Modeling Information Technology Value

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Abstract

This paper offers a comprehensive study to research the relationship between IT and business performance. According to Resource-Based View (RBV) theory, the study explores parts of resource and business performance based on 24 studied papers using meta-analysis methodology. In order to understand IT value within business, the study breaks down IT value into resource, capability, competence, and competitive advantage component. The well-managed resources will result in capabilities. Furthermore, the capability will embody as a core firm competence. The competence leads to achieve more market share because of improvement of its competitive advantage. Previously, the researchers have highlighted the study directly between resources to competitive advantage or resources to capabilities then to competitive advantage. However, this study has not yet formulated details of factors/parameters of those components. Also, the limitation of the meta-analysis is that results are based on prior research conducted on different sources at different times, in turn, it may cause study biases. Moreover, the model might be an urgent requirement of industries because they will take care of IT investment to obtain a normal return in terms of the spent investment.

Keywords: *IT resource; resource-based view; IT capability; IT competence; competitive advantage,meta analysis.*

Introduction

The existence of Information Technology (IT) within nowadays businesses is a common thing. Managers viewed IT investment will improve business efficiency and competitiveness [13]. IT has an increasingly important role in almost all parts of the firm's processes and corporate strategies, and for almost all industries, IT is supposed as a significant strategic asset [16].

In contrast, it will be a question that whether or not IT is bringing its business organization up in performance [24]. This subject had become an interesting topic to do research in information systems recently [17]. Why is it interested in? Simply because there are a variety of IT investments in order to help the organization increasing its business values. Many organizations currently observe that up to 50 % of their total

capital expenditure is for IT [25, 1]. Rau and Bye [20] estimate that for U.S. IT spending growth in 2003 average 4% to 6%; estimates for worldwide spending growth are a bit higher at 5% to 7% [20]. Also, the US financial services sector, which accounts for a large part of US IT spending, is projected to increase spending by about 15% by 2005 [12].

On the recent Gartner report of second Quarter 2013 (see figure 1) there is an increasing trend on global IT spending although there is a growth to drop to 2 % in 2013, which is projected previously to increase 4.1 % [7].

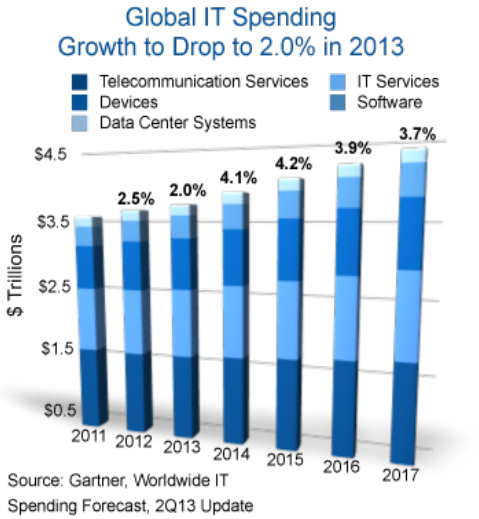

Figure 1. *Global IT Spending (adopted from [7])*

However, how far does the investment contribute to organization performance improvement? There are various answers. One of them is what Wagner and Weitzel (2007) stated, i.e. that the relationship between IT and business value is not always directly proportional. Similarly, Cao, Wiengarten, and Humphreys [4] mentioned that the role of IT should be combined with other internal organizational factors. Therefore, there are many factors regarding the relationship between IT and the business values.

Zee [25, p.10] in his book, *Measuring the Value of Information Technology*, explains that the role of IT is to enable strategic change and improve business performance in several dimensions. Also, IT enables the rapid delivery of top-quality, increasingly customized products and services, it carries organizations to support high standards in customer care, and provides the means to squeeze design and development times in order to be the first market. Furthermore, IT helps to launch new products more frequently, to explore and enter new markets faster, and to seek new distribution channels.

In other words, IT helps the organization realize its competitive advantage in global environment. In the present business environment, the use of IT is pervasive and could lead to extended advantages in competitive situations [10].

