

Original Article

Analysis of IT Capability Impact on Organizational Performance

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Abstract - This paper explores and analyses IT capability in terms of organizational performance. IT capability (ITC) is often seen as one of a company's most valuable resources, and when correctly managed, it may help the organization perform efficiently. The paper deploys the ITC model as a lens to unpack how a mine can realize the value derived from information technology investments while Upper Echelon Theory (UET) is deployed to understand how leaders engage in business strategy and operational activities. The problem identified is that although IT capability is deemed necessary for increased organizational performance, its impact is often not well understood or appreciated within organizational leadership. Following an interpretive philosophy and inductive approach, this paper shows and argues that IT capability has an impact on performance when the investments in infrastructure and resources are aligned with the business strategy and the operational context of the organization. This paper conceptualizes an IT capability framework for enhanced organizational performance. The framework shows how to derive IT value from IT investments and resources.

Keywords - IT capability, Organizational performance, Leaders, Mine, Business strategy, IT-business strategic alignment, South Africa.

I. INTRODUCTION

Organizations are increasingly dependent on IT, as well as on their capability to effectively and efficiently integrate IT resources with other organizational activities. Clearly, the capability to build such linkages will have a substantial influence on overall organizational performance [1]. The linkage between IT capability and organizational performance has received a lot of attention [2][3][4][5]. Although numerous pieces of research have contributed to the understanding of the link between IT capability and organizational performance, several elements still remain unknown. Although some researchers argued that IT capabilities can influence organizational performance only through some mediator mechanism, such as skill management [6], some scholars found no direct link between them. They believed that IT capability

represents a mediating effect element between independent variables, such as IT investment and IT outsourcing [7]. Even though the concepts of ITC have been around for two decades, their implications remain uncertain. This paper explores and analyses ITC in terms of organizational performance with a focus on South African (SA) mines. This paper sought to conceptualize a framework that supports the mines to derive value from IT and improve organizational performance.

The use of ITC in most organizations involves investing heavily in IT. Meanwhile, mines make major investments in information systems (IS) and technologies. Additionally, the high and increasing expenditure on IT compels business leaders to consider the contribution of information technologies to organizational performance. Furthermore, it is important to manage how IT investment translates into better organizational results in light of the enormous and rising costs of IT [8]. Weill and Aral [9] state that the functions of the sector in which an organization is competing often dictate the type of IT needed, how it is implemented, and the magnitude of the value produced and maintained. The literature emphasizes that an organization's IT capability pays off if it is aligned with the specific context in which the organization functions and operates. The problem is that IT capability in every business setting is not well understood and recognized fully by business leaders within the SA mining industry, as observed. Subsequently, the mines then face obstacles and problems with the IT capability or value deriving from an IT investment.

A. South African Context

A substantial literature review on IT capability has been emphasized in strategic literature, but only in other organizational contexts. IT capability growth has not been clearly described specifically in the context of SA mines. South Africa is categorized as a developing country. Therefore, it may be anticipated that what works in other countries, especially in developed countries, may not work as expected in SA [10]. In South Africa, the mines typically consist of shallow mining operations with lower capital costs. The development and deployment of



technologies in the SA mines sector are driven by a variety of factors; for example, the growing actual cost of electricity, compliance with the environmental laws, and the fact that any technological solution needs to maintain the high level of available furnace [11]. Chapter 8 of the new Mine Health and Safety Act lays out requirements for the whole mining industry in SA to effectively have level 9 compliant systems in place for trackless mobile machinery (TMM), for which the deadline was initially set for June 2020 [12]. Level 9 has become the greatest level of safety and takes another step towards implementing an intervention engineering control measure, which automatically instructs the online control system of the machine to slow down or make an emergency or safety stop.

However, few mines are now running level 9 systems, while the remaining mines are yet to comply and are facing challenges concerning the capabilities they have in place. This study also examines the challenges that lie in the knowledge and skills of the mine leaders. Challenges are linked to the absence of understanding: on the one hand, organizational business leaders lack IT knowledge; and on the other hand, mine leaders do not recognize the main company and industry drivers. This is true in some areas where the implementation of ITC on the mine is misinterpreted. This becomes a challenge, therefore, because the purpose of ITC is to enable an organization to achieve its goals and be competitive.

