

# Measurement and Concepts of Individual Application Capability of e-Business

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**Abstract:** Understanding measurement and concepts for an individual application capability of e-business is important to manage and improve their work ability in an e-business environment. This study presents a 17-item tool to measure an individual application capability of e-business with the measurement items, process, and method based on the previous literature. The developed tool construct were verified by factor and reliability analysis with the questionnaire survey. This tool has four measurement factors and seventeen items. The utilization of the developed tool was confirmed by applying it to a case study.

## 1 INTRODUCTION

Nowadays, e-business is a paradigm in firm's business and is going to the advanced e-business (u-business). For preoccupying and utilizing it, enterprises have established the e-business systems based on the construction of information environment to promote their competitiveness and performance. This endeavour improves their productivity and effectiveness by applying the advanced technology to their business. The efficient utilization of the e-Business systems will contribute to raising the organizational business performances and to improving the firm's competitiveness.

In this environment, an individual who directly performs his or her tasks needs the e-business application capability to efficiently do his or her works by applying e-Business systems to his or her business tasks (Brancheau and Brown, 2002). As the workers assume greater responsibility for e-Business systems, it has become increasingly important to develop a measure appropriate for their application capability of e-business (Brancheau and Brown, 2002; Doll and Torkzadeh, 1989; Torkzadeh and Lee, 2003). Because we can measure and manage an individual application capability of e-business based on a scientific and practical tool. Individual application capability of e-Business (IACEB) means the total capability of an individual to efficiently

apply e-Business resources to his or her business tasks in this environment.

Therefore, this study presents a measurement tool that can entirely gauge the individual application capability of e-business to efficiently improve his or her e-Business capability in an e-Business environment.

## 2 RELATED LITERATURE

The studies for e-business have researched in many ways. E-business was defined as an approach to increase the competitiveness of organizations by improving management activities through using IT and the Internet (Yoon and Leem, 2006). Competency is an entire application capability with a total set of knowledge, skills, and attitudes which function as the action characteristics of an organizational member who can do his task outstandingly in an organizational environment (Spencer and Spencer, 1993).

In general competency, individual characteristics such as motives, traits, self-concepts and knowledge lead to skills, and the action of a person with skills has an effect on the performance of his or her business in an organizational environment (Spencer and Spencer, 1993). The application capability of e-Business can be conceptualized by transforming a

general competency into a type of competency in e-Business perspective.

Based on the previous literature reviews, we define the individual application capability of e-Business (IACEB) as the entire capability that an individual can efficiently apply e-Business knowledge and ability to his or her tasks to execute the given task in an e-Business environment. This focuses on development of measurement items to gauge IACEB in terms of a total application capability of e-business. That is, IACEB explains the total application capability that an individual can effectively execute his or her tasks in an e-Business environment.

Exploring literature reviews, we extracted four major components of IACEB: awareness of e-business application, knowledge of e-business application, skills of e-business application, and experience of e-Business application. They are the potential measurement factors of IACEB in terms of a total application capability of e-Business (Torkzadeh and Lee, 2003; Mnro et al, 1997; Etezadi-Amoli and Farhoomand, 1996; McCoy, 2001; Marcolin et al, 2000; Wu et al, 2005).

IACEB should have an effect on the execution ability of individual tasks. We need a measurement tool for researchers and practitioners to efficiently manage and improve it. IACEB concepts and constructs have rarely been researched in the previous literature. Hence, this study develops a tool to measure the IACEB based on its definition and four potential components. Based on the definitions and components of the IACEB, this research generated the 29 items that can measure the IACEB.

### 3 METHODS

Many previous studies presented two methods of model construct validation (Etezadi-Amoli and Farhoodmand, 1996; Torkzadeh and Doll, 1989; Torkzadeh and Lee, 2003): (1) correlations between total scores and item scores (Torkzadeh and Doll, 1989; Torkzadeh and Lee, 2003), and (2) factor analysis (Etezadi-Amoli and Farhoodmand, 1996; Torkzadeh and Lee, 2003). We used factor analysis and reliability analysis to verify the tool construct and to extract adequate items for measuring an IACEB. The measurement questionnaire used a five-point Likert-type scale from 1 (not at all) to 5 (very good). Our survey was gathered data from a variety of industries and business departments. We collected 263 responses from 436 respondents. Two incomplete or ambiguous questionnaires were

excluded. A sample of 261 usable responses was obtained from a variety of industries and business departments, and from various levels of management. Respondents had college or university degrees in: humanities and societies (15.1%), management and economics (27.4%), engineering (46.1%), and science (11.4%). The respondents had on average 8.7 years of experience (S.D.=1.12) in their field, their average age was 34.7 (S.D.=6.17), and the gender breakdown was: male (77.1%) and female (22.9%).

