

BUSINESS INTELLIGENCE, ORGANISATIONAL CAPABILITY, COMPLEMENTARY RESOURCES AND FIRM PERFORMANCE

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Abstract

While Business Intelligence (BI) initiatives have been a top priority of Chief Information Officers (CIOs) around the world for several years and accounting for billions of dollars per year, the academic research on how the actual benefit are derived from BI remains sparse. The author proposes the use Resource Based view Theory, Information Capability theory, Knowledge Base View and Organization Learning Theory to propose a conceptual model to assess the impact of BI on firm performance after extensive literature review. Business value is generated when BI capabilities are deployed to improve operation and strategic business processes. We argue that organizational capabilities (customer, process and performance management capabilities) mediate while complementary resources (culture, human resources, organization structure and decision making process) moderate the relationship between BI capability and firm's performance. This study contributes to both research and practice through proposed research framework. It fills a knowledge gap by providing a better understanding of this innovation and how it impacts firms' performance. Business Intelligence capabilities when configured and tailored with other organisational resources enable higher business capabilities which in turn influence performance.

Keywords: Business intelligence, firm performance, customer management, process management, organizational capability

INTRODUCTION

This paper seeks to examine how Business intelligence contribute to firm performance. Particular interest is paid to identifying and investigating the role of moderators and mediators on the relationship between BI and firm performance. Theoretical foundation of this study include Resource Based View (RBV) to address available resources in the firm, Information Systems Capability theory to identify BI capabilities. Knowledge Based Theory and Organisational Learning Theory included to appreciate how information from BI facilitate learning in the organisation, hence generating new knowledge the result in improved decision making. The main objective is to understand how BI impact firm performance.

Following the swift development of technologies in the last decade, the importance of knowledge as a strategic resource cannot be overemphasized. Knowledge contributes to success of an organization if properly managed (LaValle, Lesser, Shockley, Hopkins & Kruschwitz, 2011). Shollo (2013) asserts that for an organization to develop a competitive advantage in business environment, accessibility of reliable and adequate information in a timely manner is paramount. Prior to the advancement of information technology (IT), it was almost impossible to access the required information hence businesses had to largely rely on instincts (Shollo, 2013; Lavalle et al., 2011). Investment in IT was focused on stand-alone information Systems (IS) resulting in “islands of information” since they could not be integrated with other IS (Ida & Graeme, 2015). Mergers and acquisition complicated the problem because the different companies were using different enterprise applications in carrying out the same function (Ida & Graeme, 2015).

The concept of BI has acquired a wide recognition and is regarded as a cornerstone to the success of an organization in the advent of globalization. For example, award winning organizations such as Continental Airlines that realized over \$500 million in revenue and made a 1000% return on BI investment. BI facilitated capturing of real time data to support decision making in the organization (Anderson-Lehman, Watson, Wixom & Hoffer, 2004). A study of over 400 ICT experts sampled from ninety three countries indicated that BI is one of the key information technologies in firms (Arefin, Hoque, & Bao, 2015). Global BI investment was projected to stand at \$18.3 billion in 2017, a rise of 7.3% from 2016. The market is forecasted to stand at \$22.8 billion by the end of 2020 (Moore, 2017). In Kenya, ICT spent has been growing at 11% per year from \$2.28 billion to \$3.45 billion in 2017 (Kenya National Bureau of Statistics, 2018). Elbashir, Collier and Davern (2008) posit that this magnitude of investment in BI is an indication of their strategic significance and brings forth the need for more scholarly research in this area.

Motivation for this paper

Uncertainty exists on how IT contributes to a firm's performance among the researchers, hence the knowledge in this area remains undeveloped and unsystematic (Melville et al., 2004; Elbashir et al., 2008; Ida et al., 2015; Vuksic & Popovic, 2013). Given a large amount of capital spent and thin academic research in the area (Trieu, 2017), BI is a palpable issue and hence the need for more scholarly research (Elbashir et al., 2008).

