The Role of Information Technology Capability and Innovative Capability: An Empirical Analysis of Knowledge Management in Healthcare

Christie Hui-chuan Chen and Tammy Cates
College of Business and Global Affairs, University of Tennessee at Martin, Tennessee
hchen38@utm.edu; tcates@utm.edu

[Abstract] The majority of existing research studies of long-term care sectors has focused on reducing deficiencies and improving quality. The objective of this current study is to investigate how information technology capability affects innovative capability and knowledge management in the long-term healthcare sector. Our findings indicate that IT and innovative capabilities are associated with facilities’ knowledge management capability in the U.S. long-term care sector. Hence, the success of healthcare depends critically on the utilization of information technology capability and innovative capability to collect, analyze, and exchange knowledge within and across organizational boundaries.

[Keywords] Information technology capability, innovative capability, knowledge management, healthcare, healthcare information technology

Introduction
Strategic management of organizations depends on the development of distinctive competencies to improve performance over competing organizations and to serve customers. The ability to improve operations across all functions creates competency that leads to long-term survival and success. Information technology (IT) capabilities reflect the ability to support all parts of the organization while improving connectedness to the supply chain. Research seeks to determine the improvements that technology brings to various organizations. Melville et al. (2004) suggested that a broader approach was needed to conceptualize the value of IT in improving business efficiency and effectiveness. Notably, the value that IT adds to businesses continues to be the focus of upper-level managers within organizations. A broad list of approaches has specified the processes by which value is added to businesses via IT and the impact of this value on organizations. These approaches include the contributions of IT to organizational performance (Luftman et al., 2017), to internal managerial practices (Dalkir & Beaulieu, 2017), to competitive pressure (Oyemomi et al., 2016), and to supplier and customer collaboration (Liu et al., 2016).

Recently, the federal government, insurers, and employers have increased pressure for healthcare providers to be more efficient and effective in their operations. These cost pressures have led to strong competition among the various providers. Administrators and providers are looking to information technology to assist in providing better care at lower costs. New information technologies allowed healthcare providers to search for ways to improve the quality of care and operational efficiency (Bose, 2003). Thus, increased efficiency has allowed decision makers to reduce insurance premiums while finding the best utilization of resources for patient care. As service organizations, healthcare entities utilize health information technology (HIT) to improve both the quality and efficiency of decision making (Chaudhry et al., 2006). The exponential growth of available data and rapid changes in healthcare technology offer
substantial opportunities in IT. To ensure that the organization purchases the information technology which fosters the best overall value, a sustainable strategy is needed to match the organization’s needs to the IT system’s capabilities, along with a plan to maintain evaluation of the IT capability (Leung, 2012).

Therefore, top management is responsible for altering the norms and culture as a means of encouraging and influencing members to adapt to innovative technology (Chen & Prater, 2014). Earlier, García Morales and Lloréns Montes (2006) studied organizational innovation which revealed that innovative firms not only respond to the environment but also create it. Such innovative behavior is achieved by taking a proactive attitude of bringing together teams of innovative members while building on the firm’s innovative capability. The concept of firm innovativeness refers to cooperation within the firm’s environment to promote and support novel ideas. When organizations practice an innovation-based strategy to obtain specific capabilities, such behavior distinguishes these firms from their competitors via timely, appropriate reactions to variability in the environment. Therefore, innovative capabilities often lead an organization to increase performance (Ferraris et al., 2017).

The sum of the knowledge available within an organization should develop competency through IT capability and innovative capability. The integrated nature of the entire knowledge management capabilities may impact organizational performance. In fact, knowledge management capability is associated with knowledge acquisition, knowledge conversion, knowledge application, and knowledge protection (Gold et al., 2001). Typically, firms seeking to enhance their overall capabilities should first decide on necessary applications, then move to decisions about infrastructure and other required processes in support of the specific application (e.g., how knowledge will be acquired, converted and protected). Focusing on individual knowledge processes provides a more fundamental understanding of a firm’s knowledge management capability while enhancing management decision-making at the resource level (Mills & Smith, 2011). Thus, HIT cannot function well as an independent entity. Rather, it is a collaboration among physicians, nurses, administrators, and other staff members using their complementary skills to determine whether HIT can be successfully adopted by a group of healthcare organizations. For health administrators, fostering a collaborative culture among staff members is essential when adopting HIT (Leung, 2012). As such, the involvement of each stakeholder is essential for the HIT to develop its full potential, and to encourage the maximum contribution of the competitive posture of the organization.