B. Information Technology Capability

The concept of ITC was introduced by Ross et al. [13] and Bharadwaj [14]. They characterized ITC in relation to other sources and capabilities as regulating the effective use and deployment of IT resources. They identified ITC as the efficient usage, control, and deployment of IT resources, together with other resources and capacities. Lim et al. [15] have also discussed the function of senior IT managers in promoting the ITCs of their organizations. This paper examines UET to understand how leaders in the mines engage in business, strategic and operational activities to promote organizational performance.

The rest of this paper is organized as follows: the next section reviews the literature to determine what research has already been done on ITC. This is followed by a summary of the theoretical frameworks underpinning the study and the methodology used to explore the research problem, the research findings and their implications, and the paper's conclusion.

II. SURVEY OF SCHOLARSHIP

IT plays a significant role in the organization to make it possible for the organization to achieve its business goals. The study uses the term "IT capability" to distinguish it from other capability mechanisms. Scholars have been studying IT capability [16][17][18][19] for decades. The usage of the term IT capability varies. Some would argue and define it as the ability of IT to efficiently meet business needs and the key to turning an organization into

a profitable entity [20]. Bharadwaj [14] defined IT capability, in conjunction with other resources, as the capability to control the efficient use and deployment of IT-based resources. Furthermore, the researcher has noted that if organizations succeed in creating superior IT capabilities, they can enjoy the superior financial performance. This author argued that firm-specific IT resources, such as IT infrastructure, human IT resources, and IT-enabled intangibles, create enterprise-wide IT capabilities.

The influence of IT capability and organizational performance development have been examined in several papers. Bharadwaj [14] is referenced extensively in the study of significant linkages between IT capability and organizational performance. However, some studies did not find any significance between the linkages. Erkmén et al. [21] refer to the "role of innovative climate in the relationship between sustainable IT capability and firm performance". Their paper argues that sustainable IT capability makes a substantial contribution to organizational efficiency, both quantitatively and qualitatively, along with an innovative climate, with a moderating impact on the relationship between IT capability and firm performance. They found that the IT capabilities of both managerial and technical IT have a considerable impact on the performance of quantitative organizations. The results of that research do not suggest that the investment in human capital has a significant impact on quantitative effectiveness. It also determined that the qualitative outcomes for the firm are favorable for all elements of IT capability, such as IT management, technical IT, and human support. In conclusion, the resource-based approach explained that services such as IT capability are useful instruments for organizations.

Chae et al. [8] expanded on the work of Chae, Koh, and Prybutok [22] by examining how industry influences the linkage between IT capability and organizational performance. The study examined three industries: the automation, information, and transformation industries. Their findings showed that the impact of IT capability on firm performance varies by industry type. The researchers emphasized the important role of industry and concluded that it calls for more consideration of the setting in which IT is adopted and deployed.

This is why we have identified a gap in the literature on IT capability within the mining sector. This paper sought to fill this gap by conceptualizing a framework that can expand the knowledge of IT capability and subsequently provide the mines in the context of South Africa with a road map to derive value from IT. This paper contributes to ITC literature by proposing a comprehensive analysis of the mine's ITCs and, at the same time, analyzing the influence of ITCs on the mine's performance. As a result, the research will utilize the mine as a case study. This study's conclusion is critical to making the mine operate more efficiently and effectively. The significance of ITC is measured not only in terms of the

organization’s IT resources but also in terms of its IT business leaders with superior IT skills. IT executives who use their expertise to establish a superior and long-lasting ITC make a far greater contribution to their firms than those who establish an outstanding but short-lived ITC [15]. This study recognizes the use of ITC and the level at which mines can understand and realize their IT value.

