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Knowledge integration, task-technology fit and e-business implementation: An empirical study

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The main purpose of this study is to examine the effects of knowledge integration and task-technology fit on the implementation of e-business applications. Data were collected by a questionnaire survey sent to 1000 large service enterprises in Taiwan. Of the 1000 questionnaires distributed, 239 were returned, for a response rate of 23.9%. However, 44 respondents indicated that they did not implement any e-business applications in their organizations, and thus 195 completed usable questionnaires were used to perform the statistical analysis. The survey results indicate that knowledge integration and task-technology fit influence the implementation process of e-business applications. Likewise, the implementation process of e-business applications influences the implementation effectiveness of e-business applications. As such, the implications of the findings for IT practice are discussed. Moreover, this study will provide a valuable reference for business and IT managers who are implementing e-business applications in the network era, and for researchers interested in the development of e-business applications.

Key words: E-business applications, Knowledge integration, Task-technology fit, Service industry.

INTRODUCTION

As information technology and Internet applications advances, the implementation of e-business application is widely viewed as an effective means of enhancing competitive advantages. It has consistently been identified as one of the most critical issues facing information systems executives and researchers (Chuang and Shaw, 2005; Cagliano et al., 2005; Daghfous and Al-Nahas, 2006; Eikebrokk and Olsen, 2007; Eze, 2008; Matopoulos et al., 2009). The core applications of e-business includes enterprise resource planning (ERP), supply chain management (SCM), customer relationship management (CRM), as well as knowledge management (KM). Enterprise resource planning (ERP) is a tool that helps companies cut costs and improve efficiency by integrating business processes and sharing common resources across an organization (Zheng et al., 2000). ERP systems offer tremendous opportunities to more consistently provide information to organizations in a standardized, centralized, and cost efficient manner (Olson et al., 2005). Supply chain management deals with the coordination of companies along the entire supply chain that brings raw material from its source of supply through different value-adding activities ultimately to the customer (Zhang and Li, 2006). Kalakota and Robinson (2001) contended that CRM can be seen as the consistent organization activity under the using of integrated selling, marketing and service strategy. CRM is about acquiring customers, knowing them well, providing services and anticipating their needs (Goodhue and Wixdom, 2002). Knowledge management systems generally support three types of activities: generation, codification and utilization of knowledge (Davenport and Prusak, 1998). Organizations can achieve enormous benefits by implementing KMS such as better customer service, productivity, staff morale (Davenport and Prusak, 1998; Alavi and Leidner, 1999; Yates-Mercer and Bawden, 2002).

In recent years, much empirical research has been conducted in the area of e-business in recent years. For example, Li and Chang (2004) proposed a conceptual framework for e-business strategy. They further argued that the framework must be holistic, dynamic and dialectical. Koo et al. (2007) examined the influences of...
environmental factors on e-business performance. Lin (2008) examined the impacts of innovation characteristics and organizational learning capabilities on e-business implementation success. Additionally, according to the report issued by Directorate-General of Budget, Accounting and Statistics of Executive Yuan in 2007 pointed out that the GDP of service industry is 72.91% in Taiwan, working population counts to 5.91 million. As a result, service industry is crucial to the economic development of Taiwan.

However, seldom empirical research that focused on service industry has been conducted from the perspectives of knowledge integration and task-technology fit. As the rapid progress of information technology and information systems applications, there are numerous firms in service industry have implemented innovative e-business applications to enhance their competitive advantages and achieve the business goals. This study investigates the knowledge integration and task-technology fit that influence the implementation of e-business applications. The hypothesized relationships were empirically tested using a field survey of large service firms in Taiwan. The results of this study will be of interest to business managers and information systems executives of service industry who are initiating or implementing e-business applications, and to researchers in the field of information management and e-commerce/e-business.

Literature review

Matopoulos et al. (2009) indicated that the definition of e-business is still debated and the related literature offers numerous definitions and approaches. They further proposed that e-business is not considered as a single application, but rather as a term encompassing a number of applications varying from the simple use of e-mail to complex collaborative platforms (Brown and Lockett, 2004). Kalakota and Robinson (1999) defined e-business as the complex fusion of business processes, enterprise applications, and organizational structure necessary to create a high-performance business model. Zhu (2004) indicated that e-business represents a new way to integrate Internet-based technologies with core business potentially affecting the whole business. E-business encompasses the application of electronic systems to transform functional processes (Eze, 2008).