Most of the previous research studies of long-term care sectors has focused on reducing deficiencies and improving quality (Chesteen et al., 2005). This current study provides a different view of the innovative aspect of implementing information technology in the long-term care setting. The environment of nursing home care has been defined as “low-tech” and high personal contact (Lenard & Shimshak, 2009). Therefore, assessing how nursing facilities increase their investment and implementation of information technology across facilities will be a major challenge. The objective of this current study is to investigate how information technology capability affects innovative capability and knowledge management in the long-term healthcare sector. The US healthcare industry is increasingly becoming an integrated, knowledge-based community connecting hospitals, clinics, pharmacies, insurance, and customers for sharing knowledge, reducing administrative costs and improving the quality of care. Based on the strategic objectives of an organization, knowledge management should identify, capture, structure, and share information to help nursing facilities offer better service, thereby enabling the organization to achieve competitive advantages. Hence, the success of healthcare depends critically on the utilization of information
technology capability and innovative capability to collect, analyze, and exchange knowledge within and across organizational boundaries.

**Literature Review and Hypotheses**

Figure 1 provides the research model for this present study. The literature review and research hypotheses for our current study include an evaluation of the theory based on causal relationships among IT capability, Innovative capability, along with Knowledge management in both Information & data as well as Analysis & usage.

![Research framework diagram](image)

*Figure 1. Research framework*

**Information Technology Capability**

Information technology capability was derived from a resource-based perspective; however, the resource-based view involves a very broad view of assets, knowledge, capabilities, and organizational processes into tangible, intangible, and personnel-based resources (Grant, 1991). Information technology capability is defined as the “ability to mobilize and deploy IT-based resources in combination or co-present with other resource and capabilities” (Bharadwaj, 2000, p. 171). Thus, IT capability can be classified into physical IT infrastructure; human IT in technical and managerial skills; and intangible IT in knowledge assets (Grant, 1991, Mill and Smith, 2011). Moreover, Lu and Ramamurthy (2011) conceptualized three different dimensions of IT capabilities: (1) IT infrastructure capability, (2) IT business spanning capability, and (3) IT proactive stance. Firstly, IT infrastructure capability is the firm’s ability to share and manage data, services, network, and applications. Second, IT business spanning capability is the firm’s ability to maintain and advance business objectives by foreseeing and exploiting IT resources. Thirdly, an IT proactive stance is the firm’s ability to develop IT innovation and seek new opportunities to enhance IT effectiveness. Lu and Ramamurthy further stated that IT capability provided a joint effect on spending resources regarding agility in operational adjustments. In other words, more IT spending or investing in operational agility tends to enhance and foster IT capabilities.
A firm’s technology may seem like a simple “make versus buy” decision; however, at a deeper level, sourcing activities reveal its preference for combining internal and external sources of new and existing knowledge. When aggregating each technology sourcing decision up to the firm level, however, upper management must decide on how to balance internal and external technology sourcing simultaneously. The critical issue lies within the managers’ decisions regarding the preferred focus on internal versus external technology sourcing, and how this balance is dynamically adjusted considering changing conditions and the resources and capabilities available during a particular time frame. The capacity to do so is captured by our understanding of ambidexterity as a firm’s ability to simultaneously balance different activities in a trade-off situation (Rothaermel & Alexandre, 2009).

