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Project Managers' Competencies Model for Construction Industry in Poland

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Abstract

The aim of this study is to create a model of construction project managers' competencies in Poland. The model includes factors related to the project manager's attributes. The created model can serve as a reference in the development of an integrated approach to the management of construction projects in Poland. Using the proposed approach, the process of construction project management can be customized.

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Keywords: model; project capabilities; project manager competencies

1. Introduction

Growth in the number of business activities that are deployed through projects results in increase in interest of all the issues related to project management. Management of a project team is significantly different from managing team of employees. That is mainly due to the nature of project and resulting range of project manager duties. Projects are strictly defined by result requirements, the cost and time constraints, and are bounded by the environment in which are implemented. As a result a set of project manager's activities typically include motivation, time, cost, scope, quality management and various administrative duties. Gaddis [6] described project manager competencies as: "ability to have different approach towards classic management functions, ability to finish tasks within the time with no specific information at the early stages of the project and that is related to the ability of taking risks, shall have power in the organization to delegate responsibility to subordinates, "trouble shooting" skills, planning skills, avoid crises

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"selling and reselling the project" abilities, to be able to act as a front man and a man in between with communication skills, "ability to generate necessary drive and momentum to spark the project to success".

There are several definitions of that what constitutes a competency. Mulder et al. [12] classifies competency definitions into: the behaviourist, the generic and the cognitive. The behaviourist approach focuses on features of effective and successful job performers. Therefore competencies can be gain through training and development. Competence is based on the description of the most effective performance and behavior. The generic approach identifies set of abilities that can statistically explain variation in job performance. The cognitive approach describes a range of cognitive capacity that a person shall have to perform well in a specific sphere Boyatzis [2]. Cognitive, social and emotional intelligence competencies can foresee effectiveness in job performance. Outstanding results are achieved when human's capability fits the job's description. "Competencies are behavioral manifestations of emotional intelligence" [2].

In construction industry, projects are companies' source of revenue. Therefore construction industry is probably the largest project-based sector. Many organizations within the industry are interested in establishing the competencies of their managers since the project's success is highly dependent on its manager competencies. In this paper a model of construction project managers' competencies is proposed.

2. Project managers' competencies

Duties of project manager include a range of activities from administrator of the project to team leader. Therefore, to successfully execute project its manager needs a unique set of capabilities and competencies [7]. Since there is a strong relationship between the project's success and the project manager's work effectiveness, conditions ensuring that effectiveness are concern of many researchers. That initiates attempts to define competencies that have the significant impact on project manager's effectiveness. Due to the nature of project manager work, which is largely based on cooperation and project team directing, manager's characteristics can have a crucial impact on project's results. Therefore a choice of a "right" person to perform a project manager role is one of the most important decisions taken by project's sponsor/investor. The differences between the processes of employees' selection in traditional organizations and those with project structures are indicated by Lichtarski [11]. Kerzner [9] mentions following features of project managers:

- initiative
- leadership abilities
- ambition
- creativity
- flexibility and adaptability
- personal commitment
- vision
- creating trust
- ability to persuade
- effectiveness
- ability to make decisions
- ability to identify problems
- ability to organize work to subordinates.

Project Manager Competency Development (PMCD) – a Project Management Institute (PMI) standard [14] defines three project managers' competence areas: knowledge competence, performance competence and personal competence. International Project Management Association [8] defines 20 technical competency elements, 15 behavioral competency elements, and 11 contextual competency elements.

Construction project managers have to combine technical knowledge and expertise with skills that can assure effective coordination and communication of many different stakeholders [5]. American Society of Civil Engineers [1] describes construction project managers' job as: "(…) the act of managing the engineering relationships among the management tasks related to staffing, organizing, planning, financing, and the human element in production,

research, engineering, and service organizations. Engineering managers must understand and integrate organizational, technical, external, and behavioral variables and constraints in order to accomplish predetermined tasks and goals". Therefore ASCE [1] created the 24 foundation fields of knowledge, skills and attributes of a modern civil engineer. Apart from strictly technical issues that are inherently related to the profession, there is a great proportion of managerial skills such as: problem recognition and solving, risk and uncertainty, project management, communication, public policy, business and public administration, globalization, leadership, teamwork, attitudes, lifelong learning, professional and ethical responsibility

Construction project management issues have found their reflection in industry specific standards that are described in a Construction Extension to The PMBOK® Guide [15], Construction Project Management Skills [3] or Achieving Excellence in Construction Procurement Guide [13], Code of Practice for Project Management for Construction and Development [4].

