

The Impact of Big Data Analytics Adoption on the Performance of Malaysian Small and Medium Enterprises

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ABSTRACT

In today's digitalized era, the adoption of Industry 4.0 technology pillars can boost businesses by enhancing organizational performance. As one of the crucial pillars, big data potentially has been receiving heightened interests from academics and practitioners. Big Data Analytics (BDA) is viewed as a new strategic weapon in business that allows organizations to gain valuable insights for decision-making towards better performance. Most multinationals and larger companies may already be implementing BDA aiming at enhancing organizational performance, but many Small and Medium Enterprises (SMEs) are still at the exploratory stage. The present study proposes the outcome of BDA adoption on performance among Malaysian SMEs and the role of strategic agility as moderator.

Keywords: *Small and Medium Enterprises; Big Data Analytics; Adoption; Performance; Strategic Agility; Malaysia*

1. INTRODUCTION

Since 2011, the term Industry 4.0 was introduced at Hannover Fair, which was one of the world's largest trade fair. Industry 4.0 is likely to become the largest generator of big data [1]. Data has major impact on the revolution of networks, digital technology, because people and platforms changed the business. Big Data Analytics (BDA) offered as a key to addressing a wide range of business and IT management needs. However, the label "BDA" is used in variety ways, confusing people about its usefulness and how best to implement in order to drive business value.

Small and Medium Enterprises (SMEs) play important roles in Malaysia at the end of 1990s. SMEs become the backbone of business establishments in Malaysia. SMEs are the driver's for economy growths; it represented 98.5% of all business establishments in the country and having contribution 66% of employment in 2017 [2]. SMEs have been at the core of Malaysian economic transformation into middle-income nation and an important drive for employment growth. SMEs have vital contribution to economic development, political stability and social ascent of each county. SME can be started in any kind of business activities in rural and urban area. Many studies have been conducted regarding SME challenge with broad views that included SMEs unskillfulness, restricted banking service, access to credit and survival rates. Malaysian SMEs' real GDP growth has persistently exceeded overall economy, averaging at 6.6% per annum compared to the overall GDP's 5.1 growth over the past 14 years (2004-2017) [2]. SMEs are considered as the backbone of industrial development and the Report from Department of Statistic

Malaysia, Malaysia Gross Domestic Product (GDP) in 2017 was RM1.353 trillion, which grew 9.9% compared to that of 2016. Today, SMEs Company occupies a strategic and vital position in the Malaysian economic structure due its significant contribution in term of import, export and employment. The SMEs sector has a chance to benefit from BDA technology to make fast and right decisions to develop their business [3]. Having less employee and lower revenue does not mean that SMEs will not need the big data. SMEs embrace the big data in order to create new market opportunity, understand customer needs better, reduce operational costs and focus on targeted market.

2. LITERATURE REVIEW

The term BDA has been recognized as a related field of Business Intelligence and Analytics with reference to BI&A technologies, which mainly concern on data mining and statistical analysis [4]. While there are numerous definitions of analytics, Rouse [5] proposed "Analytics, is the scientific process of transforming data into insight for making better decisions" and the Operational Research Society's "Learn about O.R." Website says, "In a nutshell, operational research (O.R.) is the discipline of applying advanced analytical methods to help make better decisions". Drnevich and Kriauciunas [6] defined BDA as "a new generation of architectures and technologies, designed to economically extract value from a wide variety of data volumes, enabling high speed capture, analysis and discovery. BDA technologies allow companies to improve existing application by offering business focused practices and methods that offer a competitive pressure [4], [7]. BDA

examines large and various amount of data sets to uncover correlations, hidden patterns, market trends and customer preferences that can help organization in making business decision. Driven analytics systems like BDA will provide various business benefits, including more effective marketing, good customer service, improved operation, new revenue opportunities and competitive pressure over rivals. The study on BDA has mainly concentrated in the role of BDA capability and identified its direct effect on organizational performance. However, researchers criticized that IT resource and capability alone may not directly define organizational performance. Some studies on IT productivity paradox have suggested that big data could not yield significant productivity gains in SMEs. Wang, Kung, Wang and Cegielski [8] argued that adopting practice base view will build a more complete image of how BDA can be productivity leverage to deliver business value.

