowledge will be in an explicit format (Dalkir 2013; Dagenais et al. 2020), which can be broadly applied to related but diverse experiences or issues. The codified knowledge is stored in the Watson Knowledge Catalog service (WKC), which is IBM Watson's second service. The major benefit of WKC is that it connects employees to the data and knowledge that they need. The WKC provides various services, and we selected storage and sharing services for this study. WKC provides a separate platform for employee collaboration that is utilised for sharing knowledge articles, and employees

can have access to knowledge articles without requiring separate credentials or being able to access them (IBM 2022). Only those employees who are added to the collaborative platform can access it. Employees can utilize any of the uploaded knowledge articles. Because the artefacts are stored in Watson cloud services, employees can easily access knowledge articles using devices such as smartphones or tablets (Gupta et al. 2013) at any time and anywhere (Khayer et al. 2020) facilitating swift exploitative learning. The sample for Watson knowledge creation, storage, and sharing is illustrated in Appendix A.

In summary, we can suggest that AI-enabled WDS and WKC in combination can create a continual learning environment inside SMEs, facilitating their transformation into ALO, where AI is directly supporting explorative learning. This study uses IBM Watson services that are freely available in its Lite version, and the research team determined that this is sufficient to demonstrate the working operations of the research artefact.

3.3 Evaluation of the research artefact

We employed an exploratory, multisite intervention-based case study approach to evaluate our research artefact. Despite the growing literature on learning organisations, there is currently no design science based theoretical artefact that explains how cloud computing can create a continual learning environment to facilitate explorative learning and exploitative learning that can transform SMEs into ALO. Therefore, we adopted the revelatory cases (Benbasat et al. 1987). The motivation to adopt a multiple-case study approach is that it includes SMEs in different industries and at different stages of development, allowing for an overall understanding of the complex phenomenon in the ambidextrous learning context for promoting continual learning inside SMEs. This research was conducted according to the suggestions and guidelines for qualitative methodology (Strauss 1987). Because we used a research artefact that was demonstrated with a cloud implementation in a real-world setting, we were receptive to the emergence of new concepts and relationships.

3.3.1 Case selection:

The research sample group consisted of four SMEs from India and three SMEs from the UAE, as illustrated in Table 1. Based on ambidextrous learning literature, the success of organisational learning largely depends on the participants in the organisation (Birkinshaw & Gibson 2004). Therefore, we carefully identified employees from each SME who have digital proficiency, as our study follows an intervention based DSR approach, and we expect our participants to successfully utilise IBM Watson cloud services. Another commonality in our case selection was that every SME understood the value of continual learning in their firm and considered knowledge a strategically important resource. Moreover, they all fell under the category of J-form type SMEs, showing an inclination towards explorative learning and discarding explorative learning, and they did not have a common cloud-based platform for learning. Other major factors we considered in the case of SMEs included the need for a high degree of cooperation to maintain credibility with the research team when conducting semi-structured interviews.

No	**Firm**	**Type – Sector**	**Participants – ID KW=Knowledge worker**	**Country of Operation**
1	Company A	Medium – Construction Established in 2003	Senior Manager – KW1 Manager – KW2 Designer – KW3 Detailer – KW4	India
2	Company B	Medium – Food manufacturing Established in 1996	Manager – KW1 Op. Exec – KW2 Prod Head – KW3 Packaging Head – KW4	India
3	Company C	Small – Transportation	Manager – KW1 Ops. Head– KW2 Customer service executive – KW3	India

		Established in 2018	Documentation officer – KW4	
4	Company D	Small – Transportation & Logistics Established in 2015	Manager – KW1 Ops. Head – KW2 Logistic officer – KW3 Shipping Coordinator – KW4	India
5	Company E	Medium - – Transportation & Logistics	Manager – KW1 Ops. Head– KW2 Line Coordinator – KW3 Documentation officer – KW4	UAE
6	Company F	Small – Freight forwarding and Supply chain	Manager – KW1 Ops. Head– KW2 Customer service executive – KW3 Documentation officer – KW4	UAE
7	Company G	Small – Health sector	Senior Dr – KW1 Junior. Dr– KW2 Service assistant – KW3 Front office Desk assistant – KW4	UAE

Table 1: Participant SMEs Details

3.3.2 Data collection and data analysis:

Before data collection, we trained the selected participants of the case SMEs to use cloud services for explorative and exploitative learning towards implementing a continual learning environment inside the firm. We collected data from the case study SMEs in three time period

slots. In the first slot (T1), we handed over Watson services accounts in 2019. We provided separate Watson credentials to each participant to enable them to work independently on the platform. Our seven participants used the services for one year to understand the role of knowledge exploration and exploitation capabilities in their firm. The main intention during T1 was to support knowledge augmentation in SMEs. After using the cloud services for one year (2020), we conducted semi-structured interviews with the knowledge workers (T2). The interview transcripts were imported into NVivo software for thematic analysis. Our results showed that cloud services (in this context: Watson) enable knowledge explorative capabilities as well as knowledge exploitative capabilities to support knowledge ambidextrous outcomes facilitating technology-driven innovation. At another time period T3, we allowed all participants of seven SMEs to continue using the cloud services for another one more year of 2021 with the same Watson credentials. On completion of the year 2021, another set of semi-structured interviews were conducted. From each case firm, we sampled six to eight participants. For each case site, we first established a relationship with a top management team in the SMEs as the main point of contact. We briefed this person about the research project by conducting a teleconference session using Zoom at T1, T2 and T3. Suitable respondents in each SMEs were selected with the support of the manager at T1 and the same participants were part of the team at T2 and T3. We provided training to each participant through an online zoom session and provided the user manual to use the cloud services at T1, T2 and T3. While participants were using the Watson services, we provided fortnightly check-in support to clarify doubts during every time period. The interviews at T3 were based on a set of open-ended questions that were developed from the study by (Marsick & Watkins 2003). All the interviews were video recorded through zoom. Each interview transcript was analysed to understand the progress on their journey to be an ambidextrous learning organisation using a cloud platform. The summary of outputs during three time periods is illustrated in Figure 3.

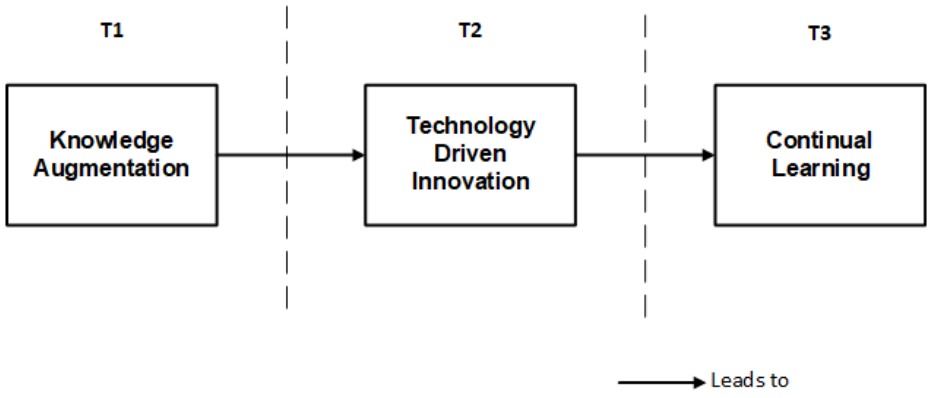

Figure 3: Intended output during different time slots

The data analysis process broadly followed the recommendations of (Strauss 1987; Eisenhardt 1989; Yin 2009). The interview data was then uploaded to Nvivo software for coding. Three rounds of coding were conducted to analyse the data. In the first round, we conducted open coding where we followed a word-by-word scrutiny of the transcripts. This helped us to identify concepts that were related to evidence of ambidextrous learning that can be attributed to cloud services that were salient in the data. In the second round, we conduct axial coding to better align, refine the emergent themes that support continual learning. The emergent themes are also supported by the prior studies. Finally, the emergent themes were further clustered into theoretical constructs (Chen et al. 2022), where we correlated these constructs with Peter Senge's five disciplines for learning organisation (Senge 1990b). We then combined the emergent themes – knowledge explorative and exploitative capabilities leading to technology driven innovation (TDI) from the T1 dataset that supported the T2 dataset emergent themes leading to continual learning inside SMEs, holistically supporting the system thinking concept of SMEs transformation to ALO. We follow (Watkins & Marsick 1993) who explained that key learning elements of a learning organisation falls under three organisation levels including individual, group, and organisational. Therefore, we categorised Senge's five disciplines under three organisational levels. In sum, the data set was transcribed, tabulated, and analysed according to the themes identified. The complete details of the data analysis process are illustrated in Figure 4.

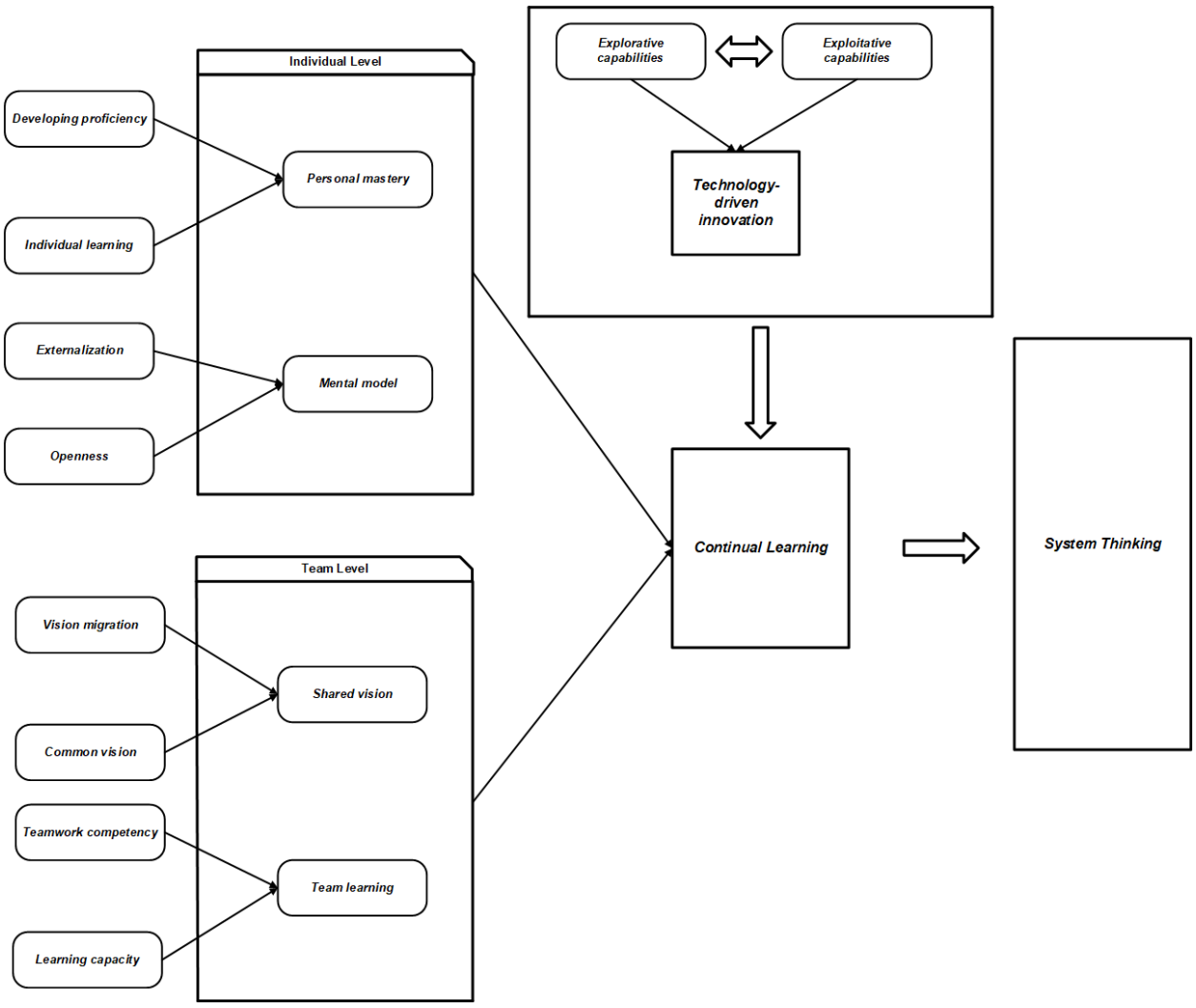

Figure 4: The data analysis process

3.3.3 Findings

To examine the findings related to our artefact's impact on SMEs' transformation into ALO, we paired our results with the five disciples of LO (Senge 1990b) as well as with the antecedents of ambidextrous learning (Raisch & Birkinshaw 2008) that emerged from the T1 dataset. According to Senge (1990b), an LO should follow five disciplines: personal mastery, mental models, shared vision, team learning, and system thinking.

Kops (1997) mentioned that the tendency for effective learning inside an organisation is enhanced by a supportive learning environment. Our study is in line with Kops (1997) findings, as Watson cloud services provide a learning environment for continual learning in SMEs. This study provides evidence that a workplace practicing ambidextrous learning using cloud services inside SMEs may provide fertile ground for cultivating a focused continual learning environment for transforming SMEs into ALO and AI can directly support explorative learning. To discuss this transformation, we correlated Peter Senge's and the antecedents of ambidextrous learning with our findings outlined below.

a) Building Personal Mastery to continual learning:

SMEs learn through employees who learn effectively. According to (Senge 1990b), personal mastery is the discipline of "continually clarifying and deepening our personal vision, of focusing our energies, of developing patience, and of observing reality objectively; it is considered a special kind of proficiency and it is not about dominance, but rather about calling". We found that developing proficiency and individual learning are the key criteria that SMEs should aim to enhance their personal mastery for continual learning.

1. ***Developing proficiency:***

Many of the participants seemed very concerned with their proficiency level; they were unaware of how to learn constantly to gain more knowledge to upgrade their self-knowledge, skills, and competencies on a regular basis. Traditionally, SMEs rely on exploitative learning through their experience and prior knowledge, with limited explorative learning (Randall et al. 2017). With the introduction of our research artifact instance (Watson) in SMEs, employees succeeded in learning new knowledge beyond their own experience and in line with understanding upcoming trends to gain superiority through developing personal knowledge and observing reality objectively. This increases the efficiency of staff and develops mastery in their areas of expertise for the organisation. For instance, KW1 of Company G, who works as an Ayurvedic medical practitioner, mentioned that he found some innovative medical articles that were new to him, and he wanted to explore more about them.

"*.. Most of the topics I read through the platform seem innovative and new to me, and some are also known to me. For example, an article about green nanotechnology based Ayurvedic formulations. I know I have already prepared the formulations... However, this study utilised plasma gold nanoparticles. It is a good study that can help us, and I believe it is important information that needs to be understood further.*" [*Company G, KW1*]

Most importantly, Watson helped to share the gained knowledge with the peer group and store the knowledge (tacit and articles) on a common platform, as knowledge articles were accessed by co-workers for future use to refine existing knowledge, facilitating exploitative learning. Watson is used as a tool for employees to handle challenges and excel in their field by providing and managing a large amount of knowledge. This supports the continual learning process inside SMEs to assist employees in identifying issues and providing better solutions, thereby developing mastery capabilities.

"*…this platform is venue for all the employees to voice their suggestion and at many a times is valuable, if not for such a platform we would never have heard such comments/guidance especially from colleagues.*" *[Company F. KW2]*

"...If we are interested in a particular area, we can search for that and gather as much information as possible. And we can keep it on a common platform; therefore, it is efficient. " [Company A. KW3]

2. ***Individual learning:***

Employees' learning from work is defined as individual learning (Lau et al. 2020). Individual learning entails employees looking for opportunities to acquire new skills and knowledge. To adapt to a changing environment, it is essential that employees identify and enhance their knowledge and skills. Explorative learning is required to acquire new knowledge, and exploitative learning is required to refine existing knowledge. AI features in Watson provide direct support for explorative learning and the generated knowledge facilitates exploitative learning (Gonzalez 2019). Therefore, when employees choose explorative learning, they pursue additional information and more in-depth learning related to their sector, whereas when employees choose exploitative learning, they attempt to work more efficiently as they utilize existing knowledge (Greco et al. 2019). These activities help in continual learning within SMEs, leading to the development of personal mastery in their area of expertise.

".. The first place where you go and explore all that is what you are supposed to do, and you will have every *knowledge ready in Watson. Certainly, any person who is keen to know more about and whatever happens in your industry can learn through searching on this platform.*" *[Company B, KW2]*

".. Because content and knowledge are accessible to more people over a digital platform, it motivates people to learn more and understand more, and it helps them in their daily work in a better way. We learn about every area of the sector." *[Company E. KW2].*

b) Creating Mental Models for continual learning

The discipline of the mental model includes learning to unearth our internal pictures of the world, bringing them to the surface, and scrutinizing them rigorously (Senge 1990b). Mental models involve the development of assumptions and generalisations held by individuals and organisations based on theories that may or may not be supported by actual data (Rook 2013). Nonaka and Konno (1998) categorised mental models under "cognitive dimension" of tacit knowledge and linked mental model conversion to explicit form through dialogue exchange. In our study, we followed Nonaka's study (Nonaka & Konno 1998) and considered knowledge articles as mental models for employees, as employees can express their ideas and tacit knowledge through knowledge articles. The key criteria for a mental model that SMEs should develop for continual learning are externalisation and openness.

3. Externalisation:

Externalisation is defined as the conversion of tacit knowledge into explicit knowledge (Nonaka 1994). Participants conduct explorative learning in AI-enabled WDS services, and the acquired knowledge is converted into knowledge articles by employees, which are stored, shared, and exploited in SMEs. If the participants conduct exploitative learning, a refinement of the existing relevant knowledge occurs. The mental model is one of the benefits that cloud computing can offer to SMEs while transforming to ALO, as with the scalability feature, the cloud can store an enormous number of knowledge articles and it will be released as well as shared on request from any location. For instance, KW2 of company B stated, "*When things are documented...this helps to express people's views and helps in collaboration; more people can reach the knowledge base articles that help them improve their knowledge*". Sharing and reflecting mental models aids in correcting mistakes and errors (Lee et al. 2021a). Knowledge creation, storage, and sharing facilitated by Watson help employees understand various mental models and promote continual learning inside SMEs.

"*.. As a commercial organisation we insist our staff to use Watson as a reference and manifest their gained knowledge here*." *[Company B. KW1]*

2) Openness

Mental models have been proven to affect individuals' actions (Rook 2013); therefore, the creation and sharing of mental models is vital in SMEs, as it aids in improving the work competency of employees (Örtenblad 2019). Although knowledge sharing is the strongest antecedent of organisational learning (Borge et al. 2018; Park & Kim 2018), this is seldom followed by employees of SMEs because of a lack of time. As organisational members have different roles and responsibilities, it can become difficult to encourage interaction, particularly when addressing the conversion of tacit knowledge into explicit knowledge that is required to be shared with others (Nonaka, 1995). Watson provides a no-barrier platform for sharing ideas and novel knowledge acquired related to industry and engages in free and open discourse for efficient learning. For instance, KW1 of company C mentioned that "*... We had a new learning together. Thus, we created freshly on Watson rather than creating it in a spreadsheet or documents*."

Shared knowledge may provide missing or corrected aspects of the mental model or provide evidence that reinforces an existing model (Chi 2008). Watson's knowledge-sharing platform also facilitates explorative learning, as employees can search for new knowledge shared by their co-workers. For instance, regarding the value of openness, KW1 of company D mentioned that "...*on the contrary, all the employees are encouraged to put forth their opinion based on what they understand from the knowledge article*." This implies that Watson's openness in sharing knowledge directly supports the creation and modification of mental models that facilitate continual learning in SMEs.

".. This becomes very important in this pandemic period, when people are not able to connect face-to-face; thus, this is actually an easy way for others to read and understand the views of other workers when they share what they have learned from this platform." [Company E. KW2]

.. the window, the tab is also very friendly because we can do it in simple steps and then share the knowledge with coworkers. Previously, there was no common platform for sharing knowledge among coworkers. As a solution, it is user friendly, from my understanding, my coworkers can easily explore knowledge from the platform." [Company A. KW1]

c) Fostering Shared Vision for continual learning:

A shared vision is defined as building a common understanding of an organisation's desired future as a collective vision. A truly shared vision is achieved when each member of the

organisation translates the organisational vision into a personal vision that enables them to plan, strategize, monitor, and evaluate their efforts toward achieving the objective (Hutasuhut et al. 2021). If an SME follows a shared vision strategy, every employee will have a common unified objective (Akella 2020). The key criteria for a shared vision that SMEs should manage for continual learning are common vision and vision migration.

