**The Effects of Intangible Assets on Firm Performance: An Empirical Investigation on Selective Listed Manufacturing Firms in DSE, Bangladesh**

1. **Introduction**

The economy of Bangladesh is moving very fast accepting the challenges of technological changes and innovation. Therefore, businesses’ specially manufacturing firms of Bangladesh are now encountering two major forces include the rapid rate of technological changes and increasing industrialization. Besides, Bangladesh economy is now passing an era driven by significant development of new aspect of information technology which helps it to be converted into a digital economy. In a digital and knowledge based economy, intangible assets (hereafter intangibles) are predominant and their role along with age and knowledge has become key success factors for manufacturing firms. Therefore, we can expect that like the firms’ of developed economies, the firms’ of Bangladesh will compete each other on the basis of intangible assets rather than tangible assets.

Among the different activities that a firm may use to produce innovation, intangibles investments occupy a top role. For example, to produce innovation, investment in research and development (R&D) and intellectual capital (e.g. human capital) are necessary. Likewise, advertising investment is critical for commercializing innovation and for appropriating the returns that R&D investment generates. These soft assets bring the competitive advantage and constitute the foundation for subsidiary expansion and performance for the firm (Kafouros and Aliyev, 2016). Therefore, it is necessary to introduce a paradigm to measure them and establish a link between intangible assets and a firm performance. The purpose to invest in intangible assets at the firm level is not all alike. Prior research finds that firms invest in intangible assets with two purposes: to develop new knowledge and to learn about the benefit from the innovation of others (Cohen and Levinthal, 1989). An alternative view could be that firms engage in intangibles investment (e.g. employee training, organizational restructuring, and new product designs) in response to perceived weakness or threats to the business (Chappell and Jaffe, 2016). It is well accepted that like traditional investment, investment in intangibles has positive consequences for various performance results, including a firm’s market position, financial position, and firm value in the stock market (Srinivasan and Hanssens, 2009). That’s why the present research argues that intangibles should be increased for the purpose of increasing a firm’s productivity in a manner analogous to that resulting from increases in tangible assets. The research questions of the study are: (a) Do intangible assets matter and improve firm performance? (b) Is there any direct relationship between intangible assets and firm performance? (c) Is the information about a firm’s investment in intangible assets valuable to investors? Keeping these questions as our background the study attempts to address this issue for Bangladesh where investment in intangibles is not much strong and firms deploy fewer resources for the creation and adoption of innovation and competitive advantages respectively. The aims of this research are twofold. First, the research aims (a) to measure investment on intangible assets, and (b) to investigate their impact on firm performance. It is worth of mentioning that this is the first ever empirical study that intends to shed the light on the nature and measurement of intangible assets and examine the linkages between intangible assets and firm performance for selective manufacturing industries in Bangladesh.

**1.1 Statement of the Problem**

Establishing direct relationship of intangible assets with firm performance is not straightforward and fully understood. Therefore, the question of identifying, classifying, and measuring intangible assets remains an important unresolved issue in finance, economics and the practice of management. This study, first of all, addresses the problem of high information asymmetry about intangible assets among the investors. This is because there are cases in which the firms’ innovation efforts are not found in balance sheet at all. Conservative accounting treatment set by international accounting standards sees investments in intangible assets as operating expenses.

U.S. GAAP (Generally Accepted Accounting Principles) requires that no expenditures of intangible assets would be considered as assets before they become technically feasible such as patent. Due to hard accounting treatment and the failure to value intangibles distorts both accounting measures of profitability (e.g. ROA, EPS) and market measures (e.g. MB, P/E ratio) from the actual. The inappropriate presentation of information by the firms’ accounting practice against intangibles misleads the investors. Hence, investors usually underestimate the information contents of intangibles and slowly respond or react in the stock market (Jinsu and Gee-Jung, 2011). This phenomenon leaves the question whether the stock market of Bangladesh

values intangible assets intensive firms.

Second problem is the measurement of intangible assets. There remains debate on which expenditures should manger consider as intangible assets, or when should outlays for intangible

assets which are often expensed as Selling, General & Administrative (SG&A) items and report

them in firm’s balance sheet. The definition of assets says, assets must bring future economic

benefits for the firm. However, the benefits received from intangible assets are uncertain. Therefore, managers should take cautious steps while recognizing those assets. Moreover, it is very much hard to codify, measure, and disclose intangible assets because of their qualitative nature. For example, when patent or goodwill is traded detailed information about them are usually not available to the public. As a result, it is very much difficult to establish direct and causal relationship between intangible assets and firm performance.

1. **A Brief Introduction about Intangible Assets**

There is no consistent and universally accepted definition of intangible assets. The recognition and measurement of intangible assetss are problematic because there is little or no historical cost to be recognized under International Financial Reporting Standards (IFRS) or U.S. GAAP standards. That’s why it is often said that intangible assets are typically tacit, hard to codify (Conner and Prahalad, 1996), difficult to acquire or develop, and to imitate and accumulate within the firm. This uncertainty of being copied by others is what makes them valuable and prone to be the basis of a sustainable competitive advantage for a firm (Hall, 1993b). Although complexity arises in defining intangible assets, some international standard settings organizations have taken an attempt in defining intangible assets:

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| **Table-1: Definition of Intangible Assets** | | |
| **Name of the Organization** | **Purpose** | **Definition of Intangible Assets** |
| The International Valuation Standards Council’s (IVSC)  Headquarter: London, UK | Responsible for developing the International Valuation Standards and associated technical guidance for the investors and others. | A non-monetary asset that manifests itself by its economic properties. It does not have physical substance but grants rights and economic benefits to its owner. |
| Financial Accounting Standards Board  Headquarter: Connecticut, United States | Responsible for establishing financial accounting and reporting standards for public and private companies and not-for-profit organizations that follow (GAAP). | Assets (not including financial assets) that lack physical substance. |
| The Brookings Institution  Headquarter : Washington, DC | Responsible to conduct in-depth research that leads to new ideas for solving problems facing society at the local, national and global level. | Nonphysical factors that contribute to or are used in producing goods or providing services or that are expected to generate future productive benefits for the individuals or firms that control the use of those factors |

It is worth of mentioning that several researchers have attempted to define, classify, and rank of intangible assets for a firm’s valuation purpose. Although their study context and findings are different, almost all of them unanimously agree that firm can create competitive advantage by assembling intangible assets that work together to create organizational capabilities. The following table-2 summarizes some of the views of those researchers.

