Business Value of IT: Revisiting Productivity Paradox through Three Theoretical Lenses and Empirical Evidence

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Business Value of IT: Revisiting Productivity Paradox through Three Theoretical Lenses and Empirical Evidence

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ABSTRACT

IT productivity paradox is one of the biggest debates in the IS literature. Even though, recent studies have identified the theoretical and methodological errors that cause this paradox, we still don’t fully understand how IT investment influences overall firm performance. This paper presents an empirical study that examines the influences of IT investment on firm performance. More importantly, this study investigates the impact of IT governance and knowledge sharing on IT investment and firm performance relationship. The paper builds on (1) resource-based view, (2) knowledge-based view, and (3) contingency theory. The findings confirm the influences of IT investment on firm performance and the time lag in this relationship. Moreover, findings of this study suggest that the interaction of IT investment and IT governance has positive and significant impact on firm performance.

Keywords

IT Investment, Firm Performance, Business Value of IT, IT Governance, Knowledge Sharing

INTRODUCTION

With rapid advances in information technology (IT), firms have been increasing their investments in IT to support their operations and improve their overall competitiveness. IT investment of firms increased from 5% in 1978 to 26% in 2010 (BEA, 2011). The effects of IT investment on firm performance have been extensively studied in the past two decades. However the results of these studies are inconclusive (Melville, Kraemer and Gurbaxani, 2004). Prior research has examined the relationship of IT with various aspects of firm performance. (1) Studies using profitability as a measure of firm performance find no significant relationship between IT investment and firm performance (Hitt and Brynjolfsson, 1996). (2) Studies using market measures for firm performance find that IT investment positively affects firm performance (Krishnan and Sriram, 2000). (3) Studies using productivity as firm performance measure find mixed results (Dasgupta, Sarkis and Talluri, 1999, Hitt and Brynjolfsson, 1996). Further, theoretical problems (e.g., ignoring the role of IT investment in lowering entry barriers) and methodological errors (e.g., IT amortization) have been cited as the reasons of the so-called IT productivity paradox (Bharadwaj, Bharadwaj and Konsynski, 1999).

In addition, prior research has investigated the lagging effect of IT investment on firm performance. This is because that it takes time for firms to implement complementary organizational and process changes that take advantage of new technologies. The lagging effect can be also explained with the diffusion hypothesis, which states that it takes several years before the productivity potential is fully realized due to learning and adjustment period of IT (Schwarz, Kalika, Kefi and Schwarz, 2010). Cline and Guynes (2001) conclude that IT investment is related to firm-level performance, yet a two-year lag is required to grasp the effect. Similarly, Yaylacicegi and Menon (2004) find that on average IT capital shows a positive impact in the sixth year after the spending. Based on these results, one can argue that IT investment will not have instant effect on firm performance. Thus, time lag effect should be considered when investigating the relationship between IT investment and firm performance.

Research has also emphasized the possible impact of organizational capabilities on the relationship between IT investment and firm performance (Benitez-Amado, Llorens-Montes and Perez-Arostegui, 2010). IT governance is one of the key organizational capabilities that are found positively related with firm performance (Gu, Xue and Ray, 2008). IT governance is necessary to ensure the effective use of IT (Bowen, Cheung and Rohde, 2007). Knowledge sharing is another important organizational capability which impacts the relationship between IT investment and firm performance (Kohli and Grover, 2008). Prior studies show how knowledge sharing impacts effective use of IT (Bowen, et al., 2007). Despite the established importance of IT governance and knowledge sharing in IT literature, little attention has been given to investigate the impact of these organizational capabilities on the relationship between IT investment and firm performance.
Moreover, prior studies have investigated the relation between IT investment and firm performance using different theoretical lenses: resource-based view (RBV) (Arslan and Ozturan, 2011), knowledge-based view (KBV) (Pavlou, Housel, Rodgers and Jansen, 2005), and contingency theory (CT) (Brown and Grant, 2005). However, to the best of our knowledge, no study has used these theories together to develop a more comprehensive understanding of the IT investment-firm performance relationship. Based on the results of the prior studies, one can argue that the relationship between IT investment and firm performance is not simple. A more comprehensive framework is expected to better capture the effects of IT investment on firm performance. Thus, further investigation is necessary to understand the complex relationship between IT investment and firm performance.

