

IT COMPETENCY PREDICTING MARKET AND DEVELOPMENT PERFORMANCE: MODERATED BY ORGANIZATIONAL SIZE

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Abstract

The resource based view (RBV) suggests that firms with greater information technology (IT) competencies may be able to leverage information to overcome competitors. This study of 167 large New Zealand companies, found that IT knowledge, IT operations, and IT objects were all directly related to market and development performance. Further, firm size was tested as a potential moderator and found to have no significant effect on market performance and found to have significant effects on all three IT competency facets and development performance. However, mapping the interactions showed that smaller sized firms were better able to leverage their IT competencies when they were low, to achieve greater development performance compared to larger firms. Overall, the findings support the RBV, indicating that New Zealand firms focusing on IT competencies will more likely gain significant benefits in market and development performance, although smaller sized firms achieve greater development performance than larger sized firms at all levels of IT competency.

Keywords: *IT competency, market performance, development performance, New Zealand, firm size.*

INTRODUCTION

Recent developments suggest that information is a valuable intangible asset that firms need to capture and leverage (Sampler, 1998; Tippins & Sohi, 2003). While the adoption of IT has continued to increase (Li, Chen, & Huang, 2006), studies have been mixed; with findings failing to consistently show that IT investment will increase firm performance (Bharadwaj 2000; Brynjolfsson, 1993; Christiannse & Venkatraman, 2002). Research into the role of IT is vital, given the extended functionalities that the Internet offers (Shapiro & Varian, 1999). Part of the mixed findings has been due to firms reporting the cost of IT investment outweighing and positive returns (Mahmood & Mann, 1993). Henderson and Venkatraman (1993) suggested that for firms to experience performance gains and competitive advantage need to have their IT entrenched across a sequence of firm linkages, such as capabilities, strategy, and infrastructure.

The objectives of this paper are to explore the direct effects of IT competencies on market and development performance, to test the Tippins and Sohi (2003) dimensions of IT capability on other firm performance measures. We utilise the resource based view (RBV) perspective (Barney, 1991), to test the effects of IT capability on performance.

The present study also extends this investigation by looking at firm size as a potential moderator of the effects of IT capability, where larger firms should be able to leverage their IT resources and capabilities to achieve heightened performance.

RESOURCE BASED VIEW

While there are a number of theoretical approaches for examining firm performance, RBV of the firm has become a popular approach (Barney, Wright & Ketchen, 2001). RBV asserts that organizations can outperform their competitors through developing resources that are unique and diversely distributed (Barney, 1991). These differences lead variations in firm performance among firms in similar industries (Peteraf, 1993). RBV defines resources as assets, processes, and capabilities. Barney (1991) asserted that firms achieve sustained performance advantages by securing rare resources of economic value, that competitors are not easily able to copied, imitated, or substitute. As such, firms with these rare resources should be able to leverage them for their own unique firm benefit. A more complete definition of resources is offered by Amit and Schoemaker (1993), who suggested resources are assets that are possessed by a firm through ownership or control, while capabilities refer to an organizations capability to combine resources and adequately exploit them, such as leverage skilled staff and organizational practices to create a uniquely innovative work culture where employees outperform their competitors. Under RBV, resources are the unit of analysis, however, it is how a firm is able to creatively accumulate, incorporate and arrange these resources, that leads to the creation of competitive advantage (Mishina, Pollock, & Porac, 2004).

IT COMPETENCIES & HYPOTHESES

Tippins and Sohi (2003) claimed that effective IT management is seriously important for firms, and IT is increasingly seen as having the potential to provide firms with a competitive advantage.

This is due to the ability of IT to fundamentally enhance the capability of firms in searching, capturing, using, storing and transferring information (Martin, 1988). Barney et al. (2001) argued that firms focusing on IT as a valuable role when creating strategies should be able to be receive and administer data regarding their position in the market in a timely manner, providing them with competitive advantage. This is because the information received can be utilised by the firm far quicker than competitors when responding to changes in the business environment. Indeed, Sampler (1998) argued then benefits of IT means that it should be viewed as a source of value formation, rather than a business expense. This has lead many to assert that it is critical for firms to develop the essential capabilities and competencies to manage their IT (Bharadwaj, 2000; Powell & Dent-Micallef, 1997; Tippins & Sohi, 2003).

