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BUSINESS INTELLIGENCE AND KNOWLEDGE MANAGEMENT INTEGRATION WITHIN SMALL AND MEDIUM ENTERPRISES

Abstract

Knowledge management (KM) and business intelligence (BI) allow businesses to acquire, store, and access important information to create competitive advantages. While large businesses have used BI and KM integrations, small and medium-sized enterprises (SMEs) have lagged behind in these areas. This qualitative exploratory case study used interviews from 11 knowledge management (KM) experts to gather their perceptions of integrating business intelligence (BI) into KM programs. The goal was to identify factors that could improve the performance of structured KM programs within SMEs. A scholarly literature review identified a gap in practice and knowledge; few studies have covered SMEs' adoption of KM and BI tools. The study's framework included a technology acceptance model and absorptive capacity (ACAP) theory. Research findings showed that integrating KM and BI tools can lead to KM and BI tool adoption, knowledge discovery, performance improvement, tacit knowledge assets, knowledge sharing, KMS/KB, and ACAP.

Keywords: knowledge management, business intelligence, knowledge sharing, knowledge assets, small and medium enterprises

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Introduction

Globalization has compelled small and medium enterprises (SMEs) to be innovative; SMEs contribute to 80% of global economic growth (Baporikar, 2016). Innovative use of systems such as knowledge management (KM) and intellectual capital development can contribute to strategic planning and competitive advantage (Surbakti & Ta'a, 2017). Data analytics and business intelligence (BI) implementation in large-scale organizations has become the norm; however, SMEs have been less inclined to incorporate enterprise systems where KM integrates with BI. Organizations should gauge their employees' ability to absorb the knowledge required to use innovative systems such as BI and KM. The ability of an organization's staff to understand and implement new systems is called their absorptive capacity (ACAP). It is unusual for SMEs to measure or understand the ACAP of their organization's staff; however, doing so becomes a competitive advantage (Senivongse et al., 2020). This qualitative study researched how SMEs implement integrated BI and KM systems that measure organizational ACAP.

Background

As SMEs globalize, they must find ways to expand their competitive footprint while remaining sustainable at their smaller size. SMEs are often family-owned and bootstrapped organizations, starting with a main focused mission, but finding that they operate within newer and bigger parameters as time passes. Global competition impacts localized SMEs, so they must become BI and KM-savvy to remain relevant.

This study explored how integrating business intelligence into knowledge management systems works for SMEs; its goal was to determine whether organizations can increase their ability to absorb new knowledge through technology. With the requirements of organizations to understand, embrace, and use new technologies (i.e., artificial intelligence, ChatGPT, and other types of cutting-edge business processes), SMEs must learn to implement these technologies quickly while ensuring that the entire operation is prepared to use them at optimal levels (Giuggioli & Pellegrini, 2023).

Business Problem and Gap in Practice

Despite the stated need, research has shown that SMEs show limited use of collaborative technologies and traditional KM tools, hindering efficiency and effectiveness (Cerchione & Esposito, 2017). While research has delved into large companies' adoption of KM and BI-integrated tools, SMEs have been neglected and are falling behind (Llave, 2017). This study addresses the business problem of the SME's competitive disadvantage when they globalize or when their business becomes subject to global competition. SME owners' gap in practice lies in understanding rapid technological changes, lack of BI vendor support for KM tools, and the need for KM models that integrate with other organizational functions, which relate to the needs of SME owners versus huge enterprises.

Conceptual Framework

Multiple constructs and models guided this study explained in the conceptual framework. This framework discusses the technology acceptance model (TAM), BI, KM, and ACAP.

TAM

TAM (Davis et al., 1989; Venkatesh, 2000) was originally derived from the theory of reasoned action (Fishbein & Ajzen, 1977) and has been widely used to predict the acceptance and adoption of information technology (IT)**.** Technology acceptance theory, rooted in behavioral research, explores user attitudes and system usage. According to Davis (1989), if a system fails to enhance job performance, it is unlikely to be well-received, even if implemented carefully. Davis (1989) proposed two factors, perceived use (PU) and perceived ease of use (PEOU), as determinants of system use. PU refers to the degree to which individuals perceive an application as beneficial for job efficiency, whereas PEOU measures the ease with which a system can be used.

The TAM helps explain how well or easily a SME team of employees can integrate KM platforms with BI systems to enhance the social aspects of KM practices. Another element of the TAM includes perceived enjoyment by the user. Davis et al. (1989) noted that system use is often dictated by whether the operators enjoy using the system.

BI

BI has evolved to become a management tool supporting organizational decision-making processes. The concept of BI was initially defined by Luhn in 1958 as a collection of activities that communicate through an intelligence system, presenting facts in a specific way to assist decision-making. Over time, decision support systems became integrated into organizations to provide management with the necessary data to make informed decisions (Keen, 1981). Data warehouses became the norm (Gangadharan & Swami, 2004), with cloud systems today becoming a propos. Using a data management system is a minimum requirement to operate a SME in modern times. Data mining processes, data visualization, and big data have all become typical standards in BI processes (Chen et al., 2012).

KM

KM, originating from organizational theory, involves creating, sharing, and developing knowledge. It encompasses tacit and explicit knowledge (Nonaka, 1994). KM systems collect, combine, transfer, and create knowledge assets. Organizations utilizing KM can obtain, transform, and implement external knowledge (Valentim et al., 2016). KM is the process and management of producing, sharing, and utilizing organizational information and knowledge (Girard & Girard, 2015). Its goal is to cultivate innovation.

ACAP

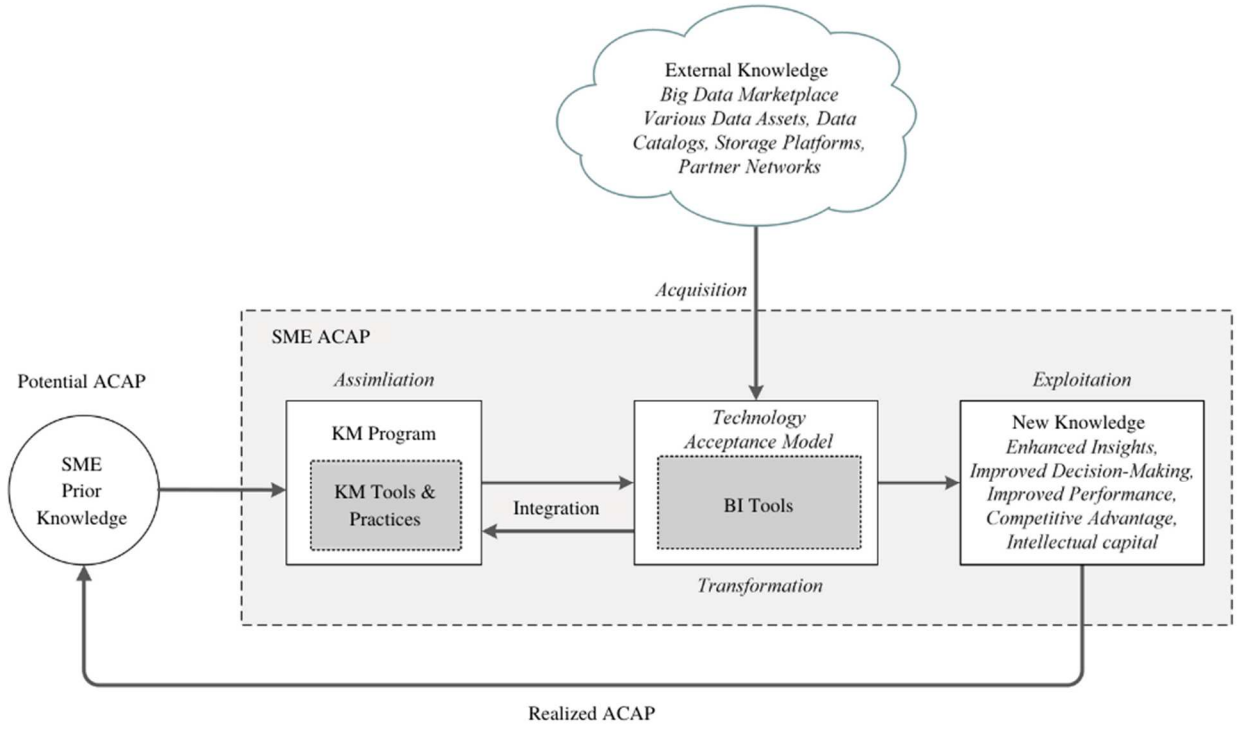
ACAP determines how easily SMEs adopt new integrations. ACAP includes organizational requirements such as innovation (Tsai, 2001), learning (Lane et al., 2001; Valentim et al., 2016), a knowledge-based view of the firm (Zhao & Anand, 2009), and dynamic capabilities (Zahra & George, 2002). The four dimensions of ACAP include acquisition, assimilations, transformation, and exploitation.