1. **Vision migration**

The knowledge management strategy of any organisation is developed based on its vision (Gold et al. 2001). Traditionally, employees in SMEs follow managers' instructions while selecting knowledge articles for the firm. This enforces the top-down navigation of vision. The benefits of a shared vision in SMEs are that it provides employees with a direction in which they should navigate (Griego et al. 2000) and also provides focused learning. Watson services help to create an environment for increased exploration. When employees started contributing towards explorative learning through AI-enabled WDS, it created a framework to promote navigation of the vision bottom-up. Common vision is enhanced when bottom-up navigation of vision is achieved (Kezar 2012; Kaiser et al. 2021). For instance, KW2 of company A stated that "*Yes, according to the vision of the organisation, directs resources, directed employees, to search for knowledge articles in line with their vision*. When participants conduct explorative learning through AI-enabled WDS, they will find various pieces of knowledge that aid them in modifying the existing knowledge, allowing an effective vision. When there is a genuine vision inside SMEs, employees excel and learn continually, not because they are told to, but because they want to (Senge 1990b)

> *".. The search database, which is oriented towards workplace safety purposes, Watson will help to direct search based on the goal that needs to be achieved' [Company F. KW1].*

> *".. Once we have access to the relevant knowledge it helps us to adjust our goals or reset our goals, make course corrections" [Company B. KW3]*

2. Common vision:

For many years practitioners and academics alike have argued that the creation of a common vision for the employees motivates them to make decisions and inspires them to reach beyond their current state (Boyatzis et al. 2015). This implies that creating common vision inside an organisation should be viewed as a propelling force that could drive all members in organisations (Huang et al. 2017). Our study found that creation of a common vision can be seen

as an instance of a knowledge creating and ambidextrous learning process that transforms personal visions and organisational visions through a dialectic process towards a shared organisational vision (Kaiser et al. 2021). For instance, KW1 of company C has stated that the knowledge articles which he created from acquiring knowledge from Watson is for the entire team to perform better. *".. As I mentioned earlier, we have created many knowledge management articles. It is not only about me as a person, but also about the team that performs the design*."

d) **Improving Team Learning for continual learning**:

Employees must act together. When employees learn together, Peter Senge (Senge 1990b) suggests that not only can there be good results for the organisation but also that employees will grow more rapidly than could have occurred otherwise. Team learning is a dynamic process of how to perform things better through sharing experience, insights, knowledge, and skills. Team learning is more than the accumulation of individual learning and develops a mental model of things that can be improved through mutual collaboration (Hutasuhut et al. 2021). Team learning always shows that it improves an individual's capacity to learn more effectively than learning alone. The key criteria that SMEs should adopt for continual team learning include teamwork competency and learning capacity.

1. Teamwork competency

Teamwork competency is defined as the ability to enhance teamwork, which mainly entails how employees behave to improve teamwork by enhancing their skills, knowledge, and attitude (Furukawa & Kashiwagi 2021). Its main characteristics include enhanced coordination, mutual performance monitoring, and team decision-making etc. (Koh et al. 2016). Watson provides comprehensive assistance to every team member, thereby facilitating continual learning. Explorative learning capacity facilitates new knowledge for team members to discuss and make decisions. They can also learn from already stored knowledge articles in the system, modify their own knowledge, and improve their skills. For instance, KW3 of Company B mentioned that "*Watson as a tool has assisted employees to handle situations or simplify procedures and make correct decisions*."

Watson enhances the efficiency of the team, as the members have now started using the system for more than two years, executing many queries and retrieving various knowledge out of

it. Therefore, the team members now feel confident in using the system, and they have started to rely on it.

"...now you know the platform and you know which documents are available and you are confident of the results the platform is providing, all these help to control resources to accomplish your work." [Company A. KW1]

Watson improves employee coordination within the team, as every credential member can undergo explorative and exploitative learning and acquire and refine their personal knowledge. Moreover, as employees share knowledge on the platform, they receive more opportunities to communicate with co-workers in the team regarding their findings, thereby improving their coordination.

".. The knowledge articles that are documented when other colleagues can go through it, that is the best way to retain the knowledge and it is an easy way of understanding in a most efficient way. "[Company F. KW2].

2. Learning capacity

Learning capacity is the ability to develop new knowledge and improve an employee's existing knowledge (Khattak et al. 2021). Learning capacity can be enhanced by focusing on KM practices, such as knowledge acquisition, creation, and sharing (Xia & Liu 2021). Therefore, facilitating knowledge creation and sharing among team members enhance the learning capacity of the entire team. Watson creates a framework for knowledge permeability, which is defined as the process of creating useful relevant knowledge within and across an organisation (Fu 2020; Tovstiga & Tovstiga 2021). Knowledge permeability aids in creating relevant knowledge articles for knowledge sharing. Explorative learning promotes knowledge permeability (Pérez-Bustamante 1999) as it provides opportunities for employees to explore various types of knowledge and create relevant knowledge for sharing and facilitating learning capacity. Therefore, Watson provides comprehensive assistance to every team member, facilitating knowledge permeability through explorative and exploitative learning and promoting continual learning.

".. I got most appropriate answers for my queries, if I share it, my colleagues will always discuss it with me. This helps in our knowledge refinement and sometimes corrects our knowledge. Thus, Watson leverages these knowledge headings. " [Company E. KW1]

"If I am there or not, my team can come and access it. Provided that they have main access. Those who all have access they can come and access it." *[Company F. KW2]*

To summarise, cloud computing aids enhancing SMEs learning capability both at individual level and at team level through creating a continual learning environment for SMEs thereby answering SQ1 of this study. At individual level, cloud services facilitate explorative learning and exploitative learning for leveraging employee's personal mastery and mental models whereas at team level, cloud services facilitate explorative learning and exploitative learning for leveraging shared vision and team learning capacity of SMEs.

4. Discussion

The primary aim of this study was to explore how to digitally transform SMEs to ALO with the support of three constructs: cloud computing, ambidextrous learning processes and KM processes. We followed DSR methodology (Hevner et al. 2004) for conducting the research. As a part of DSR, we build a preliminary research artefact by analysing the literature and the three constructs, which are the research artefacts. The main aim of the research artefact is to investigate and promote continual learning with the support of these three constructs, thereby transforming SMEs into ALO. To evaluate the artefact, we followed a case study approach in seven SMEs in India and the UAE with semi-structured interviews for analysing the artefact. To analyse our research artefact, we followed Peter Senge's (1990b) five disciplines (personal mastery, mental models, shared vision, team learning, and systems thinking) that organisations need to follow to transform into an LO. We bound our framework to each discipline and analysed the results. The findings from this study confirm that cloud services act as a pillar in creating an environment conducive to continual learning. We followed (Watkins & Marsick 1993) who explained the key learning elements of a LO at three different levels of analysis: individual, group, and organisational. In our analysis, we bound Senge's principles under the three levels and found that personnel mastery and mental models can be categorised at the individual level, as it includes the continual learning of employees in SMEs. Shared vision and team learning fall under the category of group level, as they include the continual learning of various teams inside SMEs. Finally, system thinking will be categorised at the organisational level, as it considers the holistic approach of the learning environment facilitated by continual learning and cloud services leading to ALO. The theoretical model demonstrating the SME transformation into ALO, based on our findings, is illustrated in Figure 5.

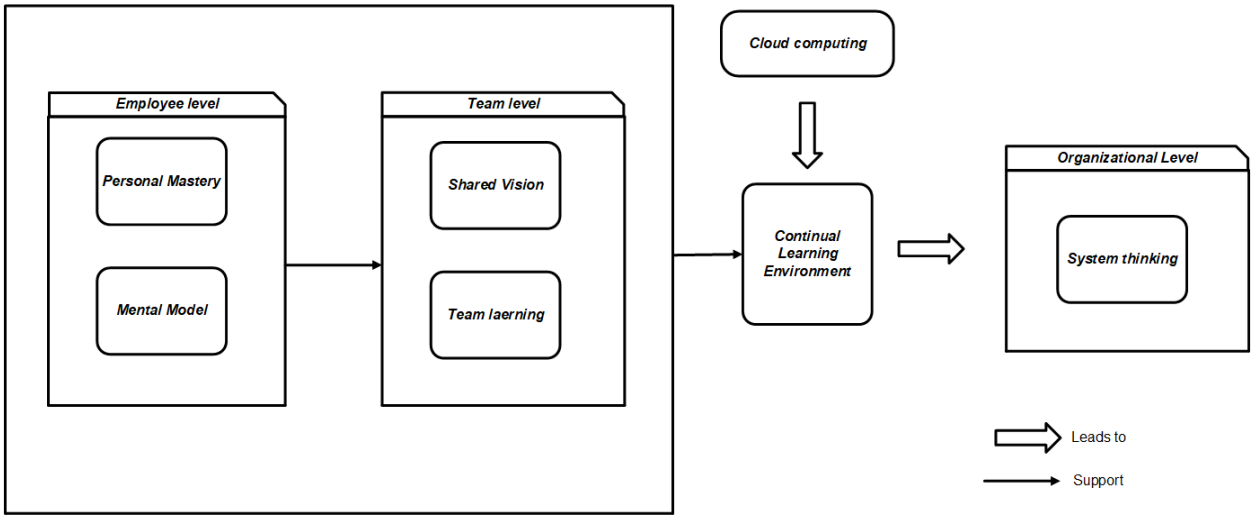

Figure 5: Theoretical model demonstrating SME transformation to ALO

4.1 Demonstration of path to ALO – Answering SQ2

The knowledge artefacts explored using the cloud services can be used for both explorative learning and exploitative learning in the firm. To maximise explorative learning, creation of knowledge artefacts that are useful/relevant to the firm is a key focus area (Le Dinh et al. 2013) and these knowledge artefacts are to be explored to maximise exploitative learning (Benitez et al. 2018). Then, the learning aspect with respect to exploration and exploitation will work in tandem to transform the SMEs into ALO.

To verify whether our research model supports continual learning, we followed Peter Senge's study, which emphasises that a LO should follow five disciples (personal mastery, mental models, shared vision, team learning, and system thinking) for promoting continual learning (Senge 1990b). Our findings categorically show that personal mastery is enhanced when cloud services facilitate explorative and exploitative learning by providing a constant stream of relevant knowledge. In mental models, we assert that cloud services will support the modification of existing mental models and creation of new mental models through explorative and exploitative learning. Cloud services can manage a large number of relevant knowledge articles (even converting tacit knowledge to explicit form) and provide access to every employee for rigorous analysis (Senge 1990a). The personal mastery gained by the employees will help them to explore both internal as well as external knowledge and internalise these knowledge by converting them to explicit form and providing access to every co-worker using cloud services. Cloud services

create an environment to facilitate both bottom-up and top-down navigation of knowledge flow inside SMEs. The strategic common vision of the firm flows into this environment, resulting in a shared vision. Here, the employees undergo explorative as well as exploitative learning according to the shared vision of the firm using cloud services. Team learning builds on personal mastery, mental models, and shared vision (Senge 2006). The cloud services assist team learning by facilitating relevant knowledge through explorative and exploitative learning. In every discipline, AI plays a vital role in enhancing explorative learning. When capabilities of personal mastery, mental models, and shared vision in SMEs are enhanced through explorative and exploitative learning, the team learning capability is also enhanced. The combined effect of these four disciplines results in a continual learning environment with the support of explorative and exploitative learning using cloud services

4.2 Systems thinking

Systems thinking is the cornerstone of the ALO. Systems thinking is a conceptual framework for problem-solving that considers problems in their entirety (Rubenstein-Montano et al. 2001; Al-Raqadi et al. 2016). Systems thinking helps employees to understand that each component of the organisation, such as the individuals, departments, decisions, products, and services, are all intercorrelated elements that influence each other in a larger context of problem solving (Senge 1990b). Systems thinking integrates all the other four disciplines and creates an environment for effective learning to solve organisational problems (Bratianu 2015). In our research, we explored how Peter Senge's four disciplines collectively enhance system thinking while transforming SMEs into ALO using cloud services.

According to our analysis, the key criteria for system thinking that SMEs should adopt are system awareness, inter-relationship awareness, holistic thinking, and response to complex contexts. System awareness is directly linked with employee level learning, as developing personal mastery and mental models aids employees to understand their knowledge requirements as well as the knowledge requirements of co-workers. This enables employees to focus on continual learning through explorative learning and exploitative learning, resulting in the transformation into ALO. Employees can efficiently solve problems based on the requirements. Inter-relationship awareness

is linked with team level learning because team learning and shared vision aid teams in facilitating relevant knowledge through focused learning. Because team members achieve clear vision and enhanced teamwork, they focus on continual learning for transformation into ALO. The shared vision allows to create an environment of holistic thinking for the employees of SMEs. The relevant knowledge stored in the cloud services facilitates continual learning and enables the employees to respond to any complex context as a part of their problem-solving engagements. Therefore, we can argue that system thinking can be achieved by establishing a continual learning environment in which employees implement explorative and exploitative learning using cloud services. To summarise, we contend that developing a continual learning environment using explorative and exploitative learning using cloud services aids SMEs in transforming into ALO.

From a theoretical perspective, we first contribute to the literature on LOs. Since the mid-1990s, numerous quantitative and qualitative studies have examined a wide range of aspects of LOs through the lens of Peter Senge's five disciplines, concluding that Peter Senge's disciplines play a vital role in LOs. We examined the literature and concluded that, from the perspective of SMEs, ambidextrous learning processes are unexplored and ambiguous, and it is unclear how cloud technology aids in transforming SMEs into ALO. From the literature, it has been found that learning is least structured in SMEs, and the impact of IS on the ambidextrous learning aspect is unexplored in most studies. To overcome these issues, we introduced a cloud service that aids explorative and exploitative learning, facilitating continual learning to transform SMEs into ALO. The findings of our study extended the scholarly understanding of how to analyse ambidextrous learning opportunities through a DSR approach (Hevner et al. 2004). To the best of our knowledge, this is the first study to examine the effects of cloud computing on ambidextrous learning within the SME sector. Previous research suggests that studies exploring the use of cloud computing in SMEs are relatively scarce (Sultan 2013a; Balina et al. 2017) and existing studies have not examined the ambidextrous learning aspect in cloud platforms (Depeige & Doyencourt 2015), Through this study, we argue that SMEs following ambidextrous processes using cloud computing will promote knowledge augmentation in the firm and continued implementation of the processes will first lead to technology-driven innovation followed by creating a continual learning environment inside the firm aiding it to transform to ALO. Finally, we contributed a research artefact framework and demonstrated a path to ALO, which can be followed by any SME for transforming into ALO.

From the practitioners' point of view, our findings help employees of SMEs identify the key indicators that are better suited to transform their organisation into an ALO. This study provides a framework for demonstrating how cloud computing facilitates continual learning through explorative and exploitative learning. Employees can benefit from becoming an ALO as they can exhibit their potential to their employers, become skilful professionals, and instill an interest in learning. By contrast, cloud computing encourages employees to learn exploratively and to acquire knowledge from multiple sources, such as big data. The cloud also provides knowledge of demand-facilitating exploitative learning. Furthermore, cloud computing manages knowledge effectively to increase SMEs' capabilities. By following these practices, employees can gain new insights and refine their knowledge to correct errors or improve their work. Therefore, SMEs focusing on continual learning through explorative and exploitative learning processes can effectively avoid obsolescence and compete better in their field.

4.3 Limitation and Future directions:

The current study has several limitations that need to be considered. The case studies were limited to two countries. The findings of the study can be generalised only to private organisations that have similar demographic profiles rather than considering wider participants from other countries following different operational structure. Therefore, the future researchers could examine the same research model in different cultural contexts in various industrial sectors. This study takes a qualitative approach to determine the relationship between cloud technology, learning aspects of ambidexterity processes and KM. Given the relative novelty of this topic, such methodology can be justified. However, the usual limitations of qualitative study and purposive case study approach applies. In order to make this study more generalisable, the proposed relationships must be studied from a quantitative lens to offer wider validity and reliability of findings through accurate measurements that allow a statistical analysis (Queirós et al. 2017). In this study, we have designed the framework of ALO for SMEs emphasising cloud technology. However, future research considerations can extend the NLP/AI features of Watson and redesign the framework to look beyond SMEs and cloud technology. This will benefit researchers to cover a wider range of industry and evaluate how NLP/AI facilitate organization in ALO transformation. Moreover, the quantitative research method is the dominant method followed by researchers as it covers a larger sample group, and does not require relatively a longer time for data collection

(Rahman 2020). Therefore, future researchers might consider quantitative research methods in their study for evaluating the artefact.

5. Conclusion

We examined whether cloud computing enables SMEs to become ambidextrous learning organisations by creating a continual learning environment with the support of ambidextrous learning processes and cloud computing. We explored one research question with two sub-questions on this topic. The main research question is to analyse whether cloud computing transforms SMEs to become an ambidextrous learning organisation. Proposing that a continual learning environment and ambidextrous learning processes are two major constructs for ALO transformation, we created our first sub-question to examine whether cloud services could enable knowledge explorative and exploitative learning for SMEs to promote continual learning. To completely understand the formation of a continual learning environment for ALO, we created our second sub-question to investigate how a continual learning environment supports SMEs transformation into an ALO. To answer these questions, we followed a design science research methodology and created a preliminary research artefact to investigate how continual learning can be implemented in SMEs. For evaluating the artefact, we selected seven SMEs from India and UAE that operate in diverse industries, and we conducted semi-structured interviews for data analysis. The findings from our study revealed that cloud computing aids enhancing SMEs learning capability both at individual level as well as at team level leading to creation of a continual learning environment. Literature has supported that the advanced IS have made it feasible for individuals to learn through providing e-learning platforms (Agrawal 2021). This enhances individual level learning capabilities. Cloud services also facilitate team learning through collaborative tools such as social media (Sein-Echaluce et al. 2021; Zou & Jian 2021) that promote team level learning capabilities. However, there are limited studies on how cloud computing supports ambidextrous learning to create a continual learning environment inside SMEs. Once a continual learning environment is created, it enables systems thinking and combined with individual and team learning capabilities, SMEs can be transformed into an ALO. We argue that

creating a continual learning environment using explorative and exploitative learning with the support of cloud computing supports SMEs transformation into ALO.

6. References

Agrawal, S 2021, 'A survey on recent applications of Cloud computing in education: Covid-19 perspective', *Journal of Physics: Conference series*, IOP Publishing, p. 012076.

Akella, D 2020, 'A learner-centric model of learning organizations', *The Learning Organization*.

Al-Emran, M, Mezhuyev, V, Kamaludin, A & Shaalan, K 2018, 'The impact of knowledge management processes on information systems: A systematic review', *International Journal of Information Management*, vol. 43, pp. 173-87.

Al-Jabri, H & Al-Busaidi, KA 2018, 'Inter-organizational knowledge transfer in Omani SMEs: influencing factors', *VINE Journal of Information and Knowledge Management Systems*, vol. 48, no. 3, pp. 333-51.

Al-Raqadi, AM, Abdul Rahim, A, Masrom, M & Al-Riyami, B 2016, 'System thinking in single-and double-loop learning on the perceptions of improving ships' repair performance', *International Journal of System Assurance Engineering and Management*, vol. 7, no. 1, pp. 126-42.

Alavi, M & Leidner, DE 2001, 'Knowledge management and knowledge management systems: Conceptual foundations and research issues', *MIS quarterly*, vol. 25, no. 1, pp. 107-36.

Ali, AA, Paris, L & Gunasekaran, A 2019, 'Key factors influencing knowledge sharing practices and its relationship with organizational performance within the oil and gas industry', *Journal of Knowledge Management*, vol. 23, no. 9, pp. 1806-37.

Ardito, L, Petruzzelli, AM, Dezi, L & Castellano, S 2018, 'The influence of inbound open innovation on ambidexterity performance: does it pay to source knowledge from supply chain stakeholders?', *Journal of Business Research*.

Argyris, C & Schön, D 1978, 'Organizational learning: a theory of action prospective. Addison-Westly', *Reading, Pennsylvania, USA*.

Arpaci, I 2017, 'Antecedents and consequences of cloud computing adoption in education to achieve knowledge management', *Computers in Human Behavior*, vol. 70, pp. 382-90.

Bag, S, Gupta, S, Kumar, A & Sivarajah, U 2021, 'An integrated artificial intelligence framework for knowledge creation and B2B marketing rational decision making for improving firm performance', *Industrial Marketing Management*, vol. 92, pp. 178-89.

Balina, S, Baumgarte, D & Salna, E 2017, 'Cloud based cross-system integration for small and medium-sized enterprises', *Procedia Computer Science*, vol. 104, pp. 127-32.

Barann, B, Hermann, A, Cordes, A-K, Chasin, F & Becker, J 2019, 'Supporting digital transformation in small and medium-sized enterprises: a procedure model involving publicly funded support units', *Proceedings of the 52nd Hawaii International Conference on System Sciences*.