With the rapid progress of information and network technology, more and more enterprises have implemented innovative e-business applications to enhance their competitive advantage. The implementation of e-business applications has been widely considered as an innovative means for contemporary organizations to improve their operational efficiency and enhance their competitive advantages (Butler, 2000; Clegg et al., 2001). Phan (2001) indicated that despite the many spectacular e-business successes, there have also been numerous failures. Bai and Lee (2003) further indicated that some companies fail not for technical reasons related to e-business implementation, but rather because they neglect the effects of organizational context on e-business implementation. Introducing an e-strategy may impact on various organizational perspectives, such as culture, skills, styles, structure, and beliefs, as well as various social and political perspectives (Bai and Lee, 2003).

Numerous empirical studies that have been conducted in the area of e-business in recent years, such as Chuang and Shaw (2005) combined interviews, case studies and an survey to determine the significant factors leading to successful implementation of e-business applications, they suggested an implementation roadmap using four stages for implementing e-business systems: planning, developing, implementing, and testing. Lin and Lee (2005) examined the impact of organizational learning factors (training available, technical expertise, and knowledge level) and knowledge management processes (knowledge acquisition, knowledge application, and knowledge sharing) on e-business systems adoption level. Eikebrokk and Olsen (2007) conducting an empirical study that investigated the competency factors affecting e-business success in European SMEs. Lee et al. (2007) examined the influence of organizational capabilities on e-business implementation success in Taiwan, the results showed that certain factors related organizational learning and knowledge management capabilities are key determinants of e-business implementation.

Moreover, Eze (2008) explored the factors that influence e-business deployment among financial firms in Nigeria. Technology-Organization-Environment (TOE) model underpins the research framework and research hypotheses development. The results showed that competitive intensity, regulatory policy, uncertainty, technology capability, fit, relative advantage, technology policy, top managers’ support and risk taking are the key factors affecting the e-business deployment. Brown and Kaewkitipong (2009) conducted a case study with five cases to explore e-business uses in small and medium-sized tourism enterprises compared with their larger counterparts. Additionally, Matopoulos et al. (2009) conducted a case study that explores the factors affecting the adoption process of e-business, the study also explored the perceived impact of e-business adoption on logistics-related processes. The results revealed that e-business adoption and impact are caused by increased operational compatibility, as well as increased levels of collaboration. However, there has been little empirical research that investigates the effects of knowledge integration and task-technology fit on the implementation of e-business applications.

Research model and hypotheses

The research model was constructed based on a
literature review, (Figure 1), utilizing information systems management, knowledge management and organizational theory as reference disciplines. Furthermore, this study also uses previous works of Grant (1996a) and Roman et al. (2006) as a basis for developing the research model. Grant (1996a) pointed out that if knowledge resides in specialized form among individual organizational members, then the essence of organizational capability is the integration of individuals’ specialized knowledge, he further developed a knowledge-based theory of organizational capability. Roman et al. (2006) proposed a model of CRM implementation that identifies four categories of organizational capabilities that may influence CRM implementation success. These capabilities are organizational learning, customer-centric orientation, business process orientation, and task–technology fit (TTF). Roman et al. (2006) further suggested that a strong TTF is a key organizational capability for transforming CRM technology into a strategic resource advantage. TTF is integrated into the research model since CRM is a type of e-business application systems.

There are two dimensions of knowledge in organizations: The process is a cyclical process consisting of technology-centered strategy to manage explicit knowledge and people-centered strategy to manage tacit knowledge (Nonaka, 1994; Hansen et al., 1999). Knowledge has emerged as the most strategically-significant resource of the firm, integration of specialist knowledge to perform a discrete productive task is the essence of organizational capability (Grant, 1996a). The benefit of knowledge integration is in meshing the different specialized knowledge of different individuals (Grant, 1996b). Effective knowledge integration is an important challenge facing both general management and project managers (Enberg et al., 2006). Mitchell (2006) indicated that integrative capability is important to large-scale information projects. During the implementation of e-business applications, four types of knowledge must be integrated, including business process, organizational specific knowledge (such as finance, production, distribution etc.), IT/IS knowledge and management competences. Such knowledge may be "tacit" or "explicit" (Nonaka, 1994). To achieve the objectives of e-business implementation, knowledge integration is necessary to the implementation of e-business applications. Therefore, the following hypotheses are proposed:

**H1a**: Knowledge integration significantly and positively affects the implementation process of e-business applications.

**H1b**: Knowledge integration significantly and positively affects the implementation effectiveness of e-business applications.

