Sustainable Advantages of Business Value of Information Technology

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INTRODUCTION

The business value of information technology (IT) and the way to sustain returns obtained through investment in IT has been a topic of interest in the last few years. Early studies during the 1980s and early 1990s on the relationship between business value and information technology investments did not find a link between them, although the firms analyzed at that time were investing large amounts of money on IT. This issue created what is called in the literature "the IT productivity paradox" (Brynjolfsson, 1993). It is essential to understand the relationship of IT and its effects on business value, especially the sustainable advantages that companies can obtain if they use IT to obtain a strategic differentiation and operating efficiency in using competitors as a benchmark.

Later studies have criticized the business value of IT investments claiming that IT does not bring any benefits to a firm because competitors can also have access to the same type of IT, thus eliminating any strategic advantage that a firm may have when they adopt a new type of IT (Carr, 2004).

However, more recent studies have found that IT improves productivity and profitability (Brynjolfsson and Hitt, 1996; Romero et al., 2010), and that IT can help firms differentiate their products from competitors and manage processes in a more efficient way (Anderson et al., 2011). For instance, Bardhan et al. (2013) proposed that IT investments interact with research and development investments of a firm enhancing its market value, and the results are visible through the increase in shareholder value. They used investments in research and development which is an intangible variable that can be used as a proxy measure of the value and capabilities of a firm. They concluded that IT investments create business value, and they measured it with Tobin's Q, which is a financial measure that takes into consideration future earnings and future growth of the firm.

With regard to the methodology used in most of the studies on the effects of business value of IT, most were based on cross sectional studies using data across industries and across different types of IT such as Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Material Requirements Planning (MRP), Supply Chain Management (SCM), and cloud-based applications among others. One criticism of this methodology is that each type of IT differs from another, including different installation periods and different investments, therefore the conclusions reached in these studies need to be analyzed with this in mind. Very few studies have looked at the business value of information technology using only one industry and using only one type of IT.

BACKGROUND: INDUSTRY STUDIES

Previous studies have concluded that the implementation of IT and its effects may affect firms in different industries in different ways (Porter, 2001; Melville et al., 2004; Mitra, 2007). Therefore, it is important to recognize the structural differences across industries when we try to measure business value and the managerial ability of firms applying IT in order to improve their performance. The understanding of those structural differences is not yet completely understood (Melville et al. 2004).

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From a methodological point of view, it is possible to control industry effects in a regression across industries, but the concern with those studies across industries is that the industry effect may be averaged out when analyzing firms from a broad group of industries. On the contrary, in a study that focuses on one industry, the effect of industry-related factors are controlled and the unique characteristics of the specific industry can be taken into consideration in order to isolate the IT effects (Mitra, 2007). There have been very few industry studies analyzing the effect of business value of IT. The main limitation has been the difficulty to obtain and collect this kind of data which is more precise and accurate than cross sectional data. One of the advantages of an industry study is that it does not restrict the analysis; rather it minimizes the possibility of bogus results due to structural differences among industries.

For instance, Anderson et al. (2011) is one of the few industry studies that analyzed the effects of one type of IT within one specific industry. Using only one industry gave them the opportunity to avoid interactions among industries, to have a more homogenous dataset and to use this industry as a control variable. Using highly specific industry data, their study used a novel model to look at the business value that is generated during the implementation and after the implementation of one type of IT. They also looked at whether or not the business value of IT was sustainable over time. They concluded that firms that were involved in shorter IT implementations outperformed firms that were involved in longer IT implementations. One of their explanations for these results is that when a firm is involved in a long implementation, then structural changes within the firm and macroeconomic changes that may occur during the implementation may affect the implementation, whereas during a short implementation, firms avoid this potential issue. Also, during a long implementation, firms also face the possibility of having an outdated system by the time the implementation is complete. They also discussed that firms involved in shorter IT implementations started to enjoy operational improvements before the IT implementation was officially declared complete. This is even more critical on large IT systems such as ERP where the operations of the whole firm may be affected and its supply chain interactions may also be affected.

BUSINESS VALUE ON ENTERPRISE RESOURCE PLANNING

It is important to discuss ERP as one type of IT because it is one of the most important types of IT that have had an important effect on business value of firms in the last two decades. ERP is a type of IT that is capable of processing enormous amounts of data and has become a widely-used package, particularly after major events such as the year 2000 problem (Y2K) when firms had to start using four digits in the variable year starting on year 2000. This, combined with the enforcement of the Sarbanes-Oxley Act of 2002 that imposed stringent accounting regulations on firms after several major financial scandals that included large publicly traded firms such as Enron, Adelphia, and Worldcom, among others, led to an increase in the use of ERP. With the enforcement of the Sarbanes-Oxley Act of 2002, ERP has helped firms standardize business processes and helped firms integrate their systems with the systems of suppliers and customers.

ERP has been considered as an extension of MRP II, but with more sophisticated features and applications (Gumaer, 1996; Yusuf and Little, 1998). Likewise, MRP was designed to replace legacy reorder point-based IT systems in production and planning departments (Cooper and Zmud, 1990). Large and complex IT systems such as ERP, that are very expensive and take a long period of time to implement, may generate disruption in the operations and will affect profitability of a company (Bardhan et al. (2013).

There are multiple studies on ERP, but there are few studies analyzing the effect of business value of IT over long periods of time using only

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