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# 13. Factors influencing the adoption of knowledge protection strategies by Australian SMEs in the Construction sector

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## Abstract

*Small and medium sized enterprises (SMEs) are major contributors to economies. The construction industry sector is one of the largest contributors towards Australian GDP. This is a sector that has many small businesses who are required to share knowledge as part of their collaboration with business partners and suppliers. In some instances, this necessitates the protection of organizational knowledge to help construction SMEs to sustain competitive advantage and/or inhibit the leakage and spillover of critical knowledge outside the business. However, SMEs in 'low-tech sectors (such as the construction sector) do not typically pay much attention to the implementation of knowledge protection (KP) strategies. Thus, this study has identified factors that potentially influence KP adoption in construction SMEs, and the types of KP strategies they adopt. Qualitative semi-structured interviews were conducted with four SMEs in a metropolitan area of Australia. An important result of the study is the identification of the extent of KP strategies and their enablers and barriers. Various organizational factors (sector [in this case, construction], location, age, organisational structure) and SMEs characteristics (size, owner/manager characteristics, flexibility, relationships) are identified that can potentially influence the adoption of KP strategies in construction SMEs. The results suggest that size, age, flexibility, relationships and organisation structure impact KP adoption, as well as owner/manager characteristics which moderately impacts KP adoption. SMEs in general are inclined towards the implementation of informal and semi-formal protection methods, mostly due to the scarcity of the resources available to them.*

**Keywords:** Knowledge management, Knowledge protection, Small and medium enterprises.

## 1. Introduction

The construction industry is Australia's third largest producing sector with around 8% of Australian GDP. It is mostly comprised of small and medium businesses (SMEs). Most construction businesses are sole operators with no employees (ABS, 2017). This is because of the traditional structure of subcontractors in the sector. Hiring subcontractors is cost efficient for small businesses rather than hiring full time employees (AiGroup, 2015). Construction companies rely on knowledge sharing and collaborations with their business partners, which makes protection of their crucial knowledge (known as knowledge protection, or KP) critical. KP is one of the steps of knowledge management, and involves efforts made by an organisation to prevent knowledge "from being altered, transferred to other organizations, lost, or becoming obsolete" (Bloodgood & Salisbury 2001, p 57). KP assists an organisation to sustain competitive advantage, as well as protecting organisational knowledge from spill overs and leakages ('spill overs' being the exchange of knowledge among individuals and companies). Knowledge leakage is an unwanted knowledge transfer or deliberate or accidental loss of knowledge from an organisation to its competitors (Ahmad, Bosua & Scheepers, 2014; Annansingh, 2012). The smaller size of many construction businesses makes their use of KP more challenging (Estrada, Faems

& Faria, 2015) as the tools required for KP are often limited and costly (Päällysaaho & Kuusisto, 2011). This study examines the factors that influence the use of KP strategies by SMEs. The study has the following research questions:

- What factors influence SMEs when adopting knowledge protection strategies?
- What strategies, if any, do SMEs use to protect their knowledge?

The study proposes a theoretical framework to examine these questions, using semi-structured interviews with Australian SMEs in the construction sector.

