

# Information Technology Capability and Firm Performance: The Role of Strategic Orientation

*Research in Progress*

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## **Abstract**

A key strand of IT business value research is concerned with the measurement of IT capability of firms and the impact of IT capability on the accounting-based measures of firm performance. Previous empirical studies examining this relationship in the context of developed economies have reported mixed results, and there is a dearth of studies in the context of emerging economies. In this study, we seek to employ archival data from the emerging economy context of India, and replicate the findings from the earlier studies, in order to examine the existing theory. We also propose to extend the existing theory by incorporating the role of strategic orientation (indicated by the Miles and Snow strategy types) of the firms while examining the impact of IT capability on firm performance. Thus, the results of this study offer possibilities of both theoretical and practical implications.

**Keywords:** IT capability, Firm performance, Strategic orientation, CIO 100, IT business value

## 1 INTRODUCTION

Business value of IT (BVIT) research tries to address the fundamental question of how firms can use their IT investments to achieve and sustain a competitive advantage (Melville et al. 2004; Sabherwal and Jeyaraj 2015). Several theoretical frameworks and methodological approaches have been utilized to explore this issue. The notion of IT capability, defined as “the ability to mobilize and deploy IT-based resources in combination or co-present with other resources and capabilities” (Bharadwaj 2000, p. 171), borrows from the resource-based view (RBV). One of the popular methodological approaches used to measure IT capability and its impact on firm performance is based on identifying IT leaders based on annual rankings or awards from sources such as Information Week’s IW500 (Bharadwaj 2000) and CIO 100 (Masli et al. 2011). The accounting-based performance measures of these IT leaders are then compared with a matched control group of firms belonging to the same industry to evaluate if the IT leaders (who possess superior IT capability) outperform their industry peers based on these performance measures. This approach has found mixed results while examining the link between IT capabilities (assessed using IT awards) and firm performance. While Bharadwaj (2000), Santhanam and Hartono (2003), and Choi and George (2016) find that IT leaders (i.e., IT capable firms) outperform their peers in the control group, Chae et al. (2014) find that IT leaders do not exhibit superior financial performance.

In this study, we will use archival data from the Indian industry to examine if the research model and findings of prior studies are valid in the context of India, which is an important emerging economy and is undergoing rapid digital transformation across industries. Such an analysis holds significance because although IS/IT investments are rising in India, there is a dearth of research in the Indian context about how to best realize the benefits from these investments (Arora and Rahman 2017; Thakurta and Guha Deb 2018). We argue that the IT capabilities of firms will help them realize maximum benefits from their IS/IT investments and not the investments per se. Also, we incorporate the role of firms’ strategic orientation (using the Miles and Snow strategy type as the indicator) in realizing performance benefits as a result of superior IT capability. Thus, this study builds on and extends the existing literature in the following ways:

1. We seek to test and generalize the model proposed by earlier researchers (Bharadwaj 2000; Chae et al. 2014, 2018; Masli et al. 2011; Santhanam and Hartono 2003; Stoel and Muhanna 2009), by incorporating data from the emerging economy context of India.
2. We seek to extend the current work in the Indian context (Arora and Rahman 2017) by incorporating data from all the industries represented in the CIO 100 India awards, whereas the previous study was confined to the chemicals and chemical products industry in India.
3. We also bring the data used for this analysis up to date by considering the period from 2006-2018, while the previous work (Arora and Rahman 2017) was confined to the period from 2006-2011.
4. We incorporate the role of business strategy orientation (indicated by the Miles and Snow strategy type) in helping firms realize the performance benefits of superior IT capability. This adds to the literature arguing for strategy-specific IT investments to reap the maximum benefit (Aral and Weill 2007).

Apart from these contributions to existing theory, this study is also expected to have implications for managers regarding the need to look beyond IS/IT investments while formulating their firm’s IS/IT strategy. They also need to incorporate the availability/development/deployment of complementary organizational resources (to develop an IT capability) and the firm’s strategic orientation. The findings of this study are likely to be essential for emerging market firms in general (Prasad and Heales 2010), and Indian firms in particular.