Our study is motivated by these challenges and aims to address the aforementioned limitations. It explores the following three research questions. (1) “Does IT investment impact firm performance?” Drawing on RBV, we argue that IT investment can be treated as a valuable resource and will affect the firm performance. Even though some of the previous studies have used RBV to investigate this relationship, they failed to distinguish the different types of IT investment. To address this, we define IT investment as the expenses related to IT resources and divide it into two subtypes, IT infrastructure investment and IT Labor investment. As a result, we expect to understand the influence of different IT investment types on firm performance. Therefore, we focus on the productivity aspect of firm performance in this study. (2) “How does IT governance influence the relationship between IT investment and firm performance?” IT Governance Institute defines IT governance as “the responsibility of executives and the board of directors, and consists of the leadership, organizational structures, and processes that ensure the enterprise's IT sustains and extends the organization's strategies and objectives” (Bowen, et al., 2007). Drawing from CT, we argue that IT governance is one of the major internal factors that impact the relationship between IT investment and firm performance. (3) “How does knowledge sharing influence the relation between IT investment and firm performance?” Drawing from KBV, we argue that knowledge sharing is key element which manipulates the relationship between IT investment and firm performance.

THEORETICAL BACKGROUND

IT Productivity Paradox

The contradicting results of the relationship between IT investment and firm performance are referred as IT productivity paradox (Shao, Feng, Choudrie and Liu, 2010). One possible explanation for IT productivity paradox is the effects of organizational transitions on IT investment (Silvius, 2006). Further, Dewan and Kraemer (2000) have concluded that the productivity paradox is absent from developed countries but does exist in the developing countries. Finally, Brynjolfsson (1993) identify four possible explanations about IT productivity paradox: (1) miss-measurement of outputs and inputs, (2) lags due to learning and adjustment, (3) redistribution and dissipation of profits, and (4) mismanagement of information and technology.

Resource-Based View (RBV)

Competitive advantage is a fundamental issue in strategic management. RBV states that firm will gain competitive advantage if it possesses a resource that is (1) valuable, (2) rare, (3) imperfectly imitable, and (4) has no strategic substitute (Barney, 1991). However, resources only create a temporary competitive advantage (Wade and Hulland, 2004). To gain sustained competitive advantage firms have to defend the advantage that they possess against imitation by their rivals. RBV is used to explain the relationship between IT investment and firm performance in the previous studies (Arslan and Ozturan, 2011). Even though there are some critiques that IT investment cannot bring any competitive advantage to firms since it can easily be acquired by competitors (Tian, Wang, Chen and Johansson, 2010), prior studies showed that firms leading in IT investment outperform those with moderate IT investment (Arslan and Ozturan, 2011). Therefore, IT investment can be used as a proxy for IT capabilities, which leads to higher firm performance through competitive advantage.

Contingency Theory (CT)

Contingency is defined as “any variable that moderates the relationship between organizational attribute and organization performance” (Morton and Hu, 2008). CT argues that there is no best way of organizing and leading an organization (Fiedler, 1964). A leadership style or organizational style can be effective in one situation but it may not be successful in other situation. Further, Fiedler (1964) argues that the success of the leadership style or organizational style is contingent upon some internal and external constraints. Therefore, prior studies have treated IT governance as an contingency of IT investment performance and have used CT to explain the value of IT governance on IT investment performance (Gu, et al., 2008).
Knowledge-Based View (KBV)

KBV argues that knowledge is one of the key determinants of sustainable competitive advantage of firms (Schwarz, Hirschheim, Jayatilaka and Goles, 2009). It is the key resource that guides management decisions (Tiwana and Bush, 2007). Pavlou, et al. (2005) define knowledge as “the stock of intellectual assets accumulated through experience, learning, and ongoing practices”. In their 1993 study, Kogut and Zander argue that knowledge is the most fundamental strategic advantage of a firm (Kogut and Zander, 1993). Prior studies emphasized the need for knowledge sharing (Bowen, et al., 2007). The better the firms are at knowledge sharing, the more competitive they are (Schwarz, et al., 2009).

Accordingly, we combine these three theories to develop a better understanding of the relationship between IT investment and firm performance. The proposed hypotheses and the framework will be discussed in the next section.