Empirical studies conducted by various researchers on how BI impact performance reveals knowledge gaps. Mithas et al. (2011) carried out study on how information capability influence performance. BI impact in developing organizational capabilities was confirmed. In turn, these capabilities (Customer, process and management) influence performance. This implies that the relationship between BI and performance is mediated relationship. However, a further study by Yogev et al. (2013) on how BI creates value observed that value is generated by improving both operational and strategic business processes. Xu & Kim (2014) argues that influence on performance is through enablement of dynamic capabilities by facilitating sense and respond strategies to the environmental changes. Eybers (2015) noted positive BI impact on business performance but did not explicitly explain variables that moderate observed impact. Paucity of studies indicates debate of on moderators is inclusive hence Elbashir et al. (2008) underscored the need for further research examining moderators. Mithas et al. (2011) observed relation between BI is moderated through leadership and strategic planning. Yogev et al. (2013) noted exploration and exploitation activities in the organization has a moderating effect but proposed other sector such culture should be included in future research. Further research by Buchana (2014) confirmed that positive attitude lead to actual use of mobile BI in decision making. In contributing to foregoing argument, Arefin et al. (2015) states that the moderating effect of organizational factors such as strategy, structure, process, culture and BI systems has remained largely unexamined. Trieu (2017) summarised this ongoing debated by stating that BI literature is fragmented and lack and overarching framework to integrate findings and systematically guide research. Hence, this study seek to answer the following question; What is the impact of business intelligence on firm performance taking into consideration the role of organizational capabilities and other complementary resources?

SYNTHESIS OF THEORY

Resource Based View

Resource Based View (RBV) holds that sustainable competitive advantage can only be realised when resources are valuable, rare, inimitable and non-substitutable (VRIN). RBV emphasises on the ability and capacity of the organisation to combine, integrate, review and reconfigure

resources as the need arises. If an organisation has control over limited resources as a source of competitive advantage then issues pertaining acquisition of skills, knowledge management, learning and know how become essential consideration. Researchers have bought fourth various IT resources which can generate competitive advantage. These resources include IT strategy, IT infrastructure and IT human capital (Yogev et al., 2013). The extant literature on the RBV view indicates that investing in IT unaccompanied by other capabilities cannot assure desired benefits, because technology resources may not be VRIN (Peppard & Ward, 2004; Yogev et al., 2013; Olszak, 2014; Chae et al., 2014).

Critics hold that one of the assumption of RBV is that resources are often utilized excellently but do not explain how utilization is done (Wade & Hulland, 2004). However, Melville et al. (2004) observed that when the correct IT is functional within the right business process, the outcome is increased organizational performance and improved processes. According to Olszak (2014), BI can be combined with available organization resources, to acquire additional VRIN resources.

Information Systems (IS) Capability

IS Capability is rooted in strategic management and RBV perspective. It relates to firm's ability to derive business value through deployment of competencies. According to Peppard & Ward (2004), IS capability has three characteristics: flexible and IT infrastructure, fusion of business and IS knowledge, efficient use of business process to link IS/IT assets with value realization. Peppard and Ward (2004) pointed underpinning IS capabilities is the IS competences, created when process and structures are combined with IS resources (skill, knowledge and behavioral attributes). IS competencies determine the degree to which IT prospects are included in the business strategy, operations efficiency using systems and digital support, how efficient the IT infrastructure is developed, performance levels attained by IT operations and finally the capability of a firm to convey value from IT investment and exploitation. Hence, a short fall in IS competence affects performance.

However, the model has been criticized by Khani, Nor, and Bahrami (2011) to the extent that it does not specify the nature of qualification, skills and capabilities, knowledge and capacity required for a firm to implement a successful information systems strategic plan. Isik et al. (2013) extended this concept by exploring the role of BI capabilities from organisation and technical perspective. They identified eleven BI capabilities adopted in the proposed research framework and include flexibility, risk management support, data type quality, integration with other systems, user access, quality of data sources and reliability.