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| **Table-2: Example of Intangible Assets** | | |
| **Researchers’ Name** | **Year** | **Example of Intangible Assets** |
| Bontis et al. | 2018 | Human capital, structural capital, and relational capital |
| Dženopoljac et al. | 2017 | knowledge, information, intellectual property, and employee’s experience |
| Vomberge et al. | 2015 | Brands and employees are two of the most important resources for managers |
| Bontempi and Mairesse | 2015 | Advertising, trademarks and R&D, software, patents intellectual property rights are the most important intangible assets in the context of Italian firms. |
| Corrado et al. | 2005 | Computerized information (software and databases), innovative property (R&D) and economic competencies (trained employees, brand names etc.). |
| Bontis | 1999 | Various forms of knowledge, Important information, Intellectual property & experience |
| Grant | 1996 | Intangible resources include assets such as reputation, brand image, and product quality. Technical know-how and other knowledge assets including dimensions such as organizational culture, employee training, loyalty, etc. are part of intangible resources. |

Although, there is no generally accepted definition of intangible assets, there are a number of characteristics that most definitions have in common. For example, intangible assets have little or no tangible substance and they have a useful life of greater than one year. In many but not all cases, the asset is separable, that is, it could be sold (for example, patent or certificate). Another common characteristic that differentiates intangible assets from tangible assets is that most of them are not traded in an active and transparent market.

1. **Conceptualization of Firm Performance**

The definition of firm performance and its measurement continues to challenge scholars due to

its complexity. Firm performance originates from firm-specific capabilities and assets that, along with isolating mechanisms, helped to establish and sustain competitive advantage. Researchers have used both ‘hard’ performance measures i.e. financial outcomes such as ROA, market share, sales, and other financial ratios; and ‘soft’ performance measures including innovation, learning, and customer satisfaction (Gentry and Shen, 2010). However, we see firm performance within the purview of stakeholder theory (developed by Freeman, 1984) which allows distinguishing between performance antecedents and outcomes. The theory says that performance measures should assess the satisfaction of at least one group of stakeholders. Freeman (1984) defines a stakeholder as “any group or individual who can affect or is affected by achievement of the organization’s objectives”. The theory also provides a conceptual structure to define performance indicators and dimensions.

3.1 **Dimensional Models for Firm Performance:**

There are two possible models can be construct to elucidate representations of firm performance. One is unidimensional model and multidimensional model on the other end. However, theoretical perspectives and empirical studies point toward multidimensionality, with multiple

dimensions that make up the complex and complete notion of performance.

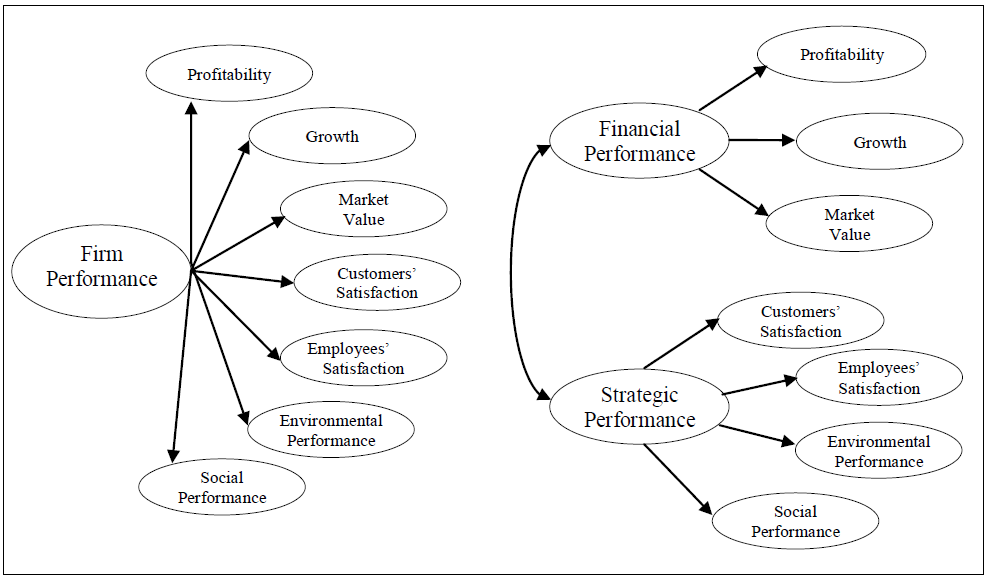


Figure-1: Second Order Model of Firm performance

A complete analysis of multidimensional constructs needs to explore the existence of second-order structures that can group first-order dimensions (Figure-1, model on the left). Venkatraman and Ramanujam (1986) conceptual model suggests an alternative representation, in which performance would have two second-order dimensions: the financial one, represented by profitability, growth and market value; and the operational domain (also known as strategic performance), that includes non-financial competitive aspects, like customer & employee satisfaction, environmental and social performance (Figure-1, model on the right). It would be better if we can take, according to second order model, all the performance dimensions of firm performance. Following the methodological approaches found in studies analyzing relationship between intangible assets and firm performance, we select indicators of profitability and market value dimensions escaping other dimensions. This approach makes the study easy and simple. Summary of firm performance dimensions and their corresponding selective indicators are presented below:

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| **Table-3:Performance Dimensions and Indicators Selected** | |
| **Performance Dimensions** | **Selected Indicators** |
| Profitability (Financial Measures) | Earnings per share (EPS) |
| Market Value (Market Based Measures) | Market value to book value (MB) |

1. **Theoretical Background**

The study attempts to explain the link between intangibles investment and firm performance within the purview of resource-based view (RBV) and knowledge-based view (KBV); and these two approaches provide theoretical underpinnings for our model and support for the relationships between intangibles and firm performance. The summary of these two approaches is given below:

**4.1 Resource-Based View (RBV)**

The main prediction from RBV is that the more intangible resources a firm has, the greater the competitive advantage and its sustainability, assuming the firm know how to value the product. RBV argues that (a) a firm’s resources are determinants of firm performance (Barney, 1991) (b) a firm’s valuable, rare, and non-imitable resources generate a competitive advantage and thereby an above average rate of return (Barney, 1991) and (c) a firm depends fundamentally on its ability to have a distinctive, sustainable competitive advantage which derives from firm intangible resources (Barney, 1991). RBV always stresses firm’s capabilities (e.g., innovation commercialization capability) to produce such invisible resources. In the spirit of RBV, the importance of intangible resources such as R&D, patent, trademark, advertising, CSR activities, brand name, goodwill, market research and product development, IT (software), intellectual capital, and corporate culture are the key to sustainability and invaluable to the firm’s competitive power. In fact, these invisible assets are often the only real source of competitive

edge that can be sustained over time.

