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Abstract

Purpose: The purpose of this review is to examine the relationship between information technology (IT) capabilities of enterprises and their ability to gain competitive advantage through IT resources, based on underpinning theories and empirical studies.

***Methodology*:** The approach to the review was to conduct extensive literature searches in the fields of strategic management and information technology management, as a result of which four supporting models and perspectives, that is, technology acceptance model (TAM), unified theory of acceptance and use of technology **(**UTAUT), the IT capability theory, and RBV, and seven empirical studies that linked IT capability dimensions of IT infrastructure; IT human resources; and IT knowledge management and competitive advantage were eventually reviewed.

***Findings*:** The review provides indications to better understand the relationship between IT capabilities and competitive advantage. The RBV was discovered to be a very popular and useful underpinning theory favored by many scholars in explaining the relationship. Evidence from empirical studies showed a positive and significant relationship between IT capabilities and competitive advantage, which led to conclusions and recommendations.

***Contributions to theory, practice, and policy*:** The review was able to highlight the importance of investment and deployment of IT resources such as infrastructure, human resources, and knowledge management to gain a competitive advantage, and established the role of RBV in strategic management research. Recommendations were made on theory, practice, and policy.

Keywords: *Competitive advantage, information technology capability, review.*

1.0 INTRODUCTION

Competitive advantage is an advantage an organization gets over competitors by offering consumers greater value, either through lower prices or by providing greater benefits and services that justify a higher price (Ganguly, Nilchiani, & Farr, 2009; Laudon & Laudon, 2013; Kaur & Mehta, 2016). Several drivers of competitive advantage have been identified, and possession of IT capabilities such as IT infrastructures, IT human resources, and IT knowledge management is an example (Ashrafi & Mueller, 2015**;** Chen & Tsou, 2012; Basellier, Reich, & Benbasat, 2001; Porter, 2008; Schwager, Byrd, & Turner, 2000).

IT capability is a firm's ability to acquire, deploy, combine, control IT-related costs, reconfigure IT resources in support and enhancement of business strategies, deliver systems when needed, and affect business objectives through IT implementations (Ross, Beath, and Goodhue, 1996; Sambamurthy & Zmud, 1997). IT capabilities have been discovered to have the ability to confer a competitive advantage on enterprises (Arora & Rahman, 2017; Breznik, 2012; Kamau, Senaji, & Nzioki, 2019; Lim & Trimi, 2014; Lin, 2007; Ngobe, 2020; Porter & Millar, 1985).

Several theories and models have been advanced to support studies in the relationship between IT capabilities and completive advantage, and these include the technology acceptance model, the diffusion of innovations theory, the unified theory of acceptance and use of technology, the IT capability theory, and the resource-based view (RBV) (Barney, 1991; Bharadwaj, 2000; Davis, 1989; Venkatesh, Morris, Davis & Davis, 2003).

Several researchers have discovered that investments in IT help firms gain a competitive advantage (Qi & Lan, 2006; Roberts & Grover, 2012; Wade & Hulland, 2004). However, a growing number of others have doubts (Cakmak & Tas, 2012; Carr, 2003; Chae, Koh, & Park, 2018; Chukwunonso, Omoju, Ikani, & Ribadu, 2011). Although more researchers have begun to connect organizational IT capabilities to competitive advantage (Bharadwaj, 2000; Bhatt & Grover, 2005), there has been substantial debate regarding what is considered an IT capability and through what causal mechanisms it affects competitive advantage.

1.1 Objectives of the study

This paper is an attempt to address the gap through a review of the literature by addressing the following questions: (a) to what extent do IT infrastructure capabilities affect competitive advantage? (b) to what extent do IT human resources capabilities affect competitive advantage? and (c) to what extent do IT knowledge management capabilities affect competitive advantage?