In this research-in-progress paper, we first provide an overview of the existing literature to establish the need for our study. Then, we list the hypotheses we will test during the study and describe the methodological approach, which will be adopted. Finally, we discuss the possible implications of this proposed study.

## 2 LITERATURE REVIEW

### 2.1 IT capability and firm performance

Several prior works have used the resource-based view (RBV) (Barney 1991) to examine the relationship between IT and sustainable competitive advantage (Wade and Hulland 2004). Following the germinal

conceptual work integrating the resource-based view (RBV) into IS research (Mata et al. 1995), Bharadwaj (2000) was the first to empirically investigate the impact of IT capability on the performance of firms. She argued that only those firms that leverage other resources (IT infrastructure, IT human resources, and IT-enabled intangible resources) in conjunction with IT spending would be able to enjoy a competitive advantage and superior firm performance, by differentiating themselves from their competitors (Bharadwaj 2000).

Extant research has examined the direct as well as the indirect (IT-enabled organizational capabilities) performance effects of IT capability. Bharadwaj (2000) used the Information Week 500 (IW500) data from 1991-1994 to identify IT leaders and compared their performance (using data obtained from Compustat). She found that IT capability indeed has a positive impact on firm performance. Santhanam and Hartono (2003) replicated this study using the same sample and corrected for specific methodological issues, but still arrived at the same conclusion. Stoel and Muhanna (2009) differentiated between externally-focused IT capability and internally-focused IT capability using data from IW500 and Compustat, and their results provided greater granularity and clarity to this theoretical model. Departing from the use of IW500 data, Masli et al. (2011) used CIO 100 awards to identify firms with superior IT capability for the period from 1988 to 2007 and found that firms with superior IT capabilities enjoyed performance benefits till 1999, but these benefits disappeared in the post-1999 period.

Similarly, Chae et al. (2014) used IW500 data from 2001 to 2004 and replicated the earlier studies to find no significant effect of IT capability on firm performance. They concluded that since IT had become more ubiquitous after the period used by Bharadwaj (2000) and Santhanam and Hartono (2003) for their studies, it was no longer a source of competitive advantage. However, Choi and George (2016) replicated the study of Chae et al. (2014) using a different approach to identify the group of control/benchmark firms and found different outcomes. Chae et al. (2018) claim that the contingent role played by the industry to which a firm belongs, may explain some of the contradictory findings in Chae et al. (2014).

Based on this overview, we argue that the following issues have still not been addressed satisfactorily in the existing literature:

1. Does IT capability, measured using awards given by *Information Week* or *CIO 100*, have a positive impact on the performance of firms?
2. What is the recommended method of selecting the control/benchmark group of firms, whose performance is to be compared with the IT leaders (IT award firms)?
3. Do the present findings generalize to the context of an emerging economy such as India, which presents idiosyncratic and unique challenges for IS and business strategy?

## 2.2 Miles and Snow typology of strategic orientation

While the strategy of each firm is unique and idiosyncratic, organizations and strategic orientations are often classified into typologies to be able to study relationships between strategy and other variables (e.g., environment, structure, and performance) more effectively (Parnell and Wright 1993; Pinder and Moore 2006). Such typologies of strategy facilitate the study of strategic patterns by highlighting commonalities of situation-specific strategies (Herbert and Deresky 1987). The Miles and Snow framework (Miles et al. 1978; Miles and Snow 1978) considers the rate at which organizations change their products and markets and classifies organizations into four strategic types – prospectors, analyzers, defenders, and reactors. For the sake of simplicity, we will consider two of the main types – prospectors and defenders – in this study. Since analyzers try to balance the characteristics of prospectors and defenders, the implications of this study will also be relevant to them.

Prospectors seek to identify and exploit new market opportunities continuously (Parnell and Wright 1993) and focus on launching new products and identifying new market opportunities (Desarbo et al. 2005). They do not attain the efficiency required for the maximization of economies of scale (Thomas and Ramaswamy 1996). In contrast to prospectors, defenders are engineering-oriented and emphasize efficiency and domain defense. They try to achieve maximum resource efficiency through stability and control in their operations, process improvements, a division of labor, high centralization, and high formalization (Desarbo et al. 2005; Parnell and Wright 1993). We propose that the incorporation of firms' strategic orientation may help provide additional clarity to the link between IT capability and firm performance.