## 2. Knowledge Protection

KP strategies are broadly classified into three categories: formal, semi-formal and informal (Zins, 2007). Formal KP methods arise mostly from intellectual property protection legislation and are termed as ‘formal’ methods as they require legal authorization (Passi, Valkokari, Hytonen, Huhtilainen & Nysten-Haarala, 2012). They are effective in protecting knowledge that can be codified and embodied in products and services, for example software. Organisations who produce new knowledge and innovative ideas apply for protection using these methods and government agencies evaluate the novelty of the knowledge and grant legal protection for exclusive use and licensing rights, usually for years (Olander, 2014). Examples of formal KP methods are: patents, design rights, trademarks, and copyright (which requires formal registration in some countries, but not in Australia, which makes it more of a semi-formal measure in that country). In Australia when something is documented then it is automatically protected under copyrights but if a design has to be commercialized then it can be protected under design rights (IP Australia, 2021). Informal methods of KP are methods which are based on companies’ internal policies and processes rather than legislation (Passi et al., 2012). Informal methods of KP generally do not require extensive investments, validation or codification. The implementation of informal methods generally does not require special tools and technologies. These methods are often attractive to SMEs (Byma & Leiponen, 2006). They can be embedded into business routine operations. Sometimes organisations adopt informal KP methods without realizing it (Paällysaaho & Kuusisto, 2011). Examples of informal KP methods are: authentication processes, authorization, cabinet locking, and division of work. Semi-formal methods of KP are methods that lie in between formal and informal methods. Examples are secrecy, restricting access to information and technical protection. The next section examines the factors that potentially influence KP strategies

### 2.2 Factors influencing knowledge protection

#### 2.2.1 Organisational and other factors

KP strategies may differ across **industry sectors**. For instance, ‘low-tech’ sectors may be drawn to informal KP methods. Bolisani, Paiola and Scarso (2013) examined KP in knowledge intensive business services and found that the rate of usage of KP methods was low across these sectors. There is a direct link between knowledge reuse and protection as companies providing customized services like accounting or other financial services employ KP more frequently than others. The geographic **location** of an industry may have an impact on its use of KP strategies. Although there is no study specifically focusing on the relationship between geographic location and KP implementation, there have been differences in the use of digital technologies by SMEs in metropolitan and rural areas (Galloway & Mochrie, 2005).

#### 2.2.2 SME factors

**Smaller sized businesses** face a scarcity of resources like finances, time, infrastructure and skills to know if and how to introduce KP effectively (Soto-Acosta & Merono-Cerdan, 2008). As noted by Faria & Sofka (2010), very large businesses tend to adopt a wide range of KP strategies. Päällysaaho & Kuusisto (2011) investigated Intellectual Property (IP) protection and management practices in small

service firms in Finland and United Kingdom. The study found that small firms prefer informal protection practices over formal methods. Olander, Laukkanen & Heilmann (2009) demonstrated the challenges of retaining core knowledge and capturing value by SMEs in choosing between knowledge sharing and protection. According to Byma and Leiponen (2009), formal KP mechanisms go through lengthy application processes and also require extensive resource commitment. SMEs with lesser resources may not invest in implementing them. Small businesses also face resource constraints with regards to the use of digital technologies (Sellitto et al., 2016). This can impact on their ability to use digital technologies as part of their KP strategies. Another characteristic of SMEs is their **informal management** style, where the owner of the business mostly acts as the manager. Managers should typically conduct long term strategic planning and ideally select strategies to be implemented based on challenges being faced (Keramati & Azadeh, 2007). However, SMEs are typically short-term planners and conservative adopters of information technology, which often reflects the characteristics of the owner/ manager (Sellitto, Banks, Bingley & Burgess, 2016). It is reasonable to assume that KP practices will also be related to the characteristics of the owner/ manager. Another consideration is that small businesses are **flexible** (Burgess, Sellitto & Karanasios, 2009) which makes it easier for them to introduce KP practices. They do not have to go through lengthy formal procedures to change approaches and may find it easier to adjust. Finally, strong **relationships** between SMEs and their suppliers and collaborators also make it easier for them to share information, but to protect their unique ideas and innovation from imitation they require KP strategies. (Chesbrough, 2011). The factors that potentially influence KP strategies in SMEs are summarised in Figure 1.