Benbasat, I, Goldstein, DK & Mead, M 1987, 'The case research strategy in studies of information systems', *MIS quarterly*, pp. 369-86.

Benitez, J, Castillo, A, Llorens, J & Braojos, J 2018, 'IT-enabled knowledge ambidexterity and innovation performance in small U.S. firms: The moderator role of social media capability', *Information & Management*, vol. 55, no. 1, pp. 131-43.

Benson, V & Morgan, S 2013, 'Student experience and ubiquitous learning in higher education: Impact of wireless and cloud applications', *Creative Education*, vol. 4, no. 8a, pp. 1-5.
Bhat, JM 2013, 'Adoption of cloud computing by SMEs in India: a study of the institutional factors', *Proceedings of the Nineteenth Americas Conference on Information Systems*, Chicago, Illinois.
Bhimani, A & Willcocks, L 2014, 'Digitisation,'Big Data'and the transformation of accounting information', *Accounting and Business Research*, vol. 44, no. 4, pp. 469-90.
Birkinshaw, J & Gibson, CB 2004, 'Building an ambidextrous organisation', *Advanced Institute of Management Research Paper*, no. 003.
Bohlouli, M, Dalter, J, Dornhöfer, M, Zenkert, J & Fathi, M 2015, 'Knowledge discovery from social media using big data-provided sentiment analysis (SoMABiT)', *Journal of Information Science*, vol. 41, no. 6, pp. 779-98.
Bołkunow, W 2019, 'Knowledge Management in SMEs in Poland in Comparison to big Corporations: Pilot Study', *20th European Conference on Knowledge Management* Academic Conferences and publishing limited, Lisbon, Portugal, p. 168.
Borge, BH, Filstad, C, Olsen, TH & Skogmo, PØ 2018, 'Diverging assessments of learning organizations during reform implementation', *The Learning Organization*.
Boyatzis, RE, Rochford, K & Taylor, SN 2015, 'The role of the positive emotional attractor in vision and shared vision: Toward effective leadership, relationships, and engagement', *Frontiers in Psychology*, p. 670.
Bratianu, C 2015, 'Organizational learning and the learning organization', *Organizational Knowledge Dynamics: Managing Knowledge Creation, Acquisition, Sharing, and Transformation. Hershey, PA: Information Science Reference*, pp. 286-312.
Bratianu, C, Prelipcean, G & Bejinaru, R 2020, 'Exploring the latent variables which support SMEs to become learning organizations', *Management & Marketing. Challenges for the Knowledge Society*, vol. 15, no. 2, pp. 154-71.
Brix, J 2019, 'Ambidexterity and organizational learning: revisiting and reconnecting the literatures', *The Learning Organization*.
Cabeza-Pullés, D, Fernández-Pérez, V & Roldán-Bravo, MI 2020, 'Internal networking and innovation ambidexterity: The mediating role of knowledge management processes in university research', *European Management Journal*, vol. 38, no. 3, pp. 450-61.
Caione, A, Paiano, R, Guido, AL, Fait, M & Scorrano, P 2015, 'Knowledge Gathering from Social Media to Improve Marketing in Agri-food Sector', *Communications of the IBIMA*, vol. 2015, pp. d1-13.
Caputo, F, Garcia-Perez, A, Cillo, V & Giacosa, E 2019, 'A knowledge-based view of people and technology: directions for a value co-creation-based learning organisation', *Journal of Knowledge Management*.
Cassidy, L & Hamilton, J 2016, 'A design science research approach to website benchmarking', *Benchmarking: An International Journal*.
Cerchione, R, Centobelli, P, Zerbino, P & Anand, A 2020, 'Back to the future of Knowledge Management Systems off the beaten paths', *Management Decision*.
Cha, KJ, Kim, YS, Park, B & Lee, CK 2015, 'Knowledge management technologies for collaborative intelligence: A study of case company in Korea', *International Journal of Distributed Sensor Networks*, vol. 11, no. 9, p. 368273.
Chan, I 2017, 'Knowledge Management Hybrid Strategy with People, Technology and Process Pillars', in *Knowledge Management Strategies and Applications*, IntechOpen.

Chan, JO 2014, 'Big data customer knowledge management', *Communications of the IIMA*, vol. 14, no. 3, p. 5.
Chen, P-T, Lin, C-L & Wu, W-N 2020, 'Big data management in healthcare: Adoption challenges and implications', *International Journal of Information Management*, vol. 53, p. 102078.
Chen, Y, Luo, H, Chen, J & Guo, Y 2022, 'Building data-driven dynamic capabilities to arrest knowledge hiding: A knowledge management perspective', *Journal of Business Research*, vol. 139, pp. 1138-54.
Chi, MT 2008, 'Three types of conceptual change: Belief revision, mental model transformation, and categorical shift', *International handbook of research on conceptual change*, vol. 61, p. 82.
Cupial, M, Szelag-Sikora, A, Sikora, J, Rorat, J & Niemiec, M 2017, *The use of IT tools for knowledge management in companies*, Institute of Economic Research (IER).
Czakon, W, Niemand, T, Gast, J, Kraus, S & Frühstück, L 2020, 'Designing coopetition for radical innovation: An experimental study of managers' preferences for developing self-driving electric cars', *Technological Forecasting and Social Change*, vol. 155, p. 119992.
Dagenais, C, Dupont, D, Brière, FN, Mena, D, Yale-Soulière, G & Mc Sween-Cadieux, E 2020, 'Codifying explicit and tacit practitioner knowledge in community social pediatrics organizations: Evaluation of the first step of a knowledge transfer strategy', *Evaluation and Program Planning*, vol. 79, p. 101778.
Dalkir, K 2013, *Knowledge management in theory and practice*, Routledge.
Del Giudice, M, Maggioni, V, Cruz-González, J, López-Sáez, P, Navas-López, JE & Delgado-Verde, M 2014, 'Directions of external knowledge search: investigating their different impact on firm performance in high-technology industries', *Journal of Knowledge Management*.
Depeige, A & Doyencourt, D 2015, 'Actionable Knowledge As A Service (AKAAS): Leveraging big data analytics in cloud computing environments', *Journal of Big Data*, vol. 2, no. 1, p. 12.
Dezi, L, Santoro, G, Gabteni, H & Pellicelli, AC 2018, 'The role of big data in shaping ambidextrous business process management', *Business Process Management Journal*, vol. 24, no. 5, pp. 1163-75.
Dirani, K, Baldauf, J, Medina-Cetina, Z, Wowk, K, Herzka, S, Bolio, RB, Martinez, VG & Ubando, LAM 2021, 'Learning organization as a framework for networks' learning and collaboration', *The Learning Organization*.
Duchek, S 2020, 'Organizational resilience: a capability-based conceptualization', *Business Research*, vol. 13, no. 1, pp. 215-46.
Duncan, RB 1976, 'The ambidextrous organization: Designing dual structures for innovation', *The management of organization*, vol. 1, no. 1, pp. 167-88.
Eisenhardt, KM 1989, 'Building theories from case study research', *Academy of management review*, vol. 14, no. 4, pp. 532-50.
Elnagar, S & Osei-Bryson, K-MA 2019, 'A Cognitive Ideation Support Framework using IBM Watson Services'.
Enkel, E & Heil, S 2014, 'Preparing for distant collaboration: Antecedents to potential absorptive capacity in cross-industry innovation', *Technovation*, vol. 34, no. 4, pp. 242-60.

Erdem, A & Şeker, F 2022, 'Tourist Experience and Digital Transformation', in *Handbook of Research on Digital Communications, Internet of Things, and the Future of Cultural Tourism*, IGI Global, pp. 103-20.
Filippini, R, Güttel, WH & Nosella, A 2012, 'Ambidexterity and the evolution of knowledge management initiatives', *Journal of Business Research*, vol. 65, no. 3, pp. 317-24.
Flores, LG, Zheng, W, Rau, D & Thomas, CH 2012, 'Organizational learning: Subprocess identification, construct validation, and an empirical test of cultural antecedents', *Journal of management*, vol. 38, no. 2, pp. 640-67.
Fu, JS 2020, 'Understanding the Internal and External Communicative Drivers of Organizational Innovativeness', *Communication Research*, p. 0093650220981299.
Furukawa, A & Kashiwagi, K 2021, 'The relationship between leadership behaviours of ward nurse managers and teamwork competency of nursing staff: A cross-sectional study in Japanese hospitals', *Journal of Nursing Management*, vol. 29, no. 7, pp. 2056-64.
Gast, J, Gundolf, K, Harms, R & Matos Collado, E 2019, 'Knowledge management and coopetition: How do cooperating competitors balance the needs to share and protect their knowledge?', *Industrial Marketing Management*, vol. 77, pp. 65-74.
Gold, AH, Malhotra, A & Segars, AH 2001, 'Knowledge management: An organizational capabilities perspective', *Journal of management information systems*, vol. 18, no. 1, pp. 185-214.
Gonzalez, RVD 2019, 'Knowledge exploration and exploitation in team context', *Total Quality Management & Business Excellence*, vol. 30, no. 15-16, pp. 1654-74.
Greco, LM, Charlier, SD & Brown, KG 2019, 'Trading off learning and performance: Exploration and exploitation at work', *Human Resource Management Review*, vol. 29, no. 2, pp. 179-95.
Griego, OV, Geroy, GD & Wright, PC 2000, 'Predictors of learning organizations: a human resource development practitioner's perspective', *The Learning Organization*.
Gupta, AK, Smith, KG & Shalley, CE 2006, 'The interplay between exploration and exploitation', *Academy of Management journal*, vol. 49, no. 4, pp. 693-706.
Gupta, P, Seetharaman, A & Raj, JR 2013, 'The usage and adoption of cloud computing by small and medium businesses', *International Journal of Information Management*, vol. 33, no. 5, pp. 861-74.
Hartstein, B & Yackel, E 2021, 'The United States Army Medical Command, becoming a learning organization', *The Learning Organization*.
Hatz, S, Spangler, S, Bender, A, Studham, M, Haselmayer, P, Lacoste, AM, Willis, VC, Martin, RL, Gurulingappa, H & Betz, U 2019, 'Identification of pharmacodynamic biomarker hypotheses through literature analysis with IBM Watson', *PloS one*, vol. 14, no. 4, p. e0214619.
Hevner, AR 2007, 'A three cycle view of design science research', *Scandinavian journal of information systems*, vol. 19, no. 2, p. 4.
Hevner, AR, March, ST, Park, J & Ram, S 2004, 'Design science in information systems research', *MIS quarterly*, pp. 75-105.
Huang, R-T, Chou, TP & Chen, C-P 2017, 'Examining the roles of shared vision and career growth opportunity in developing new employees', *Journal of Organizational Change Management*.
Huber, GP 1991, 'Organizational learning: The contributing processes and the literatures', *Organization science*, vol. 2, no. 1, pp. 88-115.

Hutasuhut, I, Adruce, SAZ & Jonathan, V 2021, 'How a learning organization cultivates self-directed learning', *Journal of Workplace Learning*.
Hwang, G-J, Wang, S-Y & Lai, C-L 2021, 'Effects of a social regulation-based online learning framework on students' learning achievements and behaviors in mathematics', *Computers & Education*, vol. 160, p. 104031.
IBM, C 2022, *Watson Knowledge Catalog on Cloud Pak for Data*, https://www.ibm.com/docs/en/cloud-paks/cp-data/4.0?topic=services-watson-knowledge-catalog>.
Irum, A & Pandey, A 2019, 'Social media – Changing the face of knowledge management', *Development and Learning in Organizations: An International Journal*, vol. ahead-of-print, no. ahead-of-print.
Iyengar, K & Montealegre, R 2021, 'Knowledge Management System Use as a Key Driver of Professional and Organizational Cognitive Engagement', *Journal of the Association for Information Systems*, vol. 22, no. 2, p. 3.
Iyengar, K, Sweeney, J & Montealegre, R 2021, 'PATHWAYS TO INDIVIDUAL PERFORMANCE: EXAMINING THE INTERPLAY BETWEEN KNOWLEDGE BASES AND REPOSITORY KMS USE', *Information & Management*, p. 103498.
Jain, N & Gupta, V 2019, 'The impact of knowledge management system on student performance: A case study of the University of Delhi', *VINE Journal of Information and Knowledge Management Systems*.
Janicot, C & Mignon, S 2012, 'Knowledge codification in audit and consulting firms: a conceptual and empirical approach', *Knowledge Management Research & Practice*, vol. 10, no. 1, pp. 4-15.
Júnior, EM, Gobbo, JA, Fukunaga, F, Cerchione, R & Centobelli, P 2020, 'Use of knowledge management systems: analysis of the strategies of Brazilian small and medium enterprises', *Journal of Knowledge Management*, vol. 24, no. 2, pp. 369-94.
Jurksiene, L & Pundziene, A 2016, 'The relationship between dynamic capabilities and firm competitive advantage', *European Business Review*.
Kaiser, A & Peschl, MF 2020, 'The role of self-transcending knowledge in Senge's understanding of learning organizations towards an interdisciplinary taxonomy of self-transcending knowledge', *The Learning Organization*.
Kaiser, A, Fahrenbach, F & Martinez, H 2021, 'Creating Shared Visions in Organizations–Taking an Organizational Learning and Knowledge Management Perspective', *Proceedings of the 54th Hawaii International Conference on System Sciences*, p. 5186.
Kane, GC 2017, 'The evolutionary implications of social media for organizational knowledge management', *Information and Organization*, vol. 27, no. 1, pp. 37-46.
Kang, H, Turi, JA, Bashir, S, Alam, MN & Shah, SA 2021, 'Moderating role of information system and mobile technology with learning and forgetting factors on organizational learning effectiveness', *Learning and Motivation*, vol. 76, p. 101757.
Kapetaniou, C & Lee, SH 2019, 'Geographical proximity and open innovation of SMEs in Cyprus', *Small Business Economics*, vol. 52, no. 1, pp. 261-76.
Kergroach, S 2020, 'Giving momentum to SME digitalization', *Journal of the International Council for Small Business*, vol. 1, no. 1, pp. 28-31.
Kezar, A 2012, 'Bottom-up/top-down leadership: Contradiction or hidden phenomenon', *The Journal of Higher Education*, vol. 83, no. 5, pp. 725-60.

Khan, NA & Khan, AN 2019, 'What followers are saying about transformational leaders fostering employee innovation via organisational learning, knowledge sharing and social media use in public organisations?', *Government Information Quarterly*, vol. 36, no. 4, p. 101391.
Khattak, SR, Fayaz, M, Rahman, SU & Ullah, A 2021, 'ORGANIZATIONAL AMBIDEXTERITY, ORGANIZATIONAL LEARNING CAPACITY, AND MARKET ORIENTATION: APOSSIBLE INDICATORS OF ORGANIZATIONAL PERFORMANCE', *Ilkogretim Online*, vol. 20, no. 4.
Khayer, A, Talukder, MS, Bao, Y & Hossain, MN 2020, 'Cloud computing adoption and its impact on SMEs' performance for cloud supported operations: A dual-stage analytical approach', *Technology in Society*, vol. 60, p. 101225.
Koh, E, Shibani, A, Tan, JP-L & Hong, H 2016, 'A pedagogical framework for learning analytics in collaborative inquiry tasks: An example from a teamwork competency awareness program', *Proceedings of the Sixth International Conference on Learning Analytics & Knowledge*, pp. 74-83.
Kops, W 1997, 'Managers as self-directed learners: Comparing findings of studies in private and public sector organizations', *Expanding horizons in self-directed learning*, pp. 71-86.
Korn, R, Chandler, K & Marzec, C 2021, 'Becoming a Learning Organization', *Curator: The Museum Journal*, vol. 64, no. 2, pp. 297-311.
Kumar, M, Paul, J, Misra, M & Romanello, R 2021, 'The creation and development of learning organizations: a review', *Journal of Knowledge Management*.
Lal, P 2015, 'Organizational learning management systems: time to move learning to the cloud!', *Development and Learning in Organizations: An International Journal*.
Lam, A 2019, 'AMB IDE XT RO US LEARN IN G O RGA NIZATIONS', *The Oxford handbook of the learning organization*, p. 163.
Lau, PYY, Park, S & McLean, GN 2020, 'Learning organization and organizational citizenship behaviour in West Malaysia: moderating role of team-oriented culture', *European Journal of Training and Development*.
Lavie, D, Stettner, U & Tushman, ML 2010, 'Exploration and exploitation within and across organizations', *The Academy of Management Annals*, vol. 4, no. 1, pp. 109-55.
Le Dinh, T, Rinfret, L, Raymond, L & Dong Thi, BT 2013, 'Towards the reconciliation of knowledge management and e-collaboration systems', *Interactive Technology and Smart Education*, vol. 10, no. 2, pp. 95-115.
Lee, J & Kim, N 2019, 'Know yourself and find your partners', *Management Research Review*, vol. 42 no. 12, pp. 1333-52.
Lee, JY, Yang, YS & Park, BI 2019, 'Interplay between dual dimensions of knowledge sharing within globalized chaebols: The moderating effects of organization size and global environmental munificence', *International Business Review*, vol. 29, no. 6, p. 101637.
Lee, RW, Yip, JY & Shek, VW 2021a, 'Building a Learning Organization', in *Knowledge Risk and its Mitigation: Practices and Cases*, Emerald Publishing Limited.
Lee, RW, Yip, JY & Shek, VW 2021b, *Knowledge Risk and its Mitigation: Practices and Cases*, Emerald Group Publishing.
Levinthal, DA & March, JG 1993, 'The myopia of learning', *Strategic management journal*, vol. 14, no. S2, pp. 95-112.
Lin, A & Chen, N-C 2012, 'Cloud computing as an innovation: Percepetion, attitude, and adoption', *International Journal of Information Management*, vol. 32, no. 6, pp. 533-40.

Lombardi, R 2019, 'Knowledge transfer and organizational performance and business process: past, present and future researches', *Business Process Management Journal*.
Maravilhas, S & Martins, J 2019, 'Strategic knowledge management in a digital environment: Tacit and explicit knowledge in Fab Labs', *Journal of Business Research*, vol. 94, pp. 353-9.
March, JG 1991, 'Exploration and exploitation in organizational learning', *Organization science*, vol. 2, no. 1, pp. 71-87.
Marshall, TE & Lambert, SL 2018, 'Cloud-based intelligent accounting applications: accounting task automation using IBM watson cognitive computing', *Journal of Emerging Technologies in Accounting*, vol. 15, no. 1, pp. 199-215.
Marsick, VJ & Watkins, KE 2003, 'Demonstrating the value of an organization's learning culture: the dimensions of the learning organization questionnaire', *Advances in developing human resources*, vol. 5, no. 2, pp. 132-51.
McLaren, TS, Head, MM, Yuan, Y & Chan, YE 2011, 'A multilevel model for measuring fit between a firm's competitive strategies and information systems capabilities', *MIS quarterly*, pp. 909-29.
Meroño-Cerdan, AL, Lopez-Nicolas, C & Sabater-Sánchez, R 2007, 'Knowledge management strategy diagnosis from KM instruments use', *Journal of Knowledge Management*, vol. 11, no. 2, pp. 60-72.
Mikalef, P, Boura, M, Lekakos, G & Krogstie, J 2020, 'The role of information governance in big data analytics driven innovation', *Information & Management*, vol. 57, no. 7, p. 103361.
Mohamed, MA & Pillutla, S 2014, 'Cloud computing: a collaborative green platform for the knowledge society', *Vine*, vol. 44, no. 3, pp. 357-74.
Müller, O, Junglas, I, Vom Brocke, J & Debortoli, S 2016, 'Utilizing big data analytics for information systems research: challenges, promises and guidelines', *European Journal of Information Systems*, vol. 25, no. 4, pp. 289-302.
Nguyen, A, Tuunanen, T, Gardner, L & Sheridan, D 2021, 'Design principles for learning analytics information systems in higher education', *European Journal of Information Systems*, vol. 30, no. 5, pp. 541-68.
Nonaka, I 1994, 'A dynamic theory of organizational knowledge creation', *Organization science*, vol. 5, no. 1, pp. 14-37.
Nonaka, I & Konno, N 1998, 'The concept of "Ba": Building a foundation for knowledge creation', *California management review*, vol. 40, no. 3, pp. 40-54.
Nooshinfard, F & Nemati-Anaraki, L 2014, 'Success factors of inter-organizational knowledge sharing: a proposed framework', *The Electronic Library*.
O'Leary, DE 2016, 'Is knowledge management dead (or dying)?', *Journal of Decision Systems*, vol. 25, no. sup1, pp. 512-26.
Obeidat, BY, Al-Suradi, MM & Tarhini, A 2016, 'The impact of knowledge management on innovation: An empirical study on Jordanian consultancy firms', *Management Research Review*, vol. Vol. 39 No. 10, pp. pp. 1214-38.
Oluwafemi, TB, Mitchelmore, S & Nikolopoulos, K 2020, 'Leading innovation: Empirical evidence for ambidextrous leadership from UK high-tech SMEs', *Journal of Business Research*, vol. 119, pp. 195-208.
Örtenblad, A 2019, *The Oxford handbook of the learning organization*, Oxford University Press.