### 3 DEVELOPMENT OF HYPOTHESES

#### 3.1 IT capability and firm performance

A firm's IT capability consists of its IT infrastructure, human IT resources (technical and managerial skills), and IT-enabled intangibles such as knowledge assets (Bharadwaj 2000). IT capability can help firms improve their business performance by increasing revenues, reducing costs, or both (Porter 1980). IT capability can also help firms differentiate themselves from their competitors, increase switching costs and customer loyalty, and allow them to proactively access customer preferences and reduce search costs (Chae et al. 2014). Hence, following previous studies, we hypothesize:

**Hypothesis 1:** The average profit ratios of IT leader firms are higher than the average profit ratios of all firms in the control group

**Hypothesis 2:** The average cost ratios of IT leader firms are lower than the average profit ratios of all firms in the control group

Hypotheses 1 and 2 will be tested by using a t-test (if data distribution is normal) or Wilcoxon's signed-rank test (if data distribution is non-normal).

#### 3.2 Adjustment for the financial halo effect

It is necessary to ensure that firms are being awarded because of their superior IT capability, and due to their prior financial performance (Bharadwaj 2000; Chae et al. 2014; Santhanam and Hartono 2003). Thus, following prior research, we will test for the effect of financial halo by hypothesizing:

**Hypothesis 3:** After controlling for prior financial performance, the average profit ratios of IT leader firms are higher than the average profit ratios of all firms in the control group

**Hypothesis 4:** After controlling for prior financial performance, the average cost ratios of IT leader firms are lower than the average profit ratios of all firms in the control group

Hypotheses 3 and 4 will be tested using two regression models, similar to the procedure followed in prior research. We will use a binary variable ITL to distinguish IT leaders and control firms (ITL = 1 for IT leaders, 0 for control firms). The two regression models to be used are:

$$FP_t = b_0 + b_1 * FP_{(t-1)}$$

$$FP_t = a_0 + a_1 * FP_{(t-1)} + a_2 * ITL$$

Here, FP denotes the financial performance, t denotes the period, ITL denotes the binary dummy variable used to distinguish IT leaders from control firms and  $a_i$  and  $b_i$  denote the regression coefficients. The significance of the dummy variable ITL ( $a_2$ ) will help determine if the IT leader has a significant effect on firm performance, even after controlling for prior financial performance.

#### 3.3 The contingent role of the firm's strategic orientation

We will consider two of the Miles and Snow strategy types – prospector and defender – to examine the effect of strategic orientation on the link between IT capability and firm performance. Some prior research has proposed that only those IT investment allocations which are targeted towards specific strategic purposes can contribute positively to firm performance (Aral and Weill 2007). Firms that are prospectors focus more on entering new markets and launching new products and are not very concerned with issues of cost and efficiency. On the other hand, defender firms are more concerned with improving efficiency and reducing costs. So, we hypothesize:

**Hypothesis 5:** The average profit ratios of IT leader firms with a prospector orientation are higher than the average profit ratios of IT leader firms with a defender orientation

**Hypothesis 6:** The average cost ratios of IT leader firms with a defender orientation are lower than the average cost ratios of all IT leader firms with a prospector orientation

Hypotheses 5 and 6 will be tested using a two-step procedure. First, all the IT leader firms in a particular year will be segregated into two categories – prospector and defender – using the procedure suggested by Thomas and Ramaswamy (1996). Then, the t-test and Wilcoxon's signed-rank test will be used to compare the two groups.

## 4 METHODOLOGY

A variety of approaches have been used by researchers to measure IT capability. Some of the main approaches are – use of survey instruments (Bharadwaj et al. 1999; Bhatt and Grover 2005), use of data envelopment analysis to operationalize IT capability (Ayabakan et al. 2017), and the use of a variety of archival data and econometric methods (Bharadwaj et al. 1999; Bharadwaj 2000). In this study, we follow the approach adopted by a set of related studies (Bharadwaj 2000; Chae et al. 2014, 2018; Masli et al. 2011; Santhanam and Hartono 2003; Stoel and Muhanna 2009).