**4.2 Knowledge-Based View (KBV)**

The knowledge-based view (KBV) provides a new lens through which we may view and realize the primary rationale for a firm's existence-the creation, transfer and application of knowledge. The knowledge-based theory of the firm “postulates that knowledge is the only resource that provides sustainable competitive advantage, and, therefore, the firm’s attention and decision-making should focus primarily on knowledge and the competitive capabilities derived from it” (Roberts, 1999). As per KBV, the firm is considered a knowledge integrating institution. The KBV argues that the heterogeneous knowledge and capabilities among firms are the main determinants of performance differences. In this connection, intellectual capital (IC) is critically important to generate knowledge for the firm. Because IC produces multiple effects across the organization and brings real benefits for the firm. Similar to RBV, KBV provides a unique form of intangible resources, which are not easily neither copied nor substituted but brings superior business performance of a firm depends upon knowledge capabilities and knowledge resources.

We can summarize the above mentioned discussion of two theoretical approaches saying that intangible resources are an important part of the empirical tests performed within the RBV of the firm. Likewise, knowledge resources such as “human capital,” “structural capital,” “relational capital”, “personnel competence and experience,” and “social capital” have also frequently been the focus of attention according to KBV of the firm. Thus, the importance of intangible resource along with knowledge resource has been recognized deeply by the literature.

1. **Theoretical Framework**

From RBV and KBV perspective, the study has identified and assembled intangible resources and knowledge resources to create intangible assets which improve organizational capabilities that ensure sustainable competitive advantages for the firms.. This combination should have more value, rarity, non-imitable, and sustainable competitive advantage and enhance firm performance. Besides, following RBV and KBV rational, we posit that these two construct of intangible assets will also influence firm performance. The framework (Figure-1) illustrates the relationship between intangible assets and firm performance for the selective manufacturing industries in Bangladesh. The model is supported by the data from 49 manufacturing firms from four industry collected in conjunction with the quantitative analysis. The model highlights the

components of intangible resources and knowledge resources according to the RBV and KBV

Control Variables

(SIZE, LEV, ATO)

Intangible Resources

Financial Performance (EPS)

**Intangible Assets**

**Firm Performance**

Market Based Performance (MB)

Knowledge Resources

**Frame Work Summary:**

i. As per RBV and KBV theory, intangible resources and knowledge resources are taken together to construct intangible assets.

ii. Firm performance is seen within the purview financial performance and market based performance. Earnings per Share (EPS) and Market to Book ratio (MB) are the proxy variables respectively for those measures.

iii. Three variables such as firm size measured as net profit after tax, firm leverage (total liability to total assets), and total assets turnover ratio (total revenue to total assets) are included as control variable to see whether they affect the relationship between intangible assets and firm performance.

Control variable

**VAIC**

(Value Added Intellectual Capital)

Value Added Human Capital

(VAHU)

Structural Capital Value Added (STVA)

Value Added Capital Coefficient

(VACA)

Figure-2: Research Framework

respectively and their relevant role in evaluating the contribution to the firm performance. Taken together, intangible resources and knowledge resources form intangible assets and play an important role towards the contribution of firm performance positively.

1. **Literature Review**

In the realm of research of intangible assets and firm performance, a considerable number of studies have been made in accounting-finance-marketing interface. These studies dealt with the valuation of intangible assets expenditure and searched the contribution of intangible assets to create competitive advantages for the firms. It is very much difficult to cover and present all the prior works related to intangible assets and firm performance relationship. Following the review of the relevant literature of prior studies, we shall present below the results of prior studies that explicitly focus on the relation between intangible assets and firm performance.

**6.1 Intangible Assets and Firm performance**

It has found that several researches have conducted their research by taking different elements of intangible assets in the context of different economy. They mainly focus on to testify significant and direct association between revenue, earnings, market value, and innovative activities such as R&D values, controlling other factors. For example, Lin and Lo (2015) use panel data of Taiwanese manufacturing firms and their expenditures on intangibles as measured by the acquisition of technology, purchasing of software and databases, marketing, employee training, and R&D. They present evidence of a positive impact of intangible investment on productivity. Using production possibility frontier, Chun and Nadiri (2016) investigate the contribution of intangibles intensive industries to aggregate productivity growth and found significant increased relationship. Montresor and Vezzani (2016) investigate the links between intangibles investment and innovation by looking at a cross-section of European firms. Their expenditures on intangible assets are measured by R&D, software, design, training, reputation/ branding, and organizational /business processes. They conclude that the amount invested in intangible assets is crucial and important for firms in manufacturing but not in service. In general, studies based on resource-based or knowledge-based views show that investment in intangibles have positive and direct link with the innovation and firm performance (Chauvin and Hirschey, 1993; Stiroh, 2002; Brynjolfsson and Hitt, 2003; Griffith *et al*., 2004; Bloom and Van Reenen, 2007; Kong, 2010; Goyal, 2012; Gamayuni, 2015; Satt, 2016. At this point of study, to see individual element’s influence on firm performance we shall review, presented in table-4 below, the literature of selective elements of intangible assets to establish relationship between intangible assets and firm performance.