### 4 ANALYSIS AND DISCUSSION

We analyzed the collected questionnaires by using SPSS ver.12 software. The correlations with the corrected item-total and the criterion item were significant at  $p \leq 0.01$  and similar to those used by others in previous literature (McCoy, 2001; Rifkin et al., 1999; Torkzadeh and Lee, 2003).

Table 1: Factor analysis results.

Variable	Factor Loadings			
	Factor 1	Factor 2	Factor 3	Factor 4
V04	0.793			
V01	0.725			
V05	0.716			
V03	0.708			
V08		0.894		
V06		0.799		
V07		0.748		
V10		0.723		
V16			0.887	
V13			0.835	
V14			0.787	
V19			0.739	
V18			0.686	
V27				0.828
V23				0.783
V28				0.702
V25				0.659
Eigen-value	6.89	3.28	1.69	1.31
Cumulative variance	32.01	44.98	58.13	64.95

\* Significant at  $P \leq 0.01$

Based on analysis results, the first 29 measurement items were reduced to 17 items, with 12 items were deleted. The elimination was sufficiently considered to ensure that the retained items were adequate measures of IACEB. This research verified the validity and reliability of the tool by factor analysis and reliability analysis. We used to identify the underlying factors or components that include the IACEB construct.

These deletions resulted in a 17-item scale for measuring IEC. Each of the 17 items had a factor loading > 0.659. The reliability coefficients (Cronbach's alpha) of four potential factors had values > 0.811, above the threshold recommended for exploratory research (Rodriguez et al., 2002). To examine the reliability and validity of the measures, we calculated the corrected item-total correlations between each variable and its corresponding factor. These correlations along with alpha coefficients of each factor are indicated in Table 2.

Table 2: Corrected item-total correlations and coefficient alphas for 17-measurement items.

Variable	Corrected item-total correlation	Alpha if item deleted
V04	0.681	0.738
V01	0.748	0.759
V05	0.719	0.637
V03	0.641	0.684
Coefficient alpha for the above 4 items as a composite measure of		
Factor =0.871		
V08	0.773	0.825
V06	0.781	0.861
V07	0.849	0.738
V10	0.793	0.727
Coefficient alpha for the above 4 items as a composite measure of		
Factor =0.849		
V16	0.821	0.849
V13	0.732	0.735
V14	0.837	0.799
V19	0.691	0.624
V18	0.713	0.776
Coefficient alpha for the above 5 items as a composite measure of		
Factor =0.838		
V27	0.829	0.748
V23	0.813	0.719
V28	0.719	0.713
V25	0.642	0.622
Coefficient alpha for the above 4 items as a composite measure of		
Factor =0.811		

This also explains the alpha coefficients for the measurement of factors if a measure was deleted from the scale. These coefficients present the relative contribution of a measure to the construction of a scale for measuring a particular factor. They are all in the acceptable range. Most corrected item-total correlations were greater than 0.600, showing that the individual measures are good indicators of their corresponding factors. The items were grouped by their high factor loadings. Each of the 17 items had a corrected item-total correlation > 0.641. The correlation for each of the 17 items was positive and significant (p <= 0.01). Hence, this study developed the measurement items, with a validity and reliability, by conducting two analyses as shown in Table 1 and Table 2.

## 5 MEASUREMENT TOOL

This research classified into four factor groups based on the factor analysis. The factor groups mean the potential factors as major components to measure IACEB. By exploring the measurement items of each factor group based on previous studies, we identified the following four potential factors: factor 1: awareness of e-business application; factor 2: knowledge of e-business application; factor 3: skills of e-business application; and factor 4: experience of e-Business application. These extracted factors comprise the overall measurement content for IACEB from awareness of e-business application to experience of e-Business application. Namely, this means a tool that measure IACEB in terms of a total IT capability.

The construct of the developed tool shows in Figure 1. The tool has four measurement factors and 17 items. It is a crucial theoretical construct to measure the IACEB that can efficiently execute his or her tasks in an e-Business environment. Major factors of this tool construct have the meanings and measurement elements as follows. The awareness of e-Business application examines acknowledge, understanding, and ethic consciousness about e-Business.