1.2 Approach to the review

The methodology adopted for the review was to conduct extensive literature searches in the fields of strategic management and information technology management. From the literature were extracted relevant concepts, theories, and empirical studies, as a result of which four supporting models and perspectives, that is, TAM, UTAUT, the IT capability theory, and RBV, and seven empirical studies that linked IT capability dimensions of IT infrastructure; IT

human resources; and IT knowledge management and competitive advantage were eventually reviewed.

2.0 Conceptual Reviews

In this section, the two key variables of competitive advantage and information technology capabilities are reviewed.

2.1 Competitive advantage

The speculative definition of competitive advantage is the above industry average manifested exploitation of market opportunities and neutralization of competitive threats, while the operational definition deals with the above industry average manifested exploitation of all market opportunities, full exploitation of the market opportunities, and neutralization of all competitive threats, and full neutralization of the competitive threats (Sigalas, Economou, & Georgopoulos, 2013). Competitive advantage is finding a position in an industry that can protect the company from the competition between competitors in the industry, new competitor threats, supplier bargaining power, buyer bargaining power, and product substitution challenges that determine competition, and a company is considered favorable in achieving competitive advantage if it can obtain above-average industry profits, as well as if it can show performance above average or generate profits above the ordinary profit on an ongoing basis or when they provide more value to their customers or when they provide the same value to customers at a lower (Laudon & Laudon, 2013; Porter, 1985).

Competitive advantage can be measured using indicators such as quality, cost, delivery, safety, and morale (Ambarwati, 2020); exploitation of market opportunities and the neutralization of competitive threats (Sigalas, et al., 2013); the nine-dimension Competitive Advantage Provided by an Information Application (CAPITA) by Sethi and King (1994); differentiation, cost, innovation, growth, alliance (Rackoff, Wiseman, & Ullrich, 1985); and customer retention, profitability, sales growth, and return on investments (Bhatt & Grover, 2005).

2.2 IT capabilities

IT capabilities are the abilities to operate a firm's digital network of information to create, control, and execute inter-firm transactions, as well as the capacity to control IT-related costs, to deliver systems when required, and to affect firm objectives through IT implementation (Chen & Tsou, 2012; Rai & Tang, 2014)**.** Organizations with superior IT capabilities have an advantage over their competitors based on their ability to provide valid and timely information to manage efficiently and to make informed decisions (Akram, Goraya, Malik, & Aljarallah, 2018). Grounded on the theories developed within the RBV, it is suggested that an IT capability that presents the characteristics of rarity, appropriability, non-reproducibility, and non- substitutability can lead to a competitive advantage (Wade & Hulland, 2004).

Scholars have viewed IT capability from different dimensions. These includes IT strategy and IT structure (Bergeron, Raymond, & Rivard, 2004); IT human capabilities and IT infrastructure capabilities, IT planning capability, system development capability, and information systems operation capability (Fink, 2011; Ravichandran, Lertwongsatien, &

Lertwongsatien, 2005); IT infrastructure, IT business experience, IT relationship resources and IT human resources (Chen & Tsou, 2012); IT managerial capability, IT personnel capability and IT infrastructure capability (Kim, Shin, Kim, & Lee, 2011); IT infrastructure capability, IT business spanning capability, and IT proactive stance (Lu & Ramamurthy, 2011); value, competitive, and dynamic capabilities (Bhatt & Grover, 2005); Managerial IT capability, technical IT capability, and relational IT capability (Garrison, Wakefield, & Kim, 2015); and knowledge of technology applications and system development, knowledge of management of IT, access to IT knowledge and experience, experience in IT projects and in the management of IT (Basellier, et al., 2001).

IT infrastructure capability is a firm's ability to deploy shareable platforms and captures the extent to which the firm is good at managing data management services and architectures, network communication services, and application portfolio and services for the firm's specific information system applications (Bharadwaj, 2000; Broadbent, Weill, & St Clair, 1999; Laudon & Laudon, 2013). Flexible IT infrastructure reinforces information generation and distribution together, which in turn improves a firm's ability to compete in turbulent environments that lead to competitive advantage (Lyver & Lu, 2018).