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| **Table-4:Summary of Previous Studies on Intangible Assets and Firm Performance** | |
| **i. Research and Development (R&D) and Firm Performance** | |
| **Study** | **Main Conclusions** |
| Sougiannis,1994 | A one dollar increase in R&D expenditures leads to a two dollar increase in profit over a seven year period. |
| Ehie and Olibe, 2010 | R&D intensity Positively correlated with the financial performance of the firm. |
| Dave et al., 2013 | Positive relationship between R&D intensity and growth in sales and gross income. |
| Chan et al., 2001; VanderPal, 2015 | Market values are positively associated with new announcement about R&D initiatives. |
| **ii. Patent, Trademark & Goodwill and Firm Performance** | |
| **Study** | **Main Conclusions** |
| Bosworth and Mahdian, 1999 | The impact of patents and trademarks on market value was most evident in the smaller specialized sample of pharmaceutical firms. |
| Germeraad, 2010 | This group of assets is a powerful competitive weapon and source of unexpected earning |
| Mishra and Suar, 2010 | Goodwill is seen a driver of sustainable competitive business advantages |
| Satt, 2016 | Goodwill losses are considered as a leading indicator of a decline in future profitability. |
| Satt and Chetioui, 2017 | High level of goodwill has a positive impact on firm performance in large firms. |
| **iii. Advertising and Firm Performance** | |
| **Study** | **Main Conclusions** |
| Peterson and Jeong, 2010 | Advertising can affect a firm’s financial performance over the long term. |
| Bontempi and Mairesse, 2015 | The link between advertising expenditure and sales has been consistently supported |
| Liu et al., 2017; McAlister et al., 2016 | Advertising expenditures have a positive effect on firm value |
| **iv. Corporate Social Responsibility (CSR) and Firm Performance** | |
| **Study** | **Main Conclusions** |
| Gyves and O'Higgins, 2008 | CSR orientation is the key to stimulating long-term stability growth and sustainable performance in a dynamic and changing environment. |
| Martinez-Conesa et al., 2017 | A partial mediation effect of innovation performance on the relationship between CSR and firm performance. |
| Kim et al.,, 2018 | Positive CSR associations can enhance investors’ attitudes toward the firm |
| **v. IT Investment and Firm Performance** | |
| **Study** | **Main Conclusions** |
| Khallaf and Skantz, 2007 | Capital market rewards the firms’ investment announcements of IT by increasing their stock prices. |
| Garrison et al., 2015 | IT investment is positively related with firm performance |
| **vi. Market Research & Product Development and Firm Performance** | |
| **Study** | **Main Conclusions** |
| Kohli and Jaworski, 1990 | Marketing research information in decision making is a crucial factor in overall business performance |
| Bulut, 2013 | Marketing research has a positive impact on firm performance and plays a vital role in ensuring satisfactory profit |
| **vii. Joint Effects of R&D and Advertising on Firm Performance** | |
| **Study** | **Main Conclusions** |
| Bublitz and Ettredge, 1989 | The market assesses advertising as short-lived whereas R&D is long lived. |
| Ho et al., 2005 | R&D investment is positively related to holding period return for manufacturing firm and non-manufacturing firms benefited from advertisement. |
| **viii. Joint Effects of R&D and Patent Citation on Firm Performance** | |
| **Study** | **Main Conclusions** |
| Dindaroğlu and TAKIM, 2013 | Patent citations along with R&D contain significant information on the market value of firms. |
| **ix. Joint Effects of R&D and CSR on Firm Performance** | |
| **Study** | **Main Conclusions** |
| McWilliams et al. (2006) | R&D investment is a necessary aspect for a firm seeking to improve its financial performance through the use of CSR as a differentiation strategy. |
| Martinez-Conesa (2017) | There exists a partial mediation effect of innovation performance on the relationship between CSR and firm performance. |
| **x. IC and Firm Performance** | |
| **Study** | **Main Conclusions** |
| Subramaniam and Youndt, 2005 | The hypothesized relationship of IC sub-domains (human capital, structural capital and relational capital) has shown to be positively associated with firm performance. |
| Xinyu, 2014 | IC is considered a key source of firm performance and competitive advantage, and has a greater influence on a firm's innovation |
| Nimtrakoon, 2015 | Besides firm’s internal performance (earnings and profitability), IC is also the main factor that is responsible for firm’ augmented market value above their book value. |
| Amin et al., 2014; Han and Li, 2015; | There exists a positive relationship between IC and firm's financial performance |
| Dzen (2017) | Earnings have significant positive relationship with IC. |
| **xi. Negative Association between Intangible Assets and Firm Performance** | |
| **Study** | **Main Conclusions** |
| Chan et al., 2001 | No direct link between R&D spending and future stock returns |
| Toivanen et al., 2002 | Difficult to identifying the stock market gains from intangible assets. |
| Lu and Beamish, 2004 | A negative effect of advertising expenditure on firm performance |
| Villalonga, 2004 | R&D and advertising investments seems a particularly risky strategy. |
| Bobillo et al., 2006 | The impact of intangible assets on performance is negative for Greek food industries, which are labor intensive |
| Surroca et al., 2010 | There is no direct relationship between CSR and financial performance |
| Ho et al., 2011 | There is no impact of IT investment on firm performance. |
| Otim et al.., 2012 | IT paradox on firm performance |
| Ferdaous and Rahman, 2017 | A significant negative relation has found for the firm’s market based performance against R&D expenditure in the context of Bangladesh |

1. **Research Gap and Contribution of the Study**

Despite the impressive body of work related to intangible assets and firm performance, several gaps in the field of understanding of the intangible assets and firm performance relationship remain. The problems, mentioned earlier, happen because there is no specific measurement model available for intangible assets. After the discussion of a vast literature, it is also clear that there is no straightforward relationship between the intangible assets and firm performance. Though most of the researchers find positive impact of intangible assets on firm performance, they are challenged by their counterparts who came up with negative or no link. Therefore, the strategic role of intangibles and the existence of a positive relationship between intangibles and firm performance are not widely accepted by the scholars and practitioners. A common review while addressing the relationship between intangible assets and firm performance says in general that investors pay little attention to intangible assets and consequently undervalue them. Empirical research on the channels through which the link between intangibles’ and firm performance takes place is rather scant. Besides, little is known about how businesses alone measure, use and structure intangibles, how their interface affects an organization’s performance dimensions. After reviewing literature, it is also found that many of the above mentioned methodologies have been applied utilizing the data samples of UK, USA, and European countries. The focus of the literature on the USA, UK, and European countries raises the issues of generalization. Do the same results apply to less developed economies like Bangladesh? We have seen multinational firms to locate some of their innovative operations in certain less developed economies like Bangladesh. Taking these innovative operations as examples, some of the domestic Bangladeshi firms have already started investing in intangible assets. To encourage them, establishing a link between intangible assets and firm performance is utmost important. The above mentioned gaps motivate us for a further study on this topic, the relationship between intangible assets and firm performance, by looking at intangible assets more thoroughly than before in the context of Bangladesh.