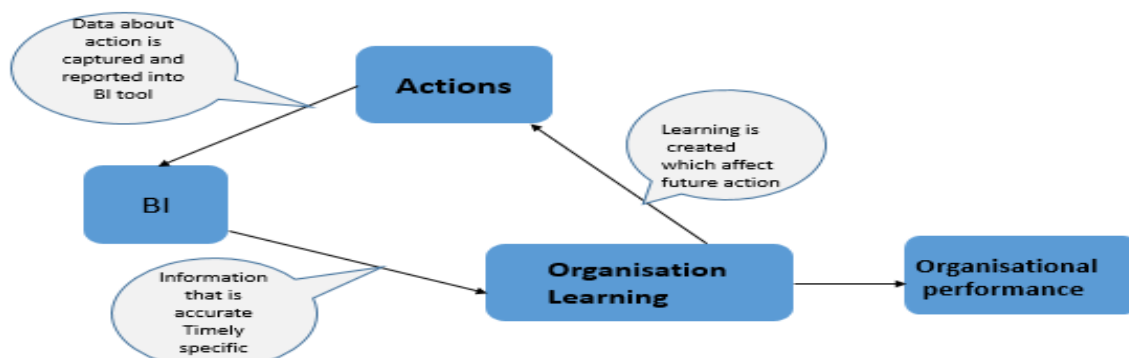
Knowledge Based Theory

The Knowledge Based Theory (KBT) of the firm postulates that knowledge is the most strategic and important asset of an organization. Knowledge is perceived to be consisting of skills, concepts and information (Grant, 1996). Data and information are key elements of knowledge. IT enables processing of data to information for decision making (Ahmad, Mohamad & Ibrahim, (2013). Although KBT depicts organization as repositions of knowledge and competencies, it is developed and held by individuals. However, it can be entrenched in the firm as part of the organization (Grant, 1996). The major critiques of the theory, according to Ahmad et al. (2013), is that KBV considers only the power of employees as sources of knowledge. However, this is subject to the absorption capacity of each individual. This capacity is influenced by the ability to identify and apply knowledge in respective work environment. This study holds that BI capability helps employees to learn, share and work more effectively contributing to better firm performance.

Organisational Learning Theory

Argrys and Schon (1974) are considered to be the greatest contributors in the development of Organizational Learning Theory (OLT) as argued by Weishäupl et al. (2015). OLT asserts that for organizations to be competitive in a dynamic environment, there is need make a deliberate decision to adjust tact in responding to changing circumstances (through data acquisition enabled by BI), link action to outcome and must quantify the outcome. The learning process starts with individuals but when entrenched within the organization then it can be said that organizational learning has taken place. However, Yadav and Agarwal (2016) critique this theory by observing that it is not possible to transform a bureaucratic organisation by learning alone. The theory is thus crucial in this study as it lays the foundation on which to base the argument that learning generates knowledge within firms and therefore the ability of the firms to transform such knowledge to actions is crucial as part of organizational capability. The figure 1 below summarises how learning can created in BI environment

Figure 1: Learning and BI environment



Source: Author 2018

Business Intelligence Capability, Organizational Capabilities, Complementary Resources and Firm Performance

Prior research by Kohli and Grover (2008) suggests that information management capability that is enabled by IT leads to higher-order business capabilities which positively affect firm performance. Hence, Mithas et al. (2011) propounded a model involving two stages consisting of BI capability as primary construct and organizational capabilities made of higher-order capabilities (that is process, performance and customer management capabilities) as an intermediary between firm performance and information management capability. Customer management capability (CMP) allows an organization to utilize customer's voice to obtain market information and spot business opportunities. BI capability is a key factor in enabling firm's CMP (Mithas et al., 2011). BI capability is also a significant enabler of Process management capability by allowing organizations to develop analytical tools that create real time visibility of business processes, combination of processes and forewarn any decline in performance of the variety of process. Effective performance management system can enable a firm to detect unfavorable variations, find out the sources and implement new strategies in an attempt to find a solution (Mithas et al., 2011). Hence it proposed organizational capabilities (customer, process and performance) has a mediating effect between BI capability and firm performance

Complementary resources were categorized by Melville et al. (2004) to include culture, structure, human resources and decision making process. Arguably technology has changed the amount of time required for decision makers to identify the problem and make a quick decision (Sharma et al., 2014). Previous studies provides evidence of incidences where insights and excellent ideas and products have been turned down by firms, only to perform extremely well when implemented by other firms. For example, the decision by Xerox's not to engage in the sale of computer hardware (Sharma et al., 2014). We argue here that the organizational decision-making processes are in many occasions involved in coming up with alternative ideas, examining them and settling on a specific option therefore providing a moderating effect.