ACAP enables organizations to identify, absorb, and commercialize external knowledge (Zahra & George, 2002). ACAP theory, initiated by Cohen and Levinthal (1989), suggested that research and development (R&D) generates new information and enhances a firm's ability to absorb and utilize existing internal information. Investing in R&D allows firms to exploit external information, such as research findings, which forms the foundation for generating new knowledge. When SME owners purposely leverage ACAP into their strategy, they can normalize the exploitation of new knowledge, which ultimately leads to KM and is best realized when a BI system helps control and analyze the ultimate results of the process. Zahra and George identified that potential and realized absorptive capacities exist as two subsets of ACAP, with the acquisition and assimilation of knowledge as potential ACAP (P-ACAP) and the transformation and exploitation of knowledge as realized ACAP (R-ACAP).

The research model in Figure 1 illustrates the integration of KM and BI, where BI serves as an ACAP enabler through data mining and knowledge discovery. Figure 1 depicts the research model for the study based on previous research; the model displays how BI can extract and transform external data through data mining and knowledge discovery and serve as an ACAP enabler, ultimately creating a KM system.

Figure 1

The TAM, KM, and BI Integration Research Design



Literature Review

The literary works summarized in Table 1 focused on four significant areas: TAM, ACAP, BI, and KM.

Table 1

Literature Review Summary

TAM	ACAP	BI	KM
Hatta et al. (2017) large enterprises have achieved BI maturity compared to SMEs, which are lagging. Verma et al. (2018) TAM is the most widely used theory for implementing BI systems. Davis et al. (2023) enhances TAM understanding for diverse technology assessment.	Valentim et al. (2016) ACAP is a mutual process between knowledge and learning. Mamun et al. (2017) ACAP allows SMEs to access external information. Cuevas-Vargas et al. (2022) ICT adoption influences absorptive capacity (ACAP) and open innovation (OI), improving business performance.	Dedić and Stanier (2017) BI is a critical component of the organizational development of competitive advantage. Hatta et al. (2017) BI can be defined as a system that accumulates, analyzes, and conveys information made available for collaboration.	Abusweilem and Abualoush (2019) How integrating KM and BI can increase organizational performance. Gálvez et al. (2018) integrating KM and BI through AI for operational efficiency. Hu et al. (2023) the benefits and challenges of using ChatGPT in KM decision-making.

TAM	ACAP	BI	KM
Nazir and Khan (2022) Using TAM to identify factors influencing SMEs' adoption of information and communication (ICT) technologies.		Al-Okaily et al. (2023) Determining the factors that determine the acceptance of BI on the cloud. Thayyib et al. (2023) The impact of AI and big data on BI.	Ball et al. (2022) executives acquire implicit knowledge by engaging in a social environment where they observe, imitate, and engage in practical activities.

KM can Enable ACAP

Valentim et al. (2016) empirically showed that small firm size positively influences KM practices when used to enhance ACAP. SMEs have the advantage of size to socialize their tacit knowledge and share knowledge connections with their partners. Implementing KM within an SME provides a foundation for increasing ACAP, but more importantly, increasing social and data connections with external knowledge sources is critical for ACAP success. Huang et al. (2016) suggested that KM can become the primary source of sustainable competitive advantage when a fully supported KM strategy focuses on the collaborative connection between people and technology. Kasemsap (2016) provided a distinct perspective by suggesting that KM serves as a system of core competencies that a company uses to maximize business opportunities and mitigate the risks associated with lost business opportunities. Mariano and Walter (2015) and Kasemsap (2016) explained that ACAP aids organizational knowledge exploration.

KMSs can Integrate KM and BI Tools

Cerchione et al. (2015) provided empirical evidence that cultural barriers no longer hinder SMEs from implementing KM practices (meaning that SMEs globally must implement them to remain competitive). SMEs adopt older and more traditional KMSs, like databases and email, instead of more updated and cost-effective KMSs, such as cloud computing, collaborative filtering, crowd-sourcing systems, and AI. Using KMSs has become a standard operating process, although updating new AI systems (i.e., ChatGPT) is only now part of the SME conversation (Hu et al., 2023). Kannan and Miah (2019) extended the use of KMS by suggesting that a BI and KTM framework could help organizational leaders promote trust and communication among digital workers within a knowledge transfer and sharing space and improve organizational learning. Using a KMS to establish collaborative networks seems to be the main purpose, but a KMS enhanced with the latest technology practices that support BI tools can facilitate more collaborative networks and further improve KM practices.

Design and Methodology

This qualitative inquiry study aimed to understand how participants use integrated KM practices/tools and BI tools. The study adopted a qualitative approach to explore diverse experiences and meanings shared by participants, gaining a contextual understanding of the research problem. The study design followed Yin's (2018) and Creswell's (2009) guidelines for exploring new topics and developing a holistic understanding.

Participants

The study involved 11 participants selected through purposive sampling from a LinkedIn KM community of practice and also from a third-party vendor, User Interviews. Participants selection criteria required that only acting KM practitioners could participate if they had the following characteristics: (a) worked at a company with an established KM program, (b) used KM tools within their company's KM program, and (c) used BI and analytics tools such as balanced scorecards, KPIs, metrics, or ad hoc reports. Table 2 shows the demographics of the selected participants.

Table 2

Participants Selected from User Interviews

Participant ID	Occupation	Region	Level of education	Company size by the number of employees
P1	Global KM Lead	Minnesota	PG degree	10,001+
P2	Quality Assurance and Analytics	Virginia	Some college	10,001+
P3	Data & Analytics Director	Virginia	UG degree	1–200
P4	Director of Engineering	New York	PG degree	1001–5000
P5	Market Development Analyst	California	PG degree	None
P6	Global Learning Operations Specialist	Ohio	PG degree	10,001+
P7	Data Scientist	Georgia	UG degree	201–1000
P8	Data Scientist/Sr. Business Analyst	California	PG degree	11–50
P9	Marketing analytics manager	Ohio	PG degree	1001–5000
P10	CIO - Senior IT Professional	New York	UG degree	201–1000
P11	Data Scientist	Texas	UG degree	10,001+

Note. CIO = chief information officer; PG = postgraduate; UG = undergraduate.