There have been a number of studies exploring IT using the RBV of the firm (Bharadwaj, 2000; Li et al., 2006; Tippins & Sohi 2003). Recently, studies have focused more specifically on IT capabilities (Bharadwaj, 2000; Tippins & Sohi, 2003). IT capabilities relate to the extent to which organizations are well informed about IT, and efficiently utilize IT to manage information within the organization (Tippins & Sohi, 2003). IT capabilities have been defined as an invisible asset that can activate various IT resources within an organization, providing a competitive advantage (Itami, 1987). Recent approaches have looked to classify IT capability, seeking to tap into multiple

aspects of IT to provide clearer testing of IT and competitive advantage (e.g. Bharadwaj, 2000).

This paper focuses upon the three dimensions of IT competency offered by Tippins and Sohi (2003), namely: knowledge, operations and objects. IT knowledge is the subset of embedded general knowledge within an organization relating to IT experience and other aspects that may be hard to calculate. IT operations are the activities within the organization that are required to meet goals. These activities are underpinned by skills that encapsulate the knowledge within the firm. Finally, IT objects are the computer-based physical resources (hardware and software) and human resources (IT personnel), that combined, aid organizations with multiple aspects of information, including production, processing and dissemination. The advantage of the Tippins and Sohi (2003) IT capability classification, is that it is well aligned to the RBV of the firm, allowing the various competencies relating to IT to be examined.

Powell and Dent-Micallef (1997) argued that the crucial advantages that organizations achieve from IT could be protected and further enhanced, through embedding IT within an organization through complementarity and cospecialization. Under the RBV of the firm, this would mean that organizations develop capabilities combining IT resources and exploit them so they are too complex for competitors to readily imitate. As such, organizations with greater IT capabilities should outperform competitors who lesser IT capabilities, if they have maximized their ability to leverage this IT capability. While previous studies have explored the IT-firm performance link, one problem has been the focus on specific technology (Dos Santos & Peffers, 1995), rather than capabilities related to IT. This links well with Li et al.'s (2006) assertion that organizational capabilities should be explored associated with IT. Tippins and Sohi (2003) explored IT competency (IT knowledge, operations, and objects) and firm performance, and these components were significantly related. This approach supports Brown and Hagel (2003) assertion that the real value of IT is only achieved when an organizations IT capability is consistent with its business strategy.

Consequently, the present study hypothesizes that IT competency will have a direct effect on firm performance. Using the RBV of the firm, we suggest that an organizations general IT knowledge base should enable it to leveraged its IT to enhance firm performance through having greater understanding and access to markets and customers. Likewise, IT operations are underpinned by sets of IT skills that allow greater goal achievement within an organization, while IT objects should allow an organization to improve performance through achieving greater access to markets and customers. Further, because IT objects includes human resources associated with IT (e.g. programmers), and these are a valued and desirable resource (Kakumanu & Portanova, 2006), this further links with the RBV of the firm. Importantly, these IT aspects are located within an organization, and consequently are hard for competitors to replicate. Overall, this leads to our first set of hypotheses.

Hypothesis 1a: Higher IT knowledge will be linked with higher market performance.

Hypothesis 1b: Higher IT knowledge will be linked with higher development performance.

Hypothesis 2a: Higher IT operations will be linked with higher market performance.

Hypothesis 2b: Higher IT operations will be linked with higher development performance.

Hypothesis 3a: Higher IT objects will be linked with higher market performance.

Hypothesis 3b: Higher IT objects will be linked with higher development performance.

Kim and Mahoney (2006) noted that a cost effective IT system could reduce internal coordination costs, providing management with the capability to manage a large firm more effectively. From a strict IT asset perspective, findings have indicated more IT investment from smaller sized firms rather than larger firms (Brynjolfsson, Malone, Gurbaxani, & Kambil, 1994). However, using the RBV for IT competency, we move beyond simple IT resources and focus on leveraging capabilities, where firm size may play a more valuable role. The present study explores the interacting effects of firm size on the direct relationships hypothesised above. This is because firm size may play a role in how firms are better able to leverage their IT competency to achieve greater market penetration and greater product development.

