

Individual behavioral competences for construction project risk manager

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Abstract: The Risk Management (RM) is applied for managing uncertainty of project. In this circumstance, the competences of RM have a direct effect on the performance of its application. Especially, as the RM, one of the project management areas, is a people-oriented management field, the individual behavioral competences are significant for a risk manager. Therefore, this paper describes the development of individual behavioral competences for construction project risk manager. For this, the research classifies the individual behavioral competences of RM. And, the Exploratory Factor Analysis (EFA) are applied to verify a validity of the competences. Likewise, a reliability analysis using Cronbach's alpha values is performed to test internal consistency. Based on the results, the authors carry out the Focus Group Interview (FGI) on expert panels of construction RM to confirm the hierarchical model of the individual behavioral competences. It is concluded that the proposed hierarchical model of individual behavioral competences helps construction companies to diagnose the competences of their project risk manager for progressing.

Keywords: Construction project; Risk management; Competence; Individual behavior

I. INTRODUCTION

In the construction industry, the risk management is applied to bring success to projects by achieving goals in cost, schedule, quality, and safety. A construction project involves a number of uncertainties due to its relation with many players, resources, and activities (Imbeah and Guikema 2009; Liu et al. 2013; Zhao et al. 2013). Meanwhile, the risk management is applied to complex, uncertain, and risky projects in general (Raz et al. 2002). Therefore, the risk management is applied in construction project for eliminating the risks and mitigating uncertainties (Monetii et al. 2006; Zhi 1995; Zou et al. 2010).

When the risk management is applied to construction projects, its competences (i.e., knowledge, performance, and individual behavioral competences), which are the proved abilities to perform activities that lead to expected results based on defined processes (PMI 2007), have a direct effect on its performance (Crawford 1997). Particularly, as the risk management is one of project management areas, which has a characteristic of people-oriented management (PMI 2007), the individual behavioral competences are significant for a risk manager to possess skills that enable an effective interaction with others. Furthermore, these enable a risk manager to apply their knowledge and performance competences on projects effectively (PMI 2007).

Therefore, this paper describes the development of individual behavioral competences of risk management in

construction project, which have the most impact on the performance of risk manager. This paper's organization is as follows; the first part offers an overview of literatures related to competences of project management. Then, it derives the individual behavioral competences and elements, which compose the competences of project management, through an in-depth literature review. On the basis of these, the Exploratory Factor Analysis (EFA) is applied to verify a validity of the competences and elements from a risk management perspective. Likewise, the reliability of the competences and elements is also analyzed by calculating Cronbach's alpha values to test the internal consistency. Lastly, the Focus Group Interview (FGI) is conducted on expert panels of risk management in construction for confirming the hierarchical model of individual behavioral competences. The final section offers conclusions.

II. BACKGROUND

Much research have been proposed to improve the competence of project management. This research reviews and analyzes the previous studies to extract and classify the individual behavior competences.

A. Previous Studies

Related with individual behavioral competences, it has been developed from various organizations and institutes as a one of competence area for project management (APM 2008; IPMA 2006; PMI 2007). For instance, the International Project Management Association (IPMA)

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(2006) provided the official concept, definitions and framework of the competences expected from project management personnel. And, the Association for Project Management (APM) (2008) also proposed competence framework which is composed of technical, behavior, and contextual competence. In addition, the Project Management Institute (PMI) (2007) provides a framework for the definition, assessment, and development of project manager competence.

Likewise, previous studies have been typically undertaken focusing on competences of project manager. For instance, the Edum-Fotwe and McCaffer (2000) describe a development of construction project managers and how they manage their professional skills in a changing construction project environment. And, the El-Sabaa (2001) assess how a project manager differs from a functional managers with respect to the attributes, skills and experiences which they associate with successful performance and careers. In addition, the Arditi and Balci. (2009) assess the managerial competences of female project managers by applying a competence assessment test and comparing the analysis results with the managerial competences of male project managers. Also, the Muller and Turner (2010) evaluate the leadership competences of successful project managers in different types of projects. In addition, much research related to competence have also been proposed. For instance, previous studies mainly regard on (1) the core competence (Dainty et al. 2005; Lampel 2001); (2) the organizational competence (Patil 2005; Zoiopoulos et al. 2008); (3) the personal competence (Dainty et al. 2005; Muller and Turner 2010); (4) the perceptions and attitudes on competence (Crawford 2005).