Data Collection

Data were collected through one-on-one interviews with participants and by reviewing external documents. The interview data were collected using a semistructured interview protocol to ensure the researcher used the same questions for each participant. Table 3 represents a sample of interview questions designed from the research questions.

Table 3

Research Questions Aligned with Interview Questions

Research Questions	Interview Questions
MRQ: What do KM professionals with BI backgrounds perceive to be reasons for the lack of BI integration into KM programs within an SME?	What does KM mean to you? What does the use of reporting dashboards mean to you? Tell me about your experience using KM within your organization.
SubQ A: How do the TAM, PU, and PEOU constructs help KM professionals explain the lack of BI integration into KM programs within SMEs?	What types of tools do you use to support your KM program? How would you describe your organization's user adoption of technology that support the KM program?

Research Questions	Interview Questions
SubQ B: How do ACAP, Potential ACAP, and Realized ACAP constructs happen when SMEs are open to integration?	Tell me about a case where your organization benefited from a KM program.
SubQ C: How does the integration of BI tools into KM happen when SMEs are reticent to the integration?	Can you tell me how you would use metrics or dashboards to support your KM efforts? Can you describe how the content created and shared with your KM tool is transferred to groups in your organization?
SubQ D: How does the integration of KM tools and practices happen when SMEs are reticent to the integration?	Can you describe how your KM tools create content? Tell me how you share content with your team using your KM tools.

Note. MRQ = main research question; SubQ = subquestion.

Further, documentation reviews of meeting presentations and training materials on KM and BI tools were conducted using available resources from the LinkedIn KM community of practice. Organizational user support and user guides were not accessible. The gathered documents were reviewed to determine contextual insights to compare with the data collected from the interviews. Six meeting presentations and training documents on KM and BI tools were selected for analysis (Table 4).

Table 4

KM and BI Tools Presentation and Training Documents

Title	KM and BI Documents Analyzed
D1	Skills Classification and Collaboration Tool
D2	KM Metrics
D3	Service Portals
D4	Knowledge-Centered Support (KCS)
D5	Story Thinking
D6	Zing: ServiceNow Text Analytics Tool

Data Analysis

Qualitative data analysis begins when a researcher focuses on five analytics stages (Yin, 2018). Five stages were followed to analyze the data.

- Compilation of data in a methodical matter, organizing the data before storage in a secure database;
- Disassembling of data using the researcher's decoding tool before inputting it into the database;
- Reassembling the data by exploring the disassembled data to reveal patterns and insights, enabling the researcher to develop a narrative and compile graphics and tables;
- Interpreting the data being reconstructed to consider qualitative research;
- Concluding the research with the researcher rendering the complete qualitative exploratory study's findings.

Results

Dedoose QDA software was used to analyze interview data once saturation was reached (following P11's interview). The thematic analysis uses coded segments of text to create categories and iteratively combine and summarize three to eight categories into themes (Braun & Clarke, 2006). The initial parent codes and child codes were used.

Coding Process

The initial ten preset codes derived from the literature review are presented in Table 5, aligned with the theories from the conceptual framework and the research questions.

Table 5

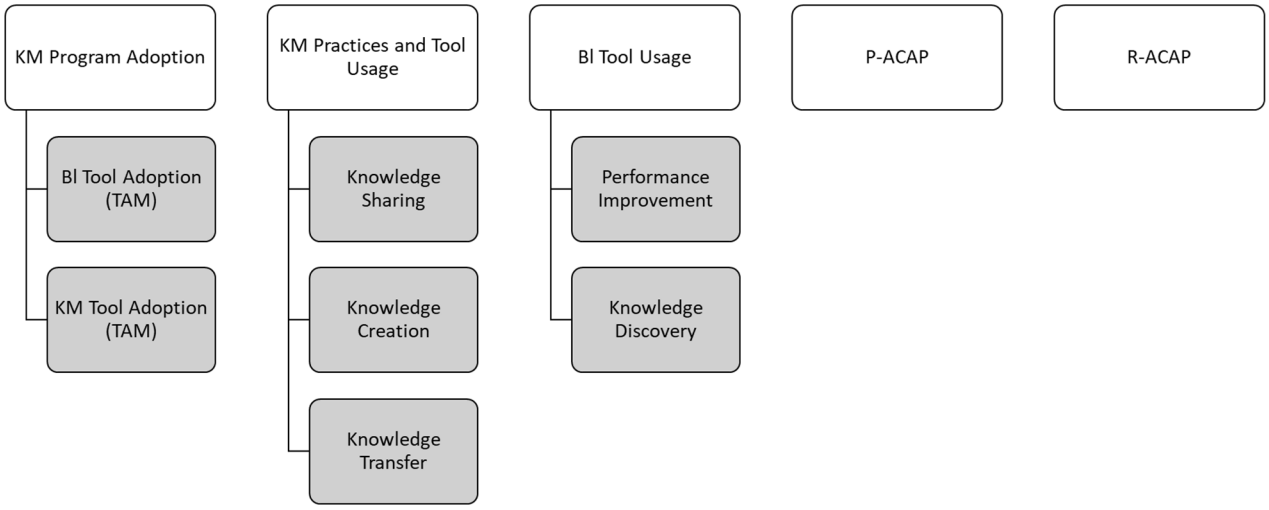
Designed Coding Structure of Known Themes

Research Questions	Theories	Codes
What do KM professionals with BI backgrounds perceive to be reasons for the lack of BI integration into KM programs within an SME?	TAM, ACAP, BI, KM	KM tools, BI tools
How do the constructs of the TAM, PU, and PEOU help KM professionals explain the lack of BI integration into KM programs within SMEs?	PU, PEOU	KM tools, BI tools
How do the constructs of ACAP, Potential ACAP, and Realized ACAP happen when SMEs are open to integration?	P-ACAPR-ACAP	KM program, ACAP
How does the integration of BI tools into KM happen when SMEs are reticent to the integration?	BI, KD, DM	KM program, BI tools
How does the integration of KM tools and practices happen when SMEs are reticent to the integration?	KM, KMS	KM program, KM tools

Level 1, parent codes were used to organize the raw data collected and determine the required saliency. Level 2 codes, child, were used for more specific groups. Additional parent and child codes were added as the coding process proceeded. The updated parent and child code structure is displayed in Figure 4.