For the purpose of that study on a basis of literature research following key construction project manager's competency areas were adopted: knowledge, management skills and attitude. Corresponding operational measures used for questionnaire survey are shown in Table 1.

Table 1. Operational measures of project manager's competency.

Attitude	Management skills	Knowledge
Intellectual	Ability to make decisions	Experience in managing projects
Creative	Ability to assess the impact of actions taken	Ability to use appropriate project management methodology
Expressing confidence	Ability to formulate goals	Competence in the area in which project is implemented
Assertiveness	Ability to organize work to subordinates	Ability to use project management software
Self-confidence	Ability to communicate	Ability to manage the scope, time and cost of the project
Authority	Ability to motivate team members	
Integrity and honesty	Help in solving problems	
Empathy	Focus on the goals	
Aspiration	Ability to resolve conflicts	
Ability to deal with stress	Ability to negotiate	
Ease of establishing contacts	Flexible management style	
Ability to work in a team		

Source: Author elaboration on the basis [1, 3, 4, 12–15].

3. Methodology

3.1. Data collection

Questionnaire survey was done among members of Polish Construction Industry Chamber. The aim of survey was to create a model of construction project managers' competencies in Poland. Questionnaire was distributed on line from January until December 2015. Respondents were asked to rate their level of project manager's competency and general competency in managing construction projects on a Likert scale. Collected data were used for a model creation and influence assessment of project manager's individual characteristics on general project management competency. In table 2 respondents characteristics is presented.

Given the fact that not all respondents acted as project managers, the difference in responses between engineers acting as a project managers and team members was assessed using Mann-Whithey test. Test results indicate that there are no statistically significant differences between the responses of construction project managers and project team members. Therefore for further analysis whole sample was used.

Table 2. Respondents' characteristics.

Feature	
Number of respondents	751
The average number of implemented projects in last 12 months	18
Share of respondents acting as project managers in last 12 months	71%
Share of respondents acting as project team members in last 12 months	29%
Average project duration (months)	8.8
The average number project team members	7
Share of males in a sample	81%
Share of females in a sample	19%
Cronbach alpha statistics	0.91

3.2. Data analysis

Clustering was chosen as a data analysis method. Clustering aggregates objects that are more similar to the objects belonging to the same cluster than the objects in other clusters. That method contributes greatly to the knowledge of the structure of the population and especially to:

- indicating some patterns
- splitting into groups that may serve as an introduction to further multivariate analysis
- reducing of a large set of data.

Cluster analysis is used without a priori hypotheses and serves as exploratory phase of research. Operational measures of project manager's competency, rated by respondents, were grouped on a basis of their rating similarity. This method aggregates elements that are correlated therefore makes possible a reduction of variables. That enables to estimate latent variables in a structural model of construction project managers' competencies. While clustering as a method of agglomeration Ward method was used. For statistical analysis STATISTICA was used [16].

The author proposes to use clustering to determine number of components instead of an Exploratory Factor Analysis due to the nature of data. The data is discrete; therefore the assumption of the normal distribution that is needed for most of statistical analyses is violated. Dimension reduction with the use of normal estimators did not give satisfactory results in identifying factors. Konarski [10] noted that information included in the total distribution of observable variables is fully summarized by the covariance matrix only in conditions of normality distribution of variables. Consequently he advises use of asymptotically distribution free (ADF) estimators for discrete data and structural model estimation. Results of a confirmatory analysis with the ADF estimator have proved a good fitting of presented model. Therefore, cluster analysis to identify a number of latent variables and model creation has been used.

4. Results and discussion

To establish the number of clusters a clustering progress plot was constructed. Clustering progress plot is shown on Fig. 1.

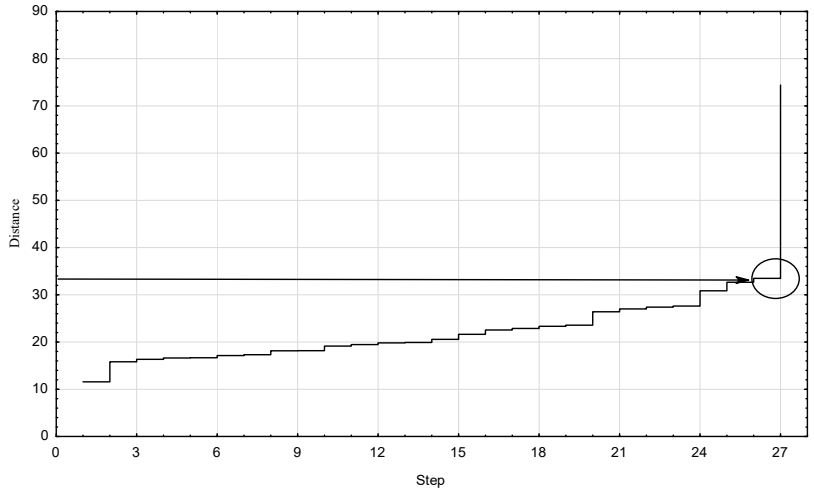

Fig. 1. Clustering progress plot.

