The Impact of IT Investment on Firm Performance in Bangladesh: A Resource-based Perspective

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Abstract

Using the RBV as a theoretical backdrop, the study is intended to begin the line of inquiry: Do IT asset matter and improve the firm performance? The firms' audited annual reports were collected during the period of 2007-2017 from 49 listed manufacturing firms of four manufacturing industries in DSE, Bangladesh. This inductive research used panel data estimation technique for unbalanced panel data to measure, describe, and analyze the firm performance. The results reveal a mixed behavioral effect of IT asset on firm performance. The positive influence of IT asset on firm performance suggests that a firm should invest to develop IT infrastructure in order to effectively promote firm IT capability and firm performance. However, inverse relationship between IT asset and firm performance suggest that IT intensive stocks are not performing well in the stock market of Bangladesh. The results should be of interest to the practitioners and managers as well as IT researchers to manage and plan the appropriate ratio of IT asset to total assets for securing sustainable competitive advantages over their rival firms. The study fills a gap by opening a new avenue for explaining IT asset's contribution to firm performance from RBV perspective in the context of Bangladesh as well as extends the literature in this field.

Keywords: *Customer Satisfaction, Hotel, Kolkata, Service Quality, Tourists Perception.*

JEL Classification Codes: M 41, L25, N65

Introduction

Bangladesh economy is now passing an era driven by significant development of new aspect of information technology (hereafter IT), which helps it to be converted into a digital economy. In the age of digital economy, with its changing work environment, IT's role has become more important in strengthening the firms' competitiveness in their respective industries. Also, in a digital economy, IT assets are predominant and their role along with age and knowledge has become the key success factors for manufacturing firms. Firms are, therefore, increasing their IT investment, since it has enormous potential for reducing costs and gaining sustainable competitive advantages. Firms can better communicate with and provide responsive services to their customers by strengthening their IT (Lee et al. 2016).As management requires IT not only to save costs but also shape business outcomes, the study argues that firms can secure their business sustainability by maximizing shareholder wealth and increase sales revenue by improving their business processes. The deployment of IT assets can contribute to these goals by improving employee productivity and collaboration among stakeholders-employees, partners, and customers.

As IT has changed the ways of the firms' operation and management, its investment and implementation is always an important portion in a firm. Although IT asset is widely acknowledged as a source of competitive advantage (Dewan & Min 1997), measuring the benefits of IT investment has been a major concern of managers and researchers

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for decades. There exists myth, arguments and conflicting results that suggest the relationship between IT investment and firm performance is much more complex than previously thought (Liu et al. 2008).It is, therefore, utmost important for a firm to evaluate its benefit of such investment though it is very much challenging task. The study would like to overcome this challenge and aims to untangle such complex relationship by investigating more thoroughly than the previous. The study also aims to offer a reasonable and objective evaluation method which assist managers to manage their information resources, and make right IT investment decisions. The study focuses on the usage of IT to create a unique and non-imitable resource for a firm. The resources-based theory (RBV) is applied in the study to discuss the content and value of IT capability. Huang et al. (2006) prescribed three different IT capabilities within the RBV theory. These are: (i) IT infrastructure (ii) Human-IT capability, and (iii) IT-enabled intangible capability. However, the study considers the first one-IT infrastructure- while defining the IT investment.

The central research question addressed in this study is whether or not IT investment has contributed to the firm performance and, if so, how investors of Bangladesh see the information content about the IT? Keeping these questions as our background, the study attempts to address this issue for some selective manufacturing industry in Bangladesh, which is one of the developing countries in south Asia. The selective manufacturing industries for the study are Cement, Engineering, Food & Allied, and Tannery industry. These four industries have been taken because these industries are technology-based where frequent up-gradation of machinery and new product & development are required; otherwise, a firm can't sustain in the long run. Excellence through innovation is the primary motto of these industries; hence, we can expect that a huge outlay of money is being invested for the purpose of making strong IT assets. The aim of the research is twofold. The research aims (a) to measure expenditure amount of IT (b) to explore its effects on firm performance for the listed manufacturing firms in Bangladesh. The study expects a positive relationship between IT and firm performance. Consequently, the study attempts to compare the findings of prior research concerning the impact of IT investment on firm performance in developed countries, which is indicated as an important context extension of the research. It is worthy of mentioning that this is the first ever empirical study that intends to shed the light on the nature and measurement of IT and examines the linkages between IT and firm performance for the Bangladesh.