Literature Reviews

Researchers mentioned that among the theories, the adopted major theory to understand the relationship between IT and firm performance is Resource-Based View (RBV) theory proposed by Wernerfelt (1984). The fundamental reason of RBV is that the resources it owns determine firm performance. The RBV differentiate between information technology (IT) and information systems (IS). IT is asset-based, while IS is a blend of assets and capabilities because of a productive use of IT [6].

Barney (1991) classified resources into physical capital, human capital and organizational capital [6]. Further, he mentioned four criteria regarding resources to be strategically important as follows [18]:

- Valuable – the resource enables the firm to increasing its efficiency and effectiveness.
- Rare – the resource owns a great different advantage to purse competitive advantage.
- Inimitable – the resource is unique, competitors cannot obtain it because they are incomparable.
- Non-substitutable – no other resources can replace the original resource.

Bharadwaj (2001) classified IT resources into three categories [6]:

1. IT infrastructure – the tangible resource consists of the physical IT infrastructure.
2. Human IT resources – both technical and managerial skills of IT human resources.
3. IT enables intangibles – three groups: customer relationship management, development of knowledge assets, and synergy to collaborate among departments (groupware systems).

Conversely, Clemons and Row (1991) proposed that IS resources should be combined with other firm assets, so IS impact on the firm is rather complementary [22]. Accordingly, there are three aspects to enforce RBV in order to provide IS with benefits [22]:

1. It should create an IS resource framework.
2. Comparing the framework to other resources, in particular non-IS resources.
3. The RBV has to clear link between resources and sustainable competitive advantage.

In here, we can cite one of conclusions resulted from Liang *et al.* [15, p.1151] research as follows, "the use of the resource-based model to investigate the relationship between IT and firm performance in ISs research has been inconclusive when the research model does not include organizational capabilities. The indirect-effect model that includes organizational capabilities as mediators between organization resources and firm performance can better explain the value of IT than the direct-effect RBV model without organizational capabilities".

Valuable IT resources, consecutively, will be able to provide a firm with their capability as well. In light of this issue, Ravichandran and Lertwongsatien (2005) argued that between firm's IT resources and IS capabilities own constructive relationships. Likewise, Tanriverdi (2005) confirmed that related and complementary IT resources would support to activate an IT-based coordination mechanism and increase organizational capabilities across business units synergistically. In other words, the resources influence business performance by enhancing organizational capabilities [14]. Further, this leads

to understanding IT capability. Here IT capability means that is "the ability to mobilize and deploy IT-based resources in combination or co-present with other resources and capabilities" [2, p.171].

Furthermore, the organizational capabilities consist of two categories: internal and external (Hulland et al., 2007; Goh et al., 2007) [15]:

1. Internal capabilities, including the ability to utilize resources, can enhance internal controls capabilities, strengthen cooperation performance between the departments, and improve capacity of the system and development.
2. External capability is the ability to adapt to the external environment, the ability to work with external partners (such as upstream and downstream suppliers and manufacturers) for cooperation and information sharing, the capacity of facing the market, and customer needs.

On the other hand, Bharadwaj (2000) mentioned that a firm's IT capability draw from fundamental strengths in IT infrastructure, human IT resources, and IT-enabled intangibles. The IT infrastructure helps the firm to launch innovative applications faster than the competitor does. While the human IT resources will be enablers to conceive of and implement such applications faster than the competitor implements. Likewise, IT-enabled intangibles will allow the firm to leverage pre-existing organizational intangibles such as customer orientation and synergy within the firm [2].

The competitiveness draws from an ability to build the core competencies that spawn unanticipated product/service. Of course, this should be at minimum cost and steps ahead of competitors. In other words, the advantages would be resulted from management's capability to consolidate organization-wide technology and production skills into competencies that will empower individual businesses to adapt quickly to changing opportunities [19].

Prahalad and Hamel [19] extended the concept of dominant logic in a very influential paper that defined the notion of a corporation's "core competence." Prahalad and Hamel [19, 82] defined a corporation's core competence as "the collective learning in the organization, especially how to coordinate diverse production skills and integrate multiple streams of technologies." Here again, Prahalad and his co-authors focus on intangible rather than tangible assets as a basis for competitive advantage in choosing and implementing corporate strategy [1].