Many studies have shown that IT investments have significantly improved the productivity and quality (Chen and Prater, 2013; Sher and Lee, 2004). Moreover, several studies have investigated the case for IT and quality. In fact, one major outcome of HIT on the quality of care arises in increasing observance of guidelines or protocol-based care (Chaudhry et al., 2006). Specifically, the nursing home industry reports Medicare and Medicaid financial information and quality indicators to speed up the reimbursement processes. When environmental changes are more predictable, firms tend to devote resources to technology internally. In an earlier study, Devaraj and Kohli (2000) noted that investing in technology for business process re-engineering supports the long-term performance of hospitals. Such re-engineering efforts may relate to all aspects of the organization, including human resources and patient quality improvements. Furthermore, Chaudhry et al., (2006) confirm that higher investment in technology compared to similar location and size of other competitors will improve the facilities’ performance. Conversely, Lu and Ramamurthy (2011) argue that investment in IT may hinder organizational performance and that IT capability requires support to avoid such negative effects. They maintain that significant investment in IT might not necessarily improve agility especially when such investments are not focused on fostering and increasing IT capability. However, they noted that wise IT investment successfully improves and strengthens critical IT capabilities.

**Innovative Capability**

The innovative capability is defined as the ability of the firm to develop new products and markets, through aligning an innovative strategic orientation with innovative behaviors and processes (Wang and Ahmed, 2007). The concept of innovative capability is multidimensional; specifically, these dimensions have been studied by numerous researchers regarding new products or services (Daneels, 2002), planning strategic marketing technology (Capon et al., 1992), and enhancing R&D of pharmaceutical firms (E’Este, 2002). Other studies (e.g., Delmas 1999; Lazonick & Prencipe 2005) also reveal that in several industries, the innovative capability is a critical factor in the firms’ evolution and survival considering external competition and change. Thus, the more innovative a firm is, the more it possesses dynamic capabilities.

As in many matters of management practice, Drucker (1954) was one of the first to call for research into the importance of innovation. The concept of innovation involves the degree to which an individual (in a social system) adopts something new (Calantone et al., 2002). While this focuses on an individual, Hurley and Hult (1998) discussed the organizational perspective of openness to new ideas as an aspect of a firm’s culture. The concept of firm innovativeness includes two areas: 1) the rate of adoption of innovation by the firm, and 2) the firm’s willingness to change. The standard classification of innovation delineates between
incremental versus radical paths (Dewar & Subramaniam & Youndt, 2005). Incremental innovation is a continuous path of improving and refining the firm’s existing products, services or technologies. Conversely, radical innovation represents a non-continuous path involving the major transformation of current products, services or technologies.

Changes in technology within product and service innovation was first studied by Comanor (1965) in the pharmaceutical industry to determine the effect of a firm’s long-term financial performance. Organizations implement useful ideas to create innovative capabilities; furthermore, firms often acquire innovation through adaptation of products or processes via external organizations. Government regulation or intervention in markets may act as an enhancer (e.g., patents for chemicals and pharmaceutical industries), or as an inhibitor of innovation in protected markets (Holloman, 1979). As a method of supporting higher long-run performance, Teece (2007) noted that invention, innovation, and manufacturing capability could enhance enterprise performance and encourage higher profits. The sourcing of technology related to organizational and technological boundaries involve two important delineations (Rothaermel & Alexandre, 2009). These delineations are (1) sourcing of known versus new technology, and (2) internal versus external sources of technology. Typically, the information technology capability within the firm assists the organization to become more innovative. Thus, we propose:

Hypothesis 1: Information technology capability is related to innovative capability.

**Knowledge Management Capability**

A model of knowledge management has been proposed by Gold et al. (2001). Gold et al. theorized knowledge management capabilities as multidimensional concepts that incorporate a process perspective focused on a set of activities. Knowledge process capabilities and an infrastructure perspective should focus on enablers (i.e., knowledge infrastructure capabilities). These, in turn, are composed of multiple dimensions: knowledge infrastructural capability comprises technology, organizational culture, and structure while knowledge process capability is made up of knowledge acquisition, knowledge conversion, knowledge application, and knowledge protection (Mills & Smith, 2011). In an earlier study, Jensen and Meckling (1995) defined specific knowledge as knowledge that is expensive to transfer among agents, whereas general knowledge is inexpensive to convey. Due to its high transfer costs, obtaining specific knowledge for decision-making involves decentralizing many decision rights. Such allocation, in turn, creates two issues: the rights assignment issue (determining who should exercise a decision right), and the control or agency issue (how to confirm that self-interested decision agents implement their rights in a way that contributes to the organizational goal).