IT human resources capabilities is an important component of the IT asset base as an organizational resource since firms can create value from IT resources with the support of corresponding human capital, by identifying potential employees, maintaining records on existing employees, and creating programs to develop employees' talents and skills. (Chen & Tsou, 2012; Laudon & Laudon, 2013; Lin, 2007). Firms that are focused on sustainable competitive advantage must emphasize attracting, developing, motivating, and retaining employees that can help achieve successful performance through achieving the firm's strategic objectives. Thus, the firm that has IT human resources capability with technical, business, and interpersonal skills will likely lead to successful sustainable competitive advantages (Wang, Liang, Zhong, Xue, & Xiao, 2012). As a technological tool, IT human resources capabilities is advocated as an opportunity for human resource professionals to become strategic partners with top management (Al-Shawabkeh, 2014).

IT knowledge management capabilities are the tangible and intangible organizational assets or resources, which enhance the generation, sharing, usage, protection of knowledge continuously, which enable enterprises to better manage processes for capturing and applying knowledge and expertise to attain competitive advantage (Corso, Martinib, Pellegrinib, Massac, & Testac, 2006; Laudon & Laudon, 2013). There are three major types of knowledge management systems, that is, enterprise-wide knowledge management systems, knowledge work systems, and intelligent techniques (Laudon & Laudon, 2013), and when an organization develops knowledge management into a distinctive competence, it is expected to work as a precursor to superior competitive advantage in the marketplace.

3.0 Theoretical Reviews

Several theories and perspectives have evolved to explain user adoption of new technologies and how they affect work processes. Similarly, other theories and perspectives have become useful in linking technology adoption with a competitive advantage. Below is a review of a few of such theories and perspectives.

The TAM explains the motivation of users by three factors; perceived usefulness perceived ease of use and attitude toward use. The goal of TAM is to predict information system adoption and identify design problems before users have experience with a system, and the model suggests that when users are presented with a new software package, several factors influence their decision about how and when they will use it. TAM states that users' adoption of information technology is dependent on their perceived ease of use and perceived usefulness of the technology. However, TAM has ignored the social influence on the adoption of technology, so it has limitations in being applied beyond the workplace. Besides, some variables as external variables need to be added to TAM to provide a more consistent prediction of system use (Taherdoost & Masrom, 2009; Taherdoost, Zamani, & Namayandeh, 2009).

The UTAUT was postulated by Venkatesh, et al., (2003**)** through a systematic review and consolidation of the constructs of earlier eight models: theory of reasonable action (TRA), technology acceptance model (TAM), motivational model (MM), the theory of planned behavior (TPB), technology acceptance model2 (TAM2), diffusion of innovations theory (DOI), social cognitive theory (SCT) and model of personal computer use. It aims to explain user intentions to use an information system and subsequent usage behavior, and is meant to serve as a comprehensive model that can be applied across a range of applications, and it has four key constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. However, the model has been criticized on the grounds of being overly complex, not being parsimonious in its approach, and its inability to explain individual behavior (Casey & Wilson-Evered, 2012; Van Raaij & Schepers, 2008).

The IT capability theory is the ability of an enterprise to mobilize and deploy IT-based resources in support of and for the improvement of business strategies and work processes (Bharadwaj, 2000). It suggests that the success of a firm relies on its ability to integrate, build, and reconfigure internal and external competencies to achieve new forms of competitive advantage. Thus, IT capability that presents the characteristics of rarity, appropriability, non-reproducibility, and non-substitutability can lead to a competitive advantage (Wade & Hulland, 2004).