Literature Review

Many researchers have worked IT investment but the results have not been consistent. Some researchers come up with their findings that IT investment positively affects the firm performance. While some highlight the IT paradox: negative impact but a lagged positive impact on firm performance. And other researchers suggest no relationship between IT investment and firm performance. The researchers, for example, Jun (2006); Terry et al.(2006), and Kleis et al. (2012) suggested positive influence of IT investment on firm performance. According to them, IT investment growth stimulates the firms' financial performance growth in longer periods. They also found that the most significant and challenging element of IT is the alignment of information systems strategy with the firms' business strategy. This alignment may not have direct contribution to firm performance but acts as a moderator between IT investment and firm performance. Some researchers have worked with IT capability and searched its relationship with the firms' financial performance. Supporting literature in this context includes the study of Bharadwaj et al. (1999); Bharadwaj (2000), and Garrison et al. (2015). They compared financial performance of IT intensive firms and non-IT intensive firms and suggested that IT capability is crucial element of a firm; it enables to achieve better financial performance compared to those that do not have IT capability. Although Santhanam & Hartono (2003) find no evidence of association between IT capability and firm performance, an important message in this context is found from the study findings of Huang et al. (2006) who considered RBV theory as theoretical background. They suggested that firm must focus on to improve IT-enabled intangible assets and human IT skill for the purpose of achieving IT capability. This is because IT investment will not make any influence on the firms' performance until the IT capability is ready for firms. By comparing a large sample taking from developed and developing countries Indjikian & Siegel's (2005) empirical findings suggest a fairly robust relationship between IT and economic performance. The authors find proof suggesting that corresponding IT investment offers a supportive work environment for maximizing returns on IT investment. According to them, IT investment also enhances the firms' productivity.

There are some studies that investigate the announcement of IT related investment and market performance by examining whether capital market rewards the firms' IT announcements by increasing

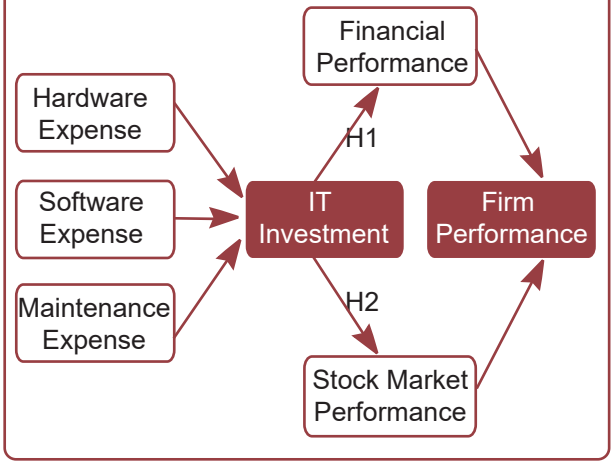
their stock prices (Khallaf & Skantz 2007). Aboody & Lev (1998) capitalized the software development cost for U.S. IT intensive firms and found that it has positive relationship with both share prices and stock returns. Similar conclusion was drawn by Abrahams & Sidhu (1998) after capitalizing software development cost in the context of Australian firm. The study findings of Smith et al. (2001) also confirm that discretionary capitalization of software development costs is highly associated with market value. They used both Australian and Canadian accounting data. This phenomenon in general suggests that disclosures of IT investment are value-relevant for firms. Although it is well documented in the literature that IT investment positively influences firm performance, this influence differs across firms and performance measures. In response, two organizational explanations for this variation were developed by Aral & Weill (2007). First one is IT investment allocations differ from firm to firm. And second one is IT capabilities which are not same to all firms. As stated earlier an arrangement of organizational IT capabilities fortifies and broadens the impact of IT assets on firm performance. Sometimes it surpasses a firm's strategic goal. Considering this variation, Aral and Weill also developed a theoretical model of IT assets and searched the relationship among IT assets, IT capabilities, and their combination of firm performance. Their study findings demonstrated that the firms' total IT investment is not positively associated with firm performance. However, investments in specific IT assets explain firm performance differences along with dimensions that are consistent with the firms' strategic goal.