**7.1 Research Contribution**

To address the gap, we have developed a framework that establishes a relationship between intangible assets and firm performance. This is a unique study because to the best of our knowledge, no prior study has been conducted in the context of Bangladesh to examine the unified structural links among intangible resources, knowledge resources and firm performance. We also contribute to the extant body of research by providing a theoretical framework. This framework offers fascinating insights about the measurement of intangible assets and gives evidence to support intangible assets as strategic resources for the purpose of enhancing firm performance. According to RBV and KBV, the proposed framework, for the first time, includes different classes of intangible assets and groups them into intangible resources and knowledge resources to form intangible assets. These different classes of intangible assets are absent in prior research frameworks which focused on either any one, RVB or KBV, while defining and searching the relationship between intangible assets and firm performance.

In this paper, we develop two hypotheses relating to a firm’s source of competitive advantage to the effectiveness of its intangible assets. In this background and based on prior studies, the following research hypotheses have been developed:

Hypothesis-1: Expenditure in intangible assets will affect a firm’s financial performance

positively.

Hypothesis-2: Expenditure in intangible assets will affect a firm’s market-based performance

positively.

1. **Research Method**

The study is a descriptive and relational one. An inductive research approach has been used for the study. This is an empirical study which is primarily based on quantitative secondary data to test the proposed framework in order to rationalize the relationship between investment in intangible assets and firm performance.

**8.1 Sample and Data**

The unit of analysis consists of manufacturing firms of selective industry in Bangladesh. All the

registered manufacturing firms belonging to the industry of Engineering, Tannery, Ceramic, and Cement currently operating in Bangladesh are the target population (firms) of this study. However, the accessible firms are listed manufacturing firms of selective industry such as Engineering, Food & Allied, Tannery, and Cement in Dhaka Stock Exchange (DSE) for the time period of 2007-2017. Public firms are chosen due to the fact that only listed firms, as per security and exchange commission (SEC) directives, are obliged to disclose their financial statements in accordance with Bangladesh Financial Reporting Standard (BFRS). Non public manufacturing firms are excluded due to their non-availability of market values (stock prices) and audited financial statements. We initially have identified 66 manufacturing firms from 4 sectors listed in DSE till July 31, 2018. We have taken all the firms; therefore, no sampling techniques are required to follow. We, however, cautiously have set some criteria and strictly followed those while selecting the firms. Firstly, we have selected the firms that spend any one or more of the followings intangible assets: advertising, R&D, CSR, software, goodwill, patent, trademarks, market research & product development, intellectual capital and disclose them in their financial statements for the selected time period of 2007-2017. Secondly, we have selected the firms that have the available accounting and financial data such as EPS and MB for the measurement of firm performance. Firms that do not fulfill these criteria are removed in order to be statistically valid for the regression. After detailed assessment (dropping observation), our matching procedure yields 49 firms that varied in size (NPAT) out of 66 firms.

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| **Table-5: Sample Selection Procedure** |
| Initial Identified Firms 66 |
| Firms with missing data on selected variables -03 |
| Firms having insufficient number of observations on selected variables -09 |
| Firms having negative value of NPAT and Capital Employed -03 |
| Firms Date of incorporation year as a company after 2007 -02 |
| Final Firms 49 |
| Firms-Year Observation (Balanced Panel Data) 539 |

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| **Table-6: Sample Distribution by Sector Group** | | | | |
| **Name of the Industry** | **No. of Firms**  **(n)** | **% of Total Firms** | **No. of Observation** | **% of Total Observation** |
| Engineering | 27 | 55.10 | 297 | 55.10 |
| Food & Allied | 13 | 26.53 | 143 | 26.53 |
| Tannery Industries | 03 | 6.12 | 33 | 6.12 |
| Cement | 06 | 12.24 | 66 | 12.24 |
| Total | 49 | 100 | 539 | 100 |

Engineering, Food & Allied, Tannery, and Cement industry have been taken because these industries are technology based where frequent upgradation 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 intangible assets. This study uses panel data analysis technique in order to capture the dynamics of selected indicators to highlight the relationship between intangible assets and firm performance. There are some advantages of using panel data because this type of data helps to improve the efficiency of econometric estimates and allows for possible development of correlations in time and units of study (Baltagi and Kao, 2000). The presented panel data has two dimensions: the time dimension (T) that includes 11 periods (years), and the cross-sectional dimension (N) consisting of 49 firms.

**8.2 Data Sources and Analysis procedure**

The study uses 3 major sources of data: DSE website, data base of financial portals and the firms annual report. As per this research paradigm, quantitative data of selective indicators of intangible assets and firm performance have been collected from the published annual reports of the firms. We have also retrieved year-end stock price information from DSE website to determine the firms’ market-based performance. The data is collected using data collection sheet and then edited, coded, and cleaned. The analysis starts with descriptive analysis of dependent variables and independent variables to know about their mean value, skewness, kurtosis, and standard deviation. This is because the variables uses for the study should follow the normal distribution. If not, then it is a prerequisite to make them normal before starting panel regression. There are several methods available for that; however, this study uses one of the most popular methods namely natural logarithms to make the data normal. Second, the Breusch-Pagan Lagrange multiplier (LM) test is employed to know any significant evidence of using pooled OLS model rather than random-effects model. Next, Hausman specification test is used to make choice between Fixed Effects Model (FEM) and Random Effects Model (REM). The remaining analysis of the study is conducted through an investigation whether the panel regression models are affected by any significant presence of multicollinearity, autocorrelation, and heteroskedasticity problem. The data analyses are performed using STATA version 14.2 for windows.

1. **Variables and Measures**

This study will investigate and see how intangible assets affect the firm performance. The key independent variable of the study is intangible assets; and firm performance is depended variable. Some control variables are selected to see if the firm performance is caused by these

variables. The following Table-7 represents the summary of variables construction for the study.