The main distinction between information management and knowledge management is that the content of each is different; specifically, knowledge management is less structured and utilizes informal problem-solving expertise and experience rather than being limited to automated processing and data manipulation as seen in information management (Bose, 2003). Development of knowledge management includes (1) careful identification of the target user community and its needs, (2) meta information that defines the types of information to be included and how they will be categorized and summarized, and (3) administrative tools providing quality control and high availability. The commonly used terms of information and knowledge build on each other conceptually. In general, accumulation of transactional data into a
meaningful context produces information. Next, moving this information to a higher level is characterized by knowledge. Knowledge is gained through managing information effectively and efficiently through proper cataloging and structuring the data. Finally, the highest level of knowledge is gained by processing the information on a timely basis and giving access to the right decision makers (Bose, 2002).

The technology component of knowledge infrastructure is the information technology (IT) system that encourages the integration of information and knowledge in the firm, as well as the creation, transfer, storage, and security of the knowledge resources. Nevertheless, the links between information technologies and measures of organizational performance have not been found in research. The research efforts have not demonstrated whether IT is directly related to performance (Powell & Dent-Micallef, 1997); IT alone does not improve organizational performance, but once IT is combined with human and business assets, organizational performance was enhanced. Teece (2007) noted that an absence of an association between technology and performance could be due to the technology being copied by other firms, making it a short-lived competitive advantage. Although technology infrastructure is not directly related to organizational performance, it enables other knowledge resources (e.g., knowledge acquisition and knowledge application processes) to enhance organizational performance (Mills & Smith, 2011). The infrastructure of a well-designed knowledge management system facilitates creation and management of e-business knowledge that improves back-office efficiency, provides greater customer intimacy, and encourages flexible adaptation to market changes. Specifically, the volatility of the current healthcare environment forces health organizations to invest in knowledge management and establish processes and infrastructure necessary to create and manage e-health knowledge (Bose, 2002). Therefore, we propose:

Hypothesis 2: Information technology capability is related to knowledge management of information and data.

Big data may help with some of the required knowledge dissemination. As an example, physicians struggle to treat a reasonable number of patients and remain current with the latest and best evidence to guide their clinical practice. Digitization of medical literature improves access, but the sheer number of studies and their inherent differences regarding findings makes it difficult to apply the research into practice. Even if clinicians obtained all the relevant evidence and guidelines, sorting through that information is time-consuming (Leung, 2012). Certainly, treating a patient with multiple illnesses is even more complicated. The big data approach differs from traditional decision support tools in that suggestions are drawn from real-time patient data analysis, rather than solely using rule-based decision trees. For example, longitudinal diagnostic data have been shown to predict a patient’s risk of a future diagnosis of domestic abuse (Murdoch & Detsky, 2013). Moreover, data-driven analysis with clinical decision support tools could also lead to cost savings and help with appropriate standardization of care. Hence, we propose:

Hypothesis 3: Information technology capability is related to knowledge management in analysis and usage.

Organizations create value by applying knowledge of their products and services by different means. Similarly, Mill and Smith (2011, pp. 160) stated that: “knowledge application means making knowledge more active and relevant for the firm in creating value.” Knowledge creation can be accomplished by
repackaging available knowledge, training and encouraging employees to think creatively. Furthermore, employees must demonstrate an understanding of the processes, products, and services offered by the facility. Ideally, organizations support organizational learning among groups or individuals as a way of developing knowledge in new product ideas, thereby leading to improved speed to market and innovation (Daneels, 2002). Mill and Smith stated that knowledge management capabilities had been found to affect innovation and organizational effectiveness. For example, a firm’s knowledge boundary determines the general direction of the innovative process. The main consideration is whether to use incremental innovation currently within the firm or to seek radical new technology. Although the incremental approach uses existing technology, the methods or materials used can still show discernable improvements. In fact, the pharmaceutical industry’s attempts to incorporate biotechnology, a radical process innovation, into their methods of drug discovery and development serve as a good example (Rothaermel & Alexandre, 2009).