Furthermore, IS infrastructure flexibility is studied in its relationships as an enabler of core competencies that have been closely linked to sustained competitive advantage in the management literature. The core competencies are mass customization and time-to-market [3]. Recent studies indicated that the relationship between IT competence and business values could be deconstructed through presence of business competences. Soh and Markus (1995) examine the need for effective deployment of appropriate IT assets to create business value, so these assets will lead to intermediate effects, such as better business competences and processes. In turn, these effects can raise firm performance.

Lee *et al.* [14] argue that IT service competence resulted from IT service infrastructure,

standard application platform, and IT service management skill can support and enhance operation-level dynamic capability. In addition, they mention that a specific set of IT resources forms service organizations' IT competence to support business needs, therefore leading to a higher level of dynamic capability in their operations. Consequently, this will positively influence the competitive performance of the firms [14].

Theory of competitive advantage, as enlargement of the resource-based theory, has numerous similarities to resource-based logic although it is developed largely independent of the work cited earlier. There are two of the most important of these parallel streams: the theory of invisible assets (Itami, 1987) and work on competence-based theories of corporate diversification (e.g., Prahalad and Bettis, 1986; Prahalad and Hamel, 1990) [1].

Itami (1987) described that invisible assets are information-based resources such as technology, customer trust, brand image, and control of distribution, corporate culture, and management skills. While physical (visible) assets, according to Itami, must be present for business operations to happen but invisible assets are necessary for competitive success. Invisible assets are the real sources of competitive power and adaptability because they are hard and time-consuming to accumulate. They can be used in multiple ways simultaneously, and are both inputs and outputs of business activity. Meanwhile people are both accumulators and producers of invisible assets (Barney and Arikan, 2001). Additionally, the firms, which concentrate their IT efforts on enhancing the benefits realized from information dependent resources, will experience greater rents (the source of sustained competitive advantage) and/or improved sustainability of those rents [9].

Research Methodology

The methodology of this paper is the meta-analysis approach. The meta-analysis bases the study on the earlier study results in terms of the same hypotheses. The methodology will enrich the study because various hypotheses will endow point of views. However, eventually the study can conclude toward a conclusion [15].

This technique let the authors study some papers addressing IT value relationship to business performance. Based on a number of previous papers, some topics such as IT resources, IT capability, IT competence and competitive advantage are grouped. Each group has relationship one to another. According to the last researches, each group can be linked one to another forming a model of IT value.

Study Result

Analysis of the papers based on the methodology results in the table 1 below.

Components	Concentration	Data Sources
Resource-Based View and IT Resources	Resource-based view: origins and implications	Barney, J.B. & Arikan, A.M. (2001) Datta, A (2007) Powell, T (2007)
	Contingency Resource-Based View	Cardeal, N. & António, N., (2012)
	Resource-based perspective on IT	Bharadwaj, A.S (2000) Liang, T.P., You, J.J. & Liu, C.C. (2010) Wade, M. & Hulland, J (2004)
IT Value	IT Business Value	Cao, G., Wiengarten, F., & Humphreys, P (2011) Kohli, R. & Devaraj, S (2004) Rau, S.E. & Bye, B.S (2003) Wagner, H.T. & Weitzel, T (2007)
	Theory and methods for measurement	Goh, K.H (2007) Kohli, R. & Devaraj, S (2003) Zee, H.V.D (2002)
	How Do Investors Value IT?	Muhanna, W.A. & Stoel, M.D (2008)
IT Capability	IT Capability and Firm Performance	Bharadwaj, A.S (2000) Jorfi, S., Nor, K.M. & Najjar, L (2011) Liang, T.P., You, J.J. & Liu, C.C. (2010)
	VRIO and VRI capability	Cardeal, N. & António, N., (2012)
	Process-Oriented Dynamic Capabilities	Kim, G., Shin, B., Kim, K.K. & Lee, H.G (2011) Lee, O.K.(D.), Xu, P.,Kuilboer, J.P. & Ashrafi, N. (2012) Xiao, L.,(2008)
	IT Capability and IT Spending Across Industries	Muhanna, W.A. & Stoel, M.D (2008)
	IT Capability and Value Creation	Lin, B.W (2007)
IT Competence	Information Technology and Core Competencies	Prahalad, C.K. & Hamel, G (1990) Tippins, M.J. & Sohi, R.S. (2003) Byrd, T.A (2001)
Competitive Advantage	Information Technology and Sustained Competitive Advantage	Cardeal, N. & António, N., (2012) Grant, G.L. & Royle, M.T (2011) Liang, T.P., You, J.J. & Liu, C.C. (2010) Byrd, T.A (2001)