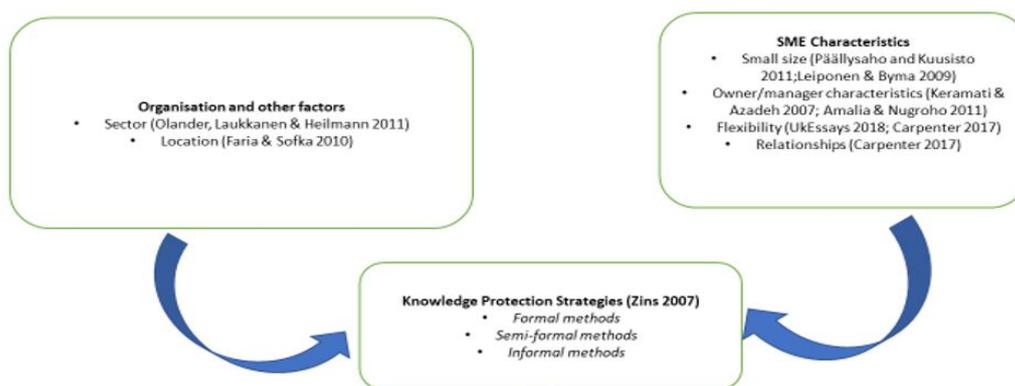


Figure 1: Proposed theoretical framework

### 3. Methodology

In this study, four selected SMEs are examined using semi structured interviews, which allow respondents to talk freely and let the conversation flow naturally (Hesse-Biber & Leavy, 2011). Interviews were conducted with the business owner/manager as SMEs do not typically have specific knowledge managers. Data was collected using various open-ended and on average each interview lasted for 45 minutes. Each interview started with some demographic questions first and then lead to questions targeted specifically on the research topic of Knowledge protection strategies such as what is age of the business, how many departments, what are the main services their business provide, whether they implement any protection strategies or not, if yes, then what protection strategies are adopted and why? Interviews help the researcher to understand respondent's perspective and seek in depth understanding through repeated interactions (Taylor & Bogdan, 1984). Also, semi structured interviews are the ability to rephrase or change the order of questions as required. For each interview, notes were taken by the researcher and each interview was written up and converted into a separate MS Word document. The researcher examined each interviewees' comments and classified them into themes

matching the different sections of the research framework. For instance, comments made that related to business size were included in the business size discussion.

	Size (employees)	Departments	Type of Services	Age (years)
CON1	4	3	Multi-Unit Development, Knock Down, Rebuild residential/commercial buildings	1.5
CON2	4	4	Multi-Unit Development, Knock Down, Rebuild single and double story buildings	1.5
CON3	19	7	Multi-Unit Development, Knock Down and Rebuild projects, Home & Land Packages and financial assistance.	9
CON4	150	9	Multi-Unit Development, Knock Down and Rebuild projects, Home & Land Packages, financial assistance.	36

Table 1: Detail of Construction sector cases

There are three main areas in construction: engineering construction, non-residential building, and residential building. This study has selected enterprises mainly working on the area of residential building. Residential building means any building which provides more than half of its floor area for dwelling purposes. They may or may not include cooking facilities. Some examples are houses, lodging rooms and apartments etc.

The study conducted interviews with four businesses in the construction sector. Two businesses were medium sized and the other two were small businesses. As Table 1 suggests, the small businesses were quite new in the market whereas the medium organisations were in operation between nine to 35 years. As the study has only interviewed four SMEs, data saturation has not been reached. However, at this stage the purpose of the study was to build theory (develop the research framework to be empirically tested at a later stage). This paper reports on the initial step of checking to see if the framework can be applied in ‘real life’ businesses.

## 4. Results

This section presents the findings for the four businesses, arranged according to the identified factors that influence the adoption of KP strategies.

### 4.1 CON1

CON1 is a micro business with three employees working across three departments (administration, accounts and purchasing). Most of their construction work is subcontracted. The types of services provided by the METCON1 relate mostly to residential developments. Along with this the company also builds new houses (from land preparation to building construction). At the time of the interview the organisation was quite new in the market, having been in operation for just one and a half years. Most of the construction to that time had involved *residential construction* and some commercial construction services. Under residential construction the company undertakes houses and multiunit single and double story homes. The company also provides ‘custom’ builds.