Institutionalization of the firm’s capability to preserve knowledge and the mechanisms to maintain this status quo are visible in its organizational capital. Organizational capital is exemplified by manuals, databases, patents, and licenses to solidify and preserve the knowledge bases with structures, processes, and routines that encourage repeated use of the knowledge (Subramaniam & Youndt, 2005). Moreover, when healthcare becomes more innovative by implementing its healthcare information system as a collection of firm’s information and data, the healthcare provider can potentially become a driving force in system-wide reconfiguration by encouraging reformulation of policies, reorganization of staff, etc. Through applying the data and information from the HIT, administrators may apply the knowledge to improve organizational routines and practices (Leung, 2012). Based on the organizational capital of information and data, it is believed that the firm’s prevailing knowledge reinforces prevailing knowledge and influences its incremental innovative capabilities. As such, we propose:

Hypothesis 4: Innovative capability is related to knowledge management in information and data.

Hypothesis 5: Innovative capability is related to knowledge management in analysis and usage.

Research Methodology

Data Collection and Factor Analysis

All measurement items were obtained from previous test questionnaires; therefore, no newly developed scales were used for this study. The research model and survey items were evaluated and approved by operations management faculty and other management professors. The questionnaires were also examined by seven administrators of skilled nursing facilities to ensure face validity. A few minor changes in wording were done to better align with the healthcare - nursing home sector. 1,500 surveys were sent out via US Mail to the administrators of skilled nursing facilities which receive Medicare and Medicaid reimbursement. Therefore, individual skilled nursing facilities are the unit of analysis for this study; as such, the unit of analysis is at the firm-level. The survey items reflect information technology capability, innovative capability, knowledge management in information and data, and knowledge management in analysis and usage.

We received a total of 264 surveys. Some surveys were excluded from the analysis due to one or more of the following reasons: incorrect mailing address, administrator’s unwillingness to share information, and
missing more than 20% of the survey items. Additionally, we omitted the surveys received from facilities with less than 30 beds due to staffing characteristics with low signal-to-noise ratios which should not be included in the analysis (Castle & Engberg, 2008). A total of 199 valid surveys were received from for-profit SNF administrators, and 44 valid surveys were received from not-for-profit SNFs’ administrators. Thus, 243 valid surveys were included in the final data analysis representing a response rate of approximately 16.2%.

**Non-respondent Bias**

Non-respondent bias was tested by examining the differences in organizational status (for-profit and not-for-profit status), as well as differences in the size of nursing facilities between responding and non-responding facilities. The nursing home ownership characteristic (For-Profit and Not-For-Profit) was applied and results indicated ($\chi^2 = 2.28$, $d.f. = 2$, $p = 0.32$) no significant difference between respondents and non-respondents. Moreover, the number of beds was tested with Chi-square test statistic. The output ($\chi^2 = 0.71$, $d.f. = 2$, $p = 0.701$) revealed a value that is not significant. Thus, the difference in response rate related to size (i.e., the number of beds) is not significant.

**Validity Measurements**

Cronbach’s coefficient alpha and composite reliability (CR) for four scale constructs were tested for scale reliability. The Cronbach’s alpha (CA) values for information technology capability, innovative capability, knowledge management in information and data, and knowledge management in analysis and usage are 0.833, 0.726, 0.777, and 0.742, respectively. Cronbach’s reliability test is often applied to inspect the fit of multiple items to measure for one underlying construct. The general guideline for Cronbach’s alpha is defined as a minimum of 0.6 in the lower limit for reliability (Nunnally, 1978). Factor analysis was examined to reduce item responses to a score for each of the four construct dimensions. Principle component analysis was applied to summarize the original data into a range of scores. All composite reliability values are between 0.900 and 0.845, indicating acceptable reliability as these values exceed 0.70. Please see Table 1 for Measurement scales and loadings.
Table 1