RESEARCH MODEL

Hypotheses Development

Using cross-sectional (Arslan and Ozturan, 2011) and longitudinal (Hitt and Brynjolfsson, 1996) data, scholars have demonstrated that IT investment has a direct effect on firm performance (Bharadwaj, et al., 1999). However, due to the learning and adoption process of IT, there is a time lag between investment and realization of its benefits (Schwarz, et al., 2010). Melville, et al. (2004) argue that RBV is suitable for analyzing the relationship between IT investment and firm performance. Further, Arslan and Ozturan (2011) use RBV to investigate the relationship between IT resources and firm performance. As a result they find support for RBV arguments. Therefore, drawing from RBV, we argue that firms which possess valuable, rare, inimitable and non-sustainable IT resources will gain competitive advantage. As a result of competitive advantage, these firms will experience increased performance. Further, we argue that there will be a time lag between IT investment and firm performance. We separate IT resources into two groups to investigate their influence on firm performance separately, IT infrastructure and IT labor, to capture their effect in detail. Thus, we hypothesize that:

\( H_{1a} \): Investment in IT infrastructure several years ago positively affects firm performance.

\( H_{1b} \): Investment in IT labor several years ago positively affects firm performance.

The knowledge possessed by an employee can be transferred to his colleagues through knowledge sharing. Prior studies show that knowledge sharing contributes to firm performance (Van den Hooft and De Ridder, 2004). If the existing knowledge has not shared among employees, it has no value to the company. Therefore, it is important to emphasize the value of knowledge sharing among employees. Further, prior studies showed the key role of knowledge on IT investment-firm performance relationship (Shao, et al., 2010). If the knowledge shared among employees, it will help employees to increase their productivity by learning from each other. Therefore, drawing from KBV, we propose that, shared knowledge positively influences the relationship between IT investment and firm performance. Thus, we hypothesize that:

\( H_2 \): Knowledge sharing will moderate the relationship between

(a) IT infrastructure and firm performance such that with a given level of investment in IT infrastructure, a better knowledge sharing practice leads to higher firm performance.

(b) IT labor and firm performance such that with a given level of investment in IT labor, a better knowledge sharing practice leads to higher firm performance.

As Marshall, McKay and Prananto (2005) state, IT governance’s objectives are:

- To support an environment for the development, exercise and exploitation of IT resources and capabilities
- To provide a framework for the fruitful exploration and explication of relationships between the IT function and the rest of the organization
- To identify and underpin a series of organizational routines and procedures through which the business value of IT is realized and IT risk contained

Moreover, IT governance generates benefits such as cost reduction (Bowen, et al., 2007). Hence, having effective IT governance will help firms to benefit more from their IT investments. Thus, drawing from CT, we state that IT governance positively influences the relationship between IT investment and firm performance. Therefore,

\( H_3 \): IT governance will moderate the relationship between
(a) IT infrastructure and firm performance such that with a given level of investment in IT infrastructure, a better IT governance practice leads to higher firm performance.

(b) IT labor and firm performance such that with a given level of investment in IT labor, a better IT governance practice leads to higher firm performance.

The proposed framework is illustrated in Figure 1.

![Figure 1: Proposed Framework](image)

**Measurement**

We adopt the constructs from Brynjolfsson and Hitt (2002) and Kudyba and Diwan (2002). Independent variables, moderating variables and industry variable are measured by the survey. Respondents were asked to provide information about the following questions to measure the independent variables.

**IT Infrastructure:**

It is measured by IT spending on hardware, software, external IT services, and internal IT services. These items will capture the total expenditure of IT infrastructure.

**IT Labor:**

Total number of IS employees is used as a proxy for IT labor investment. We assume that IT expenditure is proportional to the number of IS employees within a firm.

**Knowledge Sharing:**

The knowledge sharing attitude of the firm is captured by using the following four questions in the questionnaire:

- The company exhibits a strong sense of community, a feeling of shared interests, and purpose and cooperation, among managers; this is reinforced with reward systems and incentives that are based on a balance of companywide and local measures,
- Relevant data captured in one business area is willingly shared across the company,
- Cross-functional and business opportunities are actively sought to improve service and reduce costs,
- Cooperation is encouraged via cross-functional teams, temporary assignments and movement of personnel.