III. THE THEORETICAL FRAMEWORK UNDERPINNING THE STUDY

A. IT Capability Model

The IT Capability Model is applicable to an organization’s ability to understand IT needs [23]. The framework uses IT to improve organizational performance and provide new IT-based solutions that are cost-effective [17]. The framework offers superior organizational roles for IT as well as further IT applications with technologically effective and long-term operations and maintenance. The IT Capability Model consists of the following dimensions:

- IT architecture – high-level map of the entire organization’s information and technology needs;
- IT infrastructure – exchange of software and data by way of communication networks;
- IT human resource – problem-solving skills, professional knowledge, etc.
- IT relationship resources – achieving collaboration and teamwork and negotiating excellence on all sides of the partnership, along with a significant mutual understanding of IT strengths and market needs.

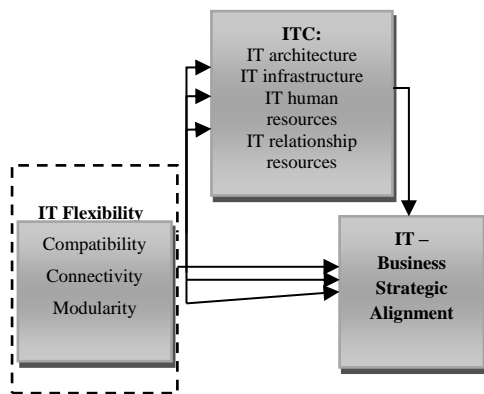


Fig 1. IT Capability Model [17]

B. Upper Echelon Theory (UET)

The UET has received a lot of attention in the IS adoption theory. The theoretical perspective of the theory is centered on the executive’s experiences, values, personality, educational qualifications, and behavior in relation to the organization’s outcomes [24]. Organizations are perceived according to what leaders think, experience, view, and believe on how to engage in business, and this influences the strategic and operational performance [25]. The qualities required from a leader to gain outstanding results include attributes such as being well-organized,

technical skills, professional expertise, and skills to manage complex situations within the organization [26]. UET offers great predictions of organizational outcomes in direct proportion to how much managerial discretion exists. UET is shown here below in Fig 2.

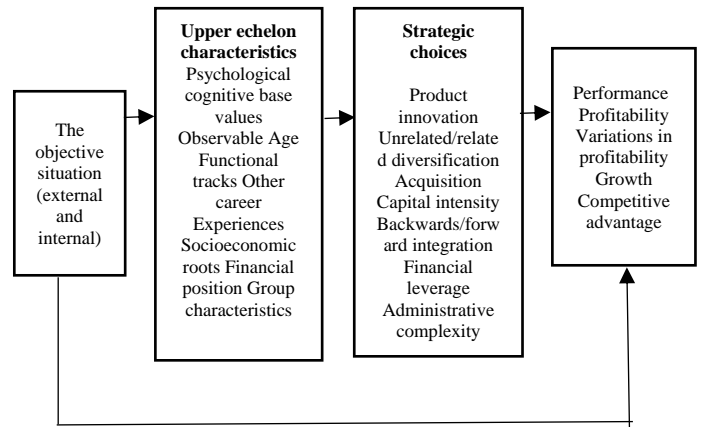


Fig 2. Upper Echelon Theory [24]

In this study, it will be interesting to understand how UET demographics (professionalism, educational background, and working experience) complement the IT capability of the business leaders in the mines.

IV. RESEARCH METHOD

This paper explores and analyses ITC in terms of organizational performance with a focus on South African (SA) mines. A case study research approach was used in the study. A case study approach is a research approach that is focused on an in-depth analysis of a particular person, organization, or event [27]. This study employed a case study of a mine with multiple case units (10 case units). The organization, Chrome Ore Mine, is the unit of analysis for this study. The research unit identifies “what” or “who” was analyzed. A mine in South Africa was the subject of the investigation: the organization, not the person, was the unit of analysis. Employees from multiple case units make up the average South African mining population. An IT unit was one of these units, and its objective is to supply technologies that allow the mine to function and operate effectively.

Purposeful sampling is the selection to “choose places, persons, or activities that supplied information relevant to the study questions” [28]. Purposeful sampling is ideal to obtain in-depth data for the study when the investigation attempts to extract deep-rooted knowledge from the participants about a topic [27].