*Measurement scales and loadings*

**IT capability**: (AVE=0.749 /CR= 0.9 /CA=0.833)

<table>
<thead>
<tr>
<th>Factor Loading</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT is comprehensively constructed in organization</td>
<td>0.868</td>
</tr>
<tr>
<td>Members in organization apply IT to search and use current organizational knowledge</td>
<td>0.867</td>
</tr>
<tr>
<td>IT is comprehensively utilized by members in our organization</td>
<td>0.861</td>
</tr>
</tbody>
</table>

Source: Sher and Lee (2004)

**Innovative capability**: (AVE=0.646 /CR=0.845 /CA=0.726)

<table>
<thead>
<tr>
<th>Source</th>
<th>Loading</th>
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<tbody>
<tr>
<td>During the past five years, our company has developed much new management approaches</td>
<td>0.813</td>
</tr>
<tr>
<td>We are continually introducing new service offerings</td>
<td>0.802</td>
</tr>
<tr>
<td>We are constantly improving our business processes</td>
<td>0.795</td>
</tr>
</tbody>
</table>

**Knowledge management in Information and Data**: (AVE=0.692 /CR=0.871 /CA=0.777)

<table>
<thead>
<tr>
<th>Source</th>
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<tbody>
<tr>
<td>Chesteen et al. (2005)</td>
<td></td>
</tr>
<tr>
<td>Our information systems are <em>integrated</em> across departments</td>
<td>0.875</td>
</tr>
<tr>
<td>Our information systems are <em>standardized</em> across departments (patient care, accounting, etc.)</td>
<td>0.811</td>
</tr>
<tr>
<td>Our information systems support front line employees</td>
<td>0.809</td>
</tr>
</tbody>
</table>

**Knowledge management in Analysis and Usage**: (AVE=0.794 /CR=0.885 /CA=0.742)

<table>
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<tr>
<th>Source</th>
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<tbody>
<tr>
<td>Chesteen et al. (2005)</td>
<td></td>
</tr>
<tr>
<td>We use objective data to identify our competitive strengths</td>
<td>0.902</td>
</tr>
<tr>
<td>Organizational planning is based on objective data which we have collected and analyzed</td>
<td>0.881</td>
</tr>
</tbody>
</table>

AVE=average variance extracted, CR=composite reliability, CA=Cronbach alpha

All average variance extracted (AVE) values ranged between 0.794 and 0.646 (at construct level) which is greater than 0.5. This indicates that convergent validity at the indicator and construct levels is verified. The square root of each AVE is tested for discriminant validity and should be greater than 0.7 (Chin, 1998) and exceed the related inter-construct correlations for reflective constructs. All the square roots of AVE are greater than the related inter-construct correlations, ranging from 0.891 to .803. Therefore, discriminant validity is confirmed.

The guidelines for scale measurement in the principal component analysis should be at least 40% to account for the variance proportion of each item (Carmines & Zeller, 1979). In our study, the factor loadings for each item within each construct ranged from 0.902 to 0.795, thereby providing additional evidence of scale reliability. Convergent validity was examined by running the measurement model for four latent constructs with 11 related individual items. The point estimates from individual item loading on the corresponding latent variable ranged from 0.86 to 0.68, with significant t-values greater than 9.034 (Boyer, 2012). Next, estimated model fit values were evaluated. The root means square error of approximation
(RMSEA) is a measure of model fit which does not depend on sample size (Hair et al., 1998) with a value of 0.062 (between 0.05 to 0.1) representing a reasonable model fit (Browne and Mels, 1994) for this present study. Other measurement model statistics are reported in Table 2: Measurement model fit and Structural model fit which includes all the reasonable fits. Specifically, a normed Chi-square value of 1.928 shows that the model adequately represents the data. The comparative fit index (CFI), goodness of fit index (GFI), adjusted goodness-of-fit index (AGFI), incremental fit index (IFI), and standardized root mean square residual (SRMR) are 0.803, 0.945, 0.904, 0.820, and 0.072, respectively.

