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The impact of healthcare informatics competencies on dynamic capabilities: A multilevel study of paramedic services

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KEYWORDS

Healthcare informatics competencies;
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Abstract

Objectives: Despite the importance placed on technology in healthcare, there is a lack of studies that link technology-related skillsets of healthcare professionals to the ability of an organization to innovate. This research investigates the role of Healthcare Informatics Competencies (HICs) of front-line healthcare workers for the ability of their healthcare organizations to innovate. This research employs a multilevel perspective, nesting paramedics within their respective services, and measuring the impact of group-level HICs on Dynamic Capabilities.

Methods: Data from Canadian paramedic services ($n = 43$) and paramedics ($n = 502$) was analyzed. Exploratory Factor Analysis (EFA) was used to detect factors from the competency models, which were then aggregated to the group level. Partial Least Squares (PLS) was used to measure the impact of group-level competency on organization-level dynamic capabilities, specifically sensing, learning, integrating and coordinating capabilities.

Results: Three factors emerged from the paramedic competency data, labeled “Technology Application Competencies” (TAC), “Information Processing Competencies” (IPC), and “Understanding of the Workings of Technology” (UWT). At the group-level, TAC significantly impacted learning, integrating and coordinating capabilities, and UWT impacted sensing and coordinating capabilities.

Conclusions: Results suggest that paramedics who possess an understanding of technology and where it can be applied in a paramedicine context contribute to the innovativeness of their paramedic services. This research underlines the importance of HICs as an organizational

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resource in both paramedicine and healthcare, and draws attention to their importance to policy makers. This study also advances the use of HICs as part of an evidence-based approach to studying technology adoption in healthcare.

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Introduction

Many forces are compelling leaders in paramedicine to embrace innovation, so that they can contribute to the improvement of healthcare system level performance, positively impacting the health and well-being of the citizens they serve. For example, a common goal for paramedic organizations is the reduction of the use of emergency healthcare resources, such as 911 calls and emergency transports, by diverting patients to non-emergency healthcare resources through home care, community referrals and other strategies [1,2]. This shift towards a more innovative focus compels paramedic organizations to adopt more technology, as well the paramedics that serve within them [3,4]. This presents challenges to paramedic leaders, technology designers, and policy makers in ensuring that organizations can successfully adopt the right technologies, ensure their paramedics can use them in an appropriate manner, and remain effective at pursuing their strategic goals. As a technology-related skillset is not typically a core part of the paramedic scope of practice, this also brings into question the importance of technological skills for the paramedic, as well as identifying what skills in particular will facilitate innovation in the organization.

The purpose of this paper is to explore the influence of paramedic's technology-related knowledge and skills on the ability of their paramedic services to innovate. Two theoretical perspectives will be employed in this research. First, the Dynamic Capabilities (DC) approach is used here to capture the organizational processes associated with sensing environmental changes and reacting to these changes by reconfiguring internal resources [7,8]. Second, Health Informatics Competencies (HICs) are used here to measure a broad perspective of technology knowledge and skills in paramedics [5,6]. This research integrates the individual and organizational theoretical perspectives by employing a multilevel theoretical model, nesting individual paramedics within their paramedic service groups.

Theoretical perspectives

Two theoretical approaches can assist in the purpose of this research. First, the Dynamic Capabilities (DC) approach focuses on organizational processes the organization to reconfigure resources to address changing forces in the environment, and their contribution to performance [8]. Although this approach is not widely used in healthcare service research, DCs are seen as important and necessary for innovation to take place [9], and the contribution of technology to the ability of organizations to address environmental challenges through change has been known [10]. Second, the Competencies approach [5] entails the

evaluation of employees based on skills and knowledge needed to occupy a defined role. This approach has been applied for the use of informatics in healthcare, referred to as Healthcare Informatics Competencies (HICs), most famously for nursing [6]. HICs are promoted as a component of evidence-based practice [11], as well as an important condition for effective organizational adoption and use of technology in healthcare [12,13]. Despite this, there is a lack of evidence of the influence of HICs on the organization in a context where innovation and the use of technology is so important, and a lack of evidence of their importance within paramedicine in particular [3,4].

Dynamic capabilities

DCs refer specifically to capabilities of a firm to reallocate their resources in order to match changes in their environment, for the purpose of maintaining superior performance in the long-term [8]. It is an extension of the Resource Based View (RBV) of the firm, which explains the performance of a firm as originating from the unique resources possessed by that firm [14]. Capabilities, which refer to a wide variety of organizational routines that are necessary to properly use the firm resources, are also unique, and must be effective to achieve high performance [15]. DCs in particular capture the firm's ability to sense changes in the environment, to develop new strategies to respond to these changes, and to reconfigure firm resources as needed [7]. DCs therefore can be thought of as the routines whose purpose are to adjust the operational capabilities, which refer to the day-to-day processes that directly create value for the firm [7].

Although small in number, the studies that have sought to explore DCs in healthcare have largely employed an interpretive approach, resulting in rich narrative of DCs, how DCs are developed, and other context-specific descriptions. Singh et al. [16] explored the role of technology in developing the ability to transform a home healthcare company, noting that DCs are developed through employees' ability to sense the value in technology by appraising it against existing processes. Davison and Hylund [17] demonstrated that the ability to share and integrate knowledge contributing to patient needs among staff contributes to the ability of a palliative care unit to innovate. Ridder et al. [18] identify that change is facilitated by ability for employees to accept innovations, availability of resources specifically to support change, and the creation of organizational processes for the purpose of changing and sharing knowledge.

Although several conceptualizations of DCs exist, a framework to be adapted in this research is outlined in Pavlou and El Sawy [19]. This conceptualization of DCs is comprised of the following four dimensions. *Sensing*

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