The discussion now moves onto different aspects of the framework. Due to their smaller *size*, CON1 preferred to implement informal protection mechanisms over formal methods as informal methods do not require big investments and training. The business also did not have any information technology (IT) department dedicated for the implementation of KP strategies. Hence, the strategies are performed

on a regular basis and are embedded in their regular business practices. The manager commented that “we do not need extra money to put a password on our computer and it's something we can do ourselves”. Because of their small size the business cannot invest in extensive formal KP methods. Also, their small size requires them to share information across departments for seamless operations and let their employees cover a wider range of tasks by easily switching from one role to another. The **owner manager characteristics** also impacted the adoption of KP strategies as the owner of the business has a qualification in IT. He is capable of reaping benefits of informal protection mechanisms that can be embedded into routine business practices. The **flexibility** offered by CON1's size played an important role in the adoption of KP strategies. With only four employees the introduction and adoption of new strategies was an easy process. Thus, their size made it easier to introduce new KP strategies. As the manager said, “We can adopt new knowledge protection strategies as the demand arises, with only a few employees it is easy for us to update our strategies.”

CON1 works closely with other SMEs in construction and aligned sectors (such as plumbing and painters), as well as with the suppliers of their raw materials. As they are relatively new to the market and still establishing their business, they also hire services from external SMEs. To build rapport and trustworthy **relationships** they are required to share some of their organisational knowledge with their suppliers and collaborators. This requires them to adopt and use protection methods against possible knowledge leakage. But it has also been identified that they do not need to share confidential information with external partners. For instance, the manager noted that “external companies do not require access to detailed cost estimations.” The business operates in a **sector** where they provide customized residential building construction or construction based on existing in demand models. They build models of proposed developments in conjunction with client requirements. As the business is not developing them, these models are not protected by formal KP methods. The business relies on other informal means of protection such as authorization, authentication, cabinet locking, confidentiality, and trustworthy internal and external relationships. CON1 is a metropolitan based organisation and they do not have any non-metropolitan branches, so they are not affected by being in rural or remote **locations**. The **age of the business** emerged from the data collection as having a major impact on the adoption of KP strategies. METCON1 is quite new in the market so their major focus is initially on establishing the business and strengthening their core activities. At the early stage of their growth, the business focus is to establish their ‘roots’ in the market and increase their customer base to make some revenue so they can later think of investing in other required strategies like KP. The manager commented that “we are too young to worry about any non-core business processes yet, At the stage our main focus is to extend our market share.” The manager suggested that the business can protect explicit knowledge by implementing protection mechanisms such as passwords and restricted document access. CON1 uses a variety of informal methods like secrecy, restricted access, contracts and documentation. The manager noted that informal methods of protection do not require big investments and training. These strategies were performed on a regular basis and eventually embedded in business practices. The manager's educational background meant that he had studied about the layers of protection that can be implemented to protect organisation knowledge. He believes it is more effective to protect knowledge at different levels than using expensive protection strategies. For example, rather than applying for IP or trademarks, it is more economical to use a lock and a password.

## 4.2 CON2

CON2 is micro business. The business has four employees across four departments (administration, accounts, sales and purchase). It is a young business, only being in market for the previous one and a half years. Most of their work is in building residential buildings. The business mostly organizes several subcontractors to manage their construction work. This is to reap the benefits of specialized skill sets not possessed by existing employees. Their work requires a varied range of capabilities that is too diverse to be carried out by a single general contractor. The main services provided by the business are

multi-unit development, knock down and rebuild single and double story buildings. However, most of their clientele is in new residential buildings under class 1A and 10.