One of the most widely used theoretical perspective in the relationship between information technology capabilities and competitive advantage and indeed in strategic management studies is the RBV (Abdelkader & Abed, 2016; Bhatt & Grover, 2005; Breznik, 2012; Fink, 2011; Gupta, Tan, Ee, & Phang, 2018). The RBV proposes that competitive advantages arise from developing and deploying unique, valuable, inimitable, and non-substitutable resources (Barney 1991; Wernerfelt, 1984). A firm can earn an above-normal return by identifying and acquiring resources that are critical to markets and are, hence, strategic, and in line with the RBV, such strategic resources are crucial components of sustainable competitive advantage. The RBV became a useful tool for exploring the value of IT and its relationship to firm performance and competitive advantage and thus many scholars have recognized the value of RBV in IT research (Wernerfelt, 1984). Applying Barney's VRIN framework can determine if a resource is a source of sustainable competitive advantage,

and, it is believed that IT as a resource can help firms obtain sustainable competitive advantage (Chi & Sun, 2015).

Although many scholars studied the relationship between IT and competitive advantage based on a variety of theories and perspectives, Chi and Sun (2015) proposes an integrated procedure model of how IT impacts a firm's competitive advantage.

4.0 Empirical Reviews

Predicated on the IT typology of Chen and Tsou (2012), as well as Basellier, et al., (2001), this section presents the review of studies conducted on the relationships between IT capabilities and competitive advantage.

4.1 IT infrastructure capabilities and competitive advantage

In a quantitative study that explored the direct influence of intangible IT resources on sustainable competitive advantages in the high-tech industry in Algeria, Makhloufi, Abu Al-Rejal and Mohtar (2018) discovered that IT infrastructure has a significant effect on sustainable competitive advantage. Similarly, Bhatt, Wang and Rodger (2017) examined the moderating effect of the learning intensity of organizations on the relationships between information systems and the competitive advantage of Chinese firms, by collecting data from 122 IT managers. The result indicates that flexible IT infrastructure has significant effects on competitive advantage. Furthermore, Lim and Trimi (2014) investigated, in a survey of a sample of 62 firms, the impact of IT infrastructure flexibility on the competitive advantage of small and medium-sized enterprises through multivariate analysis of covariance. The results showed that having a flexible IT infrastructure significantly and positively influences competitive advantage.

4.2 IT human resources capabilities and competitive advantage

In a cross-sectional survey to determine the influence of human resources information systems (HRIS) on the competitive advantage of firms listed on the Nairobi Securities Exchange, Kariuki, Obonyo, and Ogutu (2018) conducted a census of 62 firms and the data obtained from human resource managers of these firms was subjected to multiple regression analysis. The results showed that HRIS had a significant effect on competitive advantage. Similarly, in a survey on the impact of human resources information systems on the competitive advantage of cement companies in the Hashemite Kingdom of Jordan, Al-Rawashdeh and Al-Badainah (2017) collected data from 184 employees of these companies and subjected the data to multiple regression analysis. The results showed that human resources information systems have a significant effect on competitive advantage.

4.3 IT knowledge management capabilities and competitive advantage

In a survey of senior executives of 168 organizations from different industries in the central and western regions of China from a contact list in Wuhan Information Management Research Center, China, Mao, Liu, Zhang, and Deng (2016) assessed the moderating effects of resource commitment in the relationship between information technology resources, knowledge management, and competitive advantage. Through PLS-SEM discovered among others, that knowledge management capability positively related to competitive advantage. Similarly, Kiseli (2016) assessed the effects of knowledge management capabilities on the competitive advantage of five-star hotels in Nairobi,

Kenya, through a simple random sampling of 172 management staff of these hotels. Results of multiple regression analysis showed that knowledge management capabilities significantly affect competitive advantage.

5.0 Discussion and Propositions

Any enterprise that invests in and utilizes IT infrastructures such as hardware, software, service clusters, operating systems, internet platform, data storage and database management, networking and telecommunication platforms, would benefit in the long-run through cost, differentiation, and focus (Laudon & Laudon, 2013; Porter & Millar, 1985). Studies have shown that these infrastructures when fully deployed influence the attainment of competitive advantage significantly (Bhatt, et al., 2017; Lim & Trimi, 2014; Makhloufi, et al., 2018). Thus, it is proposed that:

P_1: IT infrastructure capabilities will significantly affect competitive advantage.