Semi-structured interviews, observations, and lived experiences of stakeholders are qualitative research methodologies used to collect in-depth and extensive empirical information about the mine. The case study participants were chosen based on their knowledge, experience, and experience with the topic area. An open-ended questionnaire was applied, semi-structured face-to-face interviews were carried out at the organization’s location, and observations were used to collect data. The face-to-face, semi-structured interviews took 30 to 45 minutes and were audiotaped and then transcribed.

The open-ended questionnaire and the face-to-face interviews sought to address questions such as: how the organization does things (business operations), the challenges thereof, and how those could be remedied; how they use information technologies on daily in business units/operations; how the new systems get introduced and how they determine if a user is competent to use the systems; how the culture is imposed by the organization; the roles, years of experience, competencies, academic qualifications and leadership styles of the business leaders and the role they play in terms of achieving the goals, objectives, and mandates of the organization.

The study’s research design was organized around thematic semi-structured questions that were guided by the study purpose and the underpinning conceptual elements of the research framework. The approach was also used to analyze, discuss and describe the researcher’s data gathering in detailed data sets [29].

To this end, this study sought to conceptualize a framework that supports the mines to derive value from IT and improve organizational performance.

V. CONCEPTUAL RESEARCH FRAMEWORK

The case study was used to explore and analyze IT capability in terms of organizational performance with the goal to conceptualize a framework that supports the mines to derive value from IT and improve organizational performance. The data were analyzed using a thematic approach. Figure 3 depicts the extracted elements of the conceptual research framework.

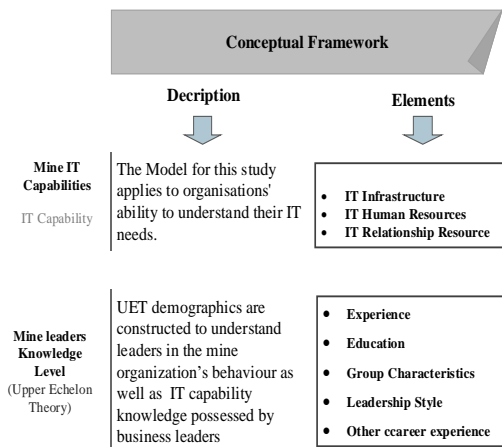


Fig. 3 Conceptualised IT capability framework

Informed by the empirical evidence, the next section provides and discusses the elements of the conceptualized IT capability framework. Findings from the interviews are articulated and discussed.

VI. DISCUSSION OF FINDINGS

While organizations are investing heavily in IT, some are unsure of the benefits they should derive from IT for increased organizational performance. What the empirical

evidence shows is that IT capability is a phenomenon not well understood within the mine. To simplify this concept, we had to explore this in terms of the business processes and how information technologies enabled the organization. We looked at who does what and how they do it within their multiple business units while looking at what the organization does as a business.

A. IT Capability Model

a) IT Infrastructure

Byrd and Turner [30] describe IT infrastructure as the capability to support a diverse range of hardware, software, communications technology, data, core applications, skills and competencies, commitments, and values within the present IT infrastructure’s technical and physical base. The evidence suggests that the organization does not utilize ITCs to their full potential. This has been shown to be true, as business units have various systems and the systems operate in silos, while other systems have the capability to integrate. System support exists; however, service to all sections of the mine is hampered by staff shortages. Some functions still run manually, such as contract management. However, IT is utilized 100 percent throughout the organization for the daily running of all business units.

Literature highlights the common knowledge that collaboration in an organization generates information synergy. Information synergy relates to the pooling of resources in a business in which persons or business units work together and use IT across roles or subunits [31]. The findings and literature concur as they show that ITCs align organizations for collaboration and thus produce more information synergy. This means that the systems in various units need to collaborate – rather than running in silos – for the organization to benefit from the value of IT. Greater collaboration produces more information synergy, which influences organizational performance. ITC is characterized as assisting organizational activities and work processes and as pooling other vital resources [32]. The study stresses that ITC should be enhanced for the organization to stay competitive and for business units to work together using IT across subunits.