**IT Governance:**

IT governance style is captured by measuring the efficiency of following 12 IT governance mechanisms through Likert scale in the questionnaire.
Executive committee (most senior management committee in the company)
Capital approval committee
IT council comprising business and IT Executives
IT leadership committee comprising IT Executives
Formally tracking business value of IT
Architecture committee
Web-based portals and intranets for IT
Tracking of IT projects and resources Consumed
Service-level agreements
Chargeback arrangements
Process teams with IT members
Business/IT relationship managers

Firm Performance:

We also ask respondent to provide some firm related information such as stock ticker symbol and industry. Since most of these firms are public firms, using the firm related information we collect firms’ financial data from COMPUSTAT. The financial data included measures related with sales and labor. The COMPUSTAT data is used to measure dependent variable (Value Added) and second control variable (Number of Employees). Table 1 summarizes the definition and constructs of variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition / Construction</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value Added</td>
<td>Sales minus Cost of Goods Sold and Selling, General &amp; Administrative Expenses</td>
<td>Compustat</td>
</tr>
<tr>
<td>IT Governance</td>
<td>Specifying the decision rights and accountability framework to encourage desirable behavior in the use of IT</td>
<td>This Study</td>
</tr>
<tr>
<td>Knowledge Sharing</td>
<td>Creation, transfer, integration and leverage of captured knowledge in one business area to across firm</td>
<td>This Study</td>
</tr>
<tr>
<td>IT Infrastructure</td>
<td>Constitutes resources expenditures such as computers, ancillary equipment, software, procedures and service</td>
<td>This Study</td>
</tr>
<tr>
<td>IT Labor</td>
<td>Represents number of employees who work in the IT department</td>
<td>This Study</td>
</tr>
<tr>
<td>Number of Employees</td>
<td>Represents total number of employees who work in the firm</td>
<td>Compustat</td>
</tr>
<tr>
<td>Industry</td>
<td>Industry sector based on self-reported industry</td>
<td>This Study</td>
</tr>
</tbody>
</table>

Table 1: Definition and construction of variables

DATA COLLECTION AND ANALYISIS

Data Collection

The data was collected in 2005 by phone interviews using a questionnaire designed by the research team. The questionnaire is distributed to the participants before interviews. Data is collected from approximately 600 firms. Since some of these firms are privately owned or have provided incomplete data, the number of useable questionnaires is 347. Due to mergers, acquisitions, and bankruptcies that happened between 2005 and 2009, 185 of the companies’ financial data are available for year 2009. The industry profile is reported in Table 2.

Our data has some superior features compared to other studies. The interviews allow us to verify the values against those of previous years. Thus the accuracy of data is likely to be higher than the ones that obtained from secondary sources based on questionnaire surveys. In addition, the firms in our sample are more balanced across several industry sectors, and thus our results should be representative of a broad cross-section of the economy.

However, the data has certain limitations that need to be kept in mind as well. IT-related information is self-reported, and with any kind of self-reported data, there is a possibility of a bias creeping in. In addition, the data may have sample selection bias. However, the relatively large sample size should mitigate the impact of the bias.
<table>
<thead>
<tr>
<th>Industry</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation</td>
<td>5</td>
<td>2.70%</td>
</tr>
<tr>
<td>Electronics</td>
<td>9</td>
<td>4.88%</td>
</tr>
<tr>
<td>Pharmaceuticals</td>
<td>15</td>
<td>8.11%</td>
</tr>
<tr>
<td>Chemicals</td>
<td>7</td>
<td>3.78%</td>
</tr>
<tr>
<td>Retail</td>
<td>20</td>
<td>10.81%</td>
</tr>
<tr>
<td>IT / Service</td>
<td>18</td>
<td>9.73%</td>
</tr>
<tr>
<td>Insurance</td>
<td>5</td>
<td>2.70%</td>
</tr>
<tr>
<td>Consumer Products</td>
<td>6</td>
<td>3.24%</td>
</tr>
<tr>
<td>Healthcare</td>
<td>7</td>
<td>3.78%</td>
</tr>
<tr>
<td>Food &amp; Beverage</td>
<td>5</td>
<td>2.70%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>39</td>
<td>21.08%</td>
</tr>
<tr>
<td>Banking</td>
<td>9</td>
<td>4.88%</td>
</tr>
<tr>
<td>Energy</td>
<td>6</td>
<td>3.24%</td>
</tr>
<tr>
<td>Professional Services</td>
<td>16</td>
<td>8.65%</td>
</tr>
<tr>
<td>Media</td>
<td>5</td>
<td>2.70%</td>
</tr>
<tr>
<td>Computer &amp; Electronics</td>
<td>6</td>
<td>3.24%</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>3.78%</td>
</tr>
</tbody>
</table>

Table 2: Industry Profile (n = 185)

**Data Analysis**

All independent variables presented earlier except for IT labor are examined by manifest variables. All of the multivariate constructs are estimated by averaging the related variables into one main variable. Although prior studies find strong evidence for time lagging effect between 1 to 7 years, we use 4 years lagging in our models. Ordinary least squares (OLS) regression analysis was used to the framework. The list-wise case exclusion method is used to ignore missing values. Hypotheses are tested using three models.