Paraponaris, C, Sigal, M, Echajari, L & Thomas, C 2015, 'Learning from complex and heterogeneous experiences: the role of knowledge codification', *Journal of Knowledge Management*, vol. 19, no. 5, pp. 968-86.
Park, S & Kim, E-J 2018, 'Fostering organizational learning through leadership and knowledge sharing', *Journal of Knowledge Management*.
Patterson, LJ 2021, 'Becoming an Ambidextrous Learning Organization: Leadership for Confidence in a Resource-Dependent Nonprofit Environment'.
Pérez-González, D, Trigueros-Preciado, S & Popa, S 2017, 'Social Media Technologies' Use for the Competitive Information and Knowledge Sharing, and Its Effects on Industrial SMEs' Innovation', *Information Systems Management*, vol. 34, no. 3, pp. 291-301.
Pérez-Bustamante, G 1999, 'Knowledge management in agile innovative organisations', *Journal of Knowledge Management*.
Peronard, J-P & Brix, J 2019, 'Organizing for inter-organizational learning in service networks', *The Learning Organization*.
Petrov, V, Ćelić, Đ, Uzelac, Z & Drašković, Z 2019, 'Three pillars of knowledge management in SMEs: evidence from Serbia', *International Entrepreneurship and Management Journal*, vol. 16, pp. 417–38.
Petruzzelli, AM & Rotolo, D 2015, 'Institutional diversity, internal search behaviour, and joint-innovations: Evidence from the US biotechnology industry', *Management Decision*.
Pimmer, C, Brühlmann, F, Odetola, TD, Dipeolu, O, Oluwasola, O, Jäger, J & Ajuwon, AJ 2021, 'WhatsApp for mobile learning. Effects on knowledge, resilience and isolation in the school-to-work transition', *The Internet and Higher Education*, vol. 50, p. 100809.
Polanyi, M 1962, *Personal Knowledge Routledge and Kegan Paul*, London.
Poon, WC & Mohamad, O 2020, 'Organisational context and behavioural complexity affecting ambidextrous behaviours among SMEs', *International Journal of Organization Theory & Behavior*.
Popadiuk, S 2012, 'Scale for classifying organizations as explorers, exploiters or ambidextrous', *International Journal of Information Management*, vol. 32, no. 1, pp. 75-87.
Queirós, A, Faria, D & Almeida, F 2017, 'Strengths and limitations of qualitative and quantitative research methods', *European journal of education studies*.
Rahman, MS 2020, 'The advantages and disadvantages of using qualitative and quantitative approaches and methods in language "testing and assessment" research: A literature review'.
Raisch, S & Birkinshaw, J 2008, 'Organizational ambidexterity: Antecedents, outcomes, and moderators', *Journal of management*, vol. 34, no. 3, pp. 375-409.
Raisch, S, Birkinshaw, J, Probst, G & Tushman, ML 2009, 'Organizational ambidexterity: Balancing exploitation and exploration for sustained performance', *Organization science*, vol. 20, no. 4, pp. 685-95.
Randall, C, Edelman, L & Galliers, R 2017, 'Ambidexterity lost? Compromising innovation and the exploration/exploitation plan', *The Journal of High Technology Management Research*, vol. 28, no. 1, pp. 1-16.
Ratten, V 2012, 'Implementing cloud learning in an organization: a training perspective', *Industrial and Commercial Training*.
Rook, L 2013, 'Mental models: A robust definition', *The Learning Organization*.
Rot, A & Sobinska, M 2017, 'Knowledge Management in the Cloud Computing Model-Challenges, Opportunities and Risks', *FedCSIS (Position Papers)*, pp. 177-81.

Rubenstein-Montano, B, Liebowitz, J, Buchwalter, J, McCaw, D, Newman, B, Rebeck, K & Team, TKMM 2001, 'A systems thinking framework for knowledge management', *Decision Support Systems*, vol. 31, no. 1, pp. 5-16.
Rupčić, N 2018, 'Complexities of learning organizations–addressing key methodological and content issues', *The Learning Organization*.
Santa, M & Nurcan, S 2016, 'Learning organization modelling patterns', *Knowledge Management Research & Practice*, vol. 14, no. 1, pp. 106-25.
Santoro, G & Usai, A 2018, 'Knowledge exploration and ICT knowledge exploitation through human resource management', *Management Research Review*, vol. 41, no. 6, pp. 701-15.
Saratchandra, M & Shrestha, A 2022, 'The role of cloud computing in knowledge management for small and medium enterprises: a systematic literature review', *Journal of Knowledge Management*.
Sathishkumar, S & Karthika, K 2021, 'Big Data Analytics in Cloud Platform', in *Challenges and Opportunities for the Convergence of IoT, Big Data, and Cloud Computing*, IGI Global, pp. 159-79.
Schaefer, C & Makatsaria, A 2021, 'Framework of Data Analytics and Integrating Knowledge Management', *International Journal of Intelligent Networks*, vol. 2, pp. 156-65.
Schniederjans, DG, Curado, C & Khalajhedayati, M 2019, 'Supply chain digitisation trends: An integration of knowledge management', *International Journal of Production Economics*, vol. 220, p. 107439.
Schulz, M & Jobe, LA 2001, 'Codification and tacitness as knowledge management strategies: an empirical exploration', *The Journal of High Technology Management Research*, vol. 12, no. 1, pp. 139-65.
Scuotto, V, Arrigo, E, Candelo, E & Nicotra, M 2019, 'Ambidextrous innovation orientation effected by the digital transformation', *Business Process Management Journal*, vol. 26, no. 5, pp. 1121-40.
Sein-Echaluce, ML, Fidalgo-Blanco, A, García-Peñalvo, FJ & Fonseca, D 2021, 'Impact of Transparency in the Teamwork Development through Cloud Computing', *Applied Sciences*, vol. 11, no. 9, p. 3887.
Senge, P 1990a, 'Peter Senge and the learning organization', *Rcuperado de*.
Senge, P 1990b, *The firth discipline: the art and science of the learning organisation*, London: Century Business.
Senge, PM 2006, *The fifth discipline: The art and practice of the learning organization*, Currency.
Shah, TR 2022, 'Can big data analytics help organisations achieve sustainable competitive advantage? A developmental enquiry', *Technology in Society*, vol. 68, p. 101801.
Shao, Z, Li, X & Wang, Q 2021, 'From ambidextrous learning to digital creativity: An integrative theoretical framework', *Information Systems Journal*.
Sheng, ML & Chien, I 2016, 'Rethinking organizational learning orientation on radical and incremental innovation in high-tech firms', *Journal of Business Research*, vol. 69, no. 6, pp. 2302-8.
Short, H 2019, *Learning in SMEs*, 5, Taylor & Francis, 1367-8868.
Shrestha, A & Chandra, MS 2020, 'How can Small Businesses Achieve Knowledge Ambidexterity Using Cloud-based Knowledge Management Systems?', *PACIS 2020 Proceedings*, pp. 1-8.

Soto-Acosta, P, Popa, S & Martinez-Conesa, I 2018, 'Information technology, knowledge management and environmental dynamism as drivers of innovation ambidexterity: a study in SMEs', *Journal of Knowledge Management*, vol. 22, no. 4, pp. 824-49.
Stankosky, M 2005, *Creating the discipline of knowledge management*, Routledge.
Strauss, AL 1987, *Qualitative analysis for social scientists*, Cambridge university press.
Sultan, N 2013a, 'Knowledge management in the age of cloud computing and Web 2.0: Experiencing the power of disruptive innovations', *International Journal of Information Management*, vol. 33, no. 1, pp. 160-5.
Sultan, N 2013b, 'Cloud computing: A democratizing force?', *International Journal of Information Management*, vol. 33, no. 5, pp. 810-5.
Tang, Q, Gu, FF, Xie, E & Wu, Z 2020, 'Exploratory and exploitative OFDI from emerging markets: Impacts on firm performance', *International Business Review*, p. 101661.
Tian, H, Dogbe, CSK, Pomegbe, WWK, Sarsah, SA & Otoo, COA 2020, 'Organizational learning ambidexterity and openness, as determinants of SMEs' innovation performance', *European Journal of Innovation Management*.
Torraco, RJ 2000, 'A theory of knowledge management', *Advances in developing human resources*, vol. 2, no. 1, pp. 38-62.
Tovstiga, N & Tovstiga, G 2021, 'COVID-19: a knowledge and learning perspective', *Knowledge Management Research & Practice*, vol. 19, no. 4, pp. 427-32.
Tsang, YP, Choy, KL, Koo, PS, Ho, GTS, Wu, CH, Lam, HY & Tang, V 2018, 'A fuzzy association rule-based knowledge management system for occupational safety and health programs in cold storage facilities', *VINE Journal of Information and Knowledge Management Systems*, vol. 48, no. 2, pp. 199-216.
Tuomisalo, T & Leppäaho, T 2019, 'Learning in international new ventures: A systematic review', *International Business Review*, vol. 28, no. 3, pp. 463-81.
Tushman, ML & O'Reilly, I, Charles A 1996, 'Ambidextrous organizations: Managing evolutionary and revolutionary change', *California management review*, vol. 38, no. 4, pp. 8-29.
Vuori, V, Schiuma, G & Okkonen, J 2012, 'Refining information and knowledge by social media applications', *Vine*, vol. 42, no. 1, pp. 117-28.
Wairimu, J, Liao, Q & Zhang, L 2021, 'Digital Investments in Organizational Learning and Entrepreneurial Agility', *Journal of Computer Information Systems*, pp. 1-13.
WAnG, Q 2009, 'Design and evaluation of a collaborative learning environment', *Computers & Education*, vol. 53, no. 4, pp. 1138-46.
Wang, S & Wang, H 2020, 'Big data for small and medium-sized enterprises (SME): a knowledge management model', *Journal of Knowledge Management*, vol. 24, no. 4, pp. 881-97.
Watkins, KE & Marsick, VJ 1993, *Sculpting the learning organization: Lessons in the art and science of systemic change*, ERIC.
Watson, I 2021, IBM Corp, https://www.ibm.com/watson/products>.
Wong, AHK, Wu, CX, Whitla, P & Snell, RS 2022, 'How LMX and marketing capabilities guide and motivate customer-facing employees' learning', *Journal of Business Research*, vol. 138, pp. 161-9.
Xia, T & Liu, X 2021, 'Cultural values and innovation: the mediating role of entrepreneurial learning capacity', *Journal of International Management*, vol. 27, no. 1, p. 100812.

Xie, L, Qiu, S & Biggs, MJG 2021, 'The influence of altruistic leadership behavior and learning culture on work–family relationship in Chinese SMEs', *Industrial and Commercial Training*.
Yi, Y, Chen, Y & Li, D 2022, 'Stakeholder ties, organizational learning, and business model innovation: A business ecosystem perspective', *Technovation*, vol. 114, p. 102445.
Yin, RK 2009, 'Case study research: design and methods/Robert K', *Yin, Applied social research methods series*, vol. 5.
Zhou, Y, Yuen, KF, Tan, B & Thai, VV 2021, 'The effect of maritime knowledge clusters on maritime firms' performance: An organizational learning perspective', *Marine Policy*, vol. 128, p. 104472.
Zou, J & Jian, C 2021, 'Does cloud computing improve team performance and employees' creativity?', *Kybernetes*.