Previous studies are conducted focusing on the competence of project manager, core competence and organizational competence. But, there are few research exploring the individual behavioral competences of construction project risk manager. As a result, this study develop the individual behavioral competences for construction project risk manager

B. Analysis of Individual Behavioral Competences

To develop the individual behavioral competences for construction project risk manager, this research analyze the literatures focusing on competences of project management for deriving the competences related with individual behavioral. The literatures are classified into two types; results from the representative groups of international standards (APM 2008; IPMA 2006; PMI 2007) and the papers related with project management competences (Fotwe and McCaffer 2000; El-Sabba 2001; Dainty et al. 2005; Jabar et al. 2013). From these literatures, the individual behavioral competences of project manager are drawn as shown TABLE 1.

Through the result of the analysis, this study derive 11 primary competences among 25 competences of project management, which are related with individual behavioral competences of project manager. The derived competences are as follows; Leadership, Self-control, Assertiveness, Openness, Results orientation, Efficiency, Negotiation, Problem (Conflict or Crisis) solving, Ethics, Communication and Teamwork. In addition, the 105 elements, which compose the 11 individual behavioral competences, are also drawn.

III. INDIVIDUAL BEHAVIORAL COMPETENCES FOR CONSTRUCTION PROJECT RISK MANAGER

This study analyzes the individual behavioral competences of project manager for customizing the competences suitable to a construction project risk manager. For this, the Exploratory Factor Analysis (EFA) is applied to verify the validity of the competences. In addition, the Cronbach's alpha vales are calculated to test the internal consistency. Lastly, the Focus Group Interview (FGI) are carried out on expert panels of risk management in construction for confirming the hierarchical model of individual behavioral competences.

To perform these analysis, the survey were conducted from 4th February 2015 to 11th May 2015. The practitioners experiencing construction project risk

TABLE I
 ANALYSIS OF INDIVIDUAL BEHAVIOR COMPETENCES

	Professional organization and institutes			Researches in project management			
	IPMA competence baseline (2006)	PMI PMCD Framework (2007)	APM competence framework (2008)	Edum- Fotwe & McCaffer (2000)	El-Sabaa (2001)	Dainty et al. (2005)	laili Jabar et al. (2013)
Leadership	✓	✓	✓	✓		✓	✓
Self-control	✓				✓	✓	✓
Assertiveness	✓					✓	
Openness	✓				✓	✓	✓
Results orientation	✓	✓				✓	
Efficiency	✓	✓					
Negotiation	✓		✓	✓			
Problem solving	✓	✓	✓	✓	✓		✓
Ethics	✓		✓				✓
Communication		✓	✓	✓	✓		✓
Teamwork			✓			✓	✓

management in Korea were invited with an offline to answer the questionnaire. Before conducting the surveys, the authors present research objectives and related details about this research to the respondents. Then, the respondents rate the importance of each competences and elements in questionnaire. Each elements was rated based on a one-to-seven Likert scale, with 'one' meaning the worst possible score for a given element and 'seven' representing the best.