Rayat and Kelidbari (2017) pointed out that organisation culture consist of four dimensions; involvement in work, consistency, mission and adaptability. Effectiveness of organizations is derived from BI systems and is dependent on corporate culture (Arefin et al., 2015). Culture create a conducive business environment that facilitate a smooth conveyance of information between stakeholders involved in decision making process. Sharma et al. (2014) further argues that the individuals are sometimes limited by organizational norms that restrict the exploration of new ideas. Organisation structure is one on the most important factors that

constitute a congenial environment for success of business IS (Arefin et al., 2015). According to Arefin et al. (2015), common variables associated with structure are the centralization and decentralization. The author has argued BI systems appear to be effective and affect firm's performance in decentralized structure in which process, customer and supplier oriented information is communicated to the top authority without delay. We hypothesis that Complementary resources (structure, culture, human resources and decision making process) have a significant moderating effect on the relationship between BI capability and firm's performance.

Performance is a multidimensional construct. Hubbard (2009) has argued that measurement of performance is complex particularly when the item under observation is dynamic. To measure performance, the study adopts dimension identified by Mithas et al. (2011) that include human resource performance, customer-focused performance, financial and market performance and organizational effectiveness. These performance perspective by Mithas et al. (2011) are drawn from well-established balance score card approach. In addition, the dimension fulfils Wade and Hulland's (2004) criteria for desirable dependent variables to assess IT enabled benefits that should focus on levels, trends, and competitiveness.

The conceptual model below schematically depicts the expected relationship among identified variables that include BI capability, organizational capability, complementary resources and firm performance. The model below adopted from Mithas et al. (2011) framework but after modifying to include moderating variables identified from literature review. It schematically depicts the expected relationship among identified variables and their influence on Firm performance. BI Capability is the independent variable comprising of quality of data source, data types, user access, data reliability, interaction capability, BI experience, flexibility and IT skills). Firm performance is the dependent variable comprising of customer management, financial management, HR performance and organizational effectiveness. Complementary resources have a moderating effect on the link between BI capability and Firm. The framework also illustrates intervening effect of organizational capabilities between BI capability and Firm performance.