Figure 4

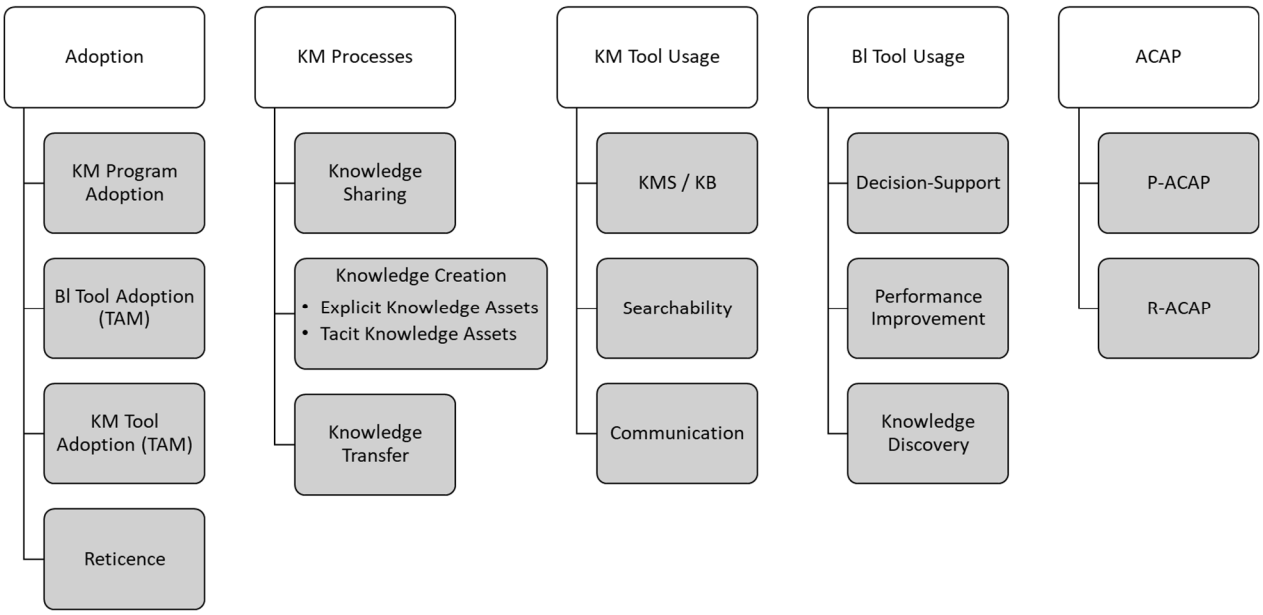
Revised Coding Structure



Patterns emerged as data was distributed through the revised coding structure described in Figure 4— reticence, explicit knowledge assets, tacit knowledge assets, searchability, communication, and decision support. These patterns are represented in the final coding structure, shown in Figure 5.

Figure 5

Concluding Coding Structure



As the coding continued, findings were generated and interpreted regarding each research question supporting the study. The following section further examined how each research question was answered, supporting the study.

Major Themes Identified

As shown in Figure 5, there were five parent codes in the final coding structure. These parent codes included: KM program adoption, KM practices and tool usage, BI tool usage, P-ACAP, and R-ACAP, and were adjusted to adoption, KM processes, KM tool usage, BI tool usage, and ACAP. Data regarding adoption was originally extracted under the parent codes of specific KM program adoption; however, as the amount of data regarding adoption grew, the parent code for adoption was created. The revised adoption parent code included the child codes KM program adoption, BI tool adoption (TAM), KM tool adoption (TAM), and reticence based on the expanding data collection.

The initial parent code, KM practices, and tool usage were split into two separate parent codes to define better KM processes and KM tool usage based on the expanding data collection. The KM process parent code was created as a necessity for the data collection relating to KM processes, which included the initial child codes knowledge sharing, knowledge creation, and knowledge transfer. Child code knowledge creation was expanded further into explicit and tacit knowledge assets to capture themes emerging from the research data. The KM tool usage parent code was created to identify KM tool usage better as the data collected supported decision support KMS/KB, searchability, and communication.

The BI tool usage parent code was revised to include decision support and performance improvement, and knowledge discovery as the data collected supported decision support. The ACAP parent code was created to consolidate P-ACAP and R-ACAP as data collection relating to ACAP was needed to distinguish if ACAP potential was realized. Each parent code was distilled into two to four child nodes, as seen in Figure 5. Eight emerging themes materialized through this process: KM tool adoption (TAM), BI tool adoption (TAM), knowledge discovery, performance improvement, tacit knowledge assets, knowledge sharing, KMS/KB, and P-ACAP/R-ACAP. The eight themes were derived from the most recurring cooccurrence codes, based on the concluding coding structure in Figure 5, illustrated in Figure 6 below, based on the research data.

Figure 6

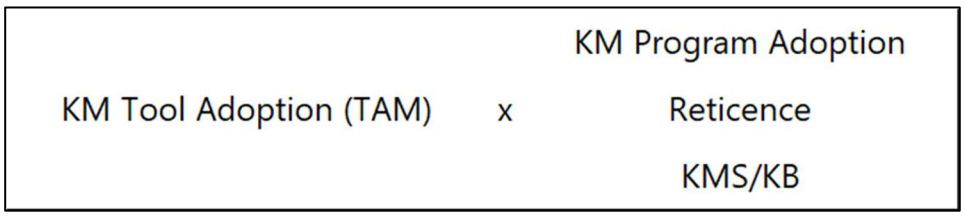
Cooccurrence Code Matrix Captured from the Research Data

Codes	Adoption	KM Program Adoption	BI Tool Adoption (TAM)	KM Tool Adoption (TAM)	Reticence	KM Processes	Knowledge Sharing	Knowledge Creation	Tacit Knowledge Assets	Explicit Knowledge Assets	Knowledge Transfer	KM Tool Usage	KMS / KB	Searchability	Communication	BI Tool Usage	Decision-Support	Performance Improvement	Knowledge Discovery	ACAP	P-ACAP	R-ACAP	Totals
Adoption																							0
KM Program Adoption			6	15	9		5		5	4	1		6	1	1		3	4	2		1		63
BI Tool Adoption (TAM)		6		9	6		3		6	4			5	3	2		20	23	12		4	3	106
KM Tool Adoption (TAM)		15	9		11		13		7	21	2		40	14	14		6	10	10		5	1	178
Reticence		9	6	11			1		2	2			2	1	1		2	2	1				40
KM Processes																							0
Knowledge Sharing		5	3	13	1				20	22	10		29	13	17		7	9	15		16	7	187
Knowledge Creation																							0
Tacit Knowledge Assets		5	6	7	2		20			11	8		20	9	11		27	32	49		25	23	255
Explicit Knowledge Assets		4	4	21	2		22		11		6		53	15	14		12	16	26		15	10	231
Knowledge Transfer		1		2			10		8	6			10	2	7			1	5		7	1	60
KM Tool Usage																							0
KMS / KB		6	5	40	2		29		20	53	10			28	25		15	17	26		22	8	306
Searchability		1	3	14	1		13		9	15	2		28		11		5	3	15		8	3	131
Communication		1	2	14	1		17		11	14	7		25	11			7	8	13		10	4	145
BI Tool Usage																							0
Decision-Support		3	20	6	2		7		27	12			15	5	7			43	33		19	13	212
Performance Improvement		4	23	10	2		9		32	16	1		17	3	8		43		49		23	23	263
Knowledge Discovery		2	12	10	1		15		49	26	5		26	15	13		33	49			36	31	323
ACAP																							0
P-ACAP		1	4	5			16		25	15	7		22	8	10		19	23	36			12	203
R-ACAP			3	1			7		23	10	1		8	3	4		13	23	31		12		139
Totals	0	63	106	178	40	0	187	0	255	231	60	0	306	131	145	0	212	263	323	0	203	139	0

The adoption of KM tools was identified as an outcome of KM program adoption and KMS/KB with some reticence, as depicted in Figure 7.

Figure 7

KM Tool Adoption (TAM)



Participant interviews revealed that the adoption of KM tools resulted from the organization implementing KMS/KB. Table 6 shows participant comments that address KM program adoption, reticence, and KMS/KB.

