A TOOL FOR MEASURING INDIVIDUAL INFORMATION COMPETENCY ON AN ENTERPRISE INFORMATION SYSTEM

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Abstract: This study presents a tool that can efficiently measure individual information competency to execute the given tasks on an enterprise information system. The measurement items are extracted from the major components of a general competency. By factor analysis and reliability analysis, a 14-item tool is proposed to totally measure individual information capability. The tool's application and utilization are confirmed by applying it to measuring the information competency of the individuals in an enterprise.

1 INDIVIDUAL INFORMATION COMPETENCY

In this study, an individual is defined as a person who directly interacts with his or her information systems based on previous studies (Rockart and Flannery, 1983; Martin, 1982). Competency is a total set of knowledge, skills, and attitudes as the action characteristics of an organizational member that can do his or her tasks outstandingly and efficiently in an organizational environment (Mirable, 1997; Arthey and Orth, 1999; Rodriguez et al., 2002). 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). Namely, information competency can be defined by transforming a general competency into a type of competency in an information perspective.

Hence, the individual information competency (IIC) can be defined as a total set of knowledge, technology, skills, and attitudes which function as action characteristics of an organizational member who can do his or her tasks outstandingly and efficiently on an enterprise information system. With these studies, we generated the first 24 items for efficiently measuring an IIC on an enterprise information system.

2 RESEARCH METHODS

In previous literature, most studies presented two methods of model construct validation (Etezadi-Amoli and Farhoodmand, 1996; Torkzadeh and Doll, 1999; and Torkzadeh and Lee, 2003): (1) correlations between total scores and item scores (Torkzadeh and Doll, 1999; Torkzadeh and Lee, 2003), and (2) factor analysis (Etezadi-Amoli and Farhoodmand, 1996; Torkzadeh and Lee, 2003). This study used factor analysis and reliability analysis to verify the tool construct and to extract adequate items for measuring an IIC. The measurement questionnaire used a five-point Likert-type scale from 1 (not at all) to 5 (very good). The survey was gathered data from a variety of industries and business departments. A sample of 258 usable responses was identified in business departments as follows: strategy planning (20.9%), development and maintenance (26.8%), business application (38.4%), and administration support (13.9%).

3 ANALYSIS AND DISCUSSION

After factor analysis and reliability analysis, the first 24 measurement items were reduced to 14 items, with 10 items were deleted. The elimination was considered sufficient to ensure that the retained items were adequate measures of IIC. These analyses were used to identify the underlying factors or components that comprise the IIC construct. Each

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of the 14 items had a factor loading > 0.635. The reliability coefficients (Cronbach's alpha) of four potential factors had values > 0.792, above the threshold recommended for exploratory research (Rodriguez, Patel, Bright, and Gowing, 2002).

Table 1: Factor loadings obtained from factor analysis.

Variable	Factor Loadings			
	Factor 1	Factor 2	Factor 3	Factor 4
V01	0.754			
V03	0.713			
V06	0.642			
V08		0.839		
V10		0.787		
V11		0.713		
V12		0.702		
V14			0.894	
V16			0.781	
V17			0.719	
V18			0.723	
V21				0.786
V23				0.727
V24				0.635

* Significant at $P \leq 0.01$

The descriptions and loadings for the 14 items are presented in Table 1 and Table 2.

Table 2: Corrected item-total correlations and coefficient alpha for each factor.

Variable	Corrected item-total correlation	Alpha if item deleted
V01	0.728	0.812
V03	0.689	0.724
V06	0.678	0.627
Coefficient alpha for the above 3 items as a composite measure of Factor =0.792		
V08	0.781	0.847
V10	0.714	0.848
V11	0.817	0.821
V12	0.629	0.723
Coefficient alpha for the above 4 items as a composite measure of Factor =0.884		
V14	0.743	0.852
V16	0.826	0.778
V17	0.634	0.836
V18	0.738	0.798
Coefficient alpha for the above 4 items as a composite measure of Factor =0.901		
V21	0.692	0.724
V23	0.712	0.738
V24	0.624	0.593
Coefficient alpha for the above 3 items as a composite measure of Factor =0.798		

In order to research the reliability and validity of the measures, we calculated the corrected item-total correlations between each variable and its corresponding factor. This also shows the alpha coefficients for the measurement of factors if a measure was deleted from the scale. These coefficients indicate 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. Each of the 14 items had a corrected item-total correlation > 0.624. The correlation for each item was positive and significant (p = 0.01 or below). Hence, the measurement items with a validity and reliability were extracted by carrying two analyses as shown in Table 1 and Table 2. However, efforts to present additional evidence of this tool's validity, internal consistency, and stability are encouraged.