Model 1: \( AV_{t+4} = B_0 + B_1IE_t + B_2IL_t + B_3TE_t + B_4IN_t + \varepsilon_t \)

Model 2: \( AV_{t+4} = B_0 + B_1IE_t + B_2IL_t + B_3KS_t + B_4IE_t*KS_t + B_5IL_t*KS_t + B_6TE_t + B_7IN_t + \varepsilon_t \)

Model 3: \( AV_{t+4} = B_0 + B_1IE_t + B_2IL_t + B_3GN_t + B_4IE_t*GN_t + B_5IL_t*GN_t + B_6TE_t + B_7IN_t + \varepsilon_t \)

Where:
- \( AV = \text{Added Value} \)
- \( IE = \text{IT Infrastructure Expenditure} \)
- \( IL = \text{IT Labor} \)
- \( GN = \text{IT Governance} \)
- \( KS = \text{Knowledge Sharing} \)
- \( TE = \text{Total Number of Employees} \)
- \( IN = \text{Industry} \)
- \( t = 2005 \)

Model 1, tests the relationship between IT investment and firm performance. In model 2, we include knowledge sharing and its interaction with IT investment variables to examine the moderating. Similarly, in model 3, we include IT governance and its interaction with IT investment variables to examine the moderating. We estimate the models with a separately run OLS regression approach. Independent variables and moderating variables are centered to reduce correlation among them.
RESULTS

Before estimating the models we check the autocorrelation. All correlations are below 0.7 (Table 3), indicating that there is no auto-correlation. The highest correlation is between added value and IT infrastructure (0.442). The regression results are presented in Table 4.

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Added Value</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. IT Infrastructure</td>
<td>0.442***</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. IT Labor</td>
<td>0.022</td>
<td>0.347***</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Number of Employees</td>
<td>0.430***</td>
<td>0.012</td>
<td>-0.029</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Industry</td>
<td>0.019</td>
<td>0.077</td>
<td>0.010</td>
<td>0.067</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Knowledge Sharing</td>
<td>0.042</td>
<td>-0.033</td>
<td>-0.169**</td>
<td>0.048</td>
<td>0.087</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>7. IT Governance</td>
<td>-0.020</td>
<td>-0.100*</td>
<td>-0.145**</td>
<td>-0.070</td>
<td>0.123**</td>
<td>0.061</td>
<td>1.000</td>
</tr>
</tbody>
</table>

*p < 0.10, **p < 0.05, ***p < 0.01.

Table 3: Correlation Coefficients

<table>
<thead>
<tr>
<th>Hypothesis / Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Std. Estimate / p-value</td>
<td>Std. Estimate / p-value</td>
<td>Std. Estimate / p-value</td>
</tr>
<tr>
<td>Intercept</td>
<td>/ 0.011**</td>
<td>/ 0.068*</td>
<td>/ 0.003***</td>
</tr>
<tr>
<td>IT Infrastructure (H1a)</td>
<td>0.486 / 0.000***</td>
<td>0.534 / 0.000***</td>
<td>0.627 / 0.000***</td>
</tr>
<tr>
<td>IT Labor (H1b)</td>
<td>-0.134 / 0.032**</td>
<td>-0.276 / 0.010***</td>
<td>-0.164 / 0.039**</td>
</tr>
<tr>
<td>Total Number of Employees</td>
<td>0.423 / 0.000***</td>
<td>0.425 / 0.000***</td>
<td>0.418 / 0.000***</td>
</tr>
<tr>
<td>Industry</td>
<td>-0.045 / 0.440</td>
<td>-0.010 / 0.860</td>
<td>-0.044 / 0.438</td>
</tr>
<tr>
<td>Knowledge Sharing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Infrastructure x Knowledge Sharing (H2a)</td>
<td>0.287 / 0.000***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Labor x Knowledge Sharing (H2b)</td>
<td>-0.203 / 0.056*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Governance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Infrastructure x IT Governance (H3a)</td>
<td></td>
<td>0.092 / 0.12</td>
<td></td>
</tr>
<tr>
<td>IT Labor x IT Governance (H3b)</td>
<td></td>
<td></td>
<td>0.254 / 0.000***</td>
</tr>
<tr>
<td>R²</td>
<td>0.393</td>
<td>0.454</td>
<td>0.439</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.380</td>
<td>0.433</td>
<td>0.417</td>
</tr>
<tr>
<td>F- Model / p-value</td>
<td>29.142 / 0.000***</td>
<td>21.039 / 0.000***</td>
<td>19.825 / 0.000***</td>
</tr>
<tr>
<td>Max VIF</td>
<td>1.144</td>
<td>3.645</td>
<td>1.979</td>
</tr>
<tr>
<td>Durbin-Watson</td>
<td>1.941</td>
<td>1.901</td>
<td>1.970</td>
</tr>
</tbody>
</table>