b) IT Human Resources

IT human resources (HR) in this study are classified as the knowledge transfer, skills, and technical capability of an organization. The ability to carry out procedures efficiently that suit a given workplace is necessary for performing work that is crucial for an organization. Mentoring, training, and practice can provide the requisite skills. An IT employee who can solve business difficulties without fail – and handle IT possibilities – is a vital human asset for every organization today. As the significance of IT develops in organizations, the skills of an IT team become imperative. Empirical evidence indicates the need for a proper training matrix for all employees. An individual development plan (IDP) should be in place, whereby an employee sits with his or her supervisor for the outlining of training and competency that aligns with the employee’s role. Although participants showed some

understanding of the need for an IDP, some findings point to the lack of a change-management system when a new application is introduced to the organization. Training and assessments are needed to establish whether the user is competent.

Chinho and Hsu [33] consider the firm's most important resources to be knowledge and expertise. Many experts state that HR is the main contributor to excellent corporate performance [34][35]. Therefore, the study argues that from a change-management perspective, the mine needs to consider its staff when introducing a new system or upgrading existing versions. That is, there is a need to train employees and to improve their competence, not just as a matter of procedure, but to make them aware that their knowledge and expertise contribute to excellent organizational performance.

c) *IT Relationship Resource*

The inevitable linkage between IT and the organizational units is explained by the IT relationship resource. The information must be delivered and exchanged across various technological platforms in the organization. Knowledge sharing in the organization is done via memos, emails, procedures, and policies in place, as shown in the results. Compatibility is regarded as the capability to distribute information throughout the company [36]. The IT infrastructure may also remain compatible. This is achievable since the company is able to share information on any kind of technology platform. The degree of communication throughout the whole organization is significantly increased thereby, facilitating the provision of information at rapid speed for users throughout the organization. Consequently, our findings suggest that relationships play a crucial role in ITC.

B. *Upper Echelon Theory*

a) *Experience, Education, Group Characteristics, Leadership, and Other Career Experiences*

According to UET [24], leaders' characteristics and behaviors are linked to the organization's performance. For this reason, we used the UET theory to look at the outcomes and processes of key decision-makers in an organization. These are determined by their life experience, education, leadership styles, and beliefs. Mining organizations operate and manage their business in a market sector that has to abide by government policy and regulations. The mine leaders are legal appointees in accordance with the Health and Safety Act, and other appointees must also be authorized and qualified.

The organization has a well-structured organizational leadership; however, the business leadership and the IT leadership appear to be in conflict over prioritization and decision making. The findings stress that other business units should focus on capabilities that they are good at and not on what they are not good at. For example, the mining business unit should focus on the production underground and leave the technological services to be rendered by the IT business unit. IT will be able to source the best

application to efficiently interact with the internal applications in place.

Participants see the failure to work together toward a common objective or to realize how they complement one another because the multiple business units' systems are not connected as a key issue. In terms of operations and applications, the various units do not appear to know what their objectives are technological. The multiple units have leaders with various leadership styles. There is a lack of skills and not enough years of leadership experience across different departments. The evidence indicates that such failures might negatively influence the performance of the organization. Too much management mobility (joining and leaving the organization) also leads to unstable leadership. This does have a negative impact on organizational performance. The paper argues that a certain IT capability cannot provide work efficiency on its own, as people in the company eventually choose how this technology is designed and used to deliver organizational performance. Social factors, such as human resources, infrastructure, relationship resources, and leadership, are favorable when the benefits of IT capability are recognized, supported, and sought in the organization.

VII. CONCLUSION

This paper analyzed IT capability and showed its impact on organizational performance. The paper concludes that IT capability impacts organizational performance when human resources, infrastructure, stakeholder relationships, leadership styles, and contextualized experience are aligned. Leadership style significantly affects the IT capability impact on organizational performance. IT capability is realized when there are appropriate investments in infrastructure, leadership, and resources. The IT strategy ought to be aligned with the business strategy and the operational context of the organization. The conceptual framework given in this paper suggests that IT value is derived when there is an integration of appropriate competencies, skills, leadership, experience, infrastructure, human resources, and stakeholder relationships. That is how IT capability impacts organizational performance.

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