4 MEASUREMENT TOOL

The extracted 14 items were classified as 4 factor groups. The 4 factor groups indicate the potential factors that can measure the IIC. With researching the measurement items of each factor, we identified the 4 potential factors as shown in Figure 1.

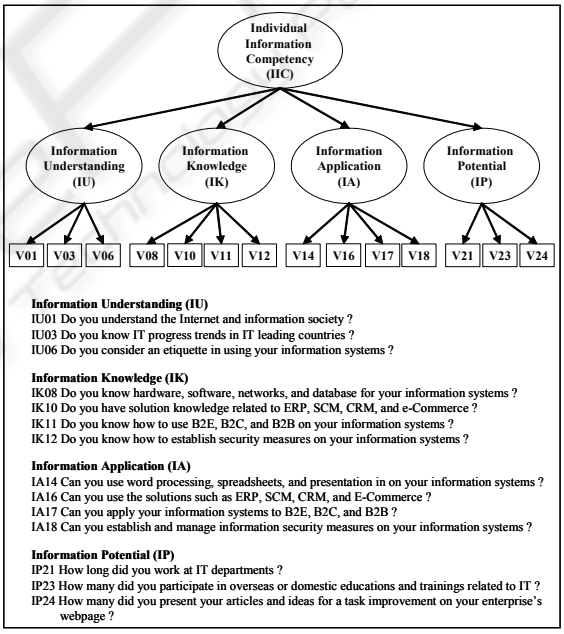

Figure 1: Structure of the developed measurement tool.

These are considered as the major measurement factors of the tool construct. Figure 1 shows the structure of the measurement tool with the 4 potential factors and 14 measurement items. Each factor has three or four measurement items, and each item is composed of two or three measurement problems from the measurement problem database. As presented in Figure 1, the information understanding is the realm where measures concepts, attitude, and adaptability on information. The

information knowledge indicates the knowledge that an individual has to know to efficiently apply information solutions and systems to his or her tasks. The information application means the ability that an individual effectively apply information knowledge, solutions, and systems to his or her tasks. The information potential refers to the potential development probability of the IIC by job experience, participation of domestic and overseas educations and trainings, and presentation of articles and ideas for a task improvement on the enterprise website.

Hence, this tool with 4 factors and 14 items is an important theoretical construct to measure an individual's total information ability.

5 MEASUREMENT SYSTEM

The measurement system, Figure 2, is comprised of two main processes including the measurement stage and interpretation stage.

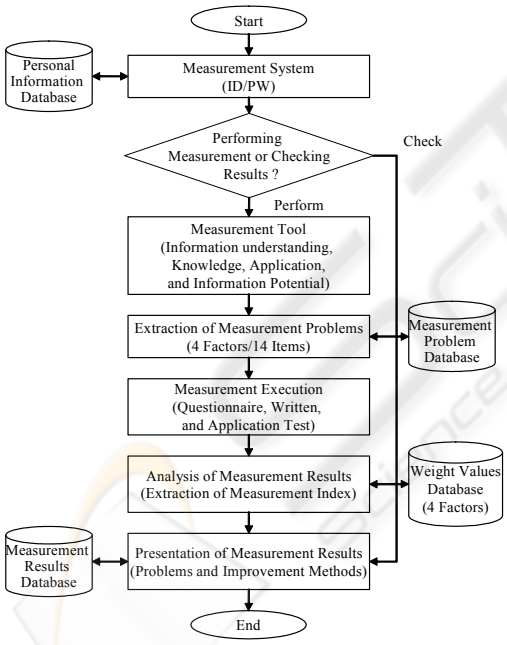

Figure 2: Framework of the measurement system.