Tasks are dimension can be narrowed down to non-routineness and interdependence, thus it is defined as the actions carried out by individuals in turning inputs into outputs (Goodhue and Thompson, 1995), they argued that technology features that are well aligned with tasks would consistently lead to better utilization of technology and subsequent performance improvement. Task-technology fit is the degree to which a technology assists an individual in positioning his or her tasks (Goodhue and Thompson, 1995). Speier and Venkatesh (2002) indicated that task-technology fit is necessary for the successful execution of CRM. Roman et al. (2006) also suggested that the match between the task and the
technology is essential for successful CRM implementation. This match can be achieved through customization of the package and through adequate training. As task-technology fit is important to the implementation of e-business systems. Therefore, the following hypotheses are proposed:

**H2a**: Task-technology fit significantly and positively the implementation process of e-business applications.

**H2b**: Task-technology fit significantly and positively affects the implementation effectiveness of e-business applications.

The effect of implementation process of IS/IT applications on implementation effectiveness of IT/IS applications has been examined in previous works. Since e-business application are the main types of IT/IS applications in the network era. Therefore, the following hypothesis is proposed:

**H3**: The implementation process of e-business applications significantly and positively affects the implementation effectiveness of e-business applications.

**METHODOLOGY**

**Sample and data collection**

The sample adopted was the Corporate 5000 from a business directory published by the China Credit Information Service, Limited in Taiwan. This directory includes top 5000 largest manufacturing, service and banking companies in Taiwan. We selected the top 1000 service companies from the business directory. Questionnaires were mailed to the information systems executives of 1000 service firms. A cover letter explaining the study objectives and a stamped return envelope were enclosed. The decision to use the IS executives as informants herein is supported by previous research conducted by Pai and Yeh (2008).

**Measures development**

From the literature on organizational and information systems management theory, this study adopted variables that have been used and validated by other researchers. The research variables were defined as briefly as possible using multiple indicator items. Knowledge integration was measured using seven items amended from the works of Grant (1996b) as well as Katz (1996) to make them relevant to the context of the implementation of e-business strategies. Task-technology fit was measured using the approaches developed by Goodhue and Thompson (1995) as well as Klopping and McKinney (2004). Besides, the implementation process of e-business applications using five items was amended from the work of Ying and Wang (2007). Finally, a seven-item measure taken from the works of Chen and Chuang (2003) as well as Plant et al. (2003) were used to assess the implementation effectiveness of e-business applications. All variables were measured with multiple items on a five point Likert-type scale, ranging from (5) strongly agree to (1) strongly disagree.

**Pre-testing**

The questionnaire was refined through two rounds of rigorous pre-testing. The pre-testing process focused on instrument clarity, question wording and validity. During the first round of pre-testing, two MIS doctoral candidates and two MIS professors were interviewed. The construct measures were revised based on the comments of these four individuals. During the second round of pre-testing, a revised questionnaire was pre-tested by three senior IS executives involved in service industry. Each of these IS executives was actively involved in implementing e-business applications and had significant experience in IS management. The IS executives were given the questionnaire and asked to examine it for meaningfulness, relevance, and clarity.

**RESULTS AND ANALYSIS**

**Sample characteristics**

Of the 1000 questionnaires distributed, 195 completed usable questionnaires were returned, for a response rate of 19.5%. Gay (1992) thought the purpose of correlational studies is to investigate if there are relations among parameters. The number of samples for appropriate statistical analyses should be at least 30. Therefore, samples retrieved in this research were suitable for statistical analyses. The respondents are all information systems executives, and had worked in the information systems field for an average of 14.3 years. Their job titles showed them to be generally at fairly high levels in their organization, and thus their views of the implementation of e-business applications are of great interest. The respondents came from diverse service industries, including banking/insurance, retail/wholesale/general merchandise, food/restaurant, transportation, information, design and other service industry (such as healthcare, publishing, distribution, hotel/travel and telecommunication). This result implies that the implementation of e-business applications is carried out in a wide variety service firms.

**Reliability and validity of research variables**

Internal consistency (Cronbach’s alpha) was calculated in order to assess the reliability of all constructs (Appendix A). As shown in Table 1, the results in our study indicate that all the constructs are greater than 0.7. The constructs are therefore considered to exhibit adequate reliability (Nunnally, 1978).

Factor analysis of the items comprising each construct determined the construct validity. Principal component factor analysis with VARIMAX rotation (Table 2) determined if all items measuring a construct cluster together, and selection of factors with eigenvalues greater than one. Subsequent analyses did not cover items with loadings of less than 0.5 on any factor. Factor analyses results for independent variables confirm that each construct is distinct from other constructs.