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| **Table-7: List of Independent Variable, Dependent Variable, and Control Variable** |
| **Name of the Variable: Intangible Assets (Independent Variable)** |
| Notation: Intangible Assets |
| **Variable Measurement:**  Intangible Assets = Accumulated Value of Intangible Resources Intensity + Accumulated Value of VAICTM  Where,   1. Accumulated Value of Intangible Resources Intensity = Intangible Resources ÷ Shareholder’s Equity     A.1. Intangible Resources = It is the sum of reported amount in the financial statement of firm’s financial year end  in the following classes: R&D, patent, trademark, license, goodwill, advertising, CSR, market research and  product development, preliminary expense, public issue expense, deferred revenue expenditure, and IT  (software).   1. Accumulated Value of VAICTM= HCE + CE + CEE (Pulic, 1998)   Where,  B.1. VAICTM =Value Added Intellectual Coefficient  VA= Value Added, Retrieve from firm’s value added statement.   * HCE=Human Capital Efficiency, Calculated as HCE=VA/HC   HC (Human Capital) = It is the sum of expenditure to develop employees’ experience, skills, capabilities,  knowledge, attitudes, morals and creativity   * SCE=Structural Capital Efficiency, Calculated as SCE= SC/VA   SC (Structural Capital) = It is the difference between human capital HC and VA   * CEE=Capital Employed Efficiency, Calculated as CEE=VA/CE   CE (Capital Employed) = It is the sum of firm’s working capital and fixed assets amount |
| **Name of the Variable: Earnings per Share (Dependent Variable)** |
| Notation: EPS (Measure of Firm’s Financial Performance) |
| **Variable Measurement:**  EPS **=** Net Profit after Tax and Preferred Dividend ÷ Number of Common Shares Outstanding (Rehman et al., 2011) |
| **Name of the Variable: Market to Book Value (Dependent Variable)** |
| Notation: MB (Measure of Firm’s Market based Performance) |
| **Variable Measurement:**  MB = (Market Value/ Book Value of Equity) \* 100 (Tayeh et al., 2015) |
| **Name of the Variable: Firm Size (Control Variable)** |
| Notation: SIZE |
| **Variable Measurement:**  SIZE = LN NPAT (Connolly and Hirschey, 2005) |
| **Name of the Variable: Financial Leverage (Control Variable)** |
| Notation: LEV |
| **Variable Measurement:**  LEV = Total debt/Total assets (Naik et al., 2015) |
| **Name of the Variable: Assets Turnover Ratio (Control Variable)** |
| Notation: ATO |
| **Variable Measurement:**  ATO = Total debt/Total assets (Naik et al., 2015) |
| **Name of the Variable: Market Price per Share (Control Variable)** |
| Notation: P |
| **Variable Measurement:**  P = The market price per share has been taken at the end of the firm’s financial year (Tahinakis and Samarinas, 2013 |

**9.1 Descriptive Statistics of Variables**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table-8: List of Independent Variable, Dependent Variable, and Control Variable** | | | | | | | | | |
| **Panel A:** Carrying Amount of Intangible Resources in Taka | | | | | | | | | |
| **Name of the Industry** | **Intangible Resources**  **( Figure in Taka)** | | **Minimum**  **(Figure in Taka)** | | **Maximum**  **(Figure in Taka)** | | **Mean**  **(Figure in Taka)** | | **Standard Deviation** |
| Engineering | 7,180,892,564.10 | | 4,220.14 | | 870,012,054.70 | | 23,314,586.25 | | 76,002,074.24 |
| Food & Allied | 22,944,202,167.40 | | 1,020.00 | | 6,174,921,775.12 | | 173,819,713.39 | | 802,982,648.12 |
| Tannery Industries | 1,438,267,882.09 | | 84,397.76 | | 190,442,714.86 | | 43,583,875.21 | | 65,516,520.50 |
| Cement | 10,070,553,715.04 | | 1,328,148 | | 1,326,006,000.00 | | 152,584,147.20 | | 311,004,675.81 |
| **Aggregate** | 41,633,916,328.62 | |  | |  | |  | |  |
| **Panel B:** Carrying Amount of Intangible Resources as % of Total Assets | | | | | | | | | |
| **Intangible Resources (IR)** | | **No. of firms** | | **IR to Total Assets (%)** | | **Total Amount**  **(Figure in Taka)** | | **Mean**  **(Figure in Taka)** | |
| Advertising | | 49 (100%) | | 1.020746% | | 25,305,413,570.35 | | 47,836,320.55 | |
| Corporate Social Responsibility (CSR) | | 37 (75.51%) | | 0.073792% | | 1,829,375,529.25 | | 3,779,701.51 | |
| Research & Development (R&D) | | 08 (16.33%) | | 0.001050% | | 26,030,795.28 | | 64,432.66 | |
| Goodwill/Patent/Trademark | | 1 (2.04%) | | 0.000001% | | 21,000.00 | | 51.98 | |
| Market Research and Product Development/ Business Develop | | 15 (30.61%) | | 0.144691% | | 3,587,053,241.16 | | 8,341,984.28 | |
| Software | | 12 (24.49%) | | 0.086149% | | 2,135,729,929.24 | | 5,097,207.47 | |
| Preproduction Expense/Deferred Revenue Expenditure/Public Issue | | 19 (38.78%) | | 0.052132% | | 1,292,417,502.67 | | 1,065,471.97 | |
| Recognized Intangible Assets | | 14 (28.57%) | | 0.300829% | | 7,457,874,760 | | 18,101,637.77 | |

1. **Development of Panel Regression Model**

The study attempts to provide efficient estimates using appropriate panel data estimation technique on 49 firms from four industries during the period of 2007-2017. Generally, in analyzing the panel data anyone of the following three estimations, namely, Pooled Ordinary Least Square (OLS), Fixed Effects Model (FEM) Model and Random Effects Model (REM) (also referred to as the Error Components Model (ECM)) can be used but with different assumptions. There is no significant evidence found using Pooled OLS estimation for this study since p value of Breusch-Pagan Lagrange multiplier (LM) test at 5% level of significance is less than 0.05. Next, Hausman specification (1978) test is run to make sure that which estimation either fixed-effect model or random-effect model can best explain estimators. Hausman specification test at 5% level of significance indicates strong evidence in supporting the use of fixed-effects model for the panel data set.

Regression model namely fixed-effect model for Model-1 dedicated to a firm’s financial performance are specified as follows:

**Model-1:**

LN EPSit = β0 + β1\* LN IntangibleAssetsit + β2 \* LN SIZEit + β3 \* LN LEVit + β4 \* LN ATO + ϵit

Likewise, regression model namely fixed-effect model for Model-2 dedicated to a firm’s market based performance can be expressed as follows:

**Model-2:**

LN EPSit = β0 + β1\* LN IntangibleAssetsit + β2 \* LN SIZEit + β3 \* LN LEVit + β4 \* LN P + ϵit

Where,

Subscript (i) = Cross-sectional unit, Firms (i=1, 2, ….N)

(t) = Time series unit (t=1, 2, …T)

ϵit= Error term with E (ϵit) = 0 and var (ϵit) = σ2ϵ

**10.1 Multicollinearity Analysis**

Correlation matrix of the independent variables of Model-1&2 shows that the models are completely free from multicolinearity problem since none of the independent variables having collinearity is more than 0.7.