Table 6

KM Tool Adoption

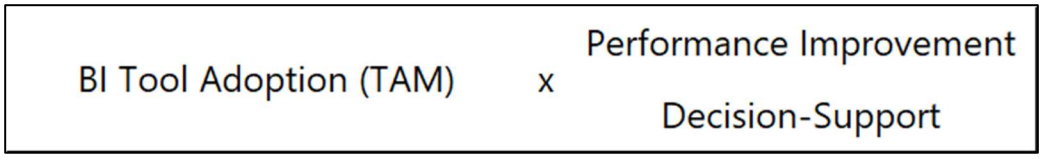
Participant	Quote	Theme
P4	"We're using Confluence, which is basically a hosted wiki from a company called Atlassian… But in any event, the core of that is the ability to share knowledge and make it searchable."	KMA
P2	"We have a program called Freshdesk, that is one of our main like KM tools and our customers. "	KMA
P3	"We will often use Basecamp to capture notes from meetings and … sharing knowledge without throughout the organization."	KMA, KMS/KB
P11	"We recently adopted Trello at the team level. Trello, it's like much more structured, although perhaps not as much as OneNote, depending on how you use it."	KMA, KMS/KB

Note. KM = knowledge management; KMA = knowledge management adoptions; KMS/KB = knowledge management system/knowledge base.

BI tool adoption (TAM) was identified as an outcome of performance improvement and decision-support, as depicted in Figure 8.

Figure 8

Bi Tool Adoption (TAM)



Participant interviews revealed that BI tool adoption (TAM) resulted from the organization wanting to improve performance and decision-support. Table 7 is a sample of participant statements briefly summarizing responses regarding BI tool adoption (TAM), performance improvement, and decision-support.

Table 7

BI Tool Adoption (TAM)

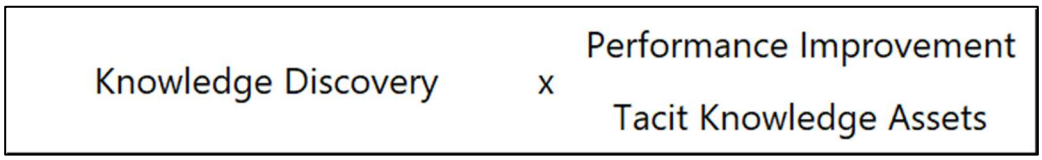
Participant	Quote	Theme
P2	"I know we have, like the pat the performance analytics tool."	BIA/PI
P1	"The use of reporting dashboards is about telling a story and telling that story to leadership."	BIA/PI
P10	'We used a tool called Qlik… It had very good mobile capabilities. And you're able to produce your metrics and being able to deliver them to the executives on their mobile phone or iPad."	BIA/DS
P6	"I've heard, you know, some not so great things about Webtrends from others."	BIA/DS
P11	"The tool that I use to build dashboards is called Spotfire."	BIA/DS

Note. BIA/PI = business intelligence tool adoptions (TAM) and performance improvement, BIA/DS = business intelligence tool adoptions (TAM) and decision support.

Knowledge extraction through knowledge discovery was identified as an outcome of performance improvement and the development of tacit knowledge assets, as depicted in Figure 9.

Figure 9

Knowledge Discovery



Participant interviews revealed that focusing on performance improvement and building tacit knowledge assets resulted in knowledge discovery. Table 8 is a sample of statements made by participants that briefly sum up responses regarding knowledge discovery, performance improvement, and tacit knowledge assets.

Table 8

Knowledge Discovery

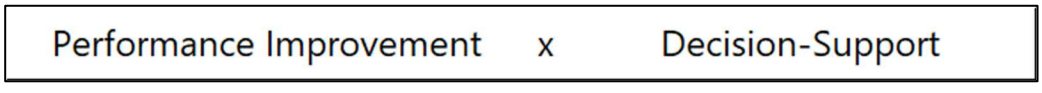
Participant	Quote	Theme
P9	"The scorecard really pulls together each of these pieces of information and kind of summarize it to show them why where they're at how they're tracking toward the goal."	KD/PI
P8	"So basically, the dashboards, just the visuals and stuff like that. That allows us to have a clear picture and be able to it comes up."	KD/PI
P10	"Let's talk about the on-time delivery metric. But what we fail to miss was that when the lead times of a product got extended, we weren't able to build that into the KPI so that we can make adjustments."	KD/TKA
P9	"A lot of us use BI tools…The big advantages of those are being able to kind of automate things and do it quicker, but also being able to put these things more in the users' hands."	KD/TKA
P4	"We just we fed in the data and had the dashboard for them. And when they took a look at it, they started to see some very fairly obvious trends around certain areas, you know, have certain customers that we should target more heavily than others because they had a higher rate of return."	KD/TKA

Note. KD/PI = knowledge discovery and performance improvement, KD/TKA = knowledge discovery and tacit knowledge assets.

Performance improvement. The focus on performance improvement was identified as an outcome of decision-support, as depicted in Figure 10.

Figure 10

Performance Improvement



Participant interviews revealed that the focus on performance improvement resulted in decision-support. Table 9 represents statements made by participants regarding performance improvement and decision-support.

Table 9

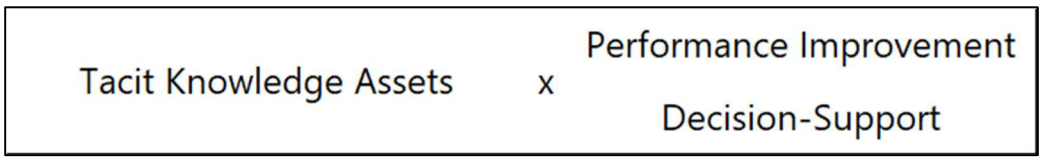
Performance Improvement

Participant	Quote
P10	"We did any analytics tool before we built in the integration with the CRM. We really need to understand how our opportunities and leads were going to focus on and drive the business."
P10	"So employee turnover rate was another one of the metrics. And then we had a couple in the financial area. One was accounts receivable. So how much receivables and how aged are the receivables."
P9	"I would say three main KPIs, and each of those can be broken down into, you know, two to five different metrics that are reported on the scorecard."

The development of tacit knowledge assets was identified as an outcome of performance improvement and decision-support, as depicted in Figure 11.

Figure 11

Tacit Knowledge Assets



Participant interviews revealed that performance improvement and the focus on decision-support developed tacit knowledge assets. Table 10 illustrates statements made by participants regarding tacit knowledge assets, performance improvement, and decision-support.

Table 10

Tacit Knowledge Assets

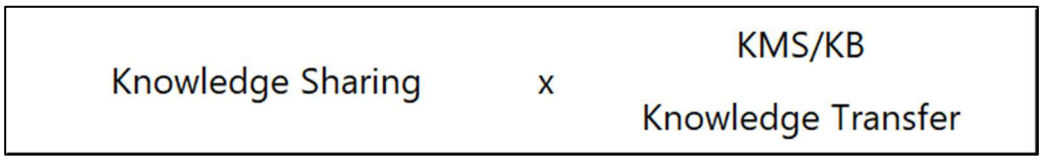
Participant	Quote	Theme
P11	"…but then once you go in and kind of build a dashboard, like, you know, sometimes you can find some additional insight, so forth through that."	TKA
P8	"the dashboards particularly allows us to be able to see the key performance indicators. In terms of the individuals."	TKA/PI
P9	"I would say internally. My team uses our dashboard to get quick answers to satisfy customer satisfaction questions."	TKA/PI
P7	"One of the things we did in our BI is an app. It's like a heat map where each store had a circle, and the radius of the circle indicated gross income like or maybe was ordinary income, like pretty much profitability."	TKA/DS
P5	"When it comes to kind curating the information that we're going over quarterly and tracking our kind of our KPIs, we had or have someone who's … created a visualization tool for that."	TKA/DS

Note. TKA = tacit knowledge assets; TKA/PI = tacit knowledge assets and performance improvement; TKA/DS = tacit knowledge assets and decision support.