**Hypothesis testing**

The hypothesized relationships depicted in research
Table 1. Reliability coefficient of research variables.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Number of items</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge integration</td>
<td>7</td>
<td>0.85</td>
</tr>
<tr>
<td>Task-technology fit</td>
<td>9</td>
<td>0.94</td>
</tr>
<tr>
<td>Implementation process of e-business applications</td>
<td>5</td>
<td>0.90</td>
</tr>
<tr>
<td>Implementation effectiveness of e-business applications</td>
<td>7</td>
<td>0.91</td>
</tr>
</tbody>
</table>

Table 2. Factor Analysis (Varimax Rotation).

<table>
<thead>
<tr>
<th>Factors</th>
<th>Acronym</th>
<th>Communalities</th>
<th>Factor1</th>
<th>Factor2</th>
<th>Factor3</th>
<th>Factor4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task-technology fit</td>
<td>TATF1</td>
<td>0.712</td>
<td>0.782</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TATF2</td>
<td>0.719</td>
<td>0.769</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TATF3</td>
<td>0.710</td>
<td>0.758</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TATF4</td>
<td>0.707</td>
<td>0.725</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TATF5</td>
<td>0.692</td>
<td>0.700</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TATF6</td>
<td>0.629</td>
<td>0.689</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TATF7</td>
<td>0.711</td>
<td>0.649</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TATF8</td>
<td>0.736</td>
<td>0.603</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TATF9</td>
<td>0.711</td>
<td>0.595</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implementation effectiveness of e-business applications</td>
<td>IEEA1</td>
<td>0.786</td>
<td>0.798</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IEEA2</td>
<td>0.726</td>
<td>0.733</td>
<td></td>
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<tr>
<td></td>
<td>IEEA3</td>
<td>0.641</td>
<td>0.719</td>
<td></td>
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<tr>
<td></td>
<td>IEEA4</td>
<td>0.552</td>
<td>0.679</td>
<td></td>
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<tr>
<td></td>
<td>IEEA5</td>
<td>0.708</td>
<td>0.674</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>IEEA6</td>
<td>0.610</td>
<td>0.623</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IEEA7</td>
<td>0.691</td>
<td>0.576</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implementation process of e-business applications</td>
<td>IPEB1</td>
<td>0.702</td>
<td>0.700</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPEB2</td>
<td>0.757</td>
<td>0.687</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPEB3</td>
<td>0.704</td>
<td>0.666</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPEB4</td>
<td>0.664</td>
<td>0.582</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPEB5</td>
<td>0.589</td>
<td>0.569</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge integration</td>
<td>KNIN1</td>
<td>0.593</td>
<td>0.720</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>KNIN2</td>
<td>0.699</td>
<td>0.716</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>KNIN3</td>
<td>0.566</td>
<td>0.700</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>KNIN4</td>
<td>0.560</td>
<td>0.650</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>KNIN5</td>
<td>0.559</td>
<td>0.612</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>KNIN6</td>
<td>0.467</td>
<td>0.582</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>KNIN7</td>
<td>0.555</td>
<td>0.520</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eigenvalue</td>
<td></td>
<td>13.848</td>
<td>1.780</td>
<td>1.735</td>
<td>1.091</td>
<td></td>
</tr>
<tr>
<td>Variance explained</td>
<td></td>
<td>49.457</td>
<td>6.357</td>
<td>6.197</td>
<td>3.896</td>
<td></td>
</tr>
</tbody>
</table>

Only factor loadings greater than 0.5 are shown.

model (Figure 1) were testing using multiple regression analysis. Table 3 summarizes the hypothesis tests. This table reveals no apparent collinearity problem among independent variable, as the variance inflation factors (VIF) for all independent variables are smaller than three (Neter et al., 1996).

A discussion on the results related to the research hypotheses follow. This study first examined the relationship between knowledge integration and the implementation process of e-business applications as well as the relationship between knowledge integration and the implementation of e-business applications. As predicted by H1a, knowledge integration significantly and positively affects the implementation process of e-business applications ($\beta=0.299$, $p<0.001$, $t=6.001$). Moreover, knowledge integration significantly affects the implementation of e-business applications ($\beta=0.580$, $p<0.001$, $t=11.628$), supporting H1b.
As proposed H2a, task-technology fit shows a positive relationship with the implementation process of e-business applications ($\beta=0.275$, $p<0.001$, $t=4.626$). Consequently, H2a is supported. Moreover, H2b is supported since the task-technology fit has a significant positive effect on the implementation of e-business applications ($\beta=0.499$, $p<0.001$, $t=8.400$). Finally, the implementation process of e-business applications has a strong significant effect on the implementation of e-business applications, so H3 ($\beta=0.727$, $p<0.001$, $t=16.290$) is supported.