Table 2
Measurement Model Fit and Structural Model Fit

<table>
<thead>
<tr>
<th>Model fit measure</th>
<th>CFA</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of freedom (d.f.)</td>
<td>38.00</td>
<td>39.00</td>
</tr>
<tr>
<td>Chi-square – Test statistic</td>
<td>73.277</td>
<td>73.798</td>
</tr>
<tr>
<td>Normed Chi-square (Chi-square/d.f.)</td>
<td>1.928</td>
<td>1.892</td>
</tr>
<tr>
<td>RMSEA Point Est</td>
<td>0.062</td>
<td>0.061</td>
</tr>
<tr>
<td>Comparative fit index (CFI)</td>
<td>0.803</td>
<td>0.805</td>
</tr>
<tr>
<td>Normed fit index (NFI)</td>
<td>0.687</td>
<td>0.684</td>
</tr>
<tr>
<td>Goodness of fit index (GFI)</td>
<td>0.945</td>
<td>0.945</td>
</tr>
<tr>
<td>Incremental fit index (IFI)</td>
<td>0.820</td>
<td>0.821</td>
</tr>
</tbody>
</table>

Research Results

Structural equation modeling (SEM) analysis was implemented regarding the specified causal model in Figure 1 to test the five proposed causal relationships in the long-term care industry. AMOS was used for data analysis in this present study. The input for the structural equation model estimations was based on scores of a total of four dimensions: information technology capability, innovative capability, knowledge management in information and data, and knowledge management in analysis and usage. Please see Table 2: Measurement model fit and Structural model fit for output results. The chi-square test for overall model fit with four dimensions has a value of 73.798 (p<0.01); moreover, the normed chi-square statistic of 1.892 and RMSEA (0.061) indicate that the model is not overestimated and is a reasonable model. Additionally, the comparative fit index (CFI) of 0.805, the goodness of fit index (GFI) of 0.945, the adjusted goodness-of-fit index (AGFI) of 0.906, the incremental fit index (IFI) of 0.821, and the standardized root mean square residual (SRMR) of 0.073 are reasonable outputs.

In Table 3: Path estimates for the overall structural model, the results of model estimation including path estimates, standard error, and t-tests for the path significance are provided. Hypotheses 1 considered the causal influence of information technology capability on innovative capability. The path estimates for this relationship are as follows: information technology capability to innovative capability ($\beta_{11} = 0.727, p < 0.01$). Thus, a significant positive relationship exists between information technology capability and innovative capability.

Hypotheses 2 and 3 proposed causal relationships of information technology capability on knowledge management in information and data, and knowledge management in analysis and usage. The path estimates for information technology capability’s significant causal relationships are as follows: knowledge
management in information and data ($\gamma_{21} = 0.491$, $p < 0.01$) and knowledge management in analysis and usage ($\gamma_{31} = 0.398$, $p < 0.01$). These results indicate a significant positive relationship between information technology capability, as well as knowledge management in information and data, and knowledge management in analysis and usage.

Hypotheses 4 predicted a causal influence of innovative capability on knowledge management in information and data. The path estimates for this relationship are as follows: the innovative capability to knowledge management in information and data ($\beta_{21} = 0.526$, $p < 0.01$). This indicates a significant positive relationship between innovative capability and knowledge management in information and data. Hypotheses 5 proposed a causal influence of innovative capability on knowledge management in analysis and usage. The path estimates for this relationship are as follows: the innovative capability to knowledge management in analysis and usage ($\beta_{31} = 0.587$, $p < 0.01$). Hence, a significant positive relationship exists between innovative capability and knowledge management in analysis and usage. As discussed in the above analysis, significant relationships occurred for all five hypotheses. In sum, our research results offer strong empirical support for each of the five causal relationships evaluated in this study.