The researchers who explore no relationship between IT investment and firm performance include Motiwalla et al. (2005) and Ho et al. (2011). While some researchers, for example, Huang et al. (2006) and Otim et al. (2012) have found IT paradox taking RBV theory as background. According to them, IT investment is not as much as necessary to improve firm performance. But, better IT service induces higher financial performance. IT paradox also means unless the firm is dominating the industry, IT investment affects firm performance negatively. From the above discussion it is clear that, there is no conclusive empirical evidence of IT investment and firm performance relationship (Stoel & Muhanna 2009 and Tambe & Hitt 2012). The debate on the effects of IT investment on firm performance is continuing, which creates further opportunity to study on this topic.

Development of Hypothesis

Resource-based view (RBV) is the main approach that provides theoretical underpinnings for the measurement of IT and supports for the relationships between IT and firm performance. The core concept of the resource-based theory is to keep a sustainable competitive advantage for the firm. Sustainable competitive advantage refers to those advantages which other firms do not have. With aim of RBV perspective, researchers have identified various IT-related resources: IT infrastructure, human-IT resources, and IT-enabled intangibles as potential facilities of competitive advantages (Huang et al. 2006). Considering RBV as theoretical backdrop, the study has set two hypotheses. The study explores the relationship between IT investment and firm performance. Hypothesis H1 relates to the relationship between the various elements of IT and financial performance. Whereas, H2 focuses on the same but it predicts the relationship with stock market performance.

Figure-1:
Expected Relations between the Components of IT and Firm Performance



The figure-1 has two parts. The first part in left side denotes the influence of IT investment which is measured in this study as hardware Expense, software Expense, and maintenance Expense. The second part denotes the influence of overall IT investment on firm performance. There is no universally accepted measurement instrument available for operation performance in a firm. Typically, it is mainly focused on financial indicators, since the payoff will eventually reflects on financial status anyway. Following the argument, we also measure the firm performance financially: profitability ratio (financial performance) and market ratio (stock market performance). The indicators for

the measurement of financial performance and stock market performance are ROA and MB ratio respectively. The study argues that IT investment directly influences the firm performance through some important variables. Among which, the most important variable is "IT capability". The study expects that IT investment will improve IT capability; otherwise it will not bring sustainable competitive advantages for the firm. It can be reasonably predicted that the more IT related investment, the more degree of information orientation utilized for the firm. Improved IT capability is supposed to trigger high stock value in the market. Therefore, investors will try to select those firms that have a track record of continuous investment of IT in an efficient and sustainable way. At this point, we propose the following hypotheses of a firm:

H1: There is a positive association between IT investment and financial performance.

H2: There is a positive association between IT investment and stock market performance.

Research Methodology

The study is empirical, descriptive, and relational. According to time reference of research, it is longitudinal (2007-2017), and research philosophy is inductive. Sources of data are secondary, published audited annual report. The study uses quantitative research as a method for data collection and analysis. The research instrument is data observation sheet. The unit of analysis consists of firms from manufacturing industry listed in Dhaka Stock Exchange (DSE), Bangladesh. However, we took some selective manufacturing industries such as Cement, Engineering, Food & Allied, and Tannery for the period of 2007-2017. All the firms of four industries were taken; therefore, no sampling techniques were required to follow.