Ebben and Johnson (2005) asserted that larger firms have significant advantages in the marketplace over small firms, with firm size often being viewed as an indicator of scale economies and market power (Bowen & Wiersema, 2005). Further advantages include greater access to financial resources and capital, stronger the bargaining power with buyers and suppliers, and greater experience curve effects (e.g. Cooper, Gimeno-Gascon, & Woo, 1994; Pissarides, 1999; Dean, Brown, & Bamford, 1998). Scherer (1980) noted that that large firms have performance advantages over smaller sized firms, through scale and scope economies, greater market power, and the ability to aggregate inputs.

Consequently, small firms with a lack of financial resources become hindered in large fixed-asset investments (Jarillo, 1989), which have been asserted as being important for optimal firm performance (Ebben & Johnson, 2005). Firm size has also been associated with greater firm development. Cohen (1995) suggested firm size provides advantages in the conduct of firms' R&D efforts or their innovative activities (Galbraith, 1952). Further, Macher and Boerner (2006) maintained that larger firms are able to spread the fixed costs of R&D over a larger sales base, thus exploiting economies of scale in the conduct of R&D (Panzar & Willig, 1981). R&D should likely enhance market and development performance, especially combined with IT competency. Consequently, larger firms can undertake development on a larger scale (Macher & Boerner, 2006), which means larger firms may further leverage their IT competency to further advantage.

Mishina, Pollock, and Porac (2004) asserted that greater firm size is desirable, because it offers additional benefits including increased visibility and prestige, and the capacity to endure environmental shocks (e.g., Hannan & Freeman, 1984). It has also been suggested that larger firms have more sophisticated management expertise (Pissarides, 1999), where they are able to effectively manage difficult environments. Finally, larger firms generally have more formal systems and procedures in place and perform more planning activities than smaller firms (Busenitz & Barney, 1997), making them more equipped to plan for and implement, which can aid efficiency and performance (Ebben & Johnson, 2005). It should also allow larger firms greater awareness of how to further leverage their IT competency for market and development gains, and firm size has been used as a potential moderator in firm performance studies (e.g. Jayaraman, Khorana, Nelling, & Covin, 2000). This leads to our last set of Hypotheses.

Hypothesis 4: Firm size will interact with IT competency and market performance, with larger firms being more likely to leverage IT competency to achieve greater market gains than smaller firms.

Hypothesis 5: Firm size will interact with IT competency and development performance, with larger firms being more likely to leverage IT competency to achieve greater development gains than smaller firms.

METHOD

Sample and Procedures

Data were collected from a random mail survey of 1000 large New Zealand companies drawn from the New Zealand Post list of company addresses. CEOs or Senior Managers were surveyed regarding their organizational strategy, IT competency, organizational learning, knowledge relatedness, firm performance, and organisational characteristics (e.g. union density, workforce composition). All letters were specifically addresses to individuals supplied with the database. Of the 1000 surveys sent, 81 surveys were returned due to the named person no longer working for the company targeted, not being at the supplied address, being against firm policy, or due to the company no longer trading. In total, 168 responses were returned for a response rate of 18.3%. On average, respondents employed 458 employees, 59% who were males, had an average turnover rate of 19%, and with 68% having some union presence. Responding firms were from a wide range of industry sectors: 7.5% agriculture, 31% manufacturing, 15% retail, 9% transport, 11% business and finance, 18% community, with the remaining 8.5% shared between electricity and construction.

Measures

Market Performance was measured using 4-items (Spanos & Lioukas, 2001), coded 1=much below average, 5=much above average. Respondents were asked to indicate their firm's performance relative to competitors for the last three years, in the areas of sales volume, growth in sales volume, market share and growth in market share. The Cronbach's alpha for this scale was .84. Development Performance was measured using 2-items (Sarkar, Echambadi, & Harrison, 2001), coded 1=much below average, 5=much above average. Respondents were asked to indicate their firm's performance relative to competitors for the last three years, in the areas of market development and product development. The Cronbach's alpha for this scale was .73.

IT Competency was measured using three sub-scales Tippins and Sohi (2003), coded 1=strongly disagree, 5=strongly agree, with questions following the stem "your firm...". IT Knowledge was measured by three-items, a sample is "Has a high degree of computer-based technical expertise", and this measure had a Cronbach's alpha for this scale was .90. IT Operations was measured by five-items, a sample is "Routinely utilise computer-based systems to access market information from outside databases", and this measure had a Cronbach's alpha for this scale was .83. IT Objectives was measured by three-items, a sample is "Every years budget has a significant amount of funds for new information technology hardware and software", and this measure had a Cronbach's alpha for this scale was .80.