*p < 0.10, **p < 0.05, ***p < 0.01.

Table 4: Results of Regression Analysis
Model 1 tests the direct effect of IT investment on firm performance controlling firm size and industry (H_{1a} and H_{1b}). Consistent with H_{1a}, IT infrastructure helps to explain firm performance. The direct effect of IT infrastructure is positive and significant at the 0.01 level. H_{1a} is therefore supported. Contrary to our expectations, the effect of IT labor is negative and significant. Consequently, H_{1b} isn’t supported.

Model 2 tests the moderating effects of knowledge sharing. H_2 suggest that knowledge sharing would interact with IT infrastructure and IT labor to explain the firm performance. Both interaction terms are significant, however IT labor is in the reversed direction and significant at the 0.10 level (B= 0.287, p= 0.000 and B= -0.203, p=0.056 respectively). Therefore, H_{2a} is supported but H_{2b} isn’t supported.

Model 3 tests the moderating effects of IT governance. Coefficients for IT infrastructure interaction term (B=0.254, p=0.000) is positive and significant. Thus, there is support for H_{3a}. However, coefficients for IT labor interaction term (B= -0.038, p=0.617) is negative and insignificant. So, H_{3b} isn’t supported. With regard to control variables, as expected, firm size had a significant impact on firm performance. However, industry had no impact on firm performance.

**DISCUSSION**

Previous theory and research had contradicting results on the relationship between IT investment and firm performance. This study seeks to identify the relationship between IT investment and firm performance and the moderating impacts of IT governance and knowledge sharing by separating IT investment into two categories. We find that IT infrastructure has positive and significant effect, whereas IT labor has a negative and significant effect on firm performance considering 4 years time lag. Prior literature has investigated this phenomenon in detail. The results commonly indicated that IT investment has positive and significant effects on firm performance. Our results confirm the findings of previous studies. Moreover, we contribute to the IT literature by comparing the influences of IT infrastructure and IT labor on firm performance separately. Based on our results, IT infrastructure has more influence on firm performance than IT labor. Given that IT infrastructure is the primary investment entry of all IT investment, it is not surprising that IT infrastructure has more influence on firm performance.

Moreover, both IT governance and knowledge sharing have a positive and significant impact on IT infrastructure-firm performance relationship. However, while knowledge sharing has negative and significant effect on IT labor-firm performance relationship, IT governance has no significant effects on IT labor-firm performance relationship. Although, the findings about IT infrastructure support the theoretical predictions based on RBV, IT labor fails to support them. A further and detailed investigation of IT labor will shed light on these contradicting findings.

A further contribution of this study is the framework that combines three theories. No study up to date tried to combine theories to investigate the relationship between IT investment and firm performance from different perspectives. We believe our framework will help us to enhance our knowledge about IT investment and firm performance relationship.

Despite the encouraging findings, several limitations should be noted. First, the cross-sectional structure of the study limits the ability to examine lag effects between IT investment and firm performance. However, due to 2009 economical crisis, the results of the longitudinal study might be misleading. Second our data is self-reported data. Therefore we cannot rule out the possibility of bias. Third, we only used Value added as firm performance measure. Other financial measures such as ROA can be used to capture other aspects of firm performance.

In the future, this study can be extended in at least two directions. First, alternative measures can be used to measure firm performance. Subsequent studies can use more than one firm performance measure to have more robust results. Second, longitudinal study would better capture time lagging effect. However, the time period should be selected very carefully to ensure the significance of the results. Any unexpected events such as economical crisis might affect the results.
REFERENCES