CON2 has limited resources. The business's IT services are outsourced due to its small *size* and limited resources. Thus, the rate of usage of protection methods is quite low, especially usage of formal protection methods. The business wants to utilise the resources to establish the business first rather than focusing on the implementation of KP strategies. The manager indicated that they not currently be able to use their resources for such non-essential activities. Most of the business decisions are made by the *manager* of the company because of the small size and lack of hierarchical organisation structure. The manager of the business did not know much about the implementation of formal methods that he could use to protect company's knowledge assets but based on his earlier experience he believes that the early years of business can survive without focusing on the use of such protection mechanisms. The manager of CON2 said that, "I agree the company certainly requires KP for growth, but we must push the idea to the back of our mind because at this early age our focus is to establish ourselves and make better use of the revenues." The small size of CON2 provides much higher *flexibility* as compared to larger businesses. The business' flexible structure directly impacts its ability to adopt new business strategies including KP strategies. In the absence of strict organisation structural hierarchies, the manager can adapt KP strategies as needed without requiring formal approvals: adding that their "simple organisational structure enables easy adoption of new strategies, so if the need arises, we will start looking into protection strategies more seriously."

CON2's manager believes in sharing knowledge with other businesses in the sector where appropriate, even competitors as exchanging knowledge enables them to create new knowledge. The knowledge exchange and external business *relationships* imposes the threat of knowledge leakage along with providing ways to learn and grow. This calls for the implementation of KP strategies. But the business relies on working with other businesses that that they can trust will not leak their trusted knowledge, as the manager stated, "that trust is something we highly rely on." CON2 usually deals in construction based on existing 'in demand' models borrowed from other businesses. Every business in this industry *sector* publishes their designs online and other business can get inspiration and develop their own display properties from these. When clients approach the business with a particular design they like, the business suggests the changes and add-ons that can be added to the selected design. As the ideas are borrowed from existing market designs, they do not need to invest in formal protection methods. Another reason for not extensively using formal protection methods is their provision of customized designs for clients, and clients bring their designs and the business is only responsible for the construction without worrying about knowledge spillovers. The manager confused knowledge with information (which happened often with the interviews in this study as, despite the difference being discussed, interviewees did not differentiate between knowledge and information for SMEs. He commented that, "The type of information that could be protected is about their expenditures, sales and profit margins and this information could be easily kept in a safe place without requiring any formal protection method." CON2 mostly operates in metropolitan areas. The physical *location* of the business does not seem to have any impact on implementation of KP strategies. The current KP methods can be either implemented remotely (like file privileges) or can be building specific (cabinet locking), independent of the location. The manager mentioned that, "I believe that the adoption of KP strategies depends more on the business needs and resources rather than where its situated."

The *age of the business* seems to impact its ability to adopt KP strategies. The young age and less exposure have forced the business to focus on their core business activities and use their resources to expand and strengthen the business. The owner stated that, "As said earlier, I agree that the age of the business impacts the adoption of KP strategies. At this stage its more important for the business to

establish itself by focusing on core business processes. It is not economical for us to spend our resources somewhere else.” CON2 has only invested in informal and semi-formal *protection methods* like restricted access. Laptops are password protected and the documents are secured in locked cabinets. Knowledge sharing requirements of the business are secured with authorization and fragmentation of work. The owner of the business stated that, “the shared documents are mostly provided with read only rights, spreadsheet data is protected with data validation and locking mechanisms provided within the software” Hence, the business does not see the need for any formal protection mechanisms yet. The business uses informal methods as they are more like daily operational requirements rather than a rigid protection mechanism. Methods like passwords, user privileges, fragmentation of work usually does not impact collaborations and partnerships.

### 4.3 CON3

CON3 has ten departments and around 20 employees. The main departments are: sales, accounts, building coordination, estimating, construction, design, maintenance, administration, finance, and project management. CON3 is a well-established business with nine years in operation. The business has a web presence which enables their customers to find out about them. The main types of services provided by the business are residential. Generally, most new houses are built by property developers. CON3 operate in a similar manner, buying land when it is released by the government, building homes, and selling them as a complete house and land package. The business also organizes financial assistance for customers. They assist their clients to establish trusted partnerships with legal advisors and financial institutions to make obtaining a home loan easier for them. This is a free service, provided to make the entire project of building a new home easier for their customers.