Appendix A

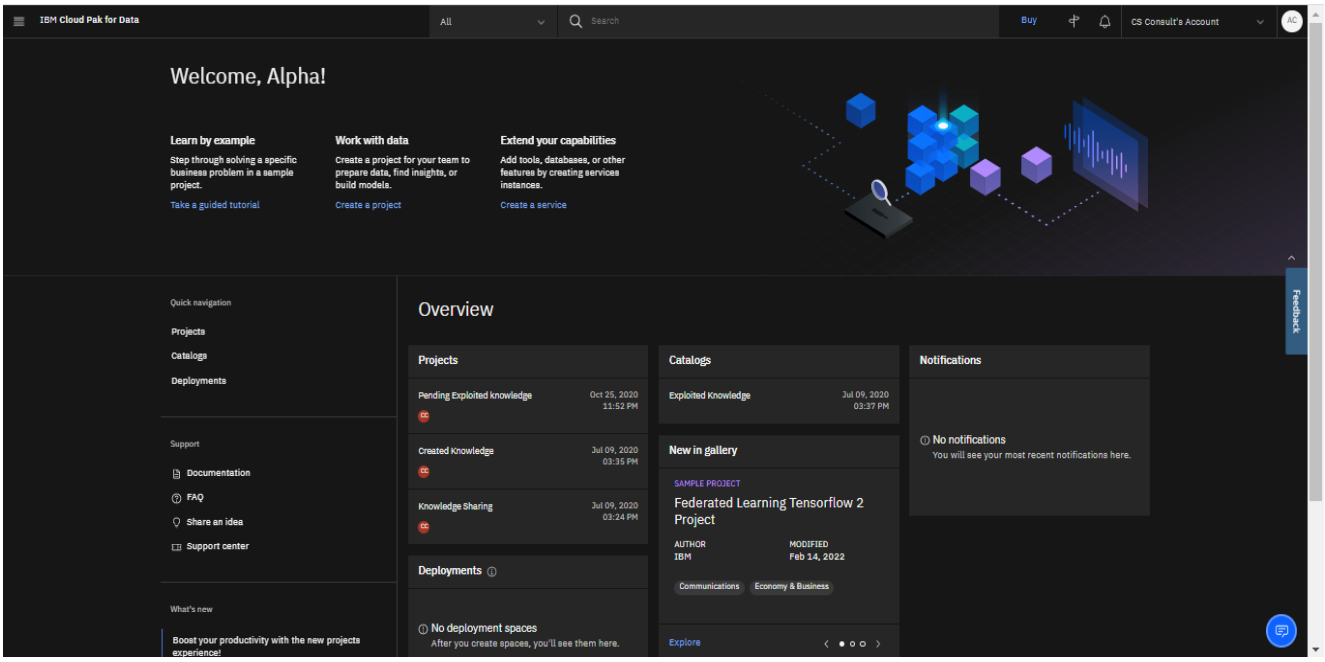

Figure I: Dashboard of Watson cloud services

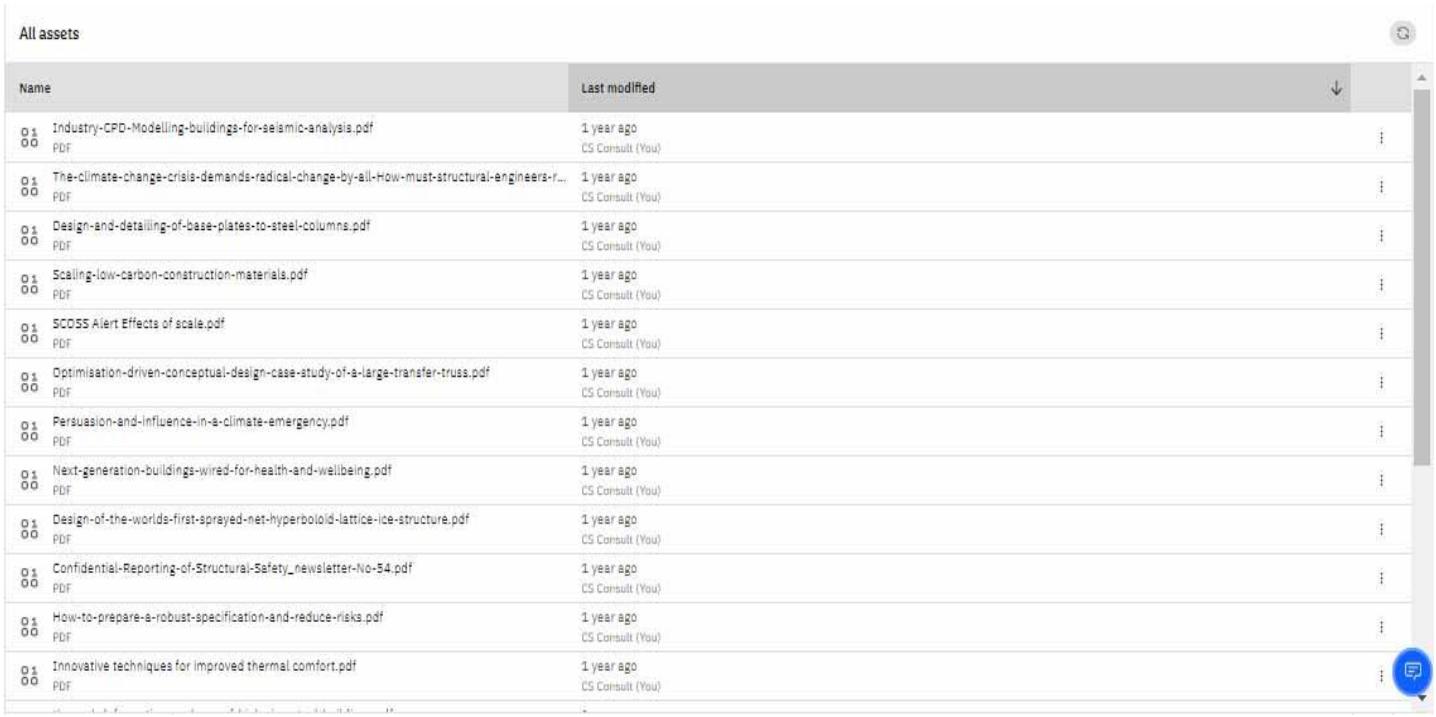

Figure II: Sample knowledge created and stored by participants

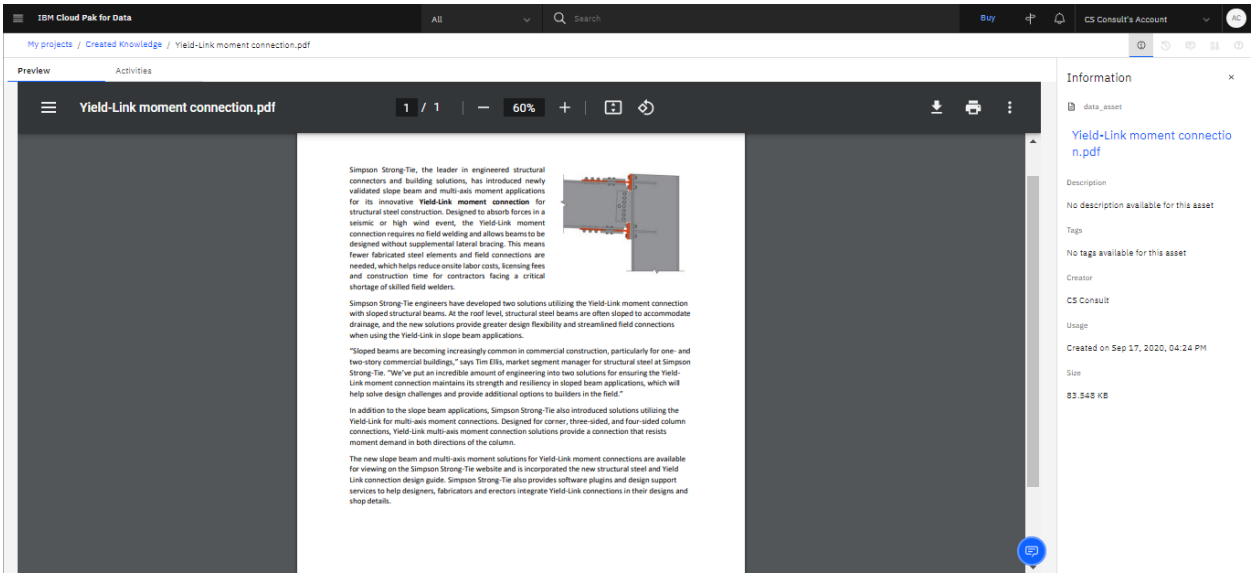

Figure III: Sample tacit knowledge in explicit form- by participant

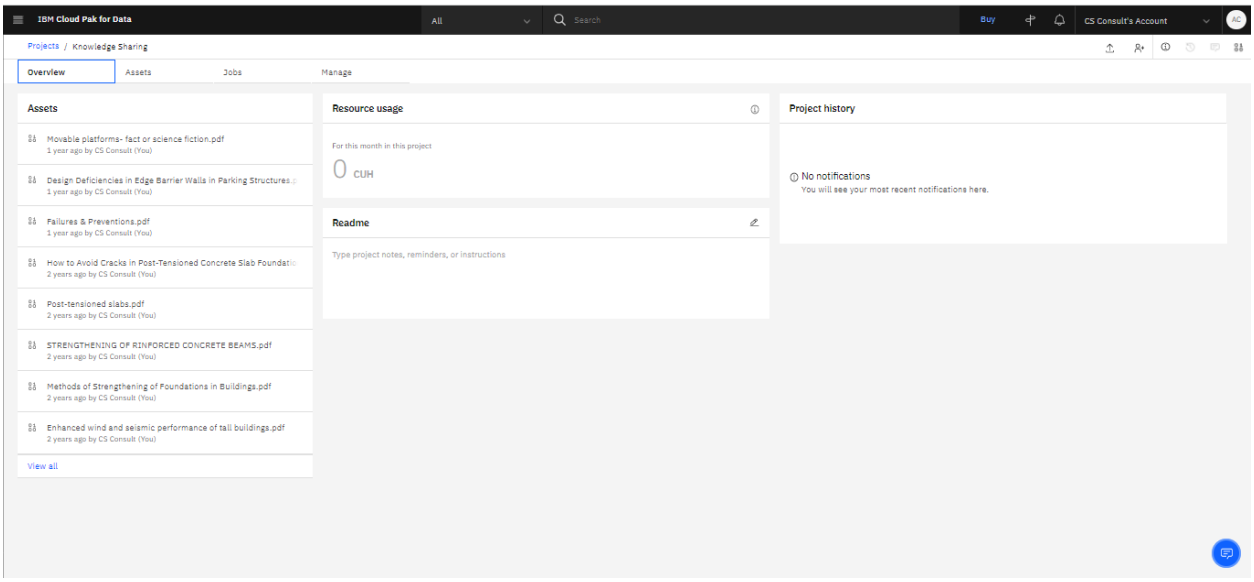

Figure IV: Knowledge sharing platform in WKC

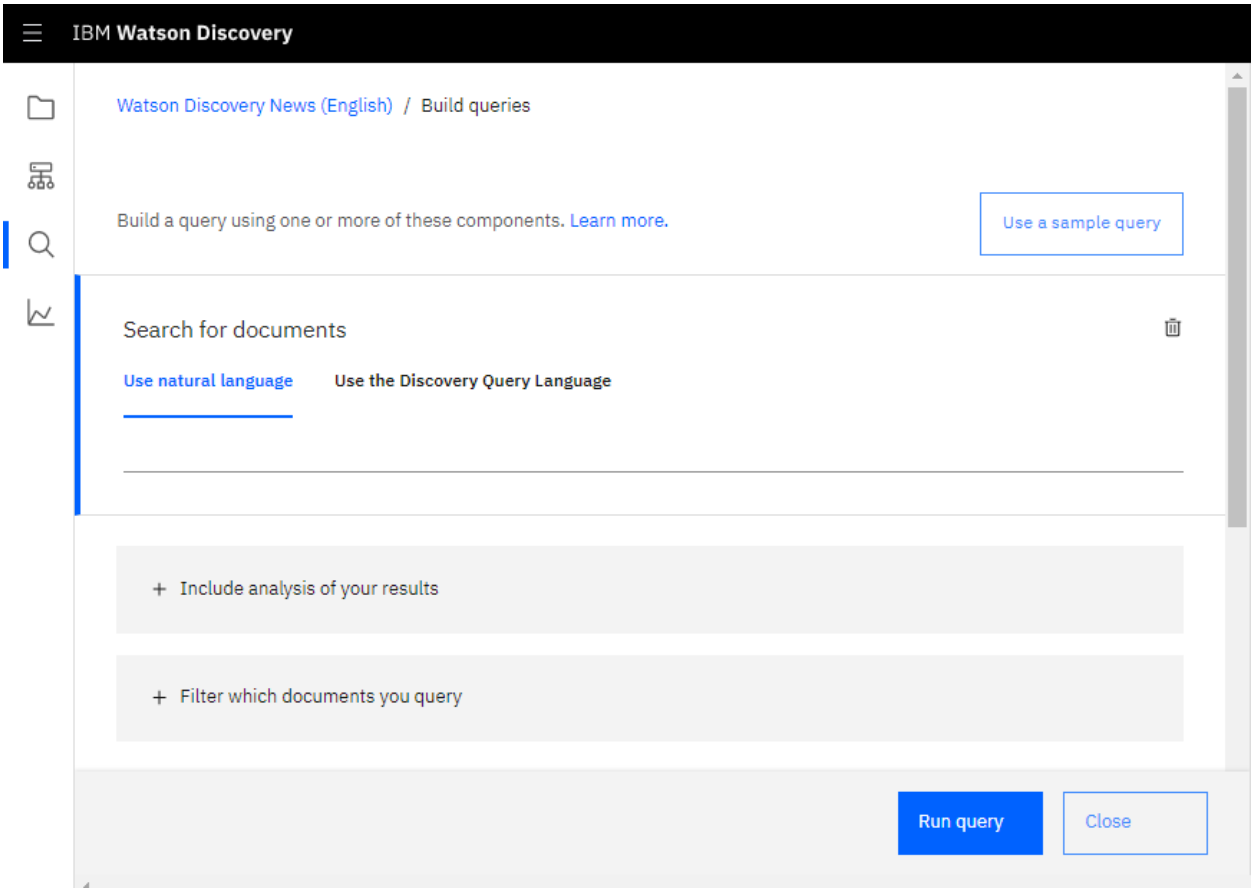

Figure V: WDS for knowledge exploration

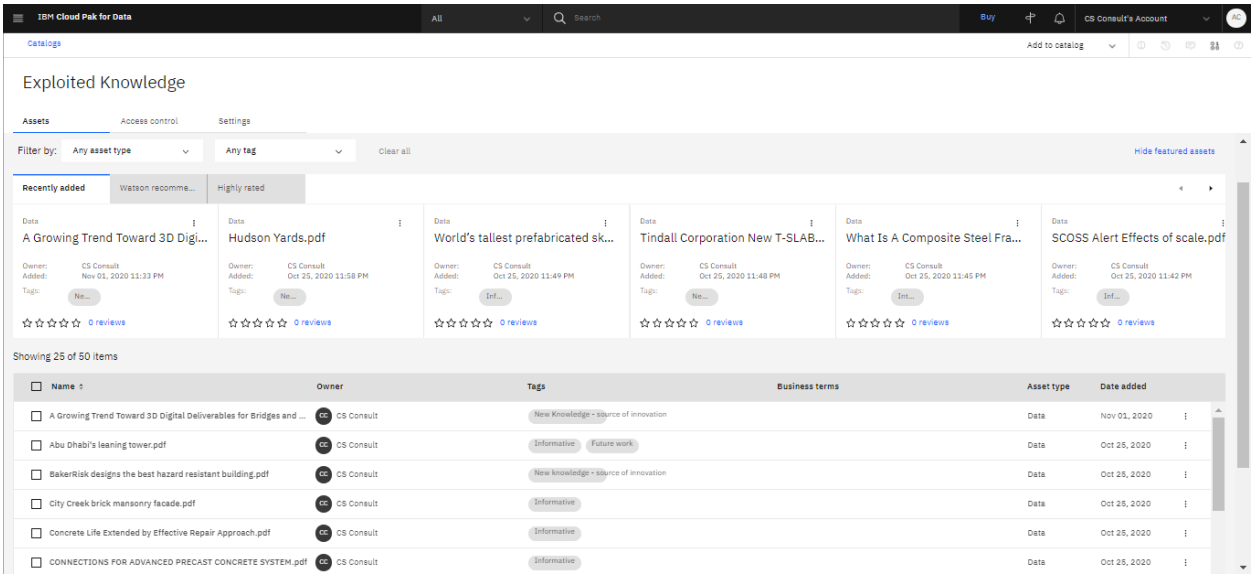

Figure VI: Sample of exploited knowledge by the participants in WKC

6.3 Chapter Summary

This chapter presented the journal article that is in a ready-to-submit stage and targeted for submission in *Journal of Management Information Systems*. This chapter elaborately discussed how cloud computing aids SMEs to transform themselves as ALO by following ambidextrous learning processes when KM processes can facilitate continual learning. The next chapter compiled the key discussions from all three research outputs and articulated the contributions to theory and practice.

CHAPTER 7: DISCUSSION AND CONCLUSION

The broad aims of this study were to explore how cloud computing enables knowledge ambidexterity and to manage knowledge effectively within the SMEs sector to build innovative capacity and ambidextrous learning orientation. Based on the research gaps identified from the literature review, three research questions were developed for this study. To answer these research questions, a DSR study was executed. A preliminary research artefact – Knowledge Ambidexterity Framework (KAF) was envisioned and proposed following the completion of a Systematic Literature Review (SLR) that also answered RQ1.

In the next stage, the KAF was demonstrated using IBM Watson cloud services at seven case study SMEs in India and UAE. This was followed by artefact evaluation at the seven case studies with two rounds of post-intervention semi-structured interviews in 2020 and 2021, that captured longitudinal data on the impact of the KAF on the case study SMEs, in terms of technology-driven innovation and ambidextrous learning organisation. Qualitative data captured from interview transcripts were analysed using NVivo to identify emerging themes that were used to discuss the findings to answer RQ2 and RQ3.

7.1 Discussion on RQ1

The first research question (RQ1) of this study is:

RQ1: What is the role of cloud computing in knowledge management for SMEs?

In order to understand the role of KM in the SME sector, an SLR was conducted. The findings from SLR were useful to fully comprehend the importance of cloud computing in managing knowledge. The result of SLR

revealed that KM is happening in an ad-hoc way because whole gamut of KM processes was not utilised effectively in SMEs. SMEs had not coded the organisational knowledge and most of the knowledge resided in tacit form where individuals are the prime source of knowledge (Nonaka, 1994).The failure of appropriate knowledge creation processes implied that SMEs were not effectively managing their knowledge and the knowledge creation as well as storage were at a nascent stage. Moreover, SMEs were inclined to use simple technology tools and ad-hoc traditional KM practices. SMEs considered IS as a platform used for knowledge sharing only, consequently obstructing effective KM cycle. Another major concern of SMEs related to KM was external knowledge acquisition, as majority of knowledge lies outside the boundary of SMEs. These analyses presented the rationale for resource/knowledge scarcity and the impediment to KM in most SMEs.

To leverage the capability of SMEs, they should invest heavily to improve their KM processes by adopting cost-effective digital technologies such as cloud computing to manage knowledge. Therefore, cloud-based KMS (C-KMS) was suggested as an appropriate solution since it provided a platform to make knowledge available on-demand (Rafiq *et al.*, 2014). Furthermore, integrating cloud computing with KMS provided a Knowledge as a Service (KaaS) environment (Abdullah *et al.*, 2011), a subtype of SaaS (Software as a Service) (Balco and Drahoová, 2016). This aided knowledge artefacts, a term coined by Davenport and Prusak (1998) for the explicit form of knowledge, to move smoothly without boundaries (Assante *et al.*, 2016). Moreover, C-KMS supported big data (Depeige and Doyencourt, 2015), which contains a high variety of structured, unstructured and multimedia data (Chan, 2014). C-KMS with the support of cloud services such as Alchemy and Zemanta can extract knowledge from big data sources with the support of natural language processing (NLP), a process for the automatic analysis of information (Caione *et al.*, 2015). Therefore, C-KMS supported external knowledge

exploration in a structured format, which improved knowledge acquisition as reported by Dezi *et al.* (2018). If knowledge is efficiently explored from big data, it contributes to relevant knowledge acquisition. The acquired knowledge can be codified and stored as knowledge artefacts in the cloud services, which can be later shared/used/reused in the organisation. Subsequently, this could reduce scarcity of knowledge in SMEs.

Prior studies (Fouladi and Navimipour, 2017; Li *et al.*, 2019) supported that knowledge-based cloud services can support effective sharing of the knowledge, skills and experiences in SMEs. Since C-KMS sits on a cloud platform which makes knowledge available on demand (Rafiq *et al.*, 2014) and it is a knowledge-based cloud services, C-KMS can readily share and enable utilisation of knowledge in the organisation. The C-KMS offered easy access to knowledge artefacts (Gupta *et al.*, 2013), which facilitated employees to apply knowledge for various requirements. These discussions support that C-KMS can systematically strengthen KM in an efficient manner.

In order to analyse the benefits of Cloud-based-KMS services in SMEs, this study looked through the lens of the Quality of Service (QoS) dimensions (Bouzary and Chen, 2020). QoS is typically used to analyse the quality of any cloud services (Jiang *et al.*, 2019; Bouzary and Chen, 2020) and to understand how well the cloud services meets user and organisation needs and expectation (Jabar and Alnatsha, 2014; Kourtesis *et al.*, 2014). The QoS dimensions considered were: availability, reliability, cost, scalability and security, adopting from studies of (Gupta *et al.*, 2013; Bardsiri and Hashemi, 2014; Ding *et al.*, 2014; Wang, S. *et al.*, 2014; Balina *et al.*, 2017; Jiang *et al.*, 2019; Bouzary and Chen, 2020) for analysing the benefits of C-KMS. Since external knowledge acquisition and sustainability were major concerns in SMEs, ambidexterity was incorporated as the critical sixth dimension since theory of ambidexterity was identified as the second most studied theory.

Ambidexterity is a necessary factor for innovation, competitive advantage and sustainability in an organisation (O'Reilly III and Tushman, 2013). Ambidexterity supports exploration and exploitation of the knowledge in an organisation, which is required for thriving the knowledge and sustainability (Tushman and O'Reilly, 1996; Raisch *et al.*, 2009). The details of the dimensions are illustrated in **Figure 7-1**.

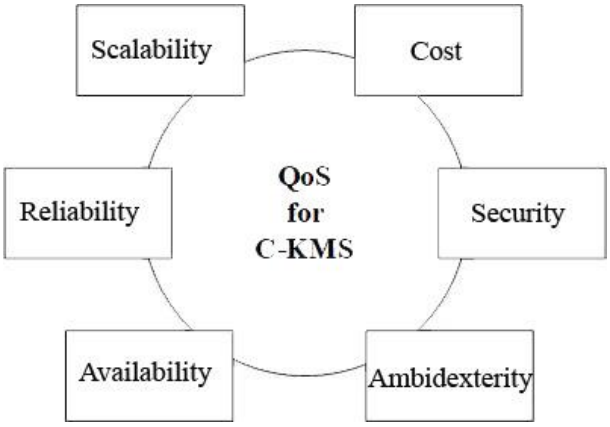

Figure 7-1: QoS for C-KMS

The first major aspect of QoS dimension is *availability*. The cloud services improved service availability (Singh *et al.*, 2020) through offering easy access to knowledge artefacts using any devices such as smartphones and laptops (Gupta *et al.*, 2013) from anywhere and anytime (Khayer *et al.*, 2020). The second aspect of QoS dimension is *reliability***,** which is expressed either by including failure free operation of a system, or a combination of quality attributes like accuracy, fault tolerance, fault recovery (Alam *et al.*, 2017). The third aspect of QoS dimension entails *scalability***,** which gives SMEs greater control over their activities, knowledge artefacts and IT expenditure (Khayer *et al.*, 2020). Fourth dimension is *Cost***.** Cloud services provides SMEs with cost-effective solutions (Assante *et al.*, 2016), as it delivers services on a pay-per-use basis (Dessì *et al.*, 2016; Khayer *et al.*, 2020) to meet the demands of SMEs routine activities and reduces their operations and maintenance costs (Gupta *et al.*, 2013). The fifth dimension is *Security,* which emphasises the protection of data from other users through proper

credentials (Aksoy and Algawiaz, 2014). Finally, this study considered *ambidexterity* as sixth dimension in QoS**.** C-KMS platforms can support SMEs to explore external knowledge via multiple data sources, including big data (Depeige and Doyencourt, 2015). The explored knowledge can then facilitate creation, storage, sharing and utilisation of knowledge in SMEs. These created knowledge artefacts can be used to improve the present knowledge base of SMEs thereby facilitating knowledge exploitation (Lavie *et al.*, 2010) and eradication of resource scarcity. SMEs that implement the knowledge exploration and exploitation process simultaneously can become ambidextrous (O'Reilly III and Tushman, 2013; Benitez *et al.*, 2018), which has been proven to promote superior performance.

This discussion using the lens of QoS demonstrated the role of cloud computing in KM for SMEs, thereby answering RQ1. In this light, this research proposed the research artefact as the Knowledge Ambidexterity Framework (KAF) as presented in Figure 4-1 for further research. Cloud computing, KM and ambidexterity theory were investigated to demonstrate SMEs adoption of technology-driven innovation which is the focus of RQ2 discussed next.

7.2 Discussion on RQ2

The second research question (RQ2) of this study is:

RQ2: How is K-AMB achieved by SMEs from technology-driven innovation using cloud computing?

To examine the contextual effects of integrating K-AMB using cloud services across SMEs and to analyse whether SMEs can achieve K-AMB (RQ2), two sub-research questions were developed after analysing the SLR findings and proposing the research artefact. The first sub-research question 1 explored whether SMEs favoured exploitation while foregoing the assimilation of cloud computing thus relinquishing

ambidextrous opportunities. The second sub-research question was to investigate whether cloud computing enables K-AMB exploratory capability such as employee-driven innovation to be enhanced over time.

The evaluation of the artefact answered the first sub-research question at the initial time period T1, supporting the prior studies that it is difficult for SMEs to implement K-AMB. The major findings were identification of hindering factors in knowledge exploration and exploitation which impeded K-AMB in SMEs. To elaborate, knowledge exploration was non-existent due to an overemphasis on employee-driven approach making exploration process weaker. The knowledge exploitation was occurring at a lower rate due to dominance of tacit knowledge. Lack of cloud service support makes these processes inefficient. Additionally, knowledge creation was not efficiently implemented. SMEs were not using any repository for knowledge storage and ad-hoc methods were used for knowledge transfer. While considering the *dependency factors* of K-AMB processes, all SMEs depended on tacit knowledge as well as knowledge from external stakeholders. Finally, the focus area of both knowledge exploration and exploitation process were confined to employee driven innovation, which was reactive and ad-hoc. Moreover, these processes were independent and lacked a cohesive approach. The findings at T1 were in-line with the arguments made by Shamim et al. (2019) that individuals alone could not engage in the processes of knowledge exploration and exploitation and to enhance K-AMB innovation capability.

On the other hand, at the time period T2, this exploratory study took a new diversion after finding that cloud computing changed the K-AMB processes by which SMEs exploited existing knowledge and explored new knowledge thereby implementing K-AMB in SMEs in response to answering the second sub-research question. While prior research found that an ambidextrous approach was not necessarily

beneficial to SMEs (Mathias 2014) where the relationship between SME performance and ambidexterity was insignificant compared to the exploration or exploitation processes (Wenke et al. 2021, p. 660). However, this study empirically supported the argument by Im and Rai (2014) that cloud services can be leveraged to scan the environment, identify trends and opportunities, and support distributed problem solving. More specifically, the focus area of knowledge exploration processes now concentrates on effective knowledge exploitation, as exploitation processes will also help to refine the existing states of tacit or implicit knowledge acquired. By sharpening exploitation processes, our results suggest that this helped to build the exploration processes in the search for new ideas and business possibilities. Cloud computing became the mechanism for creating the production of new knowledge that was codified by SMEs in different ways e.g., in new procedures, that increased the 'knowing-how' of employees leading to instances of enhanced employee-driven innovation. Conversely, the new social and workplace social routines reflected the 'knowing-that' of knowledge behavior which was particularly germane at T2 once employees were able to build on their tacit and explicit knowledge experiences. This implies that more effective knowledge is generated in the organization from these two processes (Scuotto et al. 2019), thereby enhancing K-AMB capability in SMEs. This supports yet broadens the theory of ambidexterity, suggesting that cloud computing is a prominent technology for supporting the implementation of K-AMB capability.

The 'know-that' behaviors generated in this study were a significant revelation of realist knowledge practices that broadens scholarly understanding of existing K-AMB processes. That is, beyond the simplistic meaning associated with exploitation and exploration, K-AMB processes can be built on by refining and recombining more explicit know-how behaviors like those generated at T2 in the current study. Moreover, scholarly understanding about how to increase the

know-how of existing knowledge practices can be advanced by incorporating cloud computing as the mechanism for updating existing knowledge. Here, this study builds on the cross-theory insights of K-AMB and KM by showing that K-AMB practices need to rely on both know-how and know-that mechanisms and behaviors respectively. The study illustrates that these cross-theory benefits were more likely to occur with the introduction of cloud computing as a learning intervention for technology-driven innovation.