Table 3
Path Estimates for Overall Structural Model

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Path</th>
<th>Point estimate</th>
<th>Standard error</th>
<th>t-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>IT Cap. $\rightarrow$ Inn. Cap.</td>
<td>0.727</td>
<td>0.084</td>
<td>8.66**</td>
</tr>
<tr>
<td>H2</td>
<td>IT Cap. $\rightarrow$ Knowledge Mgmt. in Info.</td>
<td>0.491</td>
<td>0.114</td>
<td>4.30**</td>
</tr>
<tr>
<td>H3</td>
<td>IT Cap. $\rightarrow$ Knowledge Mgmt. in Analysis</td>
<td>0.398</td>
<td>0.123</td>
<td>3.24**</td>
</tr>
<tr>
<td>H4</td>
<td>Inn. Cap. $\rightarrow$ Knowledge Mgmt. in Info.</td>
<td>0.526</td>
<td>0.126</td>
<td>4.17**</td>
</tr>
<tr>
<td>H5</td>
<td>Inn. Cap. $\rightarrow$ Knowledge Mgmt. in Analysis</td>
<td>0.587</td>
<td>0.141</td>
<td>4.15**</td>
</tr>
</tbody>
</table>

*p<.05, **p<.01

Discussion and Conclusions

This research emphasizes the effects of IT and innovative capability on knowledge management of information, data, analysis, and its usage in long-term healthcare in the U.S. We provide some evidence for skilled nursing facility administrators that utilization of the firm’s information technology capability may increase firm’s innovativeness to implement knowledge management in various aspects. For the final statistical outcome, H1, H2, H3, H4, and H5 were fully supported. The statistical results for Hypothesis 1 confirm that information technology capability influences the nursing facility’s innovative behavior. As IT has moved to the network era, new opportunities have arisen for diverse parts of organizations to interact while producing new products and services both within the organization and externally (Wang & Ahmed, 2007).

These new opportunities provide a rich source of innovation to satisfy the needs of customers and to improve overall organizational performance. Next, our findings indicate that information technology can organize documents and content of the transactional data for the facilities. Various information technology tools allow users to aggregate, manage, and deliver content across different functional areas. In the framework of knowledge management, knowledge is treated as a resource by exercising selectivity,
imposing order on information resources, and adding structure to enhance information systems (Ferraris et al., 2017). Furthermore, the strength of applied information technology capability and knowledge management can assist the relationships and collaboration among employees regarding the utilization and analysis of information collected from the HIT.

This knowledge management capability can further improve the facilities’ performance in quality patient care (Murdoch & Detsky, 2013). Therefore, the relationship between IT capability and knowledge management is positive for Hypothesis 2 and Hypothesis 3. Innovative capability consists of having an innovative nature within the firm, adding innovative external resources, and finally using these resources to produce goods and services which meet market demand. The greater innovative capability is associated with a facility’s efforts to improve its knowledge-building as to the organization integrating different functional departments’ information to enhance the strength and competitiveness of the facility. In other words, the nursing administrators can communicate and integrate resources to encourage and improve the effective use of HIT (Leung, 2012). Hence, the higher innovative capability can achieve a greater knowledge management capability as identified in Hypothesis 4 and Hypothesis 5.

Despite the considerable importance of information technology, innovation, and knowledge management to the nursing facilities, limitations existed for this current study. Nursing facilities are still operating in a low technology environment. The facilities typically only use information technology to report patient quality care data for reimbursement purposes only. Determining how to encourage facilities to utilize and integrate information technology in a broader aspect among different functional departments remains a great challenge.

For future studies, administrators are convinced that the best use of IT can help solve current and potential healthcare problems. Nevertheless, the process of developing this system is still not clear. Therefore, further studies may extend this current model to test whether IT capability, innovative capability, and knowledge management can reduce costs and improve quality. For example, the current model should be applied to test secondary data such as net patient revenue, operational expenses, or percentage of low-risk long-stay residents who have pressure sores to assess costs and quality indicators.

In sum, most of the research for nursing homes have emphasized patient quality and reducing deficiencies. This present study provides a different perspective on a firm’s strategic development via information technology capability, innovative capability, and knowledge management capability of information, data, analysis, and usage. The statistical outcomes of our study indicate that IT and innovative capabilities are associated with facilities’ knowledge management capability in the U.S. long-term care sector. Ideally, IT and innovative capabilities will continue to assist nursing facility administrators in improving overall facility knowledge management, eventually leading to a higher quality of care.

References