2.1 Big Data Analytics Adoption

BDA refers to when two technical entities, which are advance analytics and big data combined, the advanced analytical techniques can work on big data [9]. BDA is enabled by organizations linked to analytics-based organizations to measure and manage what the organizations do [10]. Fan and Wei [11] argued that there is no need to distinguish BDA from data analytics, because data will continue to increase and will never be small again. Kwon, Lee and Shin [12] defined BDA as methods and technologies that can improve organizational performance by analyzing complex, large-scale data for various applications. Frost and Sullivan [13] described BDA as the entire process from the acquisition and aggregation of large-scale structured and unstructured data from various sources to economic and timely storage, management, analysis and access. Wamba, Akter, Edwards, Chopin and Gnanzou [14] explained BDA as an integrated process that involves the analysis, compilation, handling and interpretation of numerous functional divisions in order to achieve actionable insights, generate business value and create competitive pressure. According to the study, Malaysia SMEs was ranked third in adopting Industry 4.0 technologies. The study showed that 67% of Malaysian SMEs incorporated related technologies, such as automation software, mobile payments and BDA into their operations [15]. Since 2013, Malaysia started to develop BDA ecosystem ahead of other ASEAN countries such as Indonesia and Thailand. Malaysia is one of the few countries with a structured BDA roadmap to fully unleash the big data value. Early 2016, Dr Karl Ng, MDEC's innovation Capital Director, Malaysia already had the leading technological infrastructure ecosystem in ASEAN, the year's focus was on adoption. Malaysia Domestic Trade & consumer Affair Minister Dato' Saifuddin Nasution Ismail together with Fusionex founder CEO Dato' Seri Ivan launch of SME FORYOU at the MIRF Exhibition 2018. SME FORYOU is a friendly platform which is aimed at encouraging SMEs to adopt BDA, kick starting e-commerce plan and enable to promote product and their

brands to the local and international market. Malaysia has heavily invested in accelerating the BDA adoption and innovation within the country. By 2020, the Malaysia government is urging to become the BDA-hub in ASEAN.

2.2 Big Data Analytics Challenges

Technology and innovations as strategic priorities for SME growth and Big Data is considered one of the keys drivers of it [16]. A new paradigm shift for SMEs is being able to analyze and predict market and customer behavior with Big Data. When being properly implemented, it can yield productivity, flexibility, responsiveness and ability to meet customer needs by making better decisions. Thompson, Williams and Thomas [17] suggested that the common belief is that the innovation orientation could potentially increase the growth of SMEs. Ventures go across the spectrum, from multinationals to SMEs investigate avenues to burden and exploit the data. Using BDA technologies, they adjust the way business work across enterprises. To address their voluminous data challenges, SMEs are desperately required to genuinely consider the adoption of Big Data. BDA provides different open doors for SMEs to make an aggressive key impact on basic leadership. Advanced data management and analytics drive business development. SMEs are well placed to take advantage of the long lasting benefits of huge information. Because of their size and adaptability, even a minor change can effectively encourage a substantial scale. While it is reasonable to say that it is wrong to assume that all SMEs are unable to afford sophisticated computer systems, cost and in particular value for money, often plays critical role (and thus potential barrier) whenever a company is considering purchasing software. There is a natural cost-trading functionality, while the system may have the desirable functionality, but the additional costs outweigh any benefits. Perhaps equally important consideration is that SMEs often lack the in-house capabilities for selecting, configuring, installing and maintaining complex IT systems. Such factors pose a potential barrier to BDA in SMEs [18].

2.3 Big Data Analytics and Performance

BDA is now considered a new trend that helps business efficiency and productivity to be improved due to its high operational and strategic potentials. BDA's emerging literature has identified positive relationship between customer analysis deployment and organization performance [19]. For example BDA allows companies to analyze and manage strategy through data [20]. Indeed, BDA are becoming increasingly a key component of business decision-making processes [21]. The literature provides the example of Target Corporation, which uses BDA to track customer buying habits and predict their future buying trends through its loyalty card program. One of the examples of a company capitalizing on BDA is Amazon.com. Indeed, nearly 35% of purchase made on Amazon.com are based on BDA based customer purchase

recommendations [22]. Another example discussed in the literature is GE, which plans to use BDA to improve the efficiency of 1500 gas turbines monitored through software and network optimization, as well as improve service delivery and gas and power system coordination [23]. BDA is considering an enabler for asset and business process monitoring in manufacturing and operation management [24], supply chain visibility, improve manufacturing and industrial automation.

2.4 The Role of Strategic Agility

Ashrafi, Ravasan, Trkman and Afshari [25] identified that business analytics capabilities affect the agility of companies through information quality and innovative capabilities. Strategic agility refers to business strategies readily undertaken by organization to achieve agile operations [26] and is assuming an important role in organization performance [27]. From the perspective of IT managers, IT plays a significant role in promoting strategic agility even though business managers perceive differently. However, business and IT managers have recognized the value of strategic agility [28].