A. Exploratory Factor Analysis for Verifying Validity

The Exploratory Factor Analysis (EFA) is often thought of as revealing the internal structure of data in a way that best describes variables in that data. So, the EFA is applied in this study to verify the validity of the individual behavior competences and eliminate the competences, which have low impact in risk management perspective, using the results of EFA. In this process, the Principal Components Analysis (PCA), which is the eigenvector-based multivariate analysis (Ji et al. 2010), is applied for resolving the competences into their principal components (Trost and Oberlender 2003). And, the Statistical Package for Social Sciences (SPSS 22.0) was used in conducting the EFA. The Kaiser-Meyer-Olkin (KMO) and p-value was assessed for appropriateness of EFA (Field 2005). The result of the KMO statistic is 0.822 which is appropriate higher than 0.5. And, the p-value is 0.00 which is appropriate lower than 0.05. The results of EFA is shown in TABLE 2.

TABLE II
 ROTATED FACTOR-LOADING MATRIX

Personal competences	Factors		
	1	2	3
Self-control	.849	.186	.162
Ethics	.820	.099	.101
Leadership	.792	.461	-.099
Assertiveness	.772	.440	.026
Efficiency	.767	.138	.031
Communication	.057	.876	.095
Teamwork	.319	.761	-.123
Result orientation	.377	.649	.199
Openness	.409	.516	.438
Negotiation	.177	-.057	.893
Problem-solving	-.079	.140	.840

B. Cronbach's Alpha Vales for Reliability Analysis

After the Exploratory Factor Analysis (EFA), this study performed the reliability analysis to test the internal consistency. For this, the Cronbach alpha coefficients of competences and elements are calculated using the Equation 1. The scale is determined to be reliable with Cronbach alpha value higher than 0.8 (Cramer 1994).

$$Cronbach\ alpha = \frac{kCov / Var}{1 + (k - 1)Cov / Var} \quad Equation.1$$

where k=number of competences in the scale, Cov=average covariance between items, total k(k-1) / 2 items, and Var=average variance of the items, total k items.

The reliability analysis is applied in two steps. First, the Cronbach alpha coefficients of competences are analyzed. As results of the first step are shown to be reliable, the Cronbach alpha coefficients on elements of each competences are then calculated as shown in in TABLE3.

TABLE III
 THE RESULTS OF RELIABILITY ANALYSIS

Competences	Elements	Reliability analysis	
		Alpha if item deleted	Cronbach alpha
Leadership	Delegation	.850	.846
	Feedback	.828	
	Motivation	.808	
	Power (Influencing skills)	.814	
	Recognition	.820	
	Vision	.822	
	Team environment	.844	
	Accountability	.835	
	Collaboration	.828	
	Confidence	.863	
Self-control	Work attitude	.736	.754
	Balance and priorities	.667	
	Time mgt.	.608	
Assertiveness	Persuasion	.889	.896
	Sociality	.750	
	Personal conviction	.914	
Openness	Accessibility	.850	.840
	Acknowledgement to the differences	.826	
	Transparency	.650	
Results orientation	Integration of social, technical and environmental aspects	.848	.865
	Mgt. of interested parties' expectations	.750	
	Mgt. of risk, changes and configuration	.824	
Efficiency	Benchmarking	.893	0.945
	Compromises	.893	
	Problem solving for efficiency	.954	
Negotiation	Communication for negotiation	.852	.849
	Negotiation techniques	.838	
	Identification of negotiation area	.834	
	Identification of priorities	.835	
	Decision on desired outcome	.841	
	Decision on minimum acceptable position	.858	
	Collection of available information for negotiation	.833	
	Analysis of available information for negotiation	.839	
	Developments options	.846	