CON3 have a well-established market. However, the business is at the lower range of mid-*size* companies in terms of the number of employees. The business manager believes in the protection of organisational knowledge, but at the same time their limited resources (due to their size) inhibit them from the use and adoption of patents and trademark KP strategies. They believe that the process of acquiring formal protection methods is lengthy and costly which is why small businesses cannot afford them. The manager mentioned: “the business cannot indulge in the implementation of formal protection methods when it is more important to utilize the resources for our expansion.” The *manager* of the business is responsible for its daily routine operations. The manager identifies the business needs and requirements based on his experience. He had previously worked and invested in few different businesses. The learning and experience gained from working across industry sectors enabled him to use his knowledge and experience in identifying, selecting and implementing protection strategies. He added, “as far as my experience various businesses survived competition without the need to invest in patents and trademarks.” The *flexibility* offered by the small size of the business enables them to adopt varying business policies across their client base. The smaller size and the business manager being solely responsible for making major business decisions, enables CON3 to introduce and adopt protection strategies as per their need and requirements. The owner observed that sector is an industry *sector* where designs, architectural plans and diagrams are openly shared in the digital world. Businesses make their designs available on websites, use social networking for marketing and this makes it difficult to protect them.

The business believed that the roles of different departments and their flow of information has some inbuilt informal protection mechanisms due to adopted organisation structure of this business. Not all departments work with similar knowledge so access can be restricted within functional boundaries. They do not need to implement strict security measures that may slow down knowledge access across departments. CON3’s manager did not believe that *location* had any impact on the use and implementation of KP methods. Their business operates in the metropolitan region and in some rural

areas. No differences were reported operating from these different locations, as the remote access to the centralised database (with the same restrictions) enabled the business to follow the same informal and formal protection mechanisms in their regional offices. The *age of the business* is believed to be a factor that has a direct impact on the use and adoption of KP strategies. The manager felt that at the earlier stage every business has a smaller knowledge base which require lesser protection mechanisms in place but as the business grow so does their knowledge base. The manager commented that, “We might invest into patents once we grow more mature and start inventing our own designs and products.” With the growth in the business strategies and acquisition of knowledgeable resources the need for extensive protection methods might also expand. CON3 uses design rights to protect their business knowledge, as well as a mixture of semi-formal and informal methods, such as: copyright, secrecy, restricted access, contracts and documentation, fragmented division of labour and access privileges. Organisation structure also impacts the adoption of *KP* strategies. Hardcopy documents are kept to a minimum, and important files are mostly kept in digital format in a password secured system. Large, important projects are under restricted access. All soft copies are password protected. Architecture blueprints, any new design ideas and sketches are protected under copyright. The manager believes that copyright is a weak protection method as people today can easily edit images, remove copyright symbols, and use them as their own: “we don’t really know how we can track the access and usage of our images in this digital world.” The business has not invested in specific KP strategies for tacit knowledge. Contracts and documentation contribute towards KP. They also rely on state government authorities/ tribunals to deal with disputes/ complaints with suppliers, partners, and customers.

#### 4.4 CON4

CON4 is a part of a large group of companies and is a well-established business, 36 years in operation and has built over 2,000 houses in Australia. The selected business is a franchise business. The company best fits the definition of a large medium business with around 150 employees and eight departments. The main departments are Sales, Operations, Construction, Maintenance, Displays, Interior Design, Human Resource, and Accounts. The company has offices in various states of Australia. The major type of construction services provided by the business are residential. CON4 belongs to the *SME* sector but believes strongly in organisational KP. Building over 2,000 houses and with extensive customer base, the business makes larger profits than most other smaller businesses in the sector and can thus invest in adoption of KP strategies. The business believes that “it doesn’t matter if you are a big business or small, it is important that every organisation employ protection strategies.”