3. PROBLEM STATEMENT

Terziovski [29] found the high failure rate to be larger due to the lack of systems to an informal strategic planning processes that keeps track of the SMEs' performance. According to the United States small business administration, nearly 50% of SMEs failed in the first year and 95% tended to fail by the five-year mark. SMEs with fewer than 20 employees have only a 37% surviving for 4 years and 9% chance of surviving for 10 years [30]. Although there are not reliable sources of publishing failure rates for SMEs in Malaysia, there are serious issues facing sustainable SMEs performance. Since Industry 4.0 has slowly lead SMEs in the digital technology innovation development, SMEs can optimize their performance and efficiency in technologies. For the year 2012-2013, there was a decline trends in BDA as reported by Kiron, Prentice and Ferguson [31]. Progressive organizations adopted BDA to gain competitive pressure; the steep growth curve of BDA based organizations was diminishing. Coleman et al [32] proved that SMEs are slow adopters of the new technology of BDA and are in danger of being left behind. BDA plays a key role as the organization starts their digital transformation. International Data Corporation (IDC) mentions by 2021, Malaysia BDA marketing software is forecasted to reach RM595million. In 2017, Malaysia BDA software expenditures will total RM433.7 million, an increase of 10.9% over 2016 [33]. Malaysia organizations have started to prioritize analytical solutions. Early adopters are both SMEs and traditional manufacturing companies [34]. Big data is seen to be as vital to society and businesses as the technology keeps improving. Many data may lead to more accurate analysis and it leads to more confident decision-making. A good business decision can mean

greater operational efficiency, reduced risk and cost reduction to business. Big data has been giving a lot of challenges to developing countries, but it also brings tremendous benefits to improve rural communities and transformation in economic and social life [35]. Malaysia must enhance big data investment as a key factor in determining the local and regional future in the industry. The growth of the Internet, the extent of smart mobile devices and social networking have contributed to the ever-increasing amounts of data that can be accessed by companies. Coleman et al [32] identified that SMEs have various factors and conditions in the adoption of BDA in business.

4. RESEARCH QUESTIONS

The study proposes to answer two main research questions:

1. Does BDA adoption significantly impact organizational performance among Malaysian SMEs ?
2. Does strategic agility positively moderate the impact of BDA adoption on organizational performance among Malaysian SMEs ?

5. PROPOSED RESEARCH MODEL

Previous study suggested that IT resources help improve business value and influence the organizational performance [36]. BDA techniques are able to analyze larger amounts and data types with more advanced algorithms that allow for prescriptive analysis [37]. The analytical process, including the deployment and use of BDA tools, is perceived by organizations as a tool for improving operational efficiency, although it has strategic potential, drives new revenue streams and gains competitive advantages over business competition. Thus, the proposition 1 can be proposed as follow:

Proposition 1: Big Data Analytics (BDA) adoption significantly impacts organizational performance among Malaysian SMEs.

Strategic agility is critical to organization's survival as it enables the organization to respond quickly to changes in its internal and external environment. Strategic agility enables an organization to quickly and cost effectively adapt to changes in the busyness environment by successfully implementing the restriction and transformation of business process. Strategic business agility refers to an organization's ability to continuously align with its environment and respond sensitively to its business environment [27]. BDA adoption provides strategic agility as the organization responds quickly in the era of big data. BDA application can enable effective internal and external knowledge management, that helps organizations create organizational agility [38]. By having strategic agility in the context, BDA adoption will improve the organizational performance. Thus, the following Proposition 2 can be proposed as follow:

Proposition 2: Strategic agility positively moderates the impact of BDA adoption on organizational performance among Malaysian SMEs.

Based on the description above, Figure 01 depicts the proposed research model.

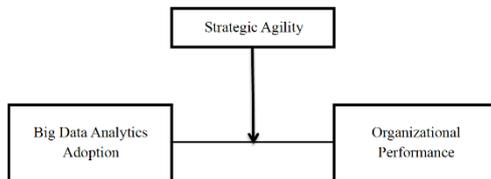


Figure 1. Proposed Research Model

This research focuses on the BDA adoption by SMEs manufacturing sector in Malaysia. Hence, the population covers all SMEs manufacturing that have deployed any form of BDA services. Past studies on BDA adoption [39] and IT system impact on organization performance utilized Partial Least Squares (PLS) approach to Structural Equation Modelling to access the measurement items while estimating the path of the structural model. To help the respondents more effectively answer the BDA adoption questions, a definition of big data and BDA will be provided at the beginning of the survey to ensure that respondents have a common understanding of the research. A seven-point Likert scale ranging from “strongly disagree” (1) to “strongly agree” (7) will be used to measure the responses.

6. CONCLUSION

BDA’s emerging technology, which can offer strategic, operational and other benefits, still has significant adoption rates in industry-wide organizations. Since the latest information system research lacks concentration on this technology and the outcome of such adoption on organizational performance, this study proposes a research model to examine the outcome of BDA adoption in the context of SMEs Malaysia as well as the role of strategic agility in this relationship. This study proposes investigative practices that would be used in the adoption of IT technology for SMEs in Malaysia. Secondly, this study will also examine how it enables IT management to integrate with business or organizational performance by more economical usage of IT, and can ultimately increase the organizational slack resources of a company which can be channeled into business activities. Theoretically, this study proposes empirical validation of a conceptual model based on theories of strategic management, resource-based view and dynamic capabilities to explain the BDA value a business is able to create. While many studies have been conducted on the value of big data, the real advantage of big data remains a myth. Therefore, this study aims to empirically validate the impact of BDA as resources and

strategic agility making as dynamic capability has impact on organizational performance.

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