Measurement Tool of IACEB
<b>Awareness of e-Business application (AEBA)</b>
-V01: Acknowledge of the Internet and IT technology
-V03: Understanding of e-Business progress trends
-V04: Ethics and morality in e-Business execution
-V05: Consciousness for e-Business security
<b>Knowledge of e-Business application (KEBA)</b>
-V06: Knowledge of hardware, software, network, and database
-V07: Knowledge of solutions (ERP, SCM, and CRM etc.)
-V08: Knowledge of operating e-Business systems
-V10: Knowledge of e-Business security measures
<b>Skills of e-Business application (SEBA)</b>
-V13: Skills using word processing and presentation etc.
-V14: Skills using the solutions of ERP, SCM, and CRM etc.
-V16: Skills utilizing e-Business systems for e-Business tasks (B to E, B to C, and B to B etc.)
-V18: Skills sharing and integrating business data
-V19: Skills establishing and managing security measures
<b>Experience of e-Business application (EEBA)</b>
-V23: Possession of degrees and certificates related to e-Business
-V25: Experience working in e-Business departments
-V28: Completion of education and training related to e-Business
-V29: Presentation of articles and ideas for e-Business works

Figure 1: Structure of the developed tool.

The awareness of e-Business application examines acknowledge, understanding, and ethic consciousness about e-Business. The knowledge of e-Business application presents the knowledge that an individual have to know to efficiently apply e-Business solutions and systems to his or her tasks. Namely, this represents e-Business knowledge that

needs to effectively perform the given tasks. The skills of e-Business application indicate the ability that an individual can effectively apply e-Business knowledge, solutions, and systems to his or her tasks. The experience of e-Business application refers to the potential ability such as certificates, job experiences, and participations of education and training related to e-Business. This factor provides the potential ability to efficiently improve the individual application capability of e-Business. This is the important factor for the extension of the e-Business application capability in terms of the breadth and depth of the IACEB.

Hence, this tool is a crucial theoretical construct to measure an individual's total application capability of e-business that can efficiently perform his or her tasks in an e-business environment.

## 6 MEASUREMENT SYSTEM

This measurement system presents measurement stages and procedures. It has the measurement and presentation stage as shown in Figure 2.

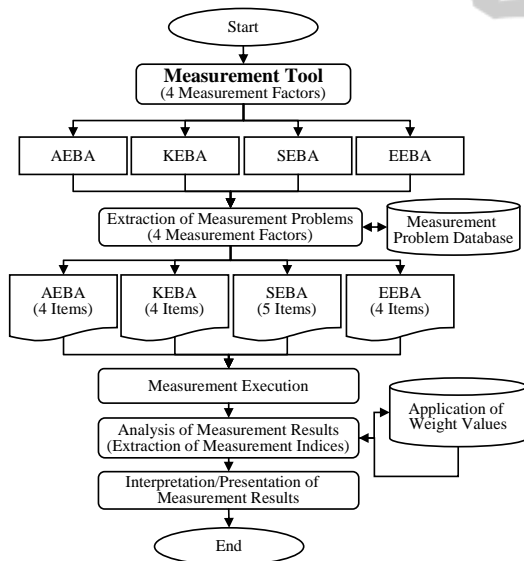


Figure 2: Framework of the measurement system.

The measurement results are analyzed by extracting the measurement values of each factor with applying each weight value to the measurement values of each factor.

The presentation stage provides the measurement results based on each factor. The results are explained by each measurement index extracted from each factor. The interpretation of the results

explains the present states and problems of the IACEB, and the directions and methods to efficiently improve the IACEB based on the extracted measurement results.

### 6.1 Measurement Method

This research used the weight values for each measurement factor in order to develop an efficient tool that reflects the relative importance of each factor in measuring the IACEB. The weight values, as indicated in Table 3, were extracted from the analysis results of the questionnaire survey (AHP) of about 40 experts working in IT or e-Business departments. The extraction method of the measurement index (MI) first calculates the measurement values of each factor, and figures out the MI of each factor by multiplying each weight value by each measurement value of each factor. The MI means the value extracted by multiplying the weight value by the measurement value. And, the sum of the measurement indices of each factor results in the total MI of the IACEB. In this way, this tool presents the measurement results of the IACEB based on the total measurement index and the indices of each factor.