The *manager* of the business has more than 40 years of experience. He has owned and operated his own construction company in the past. He is not only qualified in business management, and marketing but also holds a certificate in contract law. His knowledge and experience enable him to understand, analyse and adopt KP strategies according to business needs. The business has a group of subsidiary businesses to fulfill all necessary construction requirements of their customers. The size of the business does not offer much *flexibility*, however the organisational structure and availability of different websites for each business group enables efficient adoption of KP strategies. Each business group can have their choice of KP strategies implemented depending on their needs and structure. The manager added that, “being a franchise we are legally bound with the company policy and procedures but still our small size and flexible organisational structure allows us to implement our own protection mechanisms internally.” CON4 is a business comprising various business groups and has a large database of contractors. They do not just have to maintain strong and trustworthy *relationships* with all their inter-organisational groups but also with external business partners. One of the most important things to build such relationships and grow the business is knowledge sharing within and outside organisational boundaries. Whilst sharing knowledge, specific attention is paid to the level and extent of knowledge that is shared.

In the construction industry *sector*, the business processes, designs and ideas are remarkably similar and thus do not require extensive formal protection. The manager commented that, “Every business

should protect their organisational knowledge. The only thing which differs is the type of knowledge you are protecting in different sectors. And knowledge is an important asset for every business organisation.” CON4 utilises the digital world to advertise its services to potential new customers. In addition to their business website, they also have individual websites for each of their group of companies. The business also uses other means of digital networking such as social media. Their web presences enable their customers to do research on them, select designs and contact them for quotes. This helps in extending their business and attaining customers, but also poses security threats in the digital world. Competitors can access their online information, but the business is not concerned about knowledge leakage as such access does not give away any vital organisational knowledge. The participant commented “We are in an open business and there is no harm in sharing design ideas. Accessing pictures will not give any information about how specific business operations are performed. They are just static pictures.” The *location* does not appear to have a significant impact on the adoption of KP strategies, but this is difficult to determine from the results. Due to their long *time in the business*, CON4 has established a strong customer base. Working as a group of companies for a long time, sharing knowledge and working with contractors enabled them to learn about newer and more efficient protection mechanisms. Over time they have learnt that instead of using expensive and time-consuming protection mechanisms it is important to use multiple layers of informal and semi-formal protection methods. The *KP strategies* adopted by CON4 are copyright, secrecy, restricted access, contracts and documentation, fragmented division of labour and access privileges. There is functional division of work across departments and the business makes effective use of restricted access and fragmented division of labour across departments along with authentication and authorization. Registered design rights are the preferred formal way to protect the business designs.

## 5. Discussion

The results support the notion that Australian SMEs in the sector generally do not invest in formal KP strategies. The main KP strategies implemented were a mix of informal and semi-formal mechanisms such as secrecy, restricted access, authentication, authorization, cabinet locking and documentation. Table 2 provides an insight into the findings and data analysis.

The results suggest that the implemented protection strategies are impacted by the smaller size and revenues of the business. Formal protection methods require large investments and long processing times which is a constraint for most of the SMEs. Only two of the businesses (CON3 and CON 4) use design rights to protect their construction designs as they are comparatively larger than CON1 and CON2 and also have more market exposure and financial resources. The findings were very similar to the study performed by Leiponen and Byma (2009), which identified that the smaller firms with lesser resources do not invest in formal KP methods because of lengthy application processes and extensive resource requirements.