**Table -9: Summary of correlation coefficients between independent variables of Model-1**

. corr LNIntangibleAssets LNSIZE LNLEV LNATO

(obs=539)

| LNInta~s LNSIZE LNLEV LNATO

-------------+------------------------------------

LNIntangib~s | 1.0000

LNSIZE | 0.3708 1.0000

LNLEV | 0.0470 0.1175 1.0000

LNATO | 0.0854 0.1358 0.2369 1.0000

**Table 10: Summary of correlation coefficients between independent variables of Model-2**

. corr LNIntangibleAssets LNSIZE LNLEV LNP

(obs=416)

| LNInta~s LNSIZE LNLEV LNP

-------------+------------------------------------

LNIntangib~s | 1.0000

LNSIZE | 0.3420 1.0000

LNLEV | -0.0016 0.0474 1.0000

LNP | 0.0511 0.3128 0.0012 1.0000

**10.2 Checking of Autocorrelation**

The null hypothesis for the test is that there is no autocorrelation problem. Test results indicate that the model-1&2 can produce estimators having no influence of first order autocorrelation as the null hypothesis is not rejected at 5% significance level. The results of Wooldridge test of model-1 and model-2 are given below.

**Table-11: Autocorrelation Test of Model-1:**

. xtserial LNEPS LNIntangibleAssets LNSIZE LNLEV LNATO

Wooldridge test for autocorrelation in panel data

H0: no first-order autocorrelation

F( 1, 48) = 3.705

Prob > F = 0.0602

**Table-12: Autocorrelation Test of Model-2:**

. xtserial LNMB LNIntangibleAssets LNSIZE LNLEV LNP

Wooldridge test for autocorrelation in panel data

H0: no first-order autocorrelation

F( 1, 44) = 3.096

Prob > F = 0.0854

**10.3 Checking of Heteroskedasticity**

A test for heteroskedasticity is available only for the fixed-effects model. After running fixed- effects model unstandardized residuals have been calculated for both the models. P value which is above 0.05 indicates that residuals of both the models follow normal distribution and the models are free from heteroskedasticity problem.

**Table-13: Heteroskedasticity Test of Model-1**

. sktest Unstandardized\_Residuals

Skewness/Kurtosis tests for Normality

------ joint ------

Variable | Obs Pr(Skewness) Pr(Kurtosis) adj chi2(2) Prob>chi2

-------------+---------------------------------------------------------------

Unstandard~s | 539 0.2672 0.7180 1.37 0.5050

**Table-14: Heteroskedasticity Test of Model-2**

. sktest Unstandardized\_Residuals

Skewness/Kurtosis tests for Normality

------ joint ------

Variable | Obs Pr(Skewness) Pr(Kurtosis) adj chi2(2) Prob>chi2

-------------+---------------------------------------------------------------

Unstandard~s | 416 0.6403 0.0388 4.49 0.1057

1. **Results and Discussion of Panel Data Regression Analysis**

In order to estimate the empirical evidence for the effects of intangible assets 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 a firm’s financial performance and market based performance respectively.

**11.1 Intangible Assets Investment and Earning per Share (EPS)**

The output of regression analysis that has been employed for the EPS analysis as a measure of the firms’ financial performance is presented in the following table - 15. Table-15 shows the results of fixed-effect regression model which is free from autocorrelation and multicollinearity problem; and there is no presence of heteroskedasticity in the estimated model-1. The value of F-statistic, 127.48, is statistically significant at 1% level of significance, meaning that coefficients of all the variables except the constant are significantly different from zero and hence prove the validity of estimated model-1. It is obvious from the FEM estimation results of model-1 that the coefficients of the key variable i.e. intangible assets along with intercept are statistically significant at the level of significance 5% and 1% respectively. The coefficient, for example, of 0.118549 means that an increase of 1% intangible assets leads to the increase of EPS by 11.85%. After controlling the model-1 for SIZE, LEV, and ATO the coefficients of intangible assets are still positively significant.

**Table-15: Regression Model-1**

. xtreg LNEPS LNIntangibleAssets LNSIZE LNLEV LNATO,fe

Fixed-effects (within) regression Number of obs = 539

Group variable: CodeoftheC~y Number of groups = 49

R-sq: Obs per group:

within = 0.5120 min = 11

between = 0.5801 avg = 11.0

overall = 0.5474 max = 11

F(4,486) = 127.48

corr(u\_i, Xb) = -0.3873 Prob > F = 0.0000

------------------------------------------------------------------------------------

LNEPS | Coef. Std. Err. t P>|t| [95% Conf. Interval]

-------------------+----------------------------------------------------------------

LNIntangibleAssets | .118549 .0472074 2.51 0.012 .0257931 .2113049

LNSIZE | .6767749 .033175 20.40 0.000 .6115908 .741959

LNLEV | .3912647 .0774846 5.05 0.000 .2390186 .5435108

LNATO | .1142772 .0420628 2.72 0.007 .0316299 .1969245

\_cons | -11.12283 .5936211 -18.74 0.000 -12.28921 -9.956449

-------------------+----------------------------------------------------------------

sigma\_u | .84025859

sigma\_e | .58394176

rho | .67432602 (fraction of variance due to u\_i)

------------------------------------------------------------------------------------

F test that all u\_i=0: F(48, 486) = 17.17 Prob > F = 0.0000

The adjusted R-square of the estimated model-1 is 0.5474 (goodness of fit value), presenting a good degree of explanatory power.The value of R-square tells us financial performance (EPS) of the firm can be explained 54.74% by the variables of intangible assets, firm size, firm leverage, and assets turnover ratio (ATO). At this point, first hypothesis, Hypothesis -1, is confirmed by the significant coefficients of intangible assets on a firm’s financial performance. There exists overriding positive influence of intangibles investment on firm performance with EPS, the measure of a firm’s profitability. So, we may conclude that EPS and intangible assets are not independent. The study findings are consistent with that of VanderPal (2015) who has revealed positive linkage between intangible assets and firm performance in the context of Taiwan’s economy.