IT human resources capabilities are used in human resources administration, salary administration, leave and absence recording, performance appraisal, training and development, human resources planning, recruitment, career planning, and other human resources activities to reduce administrative costs, provide faster service to employees and help firms manage their workforce add value to the outcomes for the organization, and allows the human resources functions to become more efficient and provide better information for decision making (Kumar, 2012; Laudon & Laudon, 2013; Muriithi, Gachunga, & Mburugu, 2014). Kariuki, et al., (2018) and Al- Rawashdeh and Al-Badainah (2017) discovered that IT human resources capabilities have significant effects on competitive advantage. Thus, it is proposed that:

P_2: IT human resources capabilities will significantly affect competitive advantage.

Knowledge management capability is the ability to mobilize and deploy knowledge management –based resources in combination with other resources and capabilities, and organizations must develop knowledge management capabilities to help support a variety of important organizational operations and activities and enterprise knowledge management software includes sales of content management and portal licenses (Heisig, 2014; Laudon & Laudon, 2013). With knowledge management, managers find a systematic approach, understand and use knowledge to achieve organizational goals and by reducing the time and cost of testing and error create value, and is recognized as a major source of competitive advantage (Kiseli, 2016; Mao, et al., 2016; Nasimi, *et al*., 2013). Thus, it is proposed that:

P_3: IT knowledge management capabilities will significantly affect competitive advantage.

6.0 Findings

Based on the review of related literature, it was discovered that:

1. The RBV is the most widely-used theoretical underpinning in studies relating to IT capabilities and competitive advantage. Other theories are UTAUT, and the IT capability theory.

2. The three dimensions of IT capabilities, that is, IT infrastructure, IT human resources, and IT knowledge management had a significant relationship with competitive advantage

7.0 Theoretical and Managerial Implications

Based on the reviews of related literature, the study came up with some theoretical implications. First, the review confirms that several theories and models have been proposed to anchor researches in IT-related studies. These include the TAM, UTAUT, and the IT capability theory. Furthermore, in strategic management researches, the RBV was found to be the most widely used theoretical underpinning (Abdelkader & Abed, 2016; Bhatt & Grover, 2005; Breznik, 2012; Fink, 2011; Gupta, et al., 2018). However, Chi and Sun (2015) propose an integrated procedure model of how IT impacts a firm's competitive advantage. Beyond the theoretical implications of this review, there are important practical values. First of all empirical evidence showed that enterprises that invest and deploy IT resources would reap the benefits by gaining competitive advantage, and managers do have at their disposal game-changing tools in IT resources to out-perform the competition. Thus, investing in IT capabilities would increase the chances of success.

8.0 Conclusion and Policy Direction

Based on the reviews of relevant theories and perspectives that supported the link between IT capabilities and competitive advantage, it became apparent that technology adoption models, the IT capability theory as well as the RBV are very relevant to explaining the connections. Consequently, the findings from reviewed empirical studies also supported the notion expressed by many scholars that investment and deployment of IT resources such as infrastructure, human resources, and knowledge management do significantly affect the ability of enterprises to gain competitive advantage. Thus, as a policy, the management of enterprises should invest in IT infrastructures as well as in the training of employees on requisite IT knowledge to facilitate their work.

9.0 Recommendations

Based on the finding of the review, the following recommendations are advanced:

1. Scholars should consider combining two or more theories/perspectives, to exploit all the advantages inherent in the respective theories.
2. Managers of enterprises should ensure that those dimensions of IT capabilities are readily available to take advantage of the significant relationships observed.
3. Management should ensure that IT infrastructures are available and that employees are adequately trained on essential knowledge.

10.0 Contributions to theory, practice, and policy

The review was able to highlight the importance of investment in IT infrastructure, IT human resources, and IT knowledge management as well as training of employees to gain competitive advantage, and further confirmed the role of the RBV in strategic management research. These contributions provided policy direction to scholars and practitioners.

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