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A Time-Lag Study of the Effect of Organisational Capital on Innovation in Australia SMEs

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Abstract
This study explores the strategic links between organisational capital and innovation performance in Australian SMEs. This study classified organisational capital as information technology as per hardware and software; and equipment or machinery that was applied in the firm. A sample involving SME from various industries was adapted from the Business Longitudinal Database (BLD) from the Australian Bureau of Statistics (ABS). The analyses validate that information technology capabilities is essential for achieving innovation performance. However the relationship decline over time for different type of innovation. Thus, SME managers should be carefully in investing in appropriate information technology in order to facilitate innovation in their firm.

Keywords: SMEs, Organisational capital, Innovation, Australia

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INTRODUCTION

According to Wheelen and Hunger (1999), 24 percent of new business in the America fails within two years of operating and 63 percent terminates the business within six years in the services. Similar patent has been identified in Australia (Lu & Beamish, 2001). According to the Australian Bureau of Statistics (ABS) (2016), in June 2012, 13.1 percent of SMEs has stopped operating their business. The percentages of SMEs that exited the business continue to diminish since June 2013 until 2015 to 23.7%, 31.7% and 38.1% respectively. The number of Small and Medium Enterprise (SME) that close down their business in Australia is increasing every year. A surviving business is defined by ABS (2012) as a business which is active on the Australian Bureau of Statistics Business Register (ABSBR) at 1 June of the current year and was also active in the previous year.

Regardless of country, SMEs contributes between 35 to 60 percent of the Gross Domestic Product (GDP) and at the same time, SMEs are important source of job creator. However, the main problem that is threatening these SMEs throughout the world is the survival issues. According to several scholars, (e.g. Madrid-Guijarro, Garcia, & Van Auken, 2009). SME that neglected creativity and innovation in their business practices will become incompetent since the process and products will be outdated comparing with other competitors that are producing more competitive products or services.

A survey done by The Global Innovation Index for 2017, found out that, Australia ranks 23th out of 127 countries for innovation, placing it below Singapore (7th) and China (16th). Most Australian firms invest far less in R&D than OECD countries based on the Department of Innovation Industry Science and Research (DIISR) (2009). In reality, poor interest in R&D will lead to bad results for the nation (Khan, 2016; Khan & Kamaruddin, 2016). Firms in Australia need to be more serious in innovation; otherwise massive potential economic benefits will be lost.

Organisational capital is seen as an important medium for SMEs to manage the business and growth (Coyte, Ricceri, & Guthrie, 2012). Organisational capital is used to manage information and simplifies the operation process in the firm. SME invest on IT on the purchase of new technology and information technology (IT) to strengthen and reshape the firm's internal processes. However, some SMEs refuse to invest in technology equipment and IT, not on account of they don't understand the long term advantages, but since the expense is too high for the survival of the firm. Managers need to considerable which resources to emphasise and invest in order to achieve their target. SMEs with significant technology equipment and IT are likely to be able to develop new innovation to the firm. These studies suggest that through time, it can be expected that SME will be more likely to improve their product and process innovation.

Therefore, the objective of the research is to study whether organisational capital significantly improves the association with product and process innovation after one and two-year interval elapses. The focus of lag time due to learning and adjustment is based on the RBV theory (Coff, 1997; Grant, 1996). Therefore, the research question for this study is: Does organisational capital have better impact on product and process innovation through time?

The next section of the paper continues with the review of the literature; follow by the methodology part. The fourth section of the paper presents the findings of the study. Finally, the last section of the paper discuss on the outcome of the study and conclusion is being made based on the on the previous critique of the literature.

LITERATURE REVIEW

This section reviews the previous literature on organisational capital that covers the information technology elements and innovations constructs that identify their general characteristics.

Organisational Capital (OC)

Organisational capital (OC) can be defined as firms' codified knowledge, databases and operational routine that was embedded in the firm (Bontis, 1998; Nelson & Winter, 1982). OC is embedded in the structures and operation procedures in the firm that focus on storing, exploiting and reclaiming the firm's knowledge and information (Subramaniam & Youndt, 2005). However, these knowledge and information needs to be integrated and transform it into valuable lesson, better decision making and avoiding redundancy. OC in this study is conceptualised as IT, technology and processes that simplify the flow of work in the firm.

Organisational capital in SMEs is usually unlike the bigger firms that have different structure and operations. SMEs need to be equipped with up-to-date technology and information system to codified knowledge and transform it in order to compete in the competitive environment. SMEs are in advantages since they are less formalized and less bureaucracy. However, firms need a systematic system and technology to documented, storage and deploy theses knowledge and information into routine and procedures in order to develop organisational knowledge. Thus, according to several scholar (e.g. Hsu & Sabherwal, 2011; Subramaniam & Youndt, 2005) databases, manuals, firm's process and structure is consider as an important organisational capital.