	Negotiation strategy	.841	
	Understanding their motivation, wants and needs	.828	
	Support strategy of project team and stakeholders	.831	
	Positive personal relationship	.832	
	Documentation the results of negotiation	.831	
Problem solving	Problem definition	.852	.848
	Preparation on potential conflict	.815	
	Identification conflict situation	.834	
	Sharing the conflict with appropriate stakeholders	.804	
	Respect all the views and questions	.846	
	Identification root cause of conflict	.842	
	Seeking paths to resolution	.869	
	Techniques for arbitration	.841	
	Techniques for Mediation	.843	
	Decision making	.830	
	Implementation of solutions	.828	
	Monitoring the ongoing situation	.815	
Ethics	Moral standards	.903	.918
	Confidence on ethics	.939	
	Fairness	.891	
	Integrity	.902	
	Transparency for ethics	.885	
	Law-abidingness	.899	
Communication	Identifying communication needs	.890	.901
	Formal or informal communication mechanisms	.890	
	Speaking or writing actively	.879	
	Listening actively	.912	
	Understanding actively	.876	
	Response actively	.895	
	Feedback on the communication	.874	
	Appropriate actions considering the results of communication	.883	
Teamwork	Information quality	.905	.891
	Building an effective team	.927	
	Agreement on ways for working together	.889	
	Mgt the requirement of team	.865	
	Mgt the circumstances of team	.848	
	Mgt the interests of team	.861	
Taking pride in achievement and	.859		

	contributions		
	Communication regularly	.871	
	Asking for support	.871	
	Assistance	.892	

C. Focus Group Interviews (FGIs)

The Focus group interviews (FGIs) were applied to confirm the model through opinions of expert panels. FGI is a widely used exploratory and qualitative research method to enhance the understanding of the topic of interest (Patton 2002). A focus group is required about their perceptions, opinions, beliefs, and attitudes toward an objective of investigation. For this, participants in interactive group are able to free talk with other group members. In addition, the FGI can also be used to support results derived by quantitative method (Krueger and Casey 2000).

The FGI in this research was performed in 20th march 2015 with one moderator specialized in construction risk management and interviewees. The moderator played the role of the interviewer and interviewees consisted of six experts in the construction project risk management field as follows; 2 practitioners on construction project risk management implement attached to construction firms in Korea, 2 Ph.D. majoring in construction engineering affiliated to an institute, 1 architectural engineering Professor and 1 Ph.D. student.

From these procedures, several elements were excluded and eliminated after expert panel opinions. The descriptions of eliminated elements are as follows;

- The coaching, leadership style, natural authority, tenacity, relationship, morals and commitment elements are excluded from leadership competence.
- The working under stress element is excluded from self-control competence.
- The authority and personality elements are excluded from assertiveness competence.
- The broad non RM knowledge and flexibility elements are excluded from openness competence.
- The continuous improvement on results orientation, entrepreneurship and efficiency elements are excluded from results orientation competence.
- The motivation for efficiency element is excluded from efficiency competence.
- The body language, problem solving for negotiation, consensus management, negotiation firmly at the content and sharing the results of negotiation elements are excluded from negotiation competence.
- The building crisis management team and interpersonal skills elements are excluded from problem solving competence.
- The preparing communication plans, communication lines and acknowledgement of personal style of communication elements are excluded from communication competence.
- The maintaining an effective team element is excluded from teamwork competence.

IV. CONCLUSIONS

This research described the development of individual behavioral competence model, which contains 11 competences and 76 elements, for construction project risk manager. In an effort to address this objective, this study first analyzed the individual behavioral competences of project management and derived the competences and elements through in-depth literature review. Then, the Exploratory Factor Analysis (EFA) and reliability analysis were applied to verify the validity and internal consistency of the individual behavior competences for customizing suitable to construction project risk manager. Lastly, this research confirm the model by applying Focus Group Interview (FGI) to reflect the opinions of expert panels.

The developed model in this study enables to diagnose current competence level of risk manager. And, the results of assessment would help them to obtain a clear view on individual behavioral competence in construction project risk management perspective. Also, individuals are able to progress their behavioral competence by improving the weaknesses based on the results of assessment. Finally, the developed model brings potential benefits that construction companies may assess themselves against key competitors to gain advantage in an international marketplace. Also, this study expands the literature relating to risk management in construction project.

Although the objectives of this study are achieved, there are some limitations to the conclusions that may be drawn from the results. The competences which is developed in this study may not be exhaustive with the passage of time. In addition, when the developed model is applied in construction project with other nationalities, the applicability of the individual behavior competences should be cautious.

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