The findings of this study are consistent with the findings of Soto-Acosta et al. (2018), who argued that KM is positively related to ambidexterity. However, our findings suggest that the K-AMB process needs to evolve through a technology-driven approach for increasing SME know-how and an employee-driven innovation approach to increase SME 'know-that' behavior. Conceivably, K-AMB capability improvements are less likely to be achieved within an SME context unless they embrace both know-how and know-that KM processes that are underscored by cloud computing. Similarly, our findings support the suggestion by Park et al. (2020) that knowledge ambidexterity may be better explained with the accompaniment of digitization, rather than by any other set of factors.

Even though this study focused on the two innovation contexts, this study emphasize that a knowledge ambidextrous approach was beneficial for SMEs only after the intervention of cloud computing and was context dependent on SMEs facilitating knowledge sharing opportunities. Therefore, this study provided support that K-AMB can be achieved in SMEs through cloud intervention as cloud services directly supported knowledge exploration and facilitated knowledge for exploitation (Gonzalez 2019). The analysis from case studies aids to create a framework for a path to K-AMB (Refer Chapter 5- **Figure 3**) that can be used to guide SMEs to enhance their innovation capabilities using cloud computing.

These analyses demonstrated how K-AMB was achieved in SMEs leading to technology-driven innovation using cloud computing and answered RQ2 in this process. This study further extended the research into the impact of cloud computing on K-AMB in SMEs beyond the TDI and looking into ambidextrous learning opportunities, which led to another full year of technology intervention in a naturalistic case study evaluation setting and resulted in answering RQ3, discussed next.

7.3 Discussion on RQ3:

The third research question (RQ3) of this study is:

RQ3: How does cloud computing support transformation of SMEs into ambidextrous learning organisations?

After the period of one year, the case study participants continued to use the preliminary research artefact (KAF) strengthening the knowledge ambidexterity in the firm and it is analysed that, K-AMB created a continual learning environment with the support of cloud services that helped SMEs transform into an ambidextrous learning organisation (ALO). Therefore, a new concept was incorporated in this research (RQ3) for investigating how to transform SMEs to ambidextrous learning organisation with the support of three constructs: cloud computing, ambidextrous learning processes and KM processes.

As part of DSR, the KAF was viewed through the lens of learning aspect of K-AMB processes, which is explorative learning and exploitative learning. The main intention of this view was to investigate and promote continual learning environment, thereby helping SMEs to be transformed into ALO. For evaluation, the KAF was bonded with Peter Senge's five discipline (Senge, 1990b) and analyse the results.

The findings from this study confirmed that the cloud services act as a pillar in creating an environment conducive to continual learning.

This research follows Watkins and Marsick (1993) who explained key learning elements of a learning organisation at three different levels of analysis, including individual, group, and organisational. Therefore, this study combines the five principles (Senge, 1990b) under the three levels. It was found that personnel mastery and mental models can be categorised under individual level as they support continual learning of employees of SMEs. Similarly, shared vision and team learning fall under the category of group level as they support continual learning of various teams inside SMEs. Finally, system thinking is categorized under organisational level as it considers the holistic approach of the continual learning environment facilitated by cloud services. The theoretical model demonstrating SME transformation to ALO is illustrated in Chapter 6 – **Figure 4**.

While analysing the theoretical model, the findings categorically showed that *personal mastery* is enhanced when cloud services facilitate explorative and exploitative learning by providing a constant stream of relevant knowledge. The personal mastery gained by the employees will help them to explore both internal as well as external knowledge and provide access to knowledge to every co-worker using cloud services.

In *mental models*, we assert that cloud services will support the modification of existing mental models and creation of new mental models through explorative and exploitative learning. Cloud services can manage a large number of relevant knowledge articles (even converting tacit knowledge to explicit form) and provide access to every employee for rigorous analysis (Senge, 1990b).

Cloud services create an environment to facilitate both bottom-up and top-down knowledge flow inside SMEs. The strategic common

vision of the firm flows into this environment, resulting in a *shared vision*. Here, the employees undergo explorative as well as exploitative learning according to the shared vision of the firm using cloud services.

Team learning builds on personal mastery, mental models, and shared vision (Senge, 2006). The cloud services assist team learning by facilitating relevant knowledge through explorative and exploitative learning. When capabilities of personal mastery, mental models, and shared vision in SMEs are enhanced through explorative and exploitative learning, the team learning capability is also enhanced. The combined effect of these four disciplines resulted in a continual learning environment with the support of explorative and exploitative learning using cloud services. These four disciplines, when exercised in a continual learning environment, can support systems thinking in SMEs, which is considered as the fifth discipline by Senge (1990b).

Systems thinking is the cornerstone of the ALO. Systems thinking is a conceptual framework for problem-solving that considers problems in their entirety (Rubenstein-Montano *et al.*, 2001; Al-Raqadi *et al.*, 2016). Systems thinking helps employees to understand that each component of the organisation, such as the individuals, departments, decisions, products, and services, are all intercorrelated elements that influence each other in a larger context of problem solving (Senge, 1990a). Systems thinking integrates all the other four disciplines and creates an environment for effective learning to solve organisational problems (Bratianu, 2015). This research explored how Peter Senge's four disciplines collectively enhance system thinking as the fifth discipline, paving the way to transforming SMEs into ALOs using cloud services.

According to the analysis of this study, the key criteria for system thinking that SMEs should adopt are system awareness, inter-relationship awareness, holistic thinking, and response to complex contexts. *System awareness* is directly linked with employee level

learning, as developing personal mastery and mental models aids employees to understand their knowledge requirements as well as the knowledge requirements of co-workers. This enables employees to focus on continual learning through explorative learning and exploitative learning, resulting in the transformation into ALO. Employees can efficiently solve problems based on the requirements. *Inter-relationship awareness* is linked with team level learning because team learning and shared vision aid teams in facilitating relevant knowledge through focused learning. Because team members can achieve clear vision and enhanced teamwork, they can promote continual learning for transformation into ALO. The shared vision allows to create an environment of *holistic thinking* for the employees of SMEs. The relevant knowledge stored in the cloud services facilitates continual learning and enables the employees to *respond to any complex contexts* as a part of their problem-solving engagements. To summarise, this analysis argues that developing a continual learning environment using explorative and exploitative learning using cloud services aids SMEs in transforming into ALO thereby answering RQ3.

7.4 Contribution to theory

From a theoretical contribution perspective, this study depicts the role of cloud computing towards expediting knowledge ambidexterity in SMEs. Cloud has been proposed as a prominent technology to effectively managing knowledge from previous research but the role of cloud computing in achieving K-AMB in SMEs has not been researched and this research is arguably the first to study this relationship with longitudinal data.

This research chose the SME sector because, in general, it is a vulnerable sector in any country's economy. Most SME-based studies

mentioned that knowledge is managed in an ad-hoc way and SMEs have only exploited the use of cloud-based freeware or outdated IS tools and techniques to manage their knowledge. In this context, this study explores the benefits of C-KMS, as a genuinely feasible alternative for effective KM, that have not been studied as a solution for SMEs. The SLR conducted as a part of this research emphasises the importance of C-KMS for the enhancement of KM in SMEs by investigating its benefits in terms of availability, reliability, cost, scalability and security. C-KMS supports knowledge exploration for facilitating KM processes (Gonzalez, 2019) and enhances resource availability, both of which are typically not promoted using traditional KMS. However, existing studies largely ignored the importance of cloud technology in their KM studies related to SMEs.

While analysing the role of K-AMB in SMEs, it was found that SMEs continued with exploitation because *'necessity is the mother of convention'*, and potentially because of a lack of slack resources (Abebe and Angriawan, 2014; Lee *et al.*, 2019), poor capacity to manage knowledge (Chua and Wee, 2013), a preference for using traditional digital tools and spreadsheets (Cerchione and Esposito, 2017), as well as cost issues related to cloud-based technology (Museli and Navimipour, 2018). SMEs mindsets were limited also by size and stages of growth. The adoption of cloud computing at the time period T1 (i.e., pre-intervention) was suspended, and ambidextrous opportunity relinquished in favour of only exploiting existing knowledge. However, at time period T2 by comparison, the well-known *'success trap'* (Leonard-Barton, 1992) that elevates exploitation at the cost of exploration (Levinthal and March, 1993) was avoided since SMEs gained more experience with exploration and they engaged in knowledge activities that built on and extended existing experiences (Lavie *et al.*, 2010). These findings provided an important theoretical insight into the role of technology in enabling K-AMB. There is a dearth of theories that shows

the relationship of technology and K-AMB in compared with the impact of technology on automation, innovation and learning. This study provided the K-AMB lens to study these relationships.

Similarly, the findings from this research extended scholarly understanding about how to analyse ambidextrous opportunities through a longitudinal approach. This is arguably the first study that examines the effects of cloud computing on K-AMB temporal data within the SME context. Here, this research concur with other scholars that SMEs are distinct from larger firms and that it is necessary to adapt theorising from larger firms to SMEs' unique characteristics (Wenke *et al.*, 2021, p. 660). Accordingly, in the absence of sufficient resources, it is perhaps unlikely for SMEs to engage in exploration without allowing for a lapse of time between the first effects of a KMS compared to the effects at a later point in time, i.e., at T2 in this study. This temporal effect allowed organisations to better determine the causal effect of the change (Lesener *et al.*, 2019), especially after a technological intervention. Put simply, the experiences of knowledge workers at T1 were different at T2 in the current study. The unique characteristics of micro and small to medium sized SMEs suggest that a contingency approach is a useful methodology for exploring ambidextrous capability over time. There was also a complimentary finding related to the type of IT adoption (i.e., cloud computing adoption) evident in this study. While integrating insights from previous research suggests that studies exploring the use of cloud computing in SMEs are relatively scarce (Sultan, 2013; Balina *et al.*, 2017), and that extant studies do not examine the whole KMS solution in cloud platforms (Depeige and Doyencourt, 2015), this study examined how cloud computing influences K-AMB capability even while existing studies suggest that IT infrastructure enabled innovation performance (Ardito, Besson*, et al.*, 2018; Benitez *et al.*, 2018).

From a theoretical lens, this research also contributed to the learning organisation literature. Since the mid-90's, numerous quantitative and qualitative studies have examined a wide range of aspects of learning organisation looking through the lens of Peter Senge's five disciplines (Senge, 1990a) concluding that Peter Senge's disciplines play a vital role in a learning organisation. This research oversaw this body of literature and highlighted that, from the perspectives of SMEs, the ambidextrous learning processes were unexplored and ambiguous, and it was unclear how a cloud technology aided transforming SMEs to ambidextrous learning organisation. This study found that learning is least structured in SMEs and the impact of IS over ambidextrous learning aspect is unexplored in majority of studies. To address this theoretical aperture, this study collected data at the time period T3 (i.e., two years after the cloud intervention) to understand explorative learning and exploitative learning processes that facilitated continual learning to transform SMEs to ALO. The research findings extended scholarly understanding about how to analyse ambidextrous learning opportunity through a DSR approach (Hevner *et al.*, 2004). This study examined the longitudinal effects of cloud computing on ambidextrous learning context within the SME sector. Here, this research concurred with other scholars that SMEs are distinct from larger firms and that it is necessary to adapt theorising from larger firms to SMEs' unique characteristics (Wenke *et al.*, 2021, p. 660).

There is another theoretical finding related to the type of IS adoption (i.e., cloud computing adoption) evident in this study. While previous research suggested there is a lack of ambidextrous learning opportunities in the cloud (Depeige and Doyencourt, 2015) and the role of IS in this context is under studied, this study examined how cloud computing influenced knowledge ambidextrous learning capability along with KM capability. Finally, this research contributed towards building an ALO artefact framework and a path to transformation to an

ALO model. These frameworks can offer theoretical lens for future studies on SMEs that aim to transform to ALO. To this extent, this study extends and makes a significant contribution to the existing theories and scholarly research.

This section provided the overall summary of theoretical contributions of this study. Each of the three papers produced as part of this study have specified concrete contributions to theory that has been or will be justified through the academic peer-review process.

7.5 Contribution to practice

The findings of this study have important practical implications. First, adopting C-KMS provided a strong foundation for managing knowledge artefacts for SMEs in a cost-effective and secure way. Thus, SMEs can have better control over the quantity and quality of knowledge flows within organisations, while reaping the benefits of cloud services. C-KMS improved the efficiency of KM by increasing availability of knowledge artefacts, which in turn supports SMEs growth.

Second, the research findings contributed to practice by demonstrating that SMEs can improve the growth and competitiveness of their business by enabling K-AMB through the digital intervention of cloud computing. However, what is important for practitioners is the reality that ambidextrous processes could take time to evolve and have a temporal effect because of the specific technological intervention involved, i.e., cloud computing in this study. Other IT innovations, such as Artificial Intelligence and Big Data, may also have a similar effect on SMEs. The benefits from understanding the principle of K-AMB combined with cloud computing should not be underplayed in practitioner applications and in driving innovation. When knowledge

exploration and exploitation are complementary, they create an environment for innovation and market awareness. This in turn results in increased market capture facilitating SMEs overall growth. As a result, a key practical implication of this study is the importance of educating knowledge workers about the alignment between K-AMB and cloud computing to address the innovation opportunities available. The findings suggested a greater interface is required between digital technologies and employee-driven innovation over time such that knowledge workers in the current study become more familiar with exploratory techniques using technologies, thereby supporting TDI.

Third, the findings from the study also helped employees of SMEs to identify the key indicators to transform their organisation into an ambidextrous learning organisation. This study provided a framework demonstrating how cloud computing facilitated continual learning through explorative and exploitative learning processes. Becoming an ALO can bring useful benefits to employees as they can exhibit their potential to their employers, become skilful professional and inoculate their lifelong learning interests. Cloud computing encouraged employees in explorative learning and acquired knowledge from huge amount of knowledge from various sources such as big data. Cloud also provided knowledge on demand facilitating exploitative leaning. Therefore, cloud computing managed knowledge effectively to increase innovation and learning capabilities of the SMEs. By following these practices, employees could gain new insights and refine their knowledge for correcting errors or improving their work. Therefore, a key practical implication for SMEs was that they must promote continual learning through explorative and exploitative learning processes that could help them avoid obsoleteness and compete better in the turbulent and dynamic markets.

This section provided the overall summary of practical implications of this study. Each of the three papers produced as part of this study have specified concrete implications to practice that has been or will be justified through the academic peer-review process.

7.6 Contribution to society

This research can make an impact to the society from the SMEs context. Various talented entrepreneurs have succumbed in SMEs' business due to multiple factors, mostly due to lack of resources, infrastructure, limited competitive staffs and many more. This study addressed these core issues by offering an artefact for SMEs to be ambidextrous and face these challenges successfully. Sustainability of SMEs will make a direct impact on the society as SMEs employ about 70% of the global work force and contribute largely to the local job market and economy (Ince, 2022). This study promoted entrepreneurs to venture into SMEs and enhance the rate of sustainability to promote emotional satisfaction for the skilled and talented entrepreneurs. As a present context, the COVID-19 pandemic has impacted SMEs more acutely than larger firms (Papadopoulos *et al.*, 2020) and SMEs had to face larger consequences of the lockdowns and shutdowns of businesses in addition to the government-mandated social restrictions. SMEs rely on key resources to work from their homes for business continuity. This has resulted in decreased interpersonal knowledge transfer and increased reliance on technology for KM (Soto-Acosta, 2020). In this scenario, C-KMS can enable SMEs to collect, share and store knowledge remotely, thereby supporting the regional and marginalised communities that are predominantly served by the SME sector.

7.7 Limitations and future research

This study has several limitations that need to be considered. First, the case studies were only based in two countries: India and UAE. Thus, relative resources and capabilities may not have been reflected across a broader subset of SMEs. Accordingly, in future research, the generalisability of the findings should be investigated with diverse samples of SMEs across different kinds of industries and economies that reflect a wider dispersion of resources and capabilities. Similarly, it would be useful to explore the relationship between K-AMB, cloud computing and ambidextrous learning across developed countries (e.g., OECD countries) where SMEs may have greater access to slack resources and technological availability.

This study takes an exploratory and qualitative approach to determine the relationship between cloud technology, K-AMB, Innovation and Ambidextrous learning outcomes. Given the relative novelty of this topic, such methodology can be justified. However, the usual limitations of qualitative study and purposive case study approach applies. In order to make this study more generalisable, the proposed relationships must be studied from a quantitative lens to offer wider validity and reliability of findings through accurate measurements that allow a statistical analysis (Queirós *et al.*, 2017). Practitioners have identified that technology-driven innovation is critical to reduce digital security risks to an acceptable level while managing knowledge in the SMEs (OECD 2015). Future researchers can expand the idea to link K-AMB capabilities from cloud computing that can be leveraged to reduce digital security risk. Moreover, quantitative research method is the preferred method followed by researchers as it covers a larger sample group (Rahman, 2020). Therefore, future researchers might consider

quantitative research methods in their study for evaluating the artefact more comprehensively.

While this study goes further than other studies by examining the contextual effects of integrating K-AMB and cloud computing, cross-industry knowledge effects were not considered. Cross-industry effects of K-AMB may be particularly valuable for future theorising given the shape and size of SMEs in different industries. Likewise, ALO transformation in SMEs is generalised only in private organisations that have similar demographic profiles rather than considering a wider participation from other countries that follow different operational structures. Future research might consider the benefits of shared platforms to enable greater accessibility by various SMEs. In this study, we have designed the framework of ALO for SMEs emphasising cloud technology. However, future research considerations can extend the NLP/AI features of Watson and redesign the framework to look beyond SMEs and cloud technology. This will benefit researchers to cover a wider range of industry and evaluate how NLP/AI facilitate organization in ALO transformation. While time lags of the effects of K-AMB were considered in the current study, future studies might explore more expansive time lags to help better triangulate the data. This can be a new direction which future researchers can explore with more longitudinal data on SMEs continued adoption of cloud computing for KM.

7.8 Chapter Summary

This study found that SMEs initially operated on a compromised K-AMB state where cloud computing is under-utilised, thereby missing out on ambidextrous opportunities. However, after KAF was implemented in SMEs, it was found that SMEs were able to achieve K-AMB supported by technology-driven innovation and that K-AMB created a continuous learning environment that helped SMEs transform into an ambidextrous learning organisation.

In terms of theoretical contribution, this study examined the role of cloud computing on K-AMB capability and associated K-AMB with technology-driven innovation within the SME sector. It was also identified that SMEs that continuously follow K-AMB processes can transform into ambidextrous learning organisations when supported by cloud computing. This study contributed to practice by offering guidelines for SMEs on achieving K-AMB using cloud computing to promote technology-driven innovation and to develop a continuous learning culture.

REFERENCES

Aaltonen, A & Tempini, N 2015, 'Everything counts in large amounts: a critical realist case study on data-based production', in *Formulating research methods for information systems*, Springer, vol. 2, pp. 325-57.

Abdullah, R, Eri, ZD & Talib, AM 2011, 'A model of knowledge management system for facilitating knowledge as a service (KaaS) in cloud computing environment', *2011 International Conference on Research and Innovation in Information Systems*, IEEE, Kuala Lumpur, Malaysia, pp. 1-4.

Abebe, MA & Angriawan, A 2014, 'Organizational and competitive influences of exploration and exploitation activities in small firms', *Journal of Business Research*, vol. 67, no. 3, pp. 339-45.

Adler, P & Heckscher, C 2013, 'The collaborative, ambidextrous enterprise', *Universia Business Review*, no. 40, pp. 34-51.

Ahmadi, M, Osman, MHM & Aghdam, MM 2020, 'Integrated exploratory factor analysis and Data Envelopment Analysis to evaluate balanced ambidexterity fostering innovation in manufacturing SMEs', *Asia Pacific Management Review*, vol. 25, no. 3, pp. 142-55.

Aksoy, MS & Algawiaz, D 2014, 'Knowledge management in the cloud: benefits and risks', *International Journal of Computer Applications Technology and Research*, vol. 3, no. 11, pp. 718-20.

Al-Atwi, AA, Amankwah-Amoah, J & Khan, Z 2021, 'Micro-foundations of organizational design and sustainability: The mediating role of learning ambidexterity', *International Business Review*, vol. 30, no. 1, p. 101656.

Al-Emran, M, Mezhuyev, V, Kamaludin, A & Shaalan, K 2018, 'The impact of knowledge management processes on information systems: A systematic review', *International Journal of Information Management*, vol. 43, pp. 173-87.

Al-Gamrh, B, Ku Ismail, KNI, Ahsan, T & Alquhaif, A 2020, 'Investment opportunities, corporate governance quality, and firm performance in the UAE', *Journal of Accounting in Emerging Economies*, vol. 10, no. 2, pp. 261-76.

Al-Raqadi, AM, Abdul Rahim, A, Masrom, M & Al-Riyami, B 2016, 'System thinking in single-and double-loop learning on the perceptions of improving ships' repair performance', *International Journal of System Assurance Engineering and Management*, vol. 7, no. 1, pp. 126-42.