The former extracts the problems based on each measurement factor and its items from the problem database. The problems have three kinds of problem forms such as a questionnaire test, a written test, and an application test based on the peculiarity of each factor. After generating the measurement problems, the tool examines an individual by the extracted problems. The results are analyzed by extracting the measurement values of each factor, and by applying each weight value to the values of each factor. The latter explained the measurement results based on each measurement index extracted from each factor. The interpretation presents the present states and problems of the IIC, and the directions and methods to efficiently improve the IIC.

5.1 Measurement Method

This study used the weight values for each factor in order to develop an objective and efficient tool considered the relative importance of each factor in measuring the IIC as shown in Table 3.

Table 3: Weight value of each measurement factor.

Measurement Factor	Weight Value
Information Understanding	0.22
Information Knowledge	0.25
Information Application	0.33
Information Potential	0.20

The measurement index (MI) means the value extracted by multiplying the weight value by the measurement value of each factor. The sum of the measurement indices of each factor becomes the total MI of the individual. In this way, this tool presents the measurement results of the IIC based on the total MI and the MI of each factor.

6 CASE STUDY AND DISCUSSION

This case study applied the developed tool to 163 workers working in "B" enterprise, South Korea. The business departments of respondents were identified as follows: the strategy plan department: 23.1%; development and maintenance department: 21.3%; business application department: 37.4% and administration support department: 18.2%.

First, we present the measurement results of each business department of the overall organization as shown in Figure 3. Total MI of the organization was 61.58. The business application department (BAD) were 65.78. The MI of the BAD was higher than those of the other departments. This is due to the ability to effectively accomplish their tasks by frequently applying information knowledge, solutions, and systems to their tasks on an enterprise information system.

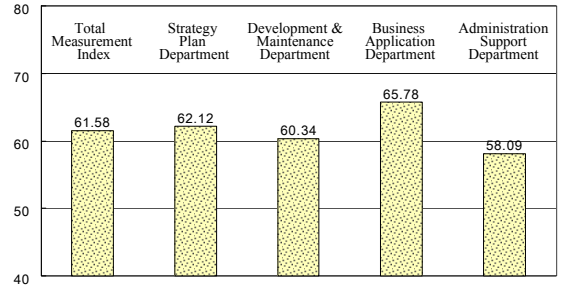

Figure 3: Measurement indices of each business department and overall organization.

Second, the measurement results of an individual working in the administration support department (ASD) were presented as a sample. The MI of each factor was generated by multiplying each weight value by the measurement value of each factor. The total MI of an individual is the sum of the measurement indices of each factor as shown in Table 4.

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

Division	Information Understanding	Information Knowledge	Information Application	Information Potential	Total Measurement Index
Measurement Indices of Each Factor	61.48	60.12	64.37	56.46	-
Weight Values of Each Factor	0.22	0.25	0.33	0.20	1.00
Calculation of Total Measurement Index	15.53	15.03	21.24	11.29	63.09

The individual MI was 63.09. The MI of the information application was a little high. This means the outstanding application ability that the individual can apply the information knowledge, solutions, and systems to his or her given tasks on an enterprise information system. But the information potential was very low.

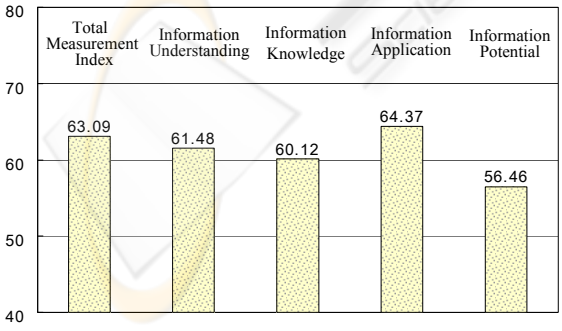

Figure 4: Measurement indices of an individual in the ASD.

Hence, this individual should endeavour after IT educations and trainings, job experience, and presentation of articles on the firm's website in order to efficiently raise his or her total information ability.

7 CONCLUSIONS

This tool can be used in measuring an IIC to perform the given tasks on an enterprise information system. This presents the concrete items, process, and method to measure the IIC. Hence, this 14-item tool maybe provides a new direction and foundation for developing the efficient measures for an IIC.

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