Innovation Performance

Innovation is one of the element in achieving global competitiveness (Knight & Kim, 2009). According to several scholars, (e.g. Balasubramanian & Lee, 2008; Bloch & Bhattacharya, 2016; Camisón-Zornoza, Lapiedra-Alcamí, Segarra-Ciprés, & Boronat-Navarro, 2004; Zahra, 1993) smaller firms innovate in informal ways that is through ad hoc improvisation. The product and process innovation in SMEs is based on their ability to rapidly incorporate, improve, and altered their internal competences to cater the variation customer demand and dynamic environment. How soon these SMEs can start commercialising their product in the market is the main challenge.

In accordance with Oslo Manual definition of product and process innovation, product innovation is being defined as '...the introduction of a good or service that is new or significant improvements in technical specifications, components and materials (OECD, 2005, p. 48). Whereas process innovation is define as '...the implementation of a new or significantly improved production or delivery method (OECD, 2005, p. 49).

New technology and innovation can lead towards faster development for developing countries (Dost, Dost, Badir, Badir, Ali, Ali, Tariq, & Tariq, 2016). Innovation means beyond the development of new products or processes, it also refer to the capability to creatively absorb the technology. However, there are differences between product and process innovation, in terms of the antecedents that influence the success of these innovation (Khan, 2014; Khan, 2016; Tornatzky & Fleischer, 1990). The factor that influences product and process innovation requires different approach, skill and resources.

Development of Hypotheses

It is stated that under the theory of Resource Based View (RBV), resources and capabilities have four features. They are value (V), rare (R), inimitably (I) and non-substituted (N) resources and capabilities, adding with having extraordinary characters in the organization (O) in position to absorb and apply these resources and capabilities (Barney, 1991). These features form the term VRIN/O. VRIN/O resources and capabilities provide the firm with the power to convert inputs into inflexible situations to achieve a competitive advantage or even sustained competitive advantage.

The inflexible situations will be the main obstacles for other competitors to imitate the specific resources. In order to make resources difficult to imitate by the competitors, firms need to create these resources so that the resources are rare and the rival does not understand the process.

In the Resource Based View (RBV), firms are understood to have various combinations of resources and routines that can contribute to competitive advantage. In the RBV context, the outcome is gain through unique resources and the combination of knowledge to create innovation and product development (Danneels, 2002). According to (Nonaka, 1994) there are two types of knowledge : tacit and explicit. Tacit knowledge cannot be easily described or transferred. While explicit knowledge is easy to imitate and to share. But, once the knowledge is transferred, it is difficult for the original owner of the knowledge to declare the ownership (Edvinsson & Sullivan, 1996).

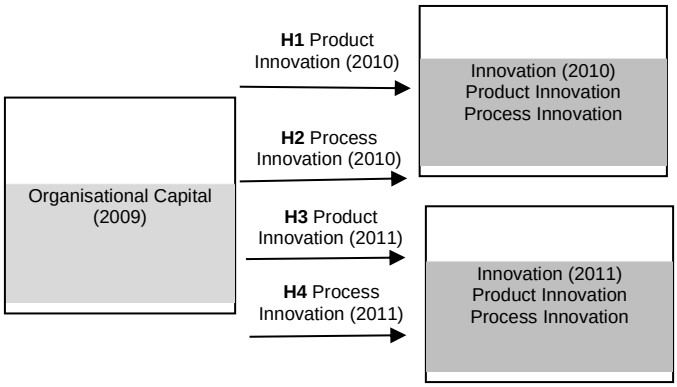

Figure 1: Conceptual Framework

Organisational Capital and Innovation Performance

Innovation performance will not be achieved if the firm does not have appropriate working processes and systems to track its activities (Widener, 2006). Recent research suggests that sufficient resources in firms' operation and commitment have a significant effect on performance (De Brentani & Kleinschmidt, 2004).

According to Persaud (2001) and Khan and Terziovski (2016), information technology is a medium of obtaining external knowledge. Bontis, Keow and Richardson (2000) in his empirical study has found out that structural capital positively influenced organizational performance in the service industry but not in the non-service industry. A study on chemical companies from 1980 to 1999 indicates that one dollar spent on R&D produces; they will gain two dollars profit after ten years (Aboody and Lev 2001 cited in Huang and Liu 2005). According to Khan, Kamaruddin, and Buyung (2017) together with Hsu and Wang (2012), the adoption of IT will keep all the tacit and explicit knowledge in the firm and will contribute to innovation.