### 4.1 Identification of award firms/IT leaders

Following prior research, we used the list of the 1300 winners of the CIO 100 India awards from 2006 to 2018, to identify the IT leaders (i.e., firms possessing superior IT capability). We were able to identify 480 unique award winners because some firms have won awards on multiple occasions. We then used the CMIE (Centre for Monitoring the Indian Economy) Prowess Database to identify the industry groups and NIC Codes of these 480 award firms.

### 4.2 Identification of control group firm(s)

We will use two separate approaches to form the control groups. First, following the approach of Bharadwaj (2000) and Chae et al. (2014), we will create a *matched sample comparison group*, we will select a control firm from the same industry as that of the IT leader and whose 5-year average sales lie in the range of 70% and 130% of the 5-year average sales of the IT leader. To ensure comprehensiveness, we will also create a second control group, following the approach of (Santhanam and Hartono 2003), Masli et al. (2011) and Choi and George (2016), we will consider all the firms in the same industry who lie in the same size quintile (based on sales revenue) and consider their median performance to be the benchmark for comparison with the IT leader's performance.

### 4.3 Checking for halo effect and self-selection bias

One of the risks of using the CIO 100 awards for identification of IT leaders is that the prior financial performance of firms might influence them being awarded. So, the effect of IT capability on firm performance will be assessed only after adjusting for the prior year's financial performance of the firm (measured using the profit ratios). Since firms self-select to apply for the CIO 100 award each year, it is necessary to control for self-selection bias. Following the approach of Masli et al. (2011), we will control for self-selection bias. We will use the un-tabulated results to predict the likelihood of a firm applying for the award based on past performance. We will then calculate the inverse Mills ratio based on this probability, and use this ratio to control for self-selection.

### 4.4 Strategic orientation of firms

We will follow the approach proposed by Thomas and Ramaswamy (1996) to determine the strategic orientation of firms. They measure strategic orientation using four indicators – marketing expenditure, R&D expenditure, production expenditure, and asset intensity (Thomas and Ramaswamy 1996). Prospectors are likely to have higher marketing expenditure (Marketing expenditure / Total sales) and higher R&D expenditure (R&D expenditure / Total sales), while defenders are likely to have higher production expenditure (Cost of goods sold/ Total sales) and asset intensity (Total assets per employee).

### 4.5 Measures of firm performance

In line with prior research, we will use the following profit ratios – Return on Assets (ROA), Return on Sales (ROS), Operating Income to Assets (OI/A), and Operating Income to Sales (OI/S) as measures of performance. Similarly, we will use the following cost ratios – Cost of goods sold to sales (COG/S), Selling and general administrative expenses to sales (SGA/S), and Operating expenses to sales (OE/S).

## 5 CONCLUSION AND PROPOSED CONTRIBUTIONS

The first contribution of this study would be to replicate the existing theoretical framework concerning the IT capability – firm performance relationship in a new context, with a new and novel data set. We identify IT leaders using the CIO 100 India rankings (from 2006 to 2018) and gather archival data from the CMIE-Prowess database. We found one other study which has used a similar data set (Arora and Rahman 2017), but we go beyond the scope of that study (they have considered only the chemicals and chemical products industry in India) as well as bring the data up to date (that study used data from 2006 to 2011 only). Such replication studies are necessary to test the robustness of theory and solidify previous findings into accepted knowledge (Chae et al. 2014; Santhanam and Hartono 2003). This is especially

helpful for research topics where mixed findings have been obtained so far, as is the case with the topic of our study (Choi and George 2016).

The second contribution of this study would be to incorporate the role of firms' strategic orientation in determining the impact of IT capability on firm performance, which is quite rare (a notable exception being Aral and Weill 2007). The use of the widely accepted Miles and Snow typology to segregate the sample firms into various strategic orientations can help reconcile some of the mixed findings in the existing literature concerning this issue. This extends the existing theory, which has thus far examined contingencies like industry (Chae et al. 2018) and IT capability type (Stoel and Muhanna 2009). The examination of business strategy orientation's role in the performance impacts of IT capability has implications for the strategic IT alignment literature as well (Coltman et al. 2015).

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