Table 3: Weight value of each measurement factor.

Measurement Factor	Weight Value
Awareness of e-Business application	0.21
Knowledge of e-Business application	0.26
Skills of e-Business application	0.31
Experience of e-Business application	0.22

Hence, the total MI can be defined as Equation (1):

$$\text{Total MI} = \sum_{i=1}^4 MV_{MFi} \times WV_{MFi} \quad (1)$$

Where, Total MI: Total Measurement Index (MI) of an individual application capability of e-business.

$MV_{MFi}$ : Measurement Value (EV) of the  $i$  th Measurement Factor.

$WV_{MFi}$ : Weight Value (WV) of the  $i$  th Measurement Factor.

Here, the sum of the weight values of each factor is 1.00 and  $i = 1, 2, 3$  and 4 indicate the four measurement factors.

Hence, we extract the total measurement index of an IACEB by the equation (1).

## 7 CASE STUDY AND DISCUSSION

In this case study, we applied the developed tool to 204 persons working in "A" company, Republic of Korea. The business departments of respondents were identified as follows: strategy plan department (SPD): 23.5%; development and maintenance department (DMD): 21.6%; business application department (BAD): 29.9% and administration support department (ASD): 25.0% and so on. The respondents had on average 7.9 years of experience. We presented the measurement results obtained from the organizational level and an individual level.

First, this research analyzed the measurement results on the overall organization and each business department. Based on the analysis results, the total MI of the overall organization was 62.89. The MI of the BAD was 69.16, the highest level among the entire business departments.

This is due to the ability to effectively accomplish their tasks by frequently utilizing e-Business knowledge and systems for e-Business of the form B to E, B to C and B to B, and the knowledge and skills to use the various solutions such as ERP, SCM, and CRM in order to do their given tasks in an e-Business environment.

Division		Measurement Indices				
Range of Measurement Index		0	40	60	80	100
Total Measurement Index		62.89				
Business Department	Strategy Plan	62.18				
	Development/Maintenance	63.97				
	Business Application	69.16				
	Administration Support	56.23				

Figure 3: Measurement indices of each business department and overall organization.

Second, the measurement results of an individual working in the business application department (BAD) were presented in an individual perspective. The MI of each measurement factor was generated by multiplying each weight value by the measurement value of each factor. The total MI is the sum of the measurement indices of each factor as shown in Table 4. The total MI of the IACEB was 70.25, and the MI of the skills of e-Business application (SEBA), 78.86, was quite high. It means the outstanding ability to utilize the e-Business

knowledge, solutions and systems for his or her tasks on an e-Business system.

Table 4: Extraction process of the total measurement index for an individual.

Division	AEBA	KEBA	SEBA	EEBA	Total MI
MI of Each Factor	65.19	69.13	78.86	64.29	-
Weight Values of Each Factor	0.21	0.26	0.31	0.22	1.00
Calculation of Total MI	13.69	17.97	24.45	14.14	70.25

The MI of the experience of e-Business application (EEBA) was a little lower than the MI of the other factors.

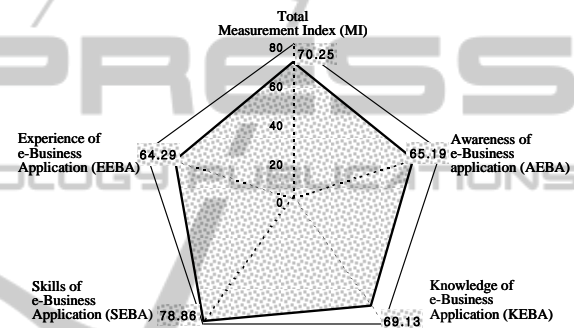


Figure 4: Measurement indices of an individual in the BAD.

Hence, the individual should make an effort to improve e-Business departments on certificates and experiences, education and training, and presentation of articles and ideas related to e-Business in order to effectively improve his or her application capability of e-Business in general.

## 8 CONCLUSIONS

This study presented the concepts of IACEB and a measurement tool that can efficiently gauge an IACEB in an e-Business environment. We provide the concrete measurement items, measurement process, method, and tool construct. Although it has a little of limitation in a special perspective, our research developed an alternative measure of IACEB and presented an IACEB tool that is applicable across industries and business departments.

Therefore, this study will contribute to the development of an IACEB tool construct and improving IACEB that can efficiently execute an

individual's given tasks in an e-Business environment.

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