Since firms are more and more utilizing advanced technologies to strive in today's economy, the working processes should be well-managed so that firm performance is accomplished. Hence, analysing this link using longitudinal data would be rewarding.

H1: Organisational Capital has a positive and significant relationship with Product Innovation after a one-year lagged.

H2: Organisational Capital has a positive and significant relationship with Process Innovation after one-year lagged.

H3: Organisational Capital has a positive and significant relationship with Product Innovation after a two-year lagged.

H4: Organisational Capital has a positive and significant relationship with Process Innovation after two-year lagged.

RESEARCH METHOD

This current study used a secondary data from the Australian Bureau of Statistics (ABS). The main reason of using a secondary data

is the highest response rate (Sawang & Matthews, 2010) and it is longitudinal data that is expensive if to conduct (Khan, 2014). Business Longitudinal Database (BLD) (2013) is used in this study. BLD contain information on SMEs throughout Australia from various industries. The data in BLD was collected through structured questionnaires and was self-administrated. This study adopts Panel 3 from the BLD that contains the most current data from the year 2007 until 2011. The total sample in Panel 3 comprise of 3,075 businesses stratified by business types and size.

Based on the definition by ABS (2014), small firms are those firm that employ less than 19 employees, while medium firms employ between 20 to 199 workers. Thus, firms with more than 200 employees were removed from this study.

This study adapt time-lag analyses that cover one and two-year interval between OC and innovation performance. OC data was taken from the year 2009, while innovation performance data was in the year 2010 and 2011.

The measurement of OC was based on subjective measures and it is in categorical data. There are seven items that measure organisational capital in the BLD and it is relating to the investment made on technology equipment and IT. The items are on the replacement of other equipment or machinery; purchase of additional IT hardware or software; purchase of additional other equipment or machinery; replacement of IT hardware; upgrade of IT hardware; upgrade of other equipment or machinery and purchase of additional assets not related to expansion.

Innovation performance in this research comprise of two extents of innovation that is product and process innovation. Based on BLD questionnaire, there are two items on product innovation that consist of new products and new services provided. While for process innovation consists of three items: new methods of manufacturing; supporting activities for business operations and other operational processes.

ANALYSIS AND RESULT

The data was analysed using STATA version 10. The appropriate analysis to analyse count data is Poisson regression analysis (PRA). In order to test the hypotheses between OC associations with innovation performance, Poisson regression is being used. However, if the data reveal overdispersion, binomial regression analysis (NBRA) is used. Overdispersion occurs if the variation is greater than the value of the mean.

Result of the Study

Correlation coefficients as well as means and standard deviations of the variables are displayed in Table 1. Product and process innovation construct in the year 2010 and 2011 are positively associated with IT.

Table 1: Descriptive statistics and Spearman's rho Correlation Coefficients with Innovation Performance in the year 2010 & 2011.

	Variables	Mean	Std. Dev	1	2	3	4
1	Organisational Capital (2009)	1.23	1.42	1			
2	Product Innovation (2010)	0.21	0.47	0.11*	1		
3	Process Innovation (2010)	0.27	0.59	0.16**	0.43**	1	
4	Product Innovation (2011)	0.23	0.50	0.15**	0.44**	0.26**	1
5	Process Innovation (2011)	0.25	0.56	0.15**	0.28**	0.41**	0.26**

N = 2,154 *p< 0.05, **p< 0.01, ***p< 0.001, two-tailed.

PRA was calculated to predict IT with innovation performance components. The goodness-of-fit test indicates that the distribution of product and process innovation in the year 2010 and 2011 were significantly revealing a Poisson distribution. The product and process innovation in 2010 that is the chi-squared of 267.61 on 365 d.f. (p = 1.00) and 344.83 on 365 d.f. (p = 0.77) respectively. While, product and process innovation in 2011 show the chi-squared of 273.02 on 347 d.f. (p = 0.99) and 338.31 on 347 d.f. (p = 0.62) in that order. The p value is above the standard threshold of 0.05. Thus, Poisson regression model is suitable.

Table 2 indicates that for each factor increase in IT will lead to a 19 percent [100(e0.17 □1) = 19 percent] rise in product innovation in the year 2010, while the impact of IT towards product innovation is greater by 1 percent in the year 2011, that is 20 percent [100(e0.17 □1)]. In addition, the corresponding 95 percent confidence interval for the multiplicative factor for IT in the year 2010 is (e0.05, e0.30) = (1.05, 1.35), and for the year 2011 is (e0.05, e0.31) = (1.05, 1.36).