**11.2 Intangible Assets Investment and Market to Book Ration (MB Ratio)**

This study attempts to examine whether investors of Bangladesh value the potential of a firm for

innovation. Besides model-1, model-2 explains a firm’s performance in the stock market as well. The output of regression analysis that has been employed for the Market to Book value (MB ratio) analysis as a measure of a firm’s market based performance is presented in the following table - 16.

**Table-16: Regression Model-2**

. xtreg LNMB LNIntangibleAssets LNSIZE LNLEV LNP,fe

Fixed-effects (within) regression Number of obs = 416

Group variable: CodeoftheC~y Number of groups = 48

R-sq: Obs per group:

within = 0.4880 min = 2

between = 0.2295 avg = 8.7

overall = 0.2808 max = 11

F(4,364) = 86.72

corr(u\_i, Xb) = -0.3734 Prob > F = 0.0000

------------------------------------------------------------------------------------

LNMB | Coef. Std. Err. t P>|t| [95% Conf. Interval]

-------------------+----------------------------------------------------------------

LNIntangibleAssets | -.1381556 .051227 -2.70 0.007 -.2388937 -.0374176

LNSIZE | -.1038436 .0421324 -2.46 0.014 -.1866972 -.0209901

LNLEV | -.2842859 .1040197 -2.73 0.007 -.4888408 -.0797309

LNP | .8463258 .0473387 17.88 0.000 .7532342 .9394175

\_cons | -.8660413 .7700256 -1.12 0.261 -2.380299 .648216

-------------------+----------------------------------------------------------------

sigma\_u | .75758387

sigma\_e | .55016062

rho | .65471909 (fraction of variance due to u\_i)

------------------------------------------------------------------------------------

F test that all u\_i=0: F(47, 364) = 14.13 Prob > F = 0.0000

As depicted in table - 16, the coefficients of variables, namely, intangible assets, as well as the control variables, namely, firm size, firm leverage, and market price per share appear to be statistically significant. So, from the above regression results it is revealed that all the independent variables are significantly affecting MB ratio of selective listed firms at DSE in Bangladesh at least at 5% level of significance except intercept. The adjusted R- Square of the second estimated model-2 is 0.2808, presenting a reasonable degree of explanatory power. This value signifies that a firm’s market based performance (MB) can be explained at a percentage of 28.08 by the variables of intangible assets, firm size, firm leverage, and market price per share. The whole estimated model-2 is significant at 1% level of significance.

Unlike the coefficient of intangible assets of model-1, the coefficient of intangible assets of

model-2 is negatively associated with MB ratio, the measure of firm’s market based performance. The coefficient amounts - 0.1381556, depicting a negative relation between investment in intangible assets and MB ratio. This negative coefficient implies that the higher the intangibles expenditure may be for a firm, the bigger the negative effect may be on its stock price and vice versa, thus depicting a paradox that is not consistent with the previous literature, and also the growth potential that supports intangibles as an innovative creator. At this point, second hypothesis, Hypothesis -2, is rejected by the negative significant coefficient of intangible assets of model-2. There exists overriding negative influence of intangibles investment on the stock price. Rejecting null hypothesis indicates a new perspective, suggesting that if a firm spends lower in intangibles, this will result in an increase of the stock price, implying that investors’ perception towards intangibles investment is negatively associated with firm performance. Therefore, future benefits cannot flow towards the firm that invests in innovation through generating intangible assets.

**12. Conclusion and Recommendation**

An important gap in the existing literature is the absence of empirical studies on intangible assets and firm performance in less developed economies like Bangladesh. This research paper documents the impact of intangible assets on firm performance in Bangladesh during the period between 2007 and 2017 and fill up that gap. All theoretical approaches agree with the prediction that intangible assets investment has a positive impact on firm performance. We also started the study assuming the same positive impact in the case of selective manufacturing industries of Bangladesh. Our findings indicate a mixed behavioral effect of intangible assets on a firm performance. Specifically, intangible assets have statistically significant positive effect on a firm’s financial performance; however, the relationship is reversed with a firm’s market based performance which indicates diminishing stock price against intangible assets intensive firms. Taken together these results are congruent with hypotheses-1 but not with hypothesis-2. By combining the behavioral effects of intangible assets on a firm’s financial and market-based performance, we may formalize the findings by saying that even if intangible assets trigger a significant rise in a firm’s EPS (measure of financial performance), a firm’s can’t maximize shareholder’s wealth due to poor performance of intangible assets intensive stocks in the capital market, Bangladesh. This phenomenon suggests that investors in Bangladesh do not consider intangible assets such as R&D as a value creator for both the firms and the economy.

The present study recommends that hard accounting treatment of intangible assets should be

revised keeping in front the reason, according to study present study findings, that like tangible

assets intangible assets can bring future economic benefits for the firm . Beside, firms should keep proper recording of their intangible expenditure data. This will help the firms to measure future economic benefits associated intangible investment and trigger them for rationale allocation of money in intangible segment in future. On the other hand, Bangladesh Accounting Standards (BAS) may take a policy and impose it to the firms for the proper recording and discloser of the amount of intangibles investment to the public as a separate segment on firm’s balance sheet for the purpose of rising cognizant about intangible assets to investors.

**13.0 Managerial Implication and Direction of Future Research**

As for practitioner implications, the findings are pivotal to managers in designing and exploiting relevant elements of intangible assets. The result of this study can be used as a blueprint for a firm to plan its intangible assets investment and as a guideline for entrepreneurs, managers when they plan to manage their investment in intangible assets. The findings also give a guideline to entrepreneurs, managers about the portion of money they should allocate in intangibles for securing sustainable competitive advantages. Additionally, the study findings may guide the users of financial statements to decide which segments they should pay attention when analyzing the intangible assets intensive firms. In this way, this study will make it easy for the general investors to take prudent investment decisions in buying or selling share of intangibles intensive firms.

Although the findings of this study bring benefit for both internal and external stakeholders, the results from this research are not without limitations. First, the findings provided in the current study are based on associations (i.e. correlations) rather than causal impacts. Therefore, further research may carry out a longitudinal examination of the causality and interrelationships among elements that are pivotal to intangible assets and firm performance relationship. Second is measurement issue: the proxy variables of intangible assets are constructed following the current accounting practice and the prior works. Such assumed construct is likely to be insufficient in understanding the full extent of latent constructs of intangible assets. Thus, it would be very interesting to further investigate to validate our research framework that has measurement method of intangible assets and linkage between intangible assets and a firm performance taking

large sample from different industries in Bangladesh to establish broader generalizability.

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