Table 1. Summary of Meta-Analysis of Papers

The study results in grouping of IT value consisting of IT resources, IT capability, IT competence, and competitive advantage. The IT resources are sources of the IT value according to the RBV theory. Each group/ component has effect-and-cause relationships. Meaning that IT resources would be causes to generate IT capability. Then the IT capability will create IT competence to win competitive advantages. In other words, IT is a valuable organizational resource, which can enhance organizational capabilities and ultimately lead to high competence to generate competitive advantage as illustrated by conceptual model on figure 2.

Figure 2. *Conceptual Model of IT Value*

The explanation above will lead to an understanding that there is a close relationship between capability and core competence, on one hand. However, on the other hand the core competence is part of the capability. Both capability and competence act as engines to process resources to result in better firm performance as depicted on figure 3.

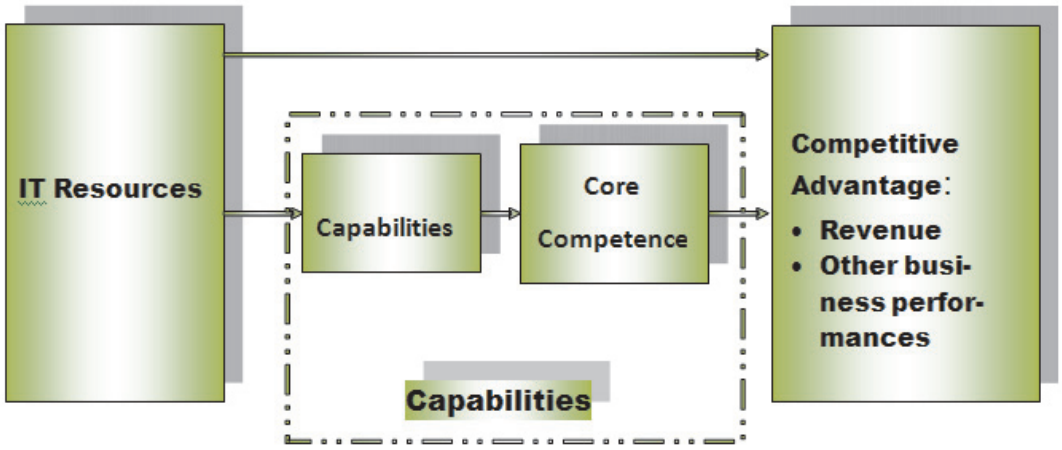

Figure 3. *IT Value Model*

Discussion and Conclusion

Researches in terms of IT's relationship to firm performance have been studied for long time. This is based on the real business world that the utility of IT is a general. The problem of IT utilization is how to use it effectively? It means from process point of views, IT should be valuable, so the processes would be effective in exploiting resources and efficient in using cost. To achieve this goal, there should be created a model in order to study behaviors of the IT values. This paper is intended to do the model so in turn; we can study the IT value based on the model with more directed.

This model offers more comprehensive viewpoints in studying IT values than before. The comprehensiveness lies in causality relationships among the four

componens, i.e. IT resources, IT capability, IT competence, and competitive advantage. However, each component has not been detailed into some indicators for measuring it. It is necessary to do the next study in terms of it.

This paper, furthermore, addresses the positive correlation. A variety of studies regarding this issue is about how to know the real relationship. However, the major theory in order to do the study is the resource-based view (RBV). The RBV could link the performance of organization to resources and skills indicated by researchers who have used the RBV as the main theoretical framework to comprehend the relationship between IT and firm performance.

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