The sharing of knowledge within the organization through knowledge sharing was identified as an outcome of using a KMS/KB through knowledge transfer, as depicted in Figure 12.

Figure 12

Knowledge Sharing



Participant interviews revealed that using a KMS/KB to promote knowledge transfer resulted in the practice of knowledge sharing. Table 11 depicts several statements made by participants who briefly sum up responses regarding knowledge sharing, KMS/KB, and knowledge transfer.

Table 11

Knowledge Sharing

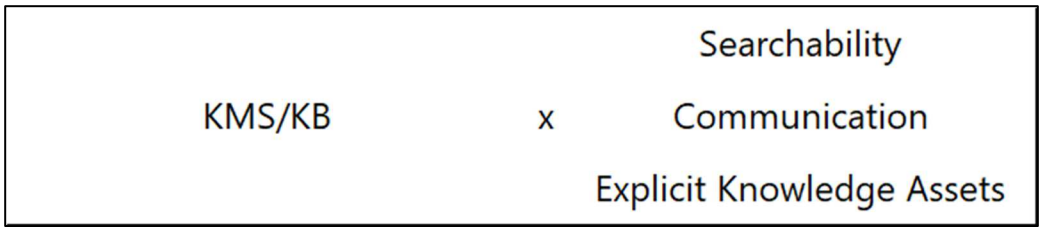
Participant	Quote	Theme
P6	"…what's been a big success for us and having that internet enterprise-level KM, is that people across the world have had the ability to quickly access, you know, the information that we've created internally or we've researched externally..."	KS+KMS/KB
P8	"And we've also with SharePoint to be able to integrate it into it Business Analytics to satisfy Power BI to find it we then started using Microsoft products and we realized that there is much more integration that is the end product because you are not able you don't use disparate systems use all the systems that you need in one place."	KS+KMS/KB
P5	"…whatever tool we're using, whether it's a click or Tableau or Microsoft BI can tap right into these help us create living dashboards where we can go in and kind of understand different pieces of the business better…"	KS+KMS/KB
P2	"We will help them fix it, and I think that's, you know, it's a really, really important thing for a company to do kind of helps bridge that gap of communication."	KS/KT
P3	"One is one example is our analytics team writes code snippets for our client websites and also uses certain code snippets in the process of data analysis"	KS/KT

Note. KS+KMS/KB = knowledge sharing and knowledge management system/knowledge base, KS/KT = knowledge sharing and knowledge transfer.

The use of a KMS/KB was identified as an outcome of needing searchability, communication, and collection of explicit knowledge assets, as depicted in Figure 13.

Figure 13

Knowledge Management System/Knowledge Base



Participant interviews revealed the need for searchability, communication, and collection of explicit knowledge assets resulting in using a KMS/KB. Table 12 is an overview of statements made by participants that briefly sum up responses regarding a KMS/KB, searchability, communication, and explicit knowledge assets.

Table 12

Knowledge Management System/Knowledge Base

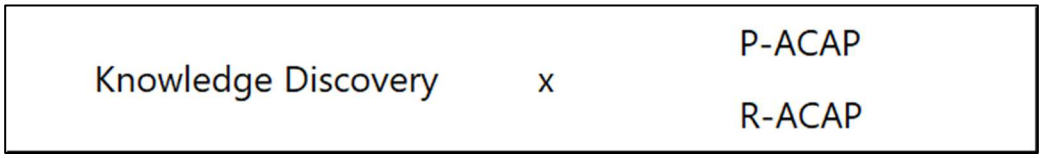
Participant	Quote	Theme
P4	"…a couple of things that Confluence does really well. I think it's good with searchability..."	KMS/KB+S
P3	"Data analytics, project management, user experience, design, visual design, each of those has its own Google site. And one of the big challenges that we faced is that the internal search across all of those is that doesn't apply."	KMS/KB+S
P8	"But often, since we use collaboration to get input to send, or even connect to be able to send, you've benefited data source using Power BI."	KMS/KB+C
P1	"In terms of the KPIs, you know, in terms of what we're trying to measure, or what I want those dashboards to contain, is really I want to know how often these articles are being used."	KMS/KB+EKA
P3	"The documentation is shared across all of the groups, so anybody is able to access it. In addition to our department groups, we also have working groups for specific, specific priorities within the company."	KMS/KB+EKA

Note. KMS/KB+S = knowledge management system/knowledge base and searchability; KMS/KB+C = knowledge management system/knowledge base and communication; KMS/KB+EKA = knowledge management system/knowledge base and explicit knowledge assets.

The advancement of P-ACAP and R-ACAP resulted from information extraction through knowledge discovery, as portrayed in Figure 14.

Figure 14

Knowledge Discovery with P-ACAP and R-ACAP



Participant interviews revealed that P-ACAP and R-ACAP brought about information extraction through knowledge discovery. Statements made by participants briefly summarizing the responses regarding knowledge discovery, P-ACAP, and R-ACAP are shown in Table 13.

Table 13

Knowledge Discovery with P-ACAP and R-ACAP

Participant	Quote	Theme
P8	"Yes, we connect data from external sources. Now, so we may use data from the SQL database. We also use what is called Stream Analytics ."	KD/ P-ACAP
P9	"Yeah, well, this, that's where we get into more of the statistical analysis. The dashboards we built are primarily to give a kind of a current view of the data and results."	KD/ P-ACAP
P6	"And we learned our users were much more receptive to, you know, that reduced content, and they actually felt like they understood the process more, um, when the number of documents was reduced."	KD/ R-ACAP
P9	"And by using these online tools like Looker, we were able to really expand our reach within our clientele and really give greater and wider access to our clients to get the information they were looking for."	KD/ R-ACAP

Note. KD/P-ACAP = knowledge discovery and potential absorptive capacity, KD/R-ACAP= knowledge discovery and realized absorptive capacity.

Unexpected Findings

Even though the themes of KM tool adoption (TAM), BI tool adoption (TAM), knowledge discovery, performance improvement, tacit knowledge assets, knowledge sharing, KMS/KB, and P-ACAP/R-ACAP were found in the literature, the sub-themes of KM tool usage: searchability and communication were not found. Because these two themes were not ascertained in the literature, they were considered unexpected findings. Further, while knowledge discovery was a known theme in the literature, the participants of this study did not raise knowledge discovery as a tool used.

Summary

The lack of integration between a structured KM program and a BI system can result in non-competitiveness, low innovation, and poor performance in SMEs (Kasemsap, 2015; Surbakti & Ta'a, 2017). This study aimed to address the gap in practice regarding the adoption and use of specific KM and BI tools by SMEs to develop explicit knowledge assets, improve organizational performance, and facilitate the discovery of tacit knowledge assets. Participants were selected purposively based on their active involvement in a KM program, experience with KM and BI tools, and utilization of them to achieve organizational objectives.

Upon completing the research, data collected confirmed two sub-themes absent from the literature review: searchability and communication. The literature did describe knowledge discovery as a known theme, but the study participants seemed unfamiliar with knowledge discovery;. Although participants identified knowledge discovery as being important to performance improvement by making statements such as, *I'm sharing insights with clients, reports with clients*, *other kind of analytics to give deeper insights*, and *expose your insights, after analyzing the data*, participants found it difficult to identify examples of ways that knowledge discovery helped them develop tacit knowledge.