Table 1: Sample Selection Procedure

Initial Identified Firms	66
Firms with missing data on selected variables	-12
Firms having negative value of net profit after tax(NPAT) and capital employed(CE)	-03
Firms Date of incorporation year as a company after 2007	-02
Final Firms	49
Firms-Year Observation (Unbalanced Panel Data)	102

We, however, cautiously have set some criteria and strictly followed those while selecting the firms. After detailed assessment, the final sample firms and firm-year observations are shown in table-1

Development of Panel Regression Model

Generally, in analyzing the panel data anyone of the following three estimations, namely, Pooled Ordinary Least Square (OLS), Fixed-Effects Model (FEM) and Random-Effects Model (REM) can be used but with different assumptions. The study considers the two most popular statistical tests: Breusch-Pagan Lagrange Multiplier (LM) and Hausman Specification test to make choice among three estimates. Test results recommend using Fixed-Effect Model. Therefore, regression model namely fixed-effects model for model-1 model -2 dedicated to explain the firms' financial performance and stock market performance, respectively are specified as follows:

$$LN\ ROA_{it} = \beta_0 + \sigma^{t}_{=2007} \quad \sigma^{j}_{j\ 0}\ \beta_{jk} * LN\ ITIntensity_{i\,jk} + \beta_2 * LN\ SIZE_{it} + \beta_3 * LN\ LEV_{it} + \beta_4 * LN\ ATO_{it} + \epsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots (1)$$

$$LN\ MB_{it} = \beta_0 + \sigma^{t}_{=2007} \quad \sigma^{j}_{j\ 0}\ \beta_{jk} * LN\ ITIntensity_{i\,jk} + \beta_2 * LN\ SIZE_{it} + \beta_3 * LN\ LEV_{it} + \beta_4 * LN\ ATO_{it} + \epsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots (2)$$

Where, Subscript (i) = Cross-sectional unit, Firms (i=1, 2, ...49)

(t) = Time series unit (t=2007- 2017)

IT_J = Hardware Expense for j=0

IT_J = Software Expense for j=1

IT_J = Maintenance Expense for j=2

ϵ_{it}= Error term with E (ϵ_{it}) = 0 and var (ϵ_{it}) = σ^2_{ϵ}

Empirical Results and Discussions

Descriptive Statistics

Table-2 describes the descriptive statistics of main dependent variables: ROA and MB ratio, independent variables: IT Asset, and control variables: SIZE, LEV, and ATO for the total sample firms. The key element of descriptive statistics is IT asset. IT intensity is used to measure the IT asset. The mean expenditure of IT over the total assets during the period of 2007 to 2017 is about 0.0999 percentage. The low mean expenditure against total assets suggests the sample firms' poor performance for the development of IT asset. This happens because Bangladesh is neither well

equipped nor has advanced IT technology for manufacturing such robust and sophisticated items that requires rigorous expenditure in IT. Although this percentage is very low, the initiative that sample firms from a developing nation take is truly appreciable.

Correlation Analysis

Table-3 shows the findings from Pearson pair wise correlation analysis. From the table it is clear that except firm leverage IT intensity, firm size, and ATO are significantly positively correlated with financial performance measures (ROA). On the one hand, all the variables except IT intensity are significantly positively associated with stock market performance. Consequently, these results entirely support hypotheses: H1 while rejecting the H2. These results constitute a first approach to test hypotheses. The next approach to test the hypotheses is linear multiple regression models (1-2).