Figure 2: Conceptual Model

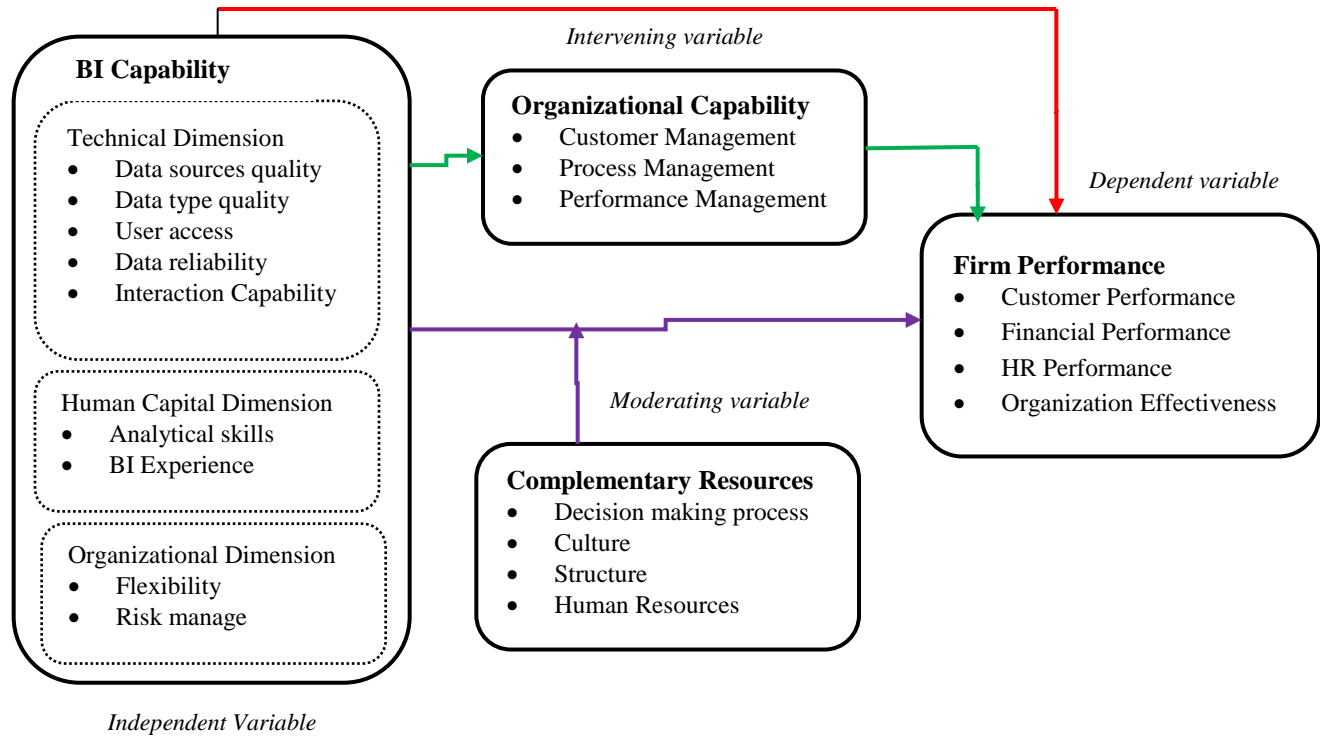


Table 1: Definition constructs in conceptual model

| Variable | Indicators | Measures | Source |
|--------------------------------------|-----------------------------------|--|---|
| BI Capability | Technical Dimension | Quality of data sources, Data type quality, use access, reliability and interaction capability | Isik et al. (2013), Ida & Graeme, (2015) |
| | Human Capital Dimension | Knowledge & skills, BI experience | Isik et al. (2013) |
| | Organisational Dimension | Flexibility, Risk management support | Isik et al. (2013) Xu & Kim, 2014 |
| Organisational Management Capability | Customer management capability | Ability to determine requirements, expectation & preference of customers. Acquisition, satisfaction and retention of customers. | Ida & Graeme, (2015); Mithas et al, (2011) |
| | Process management capability | Reduced operation cost, improved efficiency of internal processes and increased staff productivity | Elbashir et al (2008) |
| | Performance management capability | Ability to gather and monitor KPIs, ability to link metric analysis with decision making, feedback to stakeholder on performance | Mithas et al. (2011) |

| | | | | Table 1... |
|-------------------------|------------------------------|---|---|------------|
| Complementary Resources | Structure | Division of task for efficiency and clarity of purpose | Arefin et al, (2015) | |
| | Culture | Shared values and beliefs that shape behavioural norms | Arefin et al, (2015) | |
| | Decision making process | Political behaviour, Intuition, and Rationality | Jekel (2009) | |
| | Human Resources | Staff skills and competences | Mithas et al. (2011) | |
| Firm performance | Financial performance | Sales growth, Return on investments, profitability | Mithas et al. (2011) | |
| | Customer performance | Customer satisfaction outcomes | Mithas et al. (2011) | |
| | HR performance | Employee satisfaction, employee development, and organizational learning. | ChoiLee & Choi (2003) Mithas et al (2011) | |
| | Organisational effectiveness | Demonstrated through leadership, decision making structures, culture and work processes | ChoiLee & Choi (2003) Mithas et al (2011) | |

CONCLUSION AND WAY FORWARD

This study provides a significant contribution to both research and practice. The study also provides insights through integration of Resource Based Theory, Information Theory, Knowledge Based Theory, System Theory and Organization learning Theory into a single theoretical framework to depict how BI impact performance. Four variables were identified with their respectively indicators and measure that is BI capability, organisational capability, complementary resources and firm performance. The theoretical perspective adopted and proposed research framework applied will provide additional useful material to those wishing to further academic research in this area of BI.

The study also provides useful insights for managerial practice by examining the impact of BI. This proposal advances an understanding of analytical tools used by firms in business. It fills a knowledge gap by providing a better understanding of this innovation. Such is information IS beneficial to the top leadership in understanding the importance of adoption of business intelligence to raise the opportunities of success in decision making so as to promote increased competitive advantage and productivity of the firm.

This paper is essentially based on literature review, hence it is paramount that empirical study to confirm the identified relationships among variables. Critical to any research work is the

methodologies employed and philosophies adopted. While this previous research work on this topic was based either on the use of quantitative or qualitative approach, we proposed to use mixed method approach. Mixed research methodology is recommended for future research because some of the benefits accruing from this technology cannot be objectively be quantified. Mixed research is based on the assumption that neither qualitative nor quantitative can provide a better understanding problem in isolation.

The focus of this research paper has been on the internal environment of a firm. It is recommended future research should incorporate impact of external environment that donate country specific factors. For example government promotion and regulation of technology development. It is evident firms in developing countries face constrains in areas such as eructation, expertise and infrastructure (Melville et al., 2004). Poor communication infrastructure can have a moderating effect on web based application.

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