Data analysis created new child codes to organize the data collected on KM program adoption, BI tool adoption (TAM), KM tool adoption (TAM), reticence, knowledge sharing, knowledge creation, explicit knowledge assets, tacit knowledge assets, knowledge transfer, KMS/KB, searchability, communication, decision-support, performance improvement, knowledge discovery, P-ACAP, and R-ACAP. These codes help categorize and analyze the data efficiently.

The research study identified eight dominant themes: KM tool adoption (TAM), BI tool adoption (TAM), knowledge discovery, performance improvement, tacit knowledge assets, knowledge sharing, KMS/KB, and P-ACAP/R-ACAP. These themes address the reasons for the lack of BI integration into KM programs in SMEs and provide examples of how TAM and ACAP explain this lack of integration. The study also examined the integration of KM and BI tools in relation to reticence.

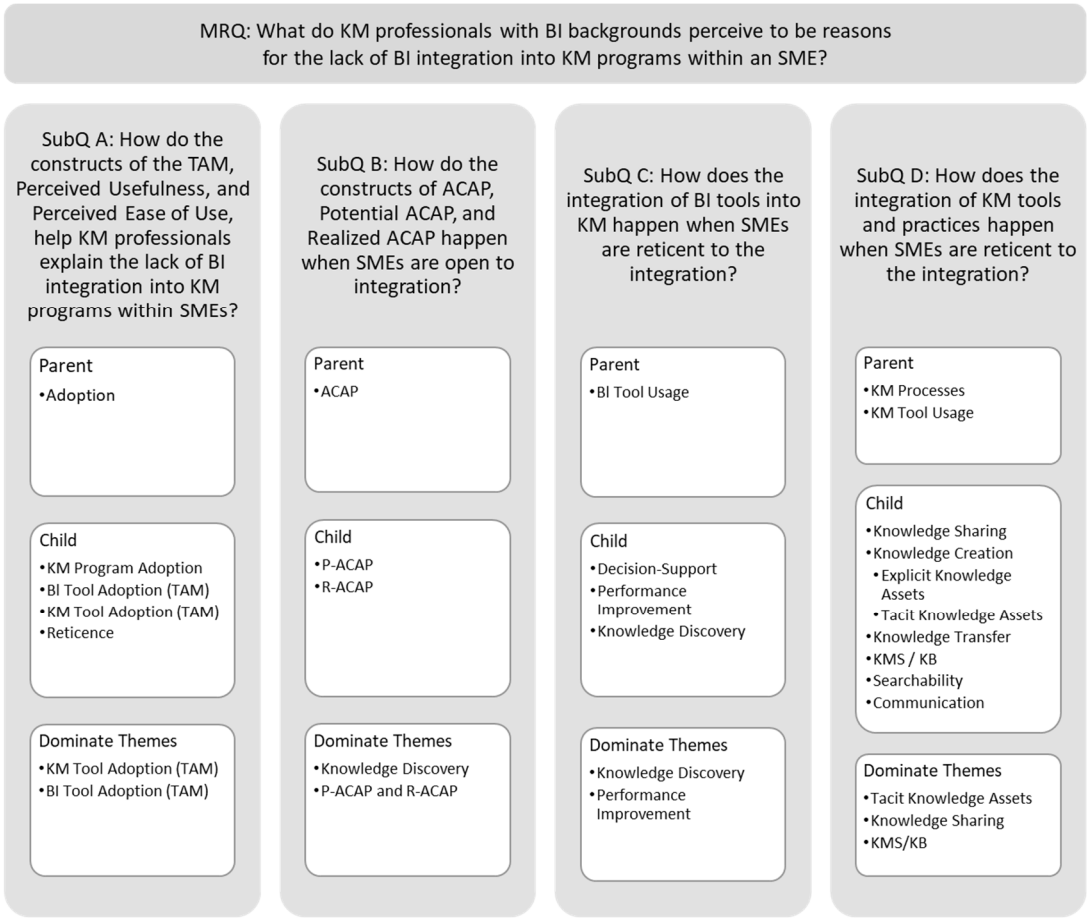
Discussion, Implications, and Recommendations

KM program adoption resulted in the positive outcome of KM tool adoption in SMEs, including using KMS/KB with some reticence due to organizational implementation. Adopting BI tools (TAM) led to performance improvement and decision-support, driven by the organization's desire to enhance performance and decision-making. Knowledge discovery contributed to performance improvement and the development of tacit knowledge assets. The focus on performance improvement also facilitated better decision-support. Knowledge sharing within the organization was achieved through a KMS/KB, enabling knowledge transfer. Using a KMS/KB was driven by the need for searchability, communication, and the collection of explicit knowledge assets. Participant interviews revealed that using a KMS/KB was motivated by the need for searchability, communication, and explicit knowledge collection. Information extraction through knowledge discovery facilitated the advancement of P-ACAP and R-ACAP.

This study's main research question and four subquestions uncovered eight dominant themes, as shown in Figure 15.

Figure 15

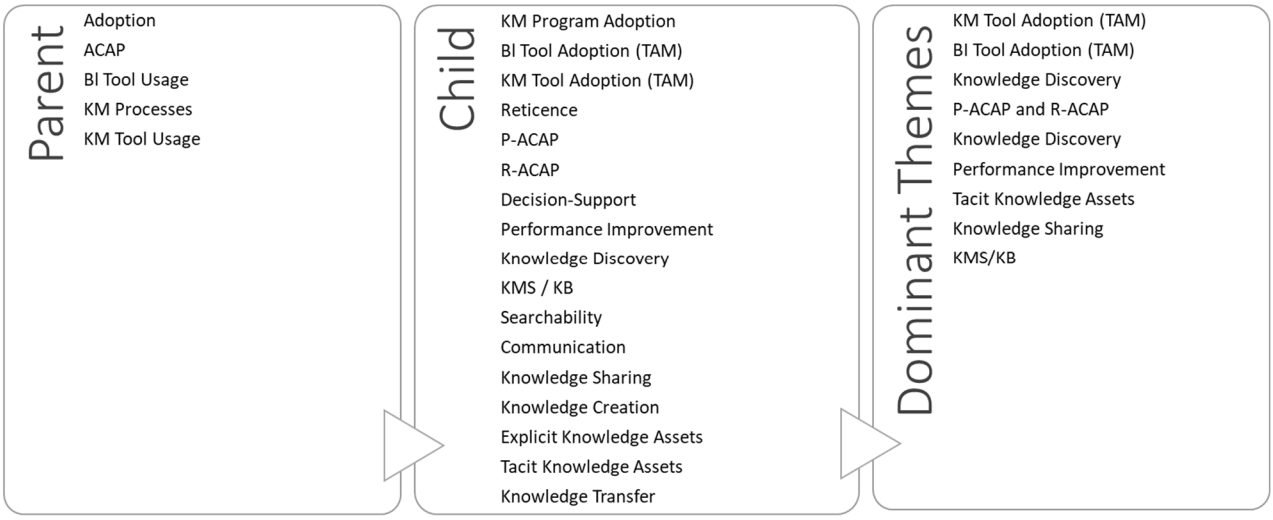
Alignment Between the Research Question, Parent Code, Child Code, and Dominant Themes



New child codes were created to capture data on KM program adoption, BI tool adoption (TAM), KM tool adoption (TAM), reticence, knowledge sharing, knowledge creation, explicit knowledge assets, tacit knowledge assets, knowledge transfer, KMS/KB, searchability, communication, decision-support, performance improvement, knowledge discovery, and P-ACAP/R-ACAP. Data analysis revealed the positive impact of knowledge discovery on ACAP, using a BI tool facilitating P-ACAP and R-ACAP in SMEs. Additionally, using a KM tool for knowledge discovery supported the development of tacit knowledge assets, searchability, communication, performance improvement, and decision-support within a KMS/KB. See Figure 16 for a visual representation.