Table 2: Descriptive Statistics for Selected Variables

Variables	No. of Observations	Mean	SD	Minimum	Maximum
ROA	539	0.0581261	0.04924	0.001696	0.5163791
MB	424	5.097797	8.09502	0.026976	109.6645
IT Intensity	102	0 .000999	0.00224	0.000000	0.011096
SIZE	539	4.60e+09	6.15e+09	1.96e+07	3.63e+10
LEV	539	0.4748342	0.227578	0.000984	1.022037
ATO	539	0.8808708	0.717473	0.001701	5.567119

Notes: Variables are defined as follows: ROA is the ratio of the net profit after tax divided by total assets, used as proxy for financial performance; MB is the ratio of the market price per share divided by BVPS, used as proxy for stock market performance; IT intensity is the ratio of IT expenditure to total assets; Firm size (SIZE) is measured as natural logarithm of total assets, and firm leverage (LEV) is measured by the ratio of book value of total liability to book value of total assets.

Table 3: Correlation Analysis of Selected Variables

Variables	LNROA	LNMB
LNITIntensity	0.2333*	-0.3852*
LNSIZE	0.0593 ***	0.2862*
LNLEV	-0.0181***	0.1426*
LNATO	0.3957 *	0.2425*

Notes: Significant at *1, **5, and * ** 10 per cent level, respectively.

Linear Regression Analysis

This section will discuss the details of the second objective of the study. In order to estimate the empirical evidence for the effects of IT asset on firm performance for the case observed, a fixed-effects model (FEM) regression has been implemented for the model-1 and model-2 to estimate the firms' financial performance and stock market performance respectively. At first, we checked the presence of multicollinearity problem for the model-1 & 2. To check the presence of multicollinearity problem, the Pearson's correlation coefficients between explanatory variables were analyzed. As can be seen from table 4, the correlation coefficients between explanatory variables are not high. They range from a low of -0.0986 to a high of 0.2367. Consequently, we can presume that both models are free from multicollinearity problem.

Table 5: Pearson Correlation Matrices for the Explanatory Variables

Variables	LNITIntensity	LNSIZE	LNLEV	LNATO
LNITIntensity	1.0000			
LNSIZE	0.0082***	1.0000		
LNLEV	-0.2414**	0.1892*	1.0000	
LNATO	0.0482***	-0.0986***	0.2367*	1.0000

Notes: Significant at *1, **5, and * ** 10 per cent level, respectively.

Financial Performance Model

Table-5 demonstrates the results of the regression coefficients for all explanatory variables, using financial performance (ROA) as the dependent variable. The value of F-statistic, 13.09, is statistically significant at 1% level of significance meaning that the coefficients of all the variables are significantly different from zero. The value of R-square of the estimated model-1 is 0.2071, presenting a moderate degree of explanatory power. It is obvious from the FEM estimation results of model-1 that the coefficient of key variable IT asset along with other explanatory variables except firm leverage is statistically significant. IT asset is positively associated with financial performance of the firm. This result supports the hypothesis (H1) that IT asset plays a crucial role in improving ROA. The study finding is consistent with the study findings of Ze´ghal & Maaloul (2010) and Casta et al. (2005) who found a similar positive effect of intangible assets on financial performance in UK and Spanish firms, respectively.

The first control variable of model-1 is firm size which is positively associated with the firms' financial performance. Larger firms are supposed to do perform better. It is evident that the sample firms are large enough to exploit the economies of scale as well as have better bargaining power over their competitors and suppliers. The second control variable is financial leverage. The leverage ratio is supposed to reduce the agency problem and tax shields of the sample firms. However, the negative coefficient of leverage ratio suggests that it does not promote ROA. This interpretation is not valid since the coefficient value of leverage is not statistically significant. The final control variable is assets turnover ratio (ATO). As our sample firms' ATO is much better as well as their positive coefficient value suggests that ATO enhances the firms' ROA.