Alam, AB, Zulkernine, M & Haque, A 2017, 'A reliability-based resource allocation approach for cloud computing', *7th International Symposium on Cloud and Service Computing (SC2)*, IEEE, Kanazawa, Japan, pp. 249-52.

Alavi, M & Leidner, DE 2001, 'Knowledge management and knowledge management systems: Conceptual foundations and research issues', *MIS quarterly*, vol. 25, no. 1, pp. 107-36.

Amankwah-Amoah, J & Adomako, S 2021, 'The effects of knowledge integration and contextual ambidexterity on innovation in entrepreneurial ventures', *Journal of Business Research*, vol. 127, pp. 312-21.

Ardito, L, Petruzzelli, AM, Dezi, L & Castellano, S 2018, 'The influence of inbound open innovation on ambidexterity performance: does it pay to source knowledge from supply chain stakeholders?', *Journal of Business Research*.

Ardito, L, Besson, E, Petruzzelli, AM & Gregori, GL 2018, 'The influence of production, IT, and logistics process innovations on ambidexterity performance', *Business Process Management Journal*, vol. 24, no. 5, pp. 1271-84.

Argyris, C & Schön, D 1978, 'Organizational learning: a theory of action prospective. Addison-Westly', *Reading, Pennsylvania, USA*.

Arpaci, I 2017, 'Antecedents and consequences of cloud computing adoption in education to achieve knowledge management', *Computers in Human Behavior*, vol. 70, pp. 382-90.

Assante, D, Castro, M, Hamburg, I & Martin, S 2016, 'The use of cloud computing in SMEs', *Procedia Computer Science*, vol. 83, pp. 1207-12.

Balco, P & Drahoová, M 2016, 'Knowledge management as a service (KMaaS)', *4th International Conference on Future Internet of Things and Cloud Workshops (FiCloudW)*, IEEE, Vienna, Austria, pp. 57-62.

Balina, S, Baumgarte, D & Salna, E 2017, 'Cloud based cross-system integration for small and medium-sized enterprises', *Procedia Computer Science*, vol. 104, pp. 127-32.

Banerjee, P, Friedrich, R, Bash, C, Goldsack, P, Huberman, B, Manley, J, Patel, C, Ranganathan, P & Veitch, A 2011, 'Everything as a service: Powering the new information economy', *Computer*, vol. 44, no. 3, pp. 36-43.

Barafort, B, Shrestha, A, Cortina, S & Renault, A 2018, 'A software artefact to support standard-based process assessment: Evolution of the TIPA® framework in a design science research project', *Computer Standards & Interfaces*, vol. 60, pp. 37-47.

Barcelo-Valenzuela, M, Carrillo-Villafaña, PS, Perez-Soltero, A & Sanchez-Schmitz, G 2016, 'A framework to acquire explicit knowledge stored on different versions of software', *Information and Software Technology*, vol. 70, pp. 40-8.

Bardsiri, AK & Hashemi, SM 2014, 'Qos metrics for cloud computing services evaluation', *International Journal of Intelligent Systems and Applications*, vol. 6, no. 12, p. 27.

Batista, L, Dora, M, Toth, J, Molnár, A, Malekpoor, H & Kumari, S 2019, 'Knowledge management for food supply chain synergies – a maturity level analysis of SME companies', *Production Planning & Control*, vol. 30:10-12, pp. 995-1004.

Beimborn, D, Miletzki, T & Wenzel, S 2011, 'Platform as a service (PaaS)', *Business & Information Systems Engineering*, vol. 3, no. 6, pp. 381-4.

Benbasat, I, Goldstein, DK & Mead, M 1987, 'The case research strategy in studies of information systems', *MIS quarterly*, pp. 369-86.

Benitez, J, Castillo, A, Llorens, J & Braojos, J 2018, 'IT-enabled knowledge ambidexterity and innovation performance in small U.S. firms: The moderator role of social media capability', *Information & Management*, vol. 55, no. 1, pp. 131-43.

Bhardwaj, S, Jain, L & Jain, S 2010, 'Cloud computing: A study of infrastructure as a service (IAAS)', *International Journal of engineering and information Technology*, vol. 2, no. 1, pp. 60-3.

Bhaskar, R 1978, *A realist theory of science*, 2nd edn, Humanities Press, NJ, USA.

Birkinshaw, J & Gibson, CB 2004, 'Building an ambidextrous organisation', *Advanced Institute of Management Research Paper*, no. 003.

Bocanet, A, Webb, HC & Almulla, H 2022, 'The Impact of the COVID-19 Pandemic: Service Quality in Reviving the United Arab Emirates Hospitality Sector', in *External Events and Crises That Impact Firms and Other Entities*, IGI Global, pp. 196-210.

Bonesso, S, Gerli, F & Scapolan, A 2014, 'The individual side of ambidexterity: Do individuals' perceptions match actual behaviors in reconciling the exploration and exploitation trade-off?', *European Management Journal*, vol. 32, no. 3, pp. 392-405.

Bouzary, H & Chen, FF 2020, 'A classification-based approach for integrated service matching and composition in cloud manufacturing', *Robotics and Computer-Integrated Manufacturing*, vol. 66, p. 101989.

Bratianu, C 2015, 'Organizational learning and the learning organization', *Organizational Knowledge Dynamics: Managing Knowledge Creation, Acquisition, Sharing, and Transformation. Hershey, PA: Information Science Reference*, pp. 286-312.

Bratianu, C, Prelipcean, G & Bejinaru, R 2020, 'Exploring the latent variables which support SMEs to become learning organizations', *Management & Marketing. Challenges for the Knowledge Society*, vol. 15, no. 2, pp. 154-71.

Caione, A, Paiano, R, Guido, AL, Fait, M & Scorrano, P 2015, 'Knowledge Gathering from Social Media to Improve Marketing in Agri-food Sector', *Communications of the IBIMA*, vol. 2015, pp. d1-13.

Calvo-Mora, A, Navarro-García, A, Rey-Moreno, M & Perianez-Cristobal, R 2016, 'Excellence management practices, knowledge management and key business results in large organisations and SMEs: A multi-group analysis', *European Management Journal*, vol. 34, no. 6, pp. 661-73.

Caniëls, MC, Neghina, C & Schaetsaert, N 2017, 'Ambidexterity of employees: the role of empowerment and knowledge sharing', *Journal of Knowledge Management*, vol. 21, no. 5, pp. 1098-119.

Cao, Q, Gedajlovic, E & Zhang, H 2009, 'Unpacking organizational ambidexterity: Dimensions, contingencies, and synergistic effects', *Organization science*, vol. 20, no. 4, pp. 781-96.

Cassidy, L & Hamilton, J 2016, 'A design science research approach to website benchmarking', *Benchmarking: An International Journal*, vol. 23, no. 5, pp. 1054-75.

Centobelli, P, Cerchione, R & Esposito, E 2019, 'Measuring the use of knowledge management systems in supply firms', *Measuring Business Excellence*, vol. 23, no. 4, pp. 426-41.

Cerchione, R & Esposito, E 2017, 'Using knowledge management systems: A taxonomy of SME strategies', *International Journal of Information Management*, vol. 37, no. 1, pp. 1551-62.

Chan, JO 2014, 'Big data customer knowledge management', *Communications of the IIMA*, vol. 14, no. 3, p. 5.

Chege, SM & Wang, D 2020, 'The influence of technology innovation on SME performance through environmental sustainability practices in Kenya', *Technology in Society*, vol. 60, p. 101210.

Chen, J, Leung, WS & Evans, KP 2016, 'Are employee-friendly workplaces conducive to innovation?', *Journal of Corporate Finance*, vol. 40, pp. 61-79.

Chen, Q & Liu, Z 2018, 'How does TMT transactive memory system drive innovation ambidexterity?', *Chinese Management Studies*.

Cho, M, Bonn, MA & Han, SJ 2019, 'Innovation ambidexterity: balancing exploitation and exploration for startup and established restaurants and impacts upon performance', *Industry and Innovation*, pp. 1-23.

Choi, DY & Lee, KC 2015, 'Dynamic resource allocation for exploitation and exploration with ambidexterity: Logical mechanism and simulations', *Computers in Human Behavior*, vol. 42, pp. 120-6.

Chong, CW, Yuen, YY & Chong, SC 2019, 'Exploring KM practices in Malaysian R&D firms', *Global Knowledge, Memory and Communication*, vol. 68, no. 4/5, pp. 356-76.

Chua, Y, K, Alton & Wee, C, N, Janet 2013, 'The peculiarities of knowledge management processes in SMEs: the case of Singapore', *Journal of Knowledge Management*, vol. 17, no. 6, pp. 958-72.

Colombo, MG, Foss, NJ, Lyngsie, J & Lamastra, CR 2021, 'What drives the delegation of innovation decisions? The roles of firm innovation strategy and the nature of external knowledge', *Research Policy*, vol. 50, no. 1, p. 104134.

Costache, S, Dib, D, Parlavantzas, N & Morin, C 2017, 'Resource management in cloud platform as a service systems: Analysis and opportunities', *Journal of Systems and Software*, vol. 132, pp. 98-118.

Crammond, R, Omeihe, KO, Murray, A & Ledger, K 2018, 'Managing knowledge through social media', *Baltic Journal of Management*, vol. 13, no. 3, pp. 303-28.

Dagenais, C, Dupont, D, Brière, FN, Mena, D, Yale-Soulière, G & Mc Sween-Cadieux, E 2020, 'Codifying explicit and tacit practitioner knowledge in community social pediatrics organizations: Evaluation of the first step of a knowledge transfer strategy', *Evaluation and Program Planning*, vol. 79, p. 101778.

Dalkir, K 2013, *Knowledge management in theory and practice*, Routledge.

Dasí, À, Iborra, M & Safón, V 2015, 'Beyond path dependence: Explorative orientation, slack resources, and managerial intentionality to internationalize in SMEs', *International Business Review*, vol. 24, no. 1, pp. 77-88.

Davenport, TH & Prusak, L 1998, *Working knowledge: How organizations manage what they know*, Harvard Business Press.

Del Giudice, M, Maggioni, V, Cruz-González, J, López-Sáez, P, Navas-López, JE & Delgado-Verde, M 2014, 'Directions of external knowledge search: investigating their different impact on firm performance in high-technology industries', *Journal of Knowledge Management*.

Dell'Era, C, Marchesi, A & Verganti, R 2010, 'Mastering technologies in design-driven innovation', *Research-Technology Management*, vol. 53, no. 2, pp. 12-23.

Depeige, A & Doyencourt, D 2015, 'Actionable Knowledge As A Service (AKAAS): Leveraging big data analytics in cloud computing environments', *Journal of Big Data*, vol. 2, no. 1, p. 12.

Derbyshire, J 2014, 'The impact of ambidexterity on enterprise performance: Evidence from 15 countries and 14 sectors', *Technovation*, vol. 34, no. 10, pp. 574-81.

Dessì, N, Milia, G, Pascariello, E & Pes, B 2016, 'COWB: A cloud-based framework supporting collaborative knowledge management within biomedical communities', *Future Generation Computer Systems*, vol. 54, pp. 399-408.

Dezi, L, Santoro, G, Gabteni, H & Pellicelli, AC 2018, 'The role of big data in shaping ambidextrous business process management', *Business Process Management Journal*, vol. 24, no. 5, pp. 1163-75.

Dezi, L, Ferraris, A, Papa, A & Vrontis, D 2019, 'The role of external embeddedness and knowledge management as antecedents of ambidexterity and performances in Italian SMEs', *IEEE Transactions on Engineering Management*, vol. 68, no. 2, pp. 360 - 9.

Ding, S, Yang, S, Zhang, Y, Liang, C & Xia, C 2014, 'Combining QoS prediction and customer satisfaction estimation to solve cloud service trustworthiness evaluation problems', *Knowledge-Based Systems*, vol. 56, pp. 216-25.

Dixon, BE, Simonaitis, L, Goldberg, HS, Paterno, MD, Schaeffer, M, Hongsermeier, T, Wright, A & Middleton, B 2013, 'A pilot study of distributed knowledge management and clinical decision support in the cloud', *Artificial Intelligence in Medicine*, vol. 59, no. 1, pp. 45-53.

Dolz, C, Iborra, M & Safón, V 2019, 'Improving the likelihood of SME survival during financial and economic crises: The importance of TMTs and family ownership for ambidexterity', *BRQ Business Research Quarterly*, vol. 22, no. 2, pp. 119-36.

Dubai, MBRE 2013, *The State of Small & Medium Enterprises (SMEs) In Dubai,* Dubai, https://sme.ae/SME_File/Files/SME_Report_English.pdf>.

Duncan, RB 1976, 'The ambidextrous organization: Designing dual structures for innovation', *The management of organization*, vol. 1, no. 1, pp. 167-88.

Eller, R, Alford, P, Kallmünzer, A & Peters, M 2020, 'Antecedents, consequences, and challenges of small and medium-sized enterprise digitalization', *Journal of Business Research*, vol. 112, pp. 119-27.

Elnagar, S & Osei-Bryson, K-MA 2019, 'A Cognitive Ideation Support Framework using IBM Watson Services'.

Enkel, E & Heil, S 2014, 'Preparing for distant collaboration: Antecedents to potential absorptive capacity in cross-industry innovation', *Technovation*, vol. 34, no. 4, pp. 242-60.

Enkel, E, Heil, S, Hengstler, M & Wirth, H 2017, 'Exploratory and exploitative innovation: To what extent do the dimensions of individual level absorptive capacity contribute?', *Technovation*, vol. 60, pp. 29-38.

Felício, JA, Caldeirinha, V & Dutra, A 2019, 'Ambidextrous capacity in small and medium-sized enterprises', *Journal of Business Research*, vol. 101, pp. 607-14.

Ferro, D & Martins, R 2019, 'Understanding the adoption of Cloud BI in SMEs'.

Filippini, R, Güttel, WH & Nosella, A 2012, 'Ambidexterity and the evolution of knowledge management initiatives', *Journal of Business Research*, vol. 65, no. 3, pp. 317-24.

Fouladi, P & Navimipour, NJ 2017, 'Human resources ranking in a cloud-based knowledge sharing framework using the quality control criteria', *Kybernetes*, vol. 46 no. 5, pp. 876-92.

Fu, H-P & Chang, T-S 2016, 'An analysis of the factors affecting the adoption of cloud consumer relationship management in the machinery industry in Taiwan', *Information Development*, vol. 32, no. 5, pp. 1741-56.

Gilfillan, G 2015, *Definitions and Data Sources for Small Business in Australia: a quick guide*, Parliamentary Library.

Glavas, C, Mathews, S & Russell-Bennett, R 2019, 'Knowledge acquisition via internet-enabled platforms', *International Marketing Review*, vol. 36, no. 1, pp. 74-107.

Gonzalez, RVD 2019, 'Knowledge exploration and exploitation in team context', *Total Quality Management & Business Excellence*, vol. 30, no. 15-16, pp. 1654-74.

Gonzalez, RVD & de Melo, TM 2018, 'The effects of organization context on knowledge exploration and exploitation', *Journal of Business Research*, vol. 90, pp. 215-25.

Grant, M, Robert 1996, 'Toward a knowledge-based theory of the firm', *Strategic management journal*.

Greco, LM, Charlier, SD & Brown, KG 2019, 'Trading off learning and performance: Exploration and exploitation at work', *Human Resource Management Review*, vol. 29, no. 2, pp. 179-95.

Grüne, M 2016, 'Teaching Software Engineering in the Cloud: Applying Cloud Computing Services in E-Business Education', *Bled eConference*, p. 16.

Gupta, P, Seetharaman, A & Raj, JR 2013, 'The usage and adoption of cloud computing by small and medium businesses', *International Journal of Information Management*, vol. 33, no. 5, pp. 861-74.

Gupta, S, Kumar, V & Karam, E 2019, 'New-age technologies-driven social innovation: What, how, where, and why?', *Industrial Marketing Management*.

Habtay, SR 2012, 'A firm-level analysis on the relative difference between technology-driven and market-driven disruptive business model innovations', *Creativity and Innovation Management*, vol. 21, no. 3, pp. 290-303.

Hambrick, DC & Mason, PA 1984, 'Upper echelons: The organization as a reflection of its top managers', *Academy of management review*, vol. 9, no. 2, pp. 193-206.

Hanifah, H, Halim, HA, Ahmad, NH & Vafaei-Zadeh, A 2019, 'Emanating the key factors of innovation performance: leveraging on the innovation culture among SMEs in Malaysia', *Journal of Asia Business Studies*.

Hatz, S, Spangler, S, Bender, A, Studham, M, Haselmayer, P, Lacoste, AM, Willis, VC, Martin, RL, Gurulingappa, H & Betz, U 2019, 'Identification of pharmacodynamic biomarker hypotheses through literature analysis with IBM Watson', *PloS one*, vol. 14, no. 4, p. e0214619.

Heras, HA, Estensoro, M & Larrea, M 2020, 'Organizational ambidexterity in policy networks', *Competitiveness Review: An International Business Journal*.

Hervas-Oliver, J-L, Sempere-Ripoll, F & Boronat-Moll, C 2021, 'Technological innovation typologies and open innovation in SMEs: Beyond internal and external sources of knowledge', *Technological Forecasting and Social Change*, vol. 162, p. 120338.

Hevner, AR, March, ST, Park, J & Ram, S 2004, 'Design science in information systems research', *MIS quarterly*, pp. 75-105.

Hevner, AR, Sudha Ram, Salvatore T. March, Jinsoo Park 2004, 'Design science in information systems research', *MIS Quarterly*, vol. Vol. 28 No. 1, pp. 75-105.

Hock-Doepgen, M, Clauss, T, Kraus, S & Cheng, C-F 2021, 'Knowledge management capabilities and organizational risk-taking for business model innovation in SMEs', *Journal of Business Research*, vol. 130, pp. 683-97.

IBM, C 2022, *Watson Knowledge Catalog on Cloud Pak for Data*, https://www.ibm.com/docs/en/cloud-paks/cp-data/4.0?topic=services-watson-knowledge-catalog>.

Iborra, M, Safón, V & Dolz, C 2020, 'What explains the resilience of SMEs? Ambidexterity capability and strategic consistency', *Long range planning*, vol. 53, no. 6, p. 101947.

Im, G & Rai, A 2014, 'IT-enabled coordination for ambidextrous interorganizational relationships', *Information Systems Research*, vol. 25, no. 1, pp. 72-92.

Ince, F 2022, 'Leadership and sustainability: from the first to the second generation of SMEs ownership', in *Research Anthology on Strategies for Maintaining Successful Family Firms*, IGI Global, pp. 639-60.

Irum, A & Pandey, A 2019, 'Social media – Changing the face of knowledge management', *Development and Learning in Organizations: An International Journal*, vol. ahead-of-print, no. ahead-of-print.

Jabar, MA & Alnatsha, AS 2014, 'Knowledge management system quality: A survey of knowledge management system quality dimensions', *2014 International Conference on Computer and Information Sciences (ICCOINS)*, IEEE, Kuala Lumpur, Malaysia, pp. 1-5.

Jain, N & Gupta, V 2019, 'The impact of knowledge management system on student performance', *VINE Journal of Information and Knowledge Management Systems*, vol. 49, no. 1, pp. 115-35.

Jiang, Y, Tao, D, Liu, Y, Sun, J & Ling, H 2019, 'Cloud service recommendation based on unstructured textual information', *Future Generation Computer Systems*, vol. 97, pp. 387-96.

Júnior, EM, Gobbo, JA, Fukunaga, F, Cerchione, R & Centobelli, P 2020, 'Use of knowledge management systems: analysis of the strategies of Brazilian small and medium enterprises', *Journal of Knowledge Management*, vol. 24, no. 2, pp. 369-94.

Jurksiene, L & Pundziene, A 2016, 'The relationship between dynamic capabilities and firm competitive advantage', *European Business Review*.

Kamal, M & Panebianco, M 2015, 'A Repository of Cloud Services for Small and Micro Enterprises'.

Kang, H, Turi, JA, Bashir, S, Alam, MN & Shah, SA 2021, 'Moderating role of information system and mobile technology with learning and forgetting factors on organizational learning effectiveness', *Learning and Motivation*, vol. 76, p. 101757.

Kapoor, M & Aggarwal, V 2021, 'Comprehending a knowledge framework as a source of dynamic capabilities in IJVs through PLS-SEM', *Journal of Knowledge Management*.

Katou, AA, Budhwar, PS & Patel, C 2020, 'A trilogy of organizational ambidexterity: Leader's social intelligence, employee work engagement and environmental changes', *Journal of Business Research*.

Kavis, MJ 2014, *Architecting the cloud: design decisions for cloud computing service models (SaaS, PaaS, and IaaS)*, John Wiley & Sons.