Category	Factor	Business				Overall
		CON1	CON2	CON3	CON4	
Organisation and other factors	Sector (construction)	Moderate	Moderate	Moderate	Moderate	Moderate
	Location	Not sure	Unsure	No impact	No impact	Unsure

	Age (in years)	Yes	Yes	Yes	Yes	Yes
SME characteristics	Small size	Yes	Yes	Yes	Yes	Yes
	Owner/manager characteristics	Moderate	Minor	Yes	Yes	Likely
	Flexibility	Yes	Yes	Yes	Moderate	Yes
	Relationships	Yes	Yes	Moderate	Yes	Yes
<b>KP Strategies adopted</b> (informal; semi-formal; formal)		Mostly informal	Mostly informal	Mix of formal, semi-formal, informal	Mix of formal, semi-formal, informal	Mix of semi-formal and informal

Table 2: Findings and analysis

The owner/manager characteristics seems to have a moderate impact on KP adoption as they have different experience, knowledge and skill set. Also, their flexible organisational structure allows them to adapt their protection mechanisms to respond to changes in organisational policies and strategies. Flexibility enable these businesses to change organisational policies and procedures without going through a formal procedure. Relationships with external partners and suppliers seems to have a considerable impact on the adoption of KP strategies. As SMEs relies on these external businesses to perform their core business processes efficiently. They mostly use outsourcing to get their work done by contractors. The external knowledge exchanges require protection against accidental knowledge spillovers. It can also be said that the industry sector likely impacts the selection of protection methods. The construction sector operates like an open business where ideas are easy to access and copy. Internet and social presence have made the information available at ‘one click’ which influences the business’s decision in the adoption and implementation of KP strategies. Even the designs that are protected with design rights are susceptible to theft. The competitors are required to change only 20% of the design before they are legally allowed to use someone else’s registered design. So even though the design ideas can be replicated, the services provided are very hard to replicate and/or copy illegally, so this does not require strict KP which coincides with the findings of the study performed by Xu and Tan (2010). The age of the business has a role to play in the adoption of KP strategies. New businesses concentrate more on expanding their business by sharing and collaborating with internal and external business partners rather than protecting their organisational knowledge. So, instead of investing in costly and time-consuming formal methods SMEs are more inclined towards informal and semi-formal protection methods. Päälyssaho and Kuusisto (2011), also concluded that small businesses prefer informal methods over expensive formal methods in their study performed on small service firms in Finland. It was not evident from the findings if the location of the business impacts the KP adoption as most of the selected businesses operate in metropolitan regions. Those that did have rural operations did not find much difference in KP strategies. Informal and semi-formal protection strategies are not highly impacted by the availability of ICT tools.

The businesses believed that both formal and informal ways of protection are important to protect knowledge spillovers and attain competitive advantage. However, their smaller size and limited turnover had mostly restricted them to informal mechanisms. They certainly require KP for growth, but at their early age their focus is to establish themselves and make better use of their revenue. Once the businesses start innovating new ideas and plans, then they plan to invest in more formal and stronger protection strategies. For instance, CON3 and CON4 use design rights to protect their architectural blueprints and designs. Overall, it can be said that the results generally support what was stated in the literature, but some factors seem to have a greater influence on KP strategies than others. There were enough common answers across the businesses to suggest that some of the findings could potentially be specific to the sector.

## 6. Conclusion

This paper has summarized the factors impacting the adoption of KP strategies by SMEs. Four Australian SMEs in the construction industry sector were interviewed to gather data and identify their adopted KP strategies. The construction industry has been one of the highest GDP contributors towards Australian economy, so it was worth investing them. Various factors such as size, Owner/manager characteristics, flexibility, relationships, sector, age and other SME characteristics have been identified as factors effecting K adoption. The protection mechanisms were categorized into three categories: formal, informal and semiformal protection strategies. The results have shown that generally SMEs are inclined towards informal and semi-formal protection methods due to their smaller size (flexibility and relationships), limited resources and age of the business. At present the biggest limitation of the study is in terms of data saturation and case study focused on one industry sector. In the next phase of the study the data collection will be extended to more industry sectors and regional areas to investigate if location and industry sector have any significant impact on KP adoption.

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