Figure 16

New Parent Codes and The Associated Dominant Themes



The following in-depth analysis uses the findings to attempt to answer each of the study's research questions.

MRQ

What do KM professionals with BI backgrounds perceive to be reasons for the lack of BI integration into KM programs within an SME?

Data indicated that most of the participants in this study perceived that their organization's leadership did not fully see the value of KM, that no KM framework was followed or standardization within the current KM program, except for one participant who noted their organization using a KCS (Knowledge-Centered Service) framework. Further, many participants did not actively use BI to measure KM effectiveness but regularly used BI for decision support.

SubQ A

How do the constructs of the TAM, PU, and PEOU help KM professionals explain the lack of BI integration into KM programs within SMEs?

Data revealed that the adoption of KM tools using TAM constructs, PU, and PEOU, is dependent on positive KM program adoption, low reticence, and flexibility of a KMS/KB and that the adoption of BI tool adoption using TAM constructs, PU, and PEOU, leads to improved performance and decision support. Likewise, some participants experienced difficulties when initially implementing KMS/KB citing system incompatibilities. Further analysis of the adoption of BI tools and KM tools within an active KM program resulted in finding that many participants of various organizations have not integrated their KM tools and BI tools to measure KM effectiveness but rather use them separately, with some participants citing that it was a tedious process to integrate.

SubQ B

How do the constructs of ACAP, Potential ACAP, and Realized ACAP happen when SMEs are open to integration?

Data showed that knowledge discovery leads to improved ACAP, both P-ACAP, and R-ACAP, and that leveraging external knowledge sources such as customer data, vendor specs, and other open-source data to assimilate with internal knowledge enhanced metrics, KPIs, dashboards, and data visualizations. Likewise, participants developed new insights outside the use of typical dashboards because of the qualitative nature of the knowledge, which led to more ad hoc discussions and improved group narratives. Further analysis of the constructs of ACAP, P-ACAP, and R-ACAP resulted in the finding that participants' insights from custom BI analysis within their organization, as opposed to typical dashboards, enabled the contextualization of data that facilitates ACAP.

SubQ C

How does the integration of BI tools into KM happen when SMEs are reticent to the integration?

Data from the study revealed that drawing insights from performance improvement and decision support results using knowledge discovery as a BI tool and process improves tacit knowledge asset development and that reticence was not an apparent issue in the use of BI tools within a KM program as the participants were experts and comfortable in the use of BI tools of various types. Further analysis of BI tool integration within a KM program resulted in the finding that it developed tacit knowledge assets when participants leveraged data visualization from dashboards, statistical models, or custom analytics models.

SubQ D

How does the integration of KM tools and practices happen when SMEs are reticent to the integration?

Data showed that developing tacit knowledge assets improves performance and decision support. Moreover, knowledge sharing within a KMS/KB leads to enhanced knowledge transfer. In contrast, the functionality of searchability, communication, and the continued development of explicit knowledge assets leads to an improved KMS/KB. Likewise, some reticence exists toward KM tools among a few participants who described their organization's competing priorities and that KM use is not a top priority. Further analysis of KM tools such as a KMS/KB revealed that when searching and query capabilities are integrated, it provides flexibility and improved knowledge-sharing functionality, encouraging the development of tacit knowledge assets.

Recommendations for Further Research

This study assessed KM and BI tool adoption and use via one-on-one interviews and documentation of a community of practice training and meeting sessions. Because the interviews occurred primarily outside of their organization, participants were limited in providing confidential information about specific processes. This study's results were limited to the responses of KM practitioners from SMEs with a KM program. This small, purposefully selected population used for this study did not provide a representative sample across all SMEs. Further, KM and BI tool adoption and use were assessed for one short duration, between May and October 2020, during the first several months of the global COVID-19 pandemic. Since changes in how KM and BI tools are adopted and used and the conditions under which the study was performed changed over time, the study's results may not represent circumstances postpandemic.

The following are considerations for future research. Researchers in the field could:

- expand the development of frameworks that SMEs could use to implement KM and BI systems that increase their ACAP;
- explore the unexpected findings of searchability and communication;
- dive deeper into the themes of searchability and communication as determinates for KMS/KB adoption expanded the knowledge to both the scholarly and practitioner communities;

- explore the unexpected finding surrounding knowledge discovery as a KM process and BI tool to increase SME ACAP;
- expand throughout more regions, including a more comprehensive selection of KM practitioners who use KM and BI tools for knowledge discovery, performance improvement, tacit knowledge asset development, and knowledge sharing;
- explore the unexpected findings of using KM tools and processes to develop new tacit knowledge assets that improve performance, searchability, and communication within a KMS/KB; or
- apply this study's developed data in a questionnaire study utilizing quantitative analysis.

Practical Applications

This study revealed that adopting KM and BI tools using TAM constructs, PU, and PEOU, depends on positive KM program adoption, low reticence, and flexibility of a KMS/KB. Using knowledge discovery as a KM tool leads to improved ACAP, and drawing insights from performance improvement and decision support results in using knowledge discovery as a BI tool to improve tacit knowledge asset development. Developing tacit knowledge assets leads to improved performance, decision support, knowledge sharing, and knowledge transfer within a KMS/KB. The contribution to knowledge toward understanding the low adoption of BI integration into a structured KM program this research fulfilled is that ACAP can be used as a framework to measure KM effectiveness when KM and BI tools are integrated.

The findings from this research study also augmented the existing body of knowledge on the phenomenon of BI tool adoption and use by providing validity to the subsets of ACAP, P-ACAP, and R-ACAP when knowledge discovery is used as a KM tool and process to develop new tacit knowledge assets. The most significant findings from this study are the adoption of BI tools to extract knowledge through knowledge discovery resulting in performance improvement. More importantly, the advancement of P-ACAP and R-ACAP to develop tacit knowledge assets and the need for searchability and communication functionality within a KMS/KB to create explicit knowledge assets. The benefit to the scholarly community is that findings from this research study augmented the existing body of knowledge on the phenomenon of KM tool adoption and use by providing insight into expanding the TAM determinates, PU, and PEOU, to include searchability and communication as determinates for KMS/KB user adoption.

The benefit to the practitioner is that findings from this study help support ACAP when KM and BI tools are adopted and integrated within a KMS/KB to facilitate knowledge discovery to develop tacit knowledge assets and enhance the functionality of a KMS/KB with searchability and communication that improves knowledge sharing and knowledge transfer. This research provides practical knowledge to assist KM practitioners with an integrated framework that can help develop new tacit knowledge assets to increase SME ACAP through KM and BI integration to improve KM performance, organizational performance, and decision support. KM practitioners of SMEs can use ACAP, more specifically P-ACAP, and R-ACAP, as an integrated conceptual framework to recognize, assimilate, transform, and exploit new knowledge through the adoption of BI tools and KM tools, using TAM for knowledge discovery and the development of new tacit knowledge assets that improve organizational performance and decision-support.

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