While, the impact on process innovation for the year 2010, IT increases the process innovation by 22 percent [100(e0.20 □1) □□22 percent], holding all other variables constant, while the impact of IT decreases by 4 percent in the year 2011. IT improves process innovation in the year 2011 by 18 percent [100(e0.17 □1) □□18 percent], Furthermore, the corresponding confidence interval for multiplicative factor is obtained as (e0.10, e0.30) = (1.10, 1.35) for the year 2010 and (e0.05, e0.29) = (1.05, 1.34) for year 2011.

Table 2: Poisson regression: Organisational capital (2009) time-lagged with innovation performance (2010) and innovation performance (2011)

Variables	Innovation	Performance (2010)	Innovation	Performance (2011)
	Product	Process	Product	Process
Control Variables				
Industry: Manufacturing	0.63	0.45	1.20***	0.44
Industry: Logistics	0.65	0.15	0.86*	0.28
Industry: Retail	0.48	-0.67	1.01	0.23
Industry: Services	0.73*	0.18	0.62	-0.14
Medium Firm	0.78*	0.92***	0.38	0.42
Small Firm	0.55	0.74**	0.28	0.11
Independent Variables				
Organisational Capital	0.17**	0.20***	0.18**	0.17**
Pseudo R^2	0.05	0.06	0.06	0.04
Chi Square	22.61**	35.12***	29.14***	23.75***
Log pseudolikelihood	-212.79	-294.49	-223.03	-285.88
No. of observations	373	373	355	355

N = 2,154 *p< 0.05, **p< 0.01, ***p< 0.001, two-tailed.

Table 2 shows that IT was significantly (p < 0.05) related with product and process innovation for both years, thus supporting Hypotheses 1, 2, 3 and 4. As for the control variables, industry type and firm size do not have long term significance in the OC – innovation performance link for SMEs, except for manufacturing and logistic industry impact on product innovation in long term.

DISCUSSION AND CONCLUSIONS

The PRA shows that OC improves product innovation better in the long term, compared to short term. This is because OC improves product innovation by 19 percent in 2010, while 20 percent in 2011. There is a 1 percent improvement after a two-year lag. The outcomes show that OC predicts product innovation, but in the long term, the impact of OC on product innovation improves by 1 percent.

Through PRA, the results indicated that IT's effect on process innovation declines over time. Analysis in the year 2010 detects a 22 percent improvement in process innovation rate and after a two-year lag on process innovation, it affects only 18 percent in the year 2011. The results indicate that OC significantly predicts process innovation.

However, over time, the PRA shows that the coefficients and the magnitude of the p-value effect of IT and process innovation is reduced to 4 percent.

OC does contribute to innovation – but only to a limited extent, a conclusion that is consistent with the findings of Subramaniam and Youndt (2005), Chen, Lin, and Chang (2006) and Wu, Lin, and Hsu (2007). Therefore, in order to transfer and share organisational knowledge or information, it is important for the firm to apply reliable and trusted technology. Based on the RBV perspective, organisational capital is a source of competitive advantage (Bharadwaj, 2000), and according to Aramburu and Sáenz (2011), organisational capital creates new ideas and shares knowledge. Organisational capital can both assist employees and enable firms to adopt innovation performance (Hsu & Wang, 2012). As mentioned above, innovation performance shows a significant connection with organisational capital, the relationship improved product innovation, but declined for process innovation after two-year time lag was included. This is consistent with Dong, He, and Karhade (2013). Through time, OC will bring down the process innovation while improving product innovation in SMEs. In the short term, OC represents a necessary condition for better product and process innovation but it is inadequate to sustain in the long term for process innovation since the knowledge stored in IT must be deployed efficiently and effectively in order to gain the benefit. Product realisation depends on how the firm reacts to the dynamic environment. However, RBV theory may not be suitable to explain the connection, using time lag. Organisational capital might lose its value and uniqueness through time and competitors might imitate the technology. At the same time, IT is costly. Applying dynamic capability view (Teece, Pisano, & Shuen, 1997) would help to understand these issues.

Managers must support codified knowledge in their organisational capital. Organisational capital acts as a guideline in routine work processes and it supports the company's standard procedures (Khan, 2016). As stated by Coyte et al. (2012), internal documentation is important for IT capabilities in SMEs. The management must also provide appropriate investment in OC that is user-friendly and reliable so as to transform the firm's tacit knowledge into explicit knowledge.

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