Table 5: Linear Multiple Regression Results for Model-1 & 2 Dependent Variable: LN ROA (for Model-1) and LN MB (for Model-2)

Variables	Model -1 (Fixed-Effect)	Model -2 (Fixed-Effect)
LNITIntensity	0.0766587 ***	-0.0886963 ***
LNSIZE	0.4399863 *	0.3876276 **
LNLEV	-0.2078164	-0.9037892 **
LNATO	1.179741 *	0.1009629***
Constant	-11.76214 *	-8.949669 **
No. of Observations	99	66
No. of Firms	49	49
The Value of R2	0.2071	0.1645
The Value of F	13.09	2.96
(P-value)	(0.0000)	(0.0285)

Notes: Significant at *1, ** 5, and *** 10 per cent level respectively.

Stock Market Performance Model

Table-5 demonstrates the results of the regression coefficients for all explanatory variables, using stock market performance (MB) as the dependent variable. The value of F-statistic, 2.96, is statistically significant at 5% level of significance meaning that the coefficients of all the variables are significantly different from zero. The value of R-square of the estimated model-2 is 0.1645, presenting a fair degree of explanatory power. It is obvious from the FEM estimation results of model-2 that the coefficient of key variable IT asset is statistically significant at 10% level of significance. IT asset is negatively associated with stock market performance of the firm. The probable reasons for such behavior of IT asset are the investors' attitude, inefficient market, and information asymmetry. This result does not support the hypothesis (H2). This finding is consistent with the previous literature. As a reference we may include the work of Huang et al. (2006) and Otim et al. (2012) in the context of Taiwan and USA economy respectively. Although their methodologies were different but they have found IT paradox taking RBV theory as background. The first control variable is firm size and the study found that it is positively associated with MB. This finding is consistent with Acheampong et al. (2014) who suggested positive influence of market value on firm size. The second control variable is firm leverage which is also negatively associated with MB. Perhaps the market considers high leveraged firms as riskier than low leveraged firms and lowers the market value. Literature suggests that there exists a negative and significant relationship between firm leverage and market value, other things being equal. For example, Acheampong et al. (2014) established a negative and significant relationship between firm leverage and market value of a firm.

Conclusion

The study reviews the IT payoff and provides a theoretical rationale for how IT investment affects the firm performance with a pure resource-based view. The central argument of the study is how IT asset affects the firm performance: financial performance and stock market performance in the context of Bangladesh. The study concerns the issue: do the manufacturing firms of Bangladesh gain benefits from IT asset?

The study findings indicate a mixed behavioral effect of IT asset on firm performance. IT asset has a positive influence on the firms' financial performance. This result provides an important message to sample firms; if firms want to use IT investment to improve their firm performance, IT capability must be improved first. And if the firms want to improve their IT capability, it is better to improve their IT infrastructure. On the other hand, there exists reverse relationship between IT asset and stock market performance. This result indicates diminishing returns against IT intensive firms. The reverse relationship does not prove that investors of Bangladesh do not perceive IT asset as a source of value creation since our stock market is not efficient. By combining the behavioral effects of IT on the firms' financial and stock market performance, the study formalizes the findings by saying that even if IT asset triggers a significant rise in the firms' EPS; the firms' can't maximize shareholder's wealth due to poor performance of IT intensive stocks. The probable reasons for such behavior of intangible assets are the nature of IT asset, investors' attitude, and information asymmetry. Due to time constraint, the study could not validate those reasons. The results should be of interest to the practitioners and managers as well as IT researchers. These research results will encourage them to promote IT capability, since the study successfully proves that insufficient IT capability may harm the firm performance. The study recommends that the role of IT investment should be considered whenever evaluating the firm performance. The study has some limitations which create scope for further research. First, the study cannot claim the causal impact of IT asset on firm performance. Second, different industries could hold different characteristics. The study validates the influence of IT investment on firm performance but could not show the relationship between IT capability and IT investment. Thus, it would be better off to examine the possibility of different relationships between IT capability and IT investment in different industries. Third, since the study took some selective manufacturing industries as sample, the result of the study cannot certainly reflect the situation of other manufacturing industries operating in Bangladesh. Future research could extend the sample scope for more representative research results.

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