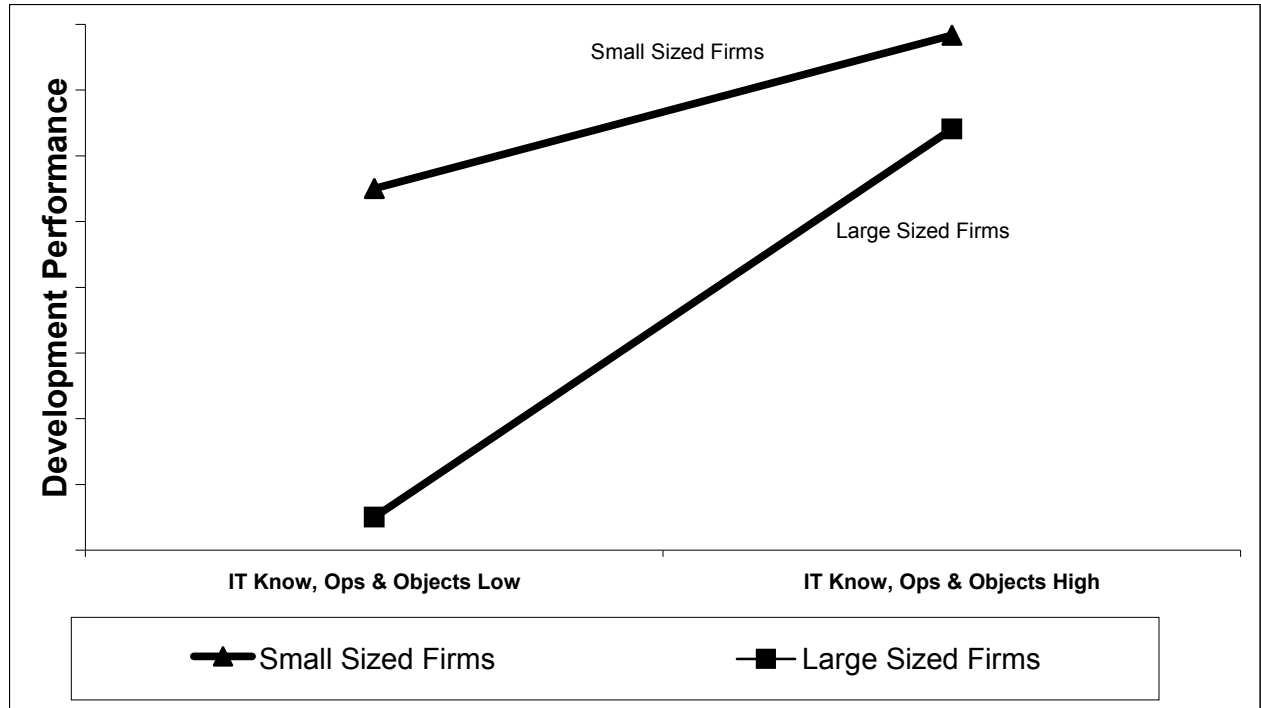
Firm size can be measured through the market value of equity, total revenue, or number of employees (Jayaraman et al., 2000; Laursen & Salter, 2006). Given that financial data on New Zealand firms is very hard to acquire, and self-reported data may

be problematic, we focus solely on self-reported number of employees. This data was log transformed to induce normality.

RESULTS

Results of the moderation regressions shown that IT knowledge was significantly related to market performance ($\beta = .25$, $p < .01$), as was IT operations ($\beta = .26$, $p < .01$) and IT objects ($\beta = .27$, $p < .01$). These findings support Hypotheses 1a, 2a, and 3a. There are similar direct effects towards development performance. IT knowledge was significantly related to development performance ($\beta = .17$, $p < .05$), as was IT operations ($\beta = .33$, $p < .001$) and IT objects ($\beta = .23$, $p < .01$). These findings support Hypotheses 1b, 2b, and 3ba. From Step 2 we can see that IT knowledge accounted for 6% ($p < .01$) of variance for market performance and 3% ($p < .05$) of variance for development performance. From Step 2 we can see that IT operations accounted for 6% ($p < .01$) of variance for market performance and 10% ($p < .001$) of variance for development performance, while IT objects accounted for 3% ($p < .05$) of variance for market performance and 5% ($p < .01$) of variance for development performance. Organizational size did not have any significant moderating effect towards market performance, providing no support for Hypothesis 4. However, organizational size did have a significant effect towards development performance. Organizational size had a significant interaction effect on IT knowledge and development performance ($\beta = .16$, $p < .05$), accounting for an additional 2% ($p < .1$) of the variance. There were similar effects for IT operations ($\beta = .20$, $p < .05$), accounting for an additional 3% ($p < .05$) of the variance, and IT objects ($\beta = .18$, $p < .05$), accounting for an additional 3% ($p < .05$) of the variance.