Khan, NA & Khan, AN 2019, 'What followers are saying about transformational leaders fostering employee innovation via organisational learning, knowledge sharing and social media use in public organisations?', *Government Information Quarterly*, vol. 36, no. 4, p. 101391.

Khayer, A, Talukder, MS, Bao, Y & Hossain, MN 2020, 'Cloud computing adoption and its impact on SMEs' performance for cloud supported operations: A dual-stage analytical approach', *Technology in Society*, vol. 60, p. 101225.

Kilpi, V, Lorentz, H, Solakivi, T & Malmsten, J 2018, 'The effect of external supply knowledge acquisition, development activities and organizational status on the supply performance of SMEs', *Journal of Purchasing and Supply Management*, vol. 24, no. 3, pp. 247-59.

Ko, WW & Liu, G 2019a, 'How Information Technology Assimilation Promotes Exploratory and Exploitative Innovation in the Small- and Medium-Sized Firm Context: The Role of Contextual Ambidexterity and Knowledge Base', *Journal of Product Innovation Management*, vol. 36, no. 4, pp. 442-66.

Ko, WW & Liu, G 2019b, 'How Information Technology Assimilation Promotes Exploratory and Exploitative Innovation in the Small-and Medium-Sized Firm Context: The Role of Contextual Ambidexterity and Knowledge Base', *Journal of Product Innovation Management*, vol. 36, no. 4, pp. 442-66.

Korauš, A, Havierniková, K, Gombár, M, Černák, F & Felcan, M 2020, 'Dimensions and their elements affecting the innovative activities of agricultural SMEs toward their sustainable development', *Entrepreneurship and Sustainability Issues*, vol. 8, no. 2, p. 1142.

Kourtesis, D, Alvarez-Rodríguez, JM & Paraskakis, I 2014, 'Semantic-based QoS management in cloud systems: Current status and future challenges', *Future Generation Computer Systems*, vol. 32, pp. 307-23.

Kumar, M, Paul, J, Misra, M & Romanello, R 2021, 'The creation and development of learning organizations: a review', *Journal of Knowledge Management*.

Lam, A 2019, 'AMB IDE XT RO US LEARN IN G O RGA NIZATIONS', *The Oxford handbook of the learning organization*, p. 163.

Lau, PYY, Park, S & McLean, GN 2020, 'Learning organization and organizational citizenship behaviour in West Malaysia: moderating role of team-oriented culture', *European Journal of Training and Development*.

Lavie, D, Stettner, U & Tushman, ML 2010, 'Exploration and exploitation within and across organizations', *The Academy of Management Annals*, vol. 4, no. 1, pp. 109-55.

Le Dinh, T, Rinfret, L, Raymond, L & Dong Thi, BT 2013, 'Towards the reconciliation of knowledge management and e-collaboration systems', *Interactive Technology and Smart Education*, vol. 10, no. 2, pp. 95-115.

Lee, CY & Huang, YC 2012, 'Knowledge stock, ambidextrous learning, and firm performance', *Management Decision*, vol. 50, no. 6, pp. 1096-116.

Lee, J & Kim, N 2019, 'Know yourself and find your partners', *Management Research Review*, vol. 42 no. 12, pp. 1333-52.

Lee, JY, Yang, YS & Park, BI 2019, 'Interplay between dual dimensions of knowledge sharing within globalized chaebols: The moderating effects of organization size and global environmental munificence', *International Business Review*, vol. 29, no. 6, p. 101637.

Lee, MR & Lan, Y-C 2011, 'Toward a unified knowledge management model for SMEs', *Expert Systems with Applications*, vol. 38, no. 1, pp. 729-35.

Lee, RW, Yip, JY & Shek, VW 2021, 'Building a Learning Organization', in *Knowledge Risk and its Mitigation: Practices and Cases*, Emerald Publishing Limited.

Lee, S, Park, G, Yoon, B & Park, J 2010, 'Open innovation in SMEs—An intermediated network model', *Research Policy*, vol. 39, no. 2, pp. 290-300.

Lee, SM & Trimi, S 2021, 'Convergence innovation in the digital age and in the COVID-19 pandemic crisis', *Journal of Business Research*, vol. 123, pp. 14-22.

Lefebvre, VM, De Steur, H & Gellynck, X 2015, 'External sources for innovation in food SMEs', *British Food Journal*.

Leonard-Barton, D 1992, 'Core capabilities and core rigidities: A paradox in managing new product development', *Strategic management journal*, vol. 13, no. S1, pp. 111-25.

Lesener, T, Gusy, B & Wolter, C 2019, 'The job demands-resources model: A meta-analytic review of longitudinal studies', *Work & Stress*, vol. 33, no. 1, pp. 76-103.

Leung, J 2022, 'An NLP Approach for Extracting Practical Knowledge from a CMS-Based Community of Practice in E-Learning', *Knowledge*, vol. 2, no. 2, pp. 310-36.

Levinthal, DA & March, JG 1993, 'The myopia of learning', *Strategic management journal*, vol. 14, no. S2, pp. 95-112.

Li, Z, Liu, X, Wang, W, Vatankhah Barenji, A & Huang, GQ 2019, 'CKshare: secured cloud-based knowledge-sharing blockchain for injection mold redesign', *Enterprise Information Systems*, vol. 13, no. 1, pp. 1-33.

Lin, A & Chen, N-C 2012, 'Cloud computing as an innovation: Percepetion, attitude, and adoption', *International Journal of Information Management*, vol. 32, no. 6, pp. 533-40.

Lin, H-F 2014, 'Contextual factors affecting knowledge management diffusion in SMEs', *Industrial Management & Data Systems*, vol. 114, no. 9, pp. 1415-37.

Lorentz, H, Laari, S, Engblom, J & Tanskanen, K 2019, 'Attention-based view on achieving ambidexterity in purchasing and supply management', *Journal of Purchasing and Supply Management*, vol. 25, no. 5, p. 100560.

Lynn, T, Liang, X, Gourinovitch, A, Morrison, JP, Fox, G & Rosati, P 2018, 'Understanding the determinants of cloud computing adoption for high performance computing', *51st Hawaii International Conference on System Sciences (HICSS-51)*, University of Hawai'i at Manoa, pp. 3894-903.

Mammassis, CS & Kostopoulos, KC 2019, 'CEO goal orientations, environmental dynamism and organizational ambidexterity: An investigation in SMEs', *European Management Journal*, vol. 37, no. 5, pp. 577-88.

Mamorobela, S & Buckley, S 2018, 'Evaluating the Effectiveness of Social Media on Knowledge Management Systems for SMEs', *European Conference on Knowledge Management*, Academic Conferences International Limited, pp. 1064-72.

March, JG 1991, 'Exploration and exploitation in organizational learning', *Organization science*, vol. 2, no. 1, pp. 71-87.

March, ST & Smith, GF 1995, 'Design and natural science research on information technology', *Decision Support Systems*, vol. 15, no. 4, pp. 251-66.

Marshall, TE & Lambert, SL 2018, 'Cloud-based intelligent accounting applications: accounting task automation using IBM watson cognitive computing', *Journal of Emerging Technologies in Accounting*, vol. 15, no. 1, pp. 199-215.

Mathias, BD 2014, 'Exploration, exploitation, ambidexterity, and firm performance: A meta-analysis', in *Exploration and exploitation in early stage ventures and SMEs*, Emerald Group Publishing Limited.

Mom, T 2006, *Managers' exploration and exploitation activities: The influence of organizational factors and knowledge inflows*.

Mom, TJ, Van Den Bosch, FA & Volberda, HW 2007, 'Investigating managers' exploration and exploitation activities: The influence of top-down, bottom-up, and horizontal knowledge inflows', *Journal of management studies*, vol. 44, no. 6, pp. 910-31.

MSMEs, Mo 2020, *What's MSME*, Ministry of India, India, https://msme.gov.in/know-about-msme>.

Museli, A & Navimipour, NJ 2018, 'A model for examining the factors impacting the near field communication technology adoption in the organizations', *Kybernetes*.

Myers, MD & Venable, JR 2014, 'A set of ethical principles for design science research in information systems', *Information & Management*, vol. 51, no. 6, pp. 801-9.

Niewöhner, N, Asmar, L, Wortmann, F, Röltgen, D, Kühn, A & Dumitrescu, R 2019, 'Design fields of agile innovation management in small and medium sized enterprises', *Procedia CIRP*, vol. 84, pp. 826-31.

Nonaka, I 1994, 'A dynamic theory of organizational knowledge creation', *Organization science*, vol. 5, no. 1, pp. 14-37.

Nunamaker Jr, JF, Chen, M & Purdin, TD 1990, 'Systems development in information systems research', *Journal of management information systems*, vol. 7, no. 3, pp. 89-106.

O'Reilly III, CA & Tushman, ML 2013, 'Organizational ambidexterity: Past, present, and future', *Academy of management Perspectives*, vol. 27, no. 4, pp. 324-38.

O'Leary, DE 2016, 'Is knowledge management dead (or dying)?', *Journal of Decision Systems*, vol. 25, no. sup1, pp. 512-26.

Obeso, M, Hernandez-Linares, R, Lopez-Fernandez, L, Concepcion , María , & Serrano-Bedia, M, Anna 2020, 'Knowledge management processes and organizational performance: the mediating role of organizational learning', *Journal of Knowledge Management*, vol. 24, no. 8, pp. 1859-80.

OECD, OfEC-oaD 2020, *Coronavirus (COVID-19): SME policy responses*, https://www.oecd.org/coronavirus/policy-responses/coronavirus-covid-19-sme-policy-responses-04440101/>.

OECD, P 2017, 'Enhancing the contributions of SMEs in a global and digitalised economy', *Paris. Retrieved Feb*, vol. 25, p. 2019.

OECD 2015, 'Digital Security Risk Management for Economic and Social Prosperity OECD Recommendation and Companion Document*', OECD Publishing*, Paris

Osiyevskyy, O, Shirokova, G & Ritala, P 2020, 'Exploration and exploitation in crisis environment: Implications for level and variability of firm performance', *Journal of Business Research*, vol. 114, pp. 227-39.

Papadopoulos, T, Baltas, KN & Balta, ME 2020, 'The use of digital technologies by small and medium enterprises during COVID-19: Implications for theory and practice', *International Journal of Information Management*, vol. 55, p. 102192.

Papas, N, O'keefe, RM & Seltsikas, P 2012, 'The action research vs design science debate: reflections from an intervention in eGovernment', *European journal of information systems*, vol. 21, no. 2, pp. 147-59.

Park, Y, Pavlou, PA & Saraf, N 2020, 'Configurations for achieving organizational ambidexterity with digitization', *Information Systems Research*, vol. 31, no. 4, pp. 1376-97.

Paschek, D, Ivascu, L & Draghici, A 2018, 'Knowledge management–the foundation for a successful business process management', *Procedia-Social and Behavioral Sciences*, vol. 238, pp. 182-91.

Patterson, LJ 2021, 'Becoming an Ambidextrous Learning Organization: Leadership for Confidence in a Resource-Dependent Nonprofit Environment'.

Pérez-González, D, Trigueros-Preciado, S & Popa, S 2017, 'Social Media Technologies' Use for the Competitive Information and Knowledge Sharing, and Its Effects on Industrial SMEs' Innovation', *Information Systems Management*, vol. 34, no. 3, pp. 291-301.

Popadiuk, S 2012, 'Scale for classifying organizations as explorers, exploiters or ambidextrous', *International Journal of Information Management*, vol. 32, no. 1, pp. 75-87.

Queirós, A, Faria, D & Almeida, F 2017, 'Strengths and limitations of qualitative and quantitative research methods', *European journal of education studies*.

Rafiq, M, Bashar, A & Shaikh, A 2014, 'Innovative trends in knowledge management: A cloud computing perspective', *Proceedings of the First Middle East Conference on Global Business, Economics, Finance and Banking*, Dubai, pp. 10-2.

Rahman, MS 2020, 'The advantages and disadvantages of using qualitative and quantitative approaches and methods in language "testing and assessment" research: A literature review'.

Raisch, S & Birkinshaw, J 2008, 'Organizational ambidexterity: Antecedents, outcomes, and moderators', *Journal of management*, vol. 34, no. 3, pp. 375-409.

Raisch, S, Birkinshaw, J, Probst, G & Tushman, ML 2009, 'Organizational ambidexterity: Balancing exploitation and exploration for sustained performance', *Organization science*, vol. 20, no. 4, pp. 685-95.

Randall, C, Edelman, L & Galliers, R 2017, 'Ambidexterity lost? Compromising innovation and the exploration/exploitation plan', *The Journal of High Technology Management Research*, vol. 28, no. 1, pp. 1-16.

Rialti, R, Marzi, G, Silic, M & Ciappei, C 2018, 'Ambidextrous organization and agility in big data era', *Business Process Management Journal*, vol. 24, no. 5, pp. 1091-109.

Rot, A & Sobinska, M 2017, 'Knowledge Management in the Cloud Computing Model-Challenges, Opportunities and Risks', *FedCSIS (Position Papers)*, pp. 177-81.

Rubenstein-Montano, B, Liebowitz, J, Buchwalter, J, McCaw, D, Newman, B, Rebeck, K & Team, TKMM 2001, 'A systems thinking framework for knowledge management', *Decision Support Systems*, vol. 31, no. 1, pp. 5-16.

Rupčić, N 2018, 'Complexities of learning organizations–addressing key methodological and content issues', *The Learning Organization*.

Sahi, GK, Gupta, MC & Cheng, T 2020, 'The effects of strategic orientation on operational ambidexterity: A study of indian SMEs in the industry 4.0 era', *International Journal of Production Economics*, vol. 220, p. 107395.

Santoro, G & Usai, A 2018, 'Knowledge exploration and ICT knowledge exploitation through human resource management', *Management Research Review*, vol. 41, no. 6, pp. 701-15.

Santoro, G, Ferraris, A, Giacosa, E & Giovando, G 2018, 'How SMEs engage in open innovation: a survey', *Journal of the Knowledge Economy*, vol. 9, no. 2, pp. 561-74.

Santoro, G, Quaglia, R, Pellicelli, AC & De Bernardi, P 2020, 'The interplay among entrepreneur, employees, and firm level factors in explaining SMEs openness: A qualitative micro-foundational approach', *Technological Forecasting and Social Change*, vol. 151, p. 119820.

Saratchandra, M & Shrestha, A 2021, 'Can cloud-based knowledge management systems enable small & medium enterprises to achieve knowledge ambidexterity?', *PACIS 2021 Proceedings*, pp. 1-8.

Scuotto, V, Arrigo, E, Candelo, E & Nicotra, M 2019, 'Ambidextrous innovation orientation effected by the digital transformation', *Business Process Management Journal*, vol. 26, no. 5, pp. 1121-40.

Senaratne, C & Wang, CL 2018, 'Organisational ambidexterity in UK high-tech SMEs', *Journal of Small Business and Enterprise Development*.

Senge, P 1990a, *The firth discipline: the art and science of the learning organisation*, London: Century Business.

Senge, P 1990b, 'Peter Senge and the learning organization', *Rcuperado de*.

Senge, PM 2006, *The fifth discipline: The art and practice of the learning organization*, Currency.

Shamim, S, Zeng, J, Choksy, US & Shariq, SM 2019, 'Connecting big data management capabilities with employee ambidexterity in Chinese multinational enterprises through the mediation of big data value creation at the employee level', *International Business Review*, vol. 29, no. 6, p. 101604.

Singh, S, Chana, I & Buyya, R 2020, 'Agri-Info: Cloud based autonomic system for delivering agriculture as a service', *Internet of Things*, vol. 9, p. 100131.

Singh, SK, Gupta, S, Busso, D & Kamboj, S 2019, 'Top management knowledge value, knowledge sharing practices, open innovation and organizational performance', *Journal of Business Research*, vol. 128, pp. 788-98.

Sinha, S 2015, 'The exploration–exploitation dilemma: a review in the context of managing growth of new ventures', *Vikalpa*, vol. 40, no. 3, pp. 313-23.

Smolarek, M & Sułkowski, Ł 2020, 'Job satisfaction among SMEs employees in Fibres & Textiles of the CEE countries', *Economics & Sociology*, vol. 13, no. 2, pp. 181-209.

Soto-Acosta, P 2020, 'COVID-19 pandemic: Shifting digital transformation to a high-speed gear', *Information Systems Management*, vol. 37, no. 4, pp. 260-6.

Soto-Acosta, P, Popa, S & Martinez-Conesa, I 2018, 'Information technology, knowledge management and environmental dynamism as drivers of innovation ambidexterity: a study in SMEs', *Journal of Knowledge Management*, vol. 22, no. 4, pp. 824-49.

Sultan, N 2013, 'Knowledge management in the age of cloud computing and Web 2.0: Experiencing the power of disruptive innovations', *International Journal of Information Management*, vol. 33, no. 1, pp. 160-5.

Tang, Q, Gu, FF, Xie, E & Wu, Z 2020, 'Exploratory and exploitative OFDI from emerging markets: Impacts on firm performance', *International Business Review*, p. 101661.

Thompson, VA 1965, 'Bureaucracy and innovation', *Administrative science quarterly*, pp. 1-20.

Torres, JP, Drago, C & Aqueveque, C 2015, 'Knowledge inflows effects on middle managers' ambidexterity and performance', *Management Decision*, vol. 53, no. 10, pp. 2303-20.

Tushman, ML & O'Reilly, I, Charles A 1996, 'Ambidextrous organizations: Managing evolutionary and revolutionary change', *California management review*, vol. 38, no. 4, pp. 8-29.

Tushman, ML & O'Reilly III, CA 1996, 'Ambidextrous organizations: Managing evolutionary and revolutionary change', *California management review*, vol. 38, no. 4, pp. 8-29.

Úbeda-García, M, Claver-Cortés, E, Marco-Lajara, B & Zaragoza-Sáez, P 2019, 'Toward a dynamic construction of organizational ambidexterity: Exploring the synergies between structural differentiation, organizational context, and interorganizational relations', *Journal of Business Research*, vol. 112, pp. 363-72.

Vaishnavi, V, Kuechler, W., and Petter, S 2004/19, 'Design Science Research in Information Systems'.

Viswanathan, R & Telukdarie, A 2021, 'A systems dynamics approach to SME digitalization', *Procedia Computer Science*, vol. 180, pp. 816-24.

Wang, C, Zhao, C & Zhang, L 2014, 'A framework for management of massive knowledge in cloud environment', *2014 7th International Conference on Biomedical Engineering and Informatics*, IEEE, pp. 843-7.

Wang, S & Wang, H 2020, 'Big data for small and medium-sized enterprises (SME): a knowledge management model', *Journal of Knowledge Management*, vol. 24, no. 4, pp. 881-97.

Wang, S, Liu, Z, Sun, Q, Zou, H & Yang, F 2014, 'Towards an accurate evaluation of quality of cloud service in service-oriented cloud computing', *Journal of Intelligent Manufacturing*, vol. 25, no. 2, pp. 283-91.

Watkins, KE & Marsick, VJ 1993, *Sculpting the learning organization: Lessons in the art and science of systemic change*, ERIC.

Watson, I 2021, IBM Corp, https://www.ibm.com/watson/products>.

Wenke, K, Zapkau, FB & Schwens, C 2021, 'Too small to do it all? A meta-analysis on the relative relationships of exploration, exploitation, and ambidexterity with SME performance', *Journal of Business Research*, vol. 132, pp. 653–65.

Wynn Jr, D & Williams, CK 2012, 'Principles for conducting critical realist case study research in information systems', *MIS quarterly*, vol. 36, no. 3, pp. 787-810.

Xie, X, Gao, Y, Zang, Z & Meng, X 2019, 'Collaborative ties and ambidextrous innovation: Insights from internal and external knowledge acquisition', *Industry and Innovation*, pp. 1-26.

Yadav, K 2014, 'Role of cloud computing in education', *International Journal of Innovative Research in Computer and Communication Engineering*, vol. 2, no. 2, pp. 3108-12.

Yap, JBH & Lock, A 2017, 'Analysing the benefits, techniques, tools and challenges of knowledge management practices in the Malaysian construction SMEs', *Journal of Engineering, Design and Technology*, vol. 15, no. 6, pp. 803-25.

Yildiz, HE, Murtic, A, Klofsten, M, Zander, U & Richtnér, A 2021, 'Individual and contextual determinants of innovation performance: A micro-foundations perspective', *Technovation*, vol. 99, p. 102130.

Zack, M, McKeen, J & Singh, S 2009, 'Knowledge management and organizational performance: an exploratory analysis', *Journal of Knowledge Management*, vol. 13, no. 6, pp. 392-409.

Zortea-Johnston, E, Darroch, J & Matear, S 2012, 'Business orientations and innovation in small and medium sized enterprises', *International Entrepreneurship and Management Journal*, vol. 8, no. 2, pp. 145-64.