**DISCUSSION AND CONCLUSIONS**

Results of this study demonstrate that knowledge integration significantly affects the implementation process of e-business applications (H1a) as well as implementation effectiveness of e-business applications (H1b), implying that as the implementation of e-business applications become more important to organizations, effective knowledge integration is required. The implementation of e-business applications requires views from a range of stakeholders in organizations and the knowledge integration of these stakeholders to achieve common goals. Previous studies have stressed the importance of knowledge integration. For example, Tiwana (2004) conducted an empirical study to explore the effect of knowledge integration on software development performance. The results confirmed that the influence of knowledge integration on various dimensions of software development performance. Ho et al. (2008) investigated the impact of fast adaptation strategy and knowledge integration from new product successes and failures on new product development (NPD) performance in Taiwanese ICT industry. The results showed that knowledge integration influences NPD performance and fast adaptation strategy influences NPD performance through knowledge integration. Furthermore, Basaglia et al. (2010) provides a model that integrates the concepts of team climate, IT knowledge integration capability, and team performance. They further tested the proposed model on a sample of 410 members and leaders of 69 organizational work teams. Empirical results showed that IT knowledge integration capability affects team outcomes, and team climate played the critical role. Enberg et al. (2006) also indicated that the good performance of projects, product development and team work results from clearly specified goals, knowledge sharing and more interacting team. As a result, we can understand that knowledge integration is an important factor for implementing e-business applications since four types of knowledge (business process, organizational-specific knowledge, IT/IS knowledge and management competences) should be integrated.

Empirical analysis results demonstrated that task-technology fit influence the implementation process of e-business applications (H2a) as well as implementation effectiveness of e-business applications (H2b). Similar findings have been found by previous studies in the IT/IS field such as Roman et al. (2006) suggested that the fit between the task and the technology is essential for successful implementation of customer relationship management. Lin and Huang (2008) applied task-technology fit and social cognitive theory (SCT) to empirically examine the key factors affecting knowledge management systems usage. The results showed that perceived task technology fit was found to have substantial influences on knowledge management systems usage. Eze (2008) conducted an empirical study to investigate the factors affecting e-business deployment, and the results revealed that the fit is one of the key factors affecting the e-business deployment.

Based on the empirical results of this study, this study has some important implications for practitioners who are implementing e-business applications. First, business managers or information systems executives of enterprises should consider knowledge integration when implementing e-business applications (such as ERP, CRM, KM, SCM or BI). Second, given the importance of task-technology fit for the implementation of e-business applications, methods of improving task-technology fit

### Table 3. Results of Hypotheses Testing.

<table>
<thead>
<tr>
<th>Hypothesis (Direction) Path</th>
<th>$\beta$ Coefficient</th>
<th>t-value</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a (+) Knowledge integration $\rightarrow$ Implementation process of e-business applications</td>
<td>0.299</td>
<td>6.001***</td>
<td>1.656</td>
</tr>
<tr>
<td>H1b (+) Knowledge integration $\rightarrow$ Implementation effectiveness of e-business applications</td>
<td>0.580</td>
<td>11.628***</td>
<td>1.656</td>
</tr>
<tr>
<td>H2a (+) Task-technology fit $\rightarrow$ Implementation process of e-business applications</td>
<td>0.275</td>
<td>4.626***</td>
<td>1.656</td>
</tr>
<tr>
<td>H2b (+) Task-technology fit $\rightarrow$ Implementation effectiveness of e-business applications</td>
<td>0.499</td>
<td>8.400***</td>
<td>1.656</td>
</tr>
<tr>
<td>H3 (+) Implementation process of e-business applications $\rightarrow$ Implementation effectiveness of e-business applications</td>
<td>0.727</td>
<td>16.290***</td>
<td>1.000</td>
</tr>
</tbody>
</table>

*p<0.05, ** p<0.01, *** p<0.001
must be considered. Moreover, this study has the following limitations. First, while the subjects are information systems executives and managers of service firms in Taiwan, yet cultural differences may exist between Taiwan and other countries. Second, besides the competency factors considered in this study, numerous other organizational factors may also affect the implementation of e-business applications, and future research should consider more general competency factors.

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