To facilitate interpretation of the significant moderator effects of organizational size on development performance, plots of the interactions are presented below for all three IT competency (as they are all similar). Plotting the interaction terms illustrates that when IT knowledge/operations/objects is low, there is a major difference between responding firms, with smaller firms reporting higher levels of development performance. Further, when IT knowledge/ operations/objects increases, smaller firms report an increase in development performance while larger firms report a significantly greater increase in development performance. Overall, smaller firms still out perform larger firms with respect to development performance at any level of IT knowledge/ operations/objects.



Finally, we examined the variance inflation factors (VIF) for evidence of multicollinearity, which occurs at the value of 10.0 or higher (Neter, Kutner, Nachtsheim, & Wasserman, 1996). Overall, all scores were below 2.0, indicating no evidence of multicollinearity unduly influencing the regression estimates.

DISCUSSION

There has been a lot of interest in the role that IT plays on firm performance and competitive advantage; however, Tippins and Sohi (2003) noted findings in the literature have been mixed and inconclusive. In response to simply targeting specific IT resources (e.g. Dos Santos & Peffers, 1995), Tippins and Sohi (2003) suggested IT capabilities might provide a more accurate way to test the influence of IT on firm performance. Using the RBV of the firm to explain the role of IT capabilities on two aspects of firm performance, the present study found IT knowledge, operations, and objects to be all directly associated to market performance and development performance. Overall, IT competency accounted for moderate but significant amounts of variance for both types of performance, ranging from 3% ($p < .05$) to 10% ($p < .001$). This suggests that while IT competency plays an important role in a firm's market and development performance, there are other aspects that also influence performance. Therefore, firms with greater IT competency have an advantage over competitors with less IT competency, but clearly, there are other aspects that also influence performance.

In addition, we also explored organizational size as a moderator of IT competency because the literature suggests larger firms will have greater resources to better leverage their IT advantages. However, we found no support for larger firms extolling greater influence from their IT competency on market performance. As such, larger firms are not better able to leverage their IT competency to achieve greater market share, penetration and volume, than smaller firms. However, there were significant effects from firm size on

development performance, and these effects were consistent for all three categories of IT competency. Interestingly, the graphed moderation effects showed that smaller sized firms were better able to achieve development performance, at both low and high levels of IT competency. While larger firms achieved significant increases in development performance when their IT competency increased from low to high, this performance was still below smaller sized firms. Consequently, we find that smaller firms are better able to leverage their IT competency to achieve superior development performance, perhaps through leveraging their speed and flexibility to modify and change aspects of their business that larger firms might struggle to achieve as quickly. This finding encourages further studies of firm size towards IT competency and firm performance to see whether these effects are generalisable. Further, given New Zealand has a firm population that is predominately small in size, might also indicate this is specific to the New Zealand context. Hence, further research is needed to determine whether smaller firms are universally able to leverage their IT to achieve greater development performance.

Overall, the present study enhances our understanding of the influence IT can have on firm's market and development performance. Further, we find smaller firms may be better able to leverage their IT competency to achieve greater market and product development, which is counter to most of the literature suggesting larger firms will outperform smaller firms due to their superior resources. This finding might explain why smaller firms can gain rapid access to emerging markets, perhaps through merging their IT competency with the ability to make rapid changes in markets and developments. Clearly additional research is needed to further support the role of IT on market and development performance, as well as other performance indicators (e.g. financial). Overall, the findings suggest that firms with superior IT competency outperform their competitors with a lesser IT competency, supporting the capabilities approach under the RBV of the firm.

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