Clustering progress plot is a linear graph of a bond distance in relation to subsequent stages of the clustering process. This graph is useful in identifying the locations, in which the numbers of clusters are forming at the same distance. Clustering progress plot will be used to determine the number of clusters. The flattening of the graph (longer vertical line) indicates that the clusters are distant and is the best cut-off point. This place is formed after the 27-step at the distance of 33 (marked with circle on Fig. 1). This distance is used to determine the number of clusters on dendrogram (Fig. 2).

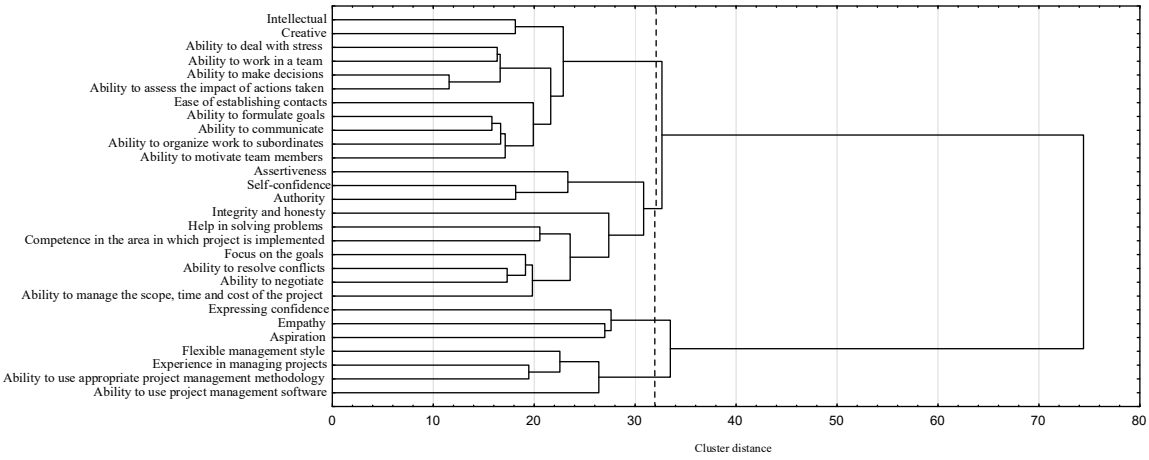

Fig. 2. Dendrogram.

Dendrogram is a tree diagram that illustrates clustering process. It shows the clusters and a distance between them. To determine the number of clusters that form homogeneous subsets of a data a distance obtained from clustering progress plot was used. At the distance of 33 (marked with a dotted line) data describing construction project managers' competency have formed four clusters. Therefore results allow for creating a construction project managers' competencies model that includes four latent variables influencing general project managers' competency. The model is shown on Fig. 3.

Elements included in the cluster 1 indicate a number of features that reflect basic management skills and there is

a reason they are combined with intelligence, creativity and abilities to deal with a stress. A project manager duty requires a combination of mental strength with organize work skills. Therefore cluster 1 and variable in the model can be named basic managerial skills.

Cluster 2 is formed by personality characteristics and corresponding with them interpersonal abilities. One should note four features that look as if they do not fit to this pattern: focus on the goals, ability to resolve conflicts, ability to negotiate, ability to manage the scope, time and cost of the project. However, it seems that the certain personal characteristics are required to enable effective implementation of these skills. These are mainly related to communication with the project team and stakeholders. Effective scope, time and cost management requires negotiation with subcontractors and conflict solving abilities. That fact emphasizes aggregation of these features at a similar distance to: help in solving problems and competence in the area in which project is implemented. Cluster 2 stresses interpersonal qualities of the project manager and experience without which it is impossible to efficiently implement managerial functions. Cluster 2 and variable in the model can be named team management abilities supporting managerial skills.

Cluster 3 is formed by emotional intelligence characteristics. These are human's ability to recognize their own as well as and other people's emotions and to deal with emotions of others. This is the essence of Boyatzis [2] assumptions that emotional intelligence is enabler of "behavioral manifestations of competence".

Cluster 4 is complementary elements of competency profile. They are usually resulted from training and certification and knowledge of tools. Highlights the significance of method and methodological recommendations. Cluster 4 and variable in the model can be named formal skills that best suits generic approach.

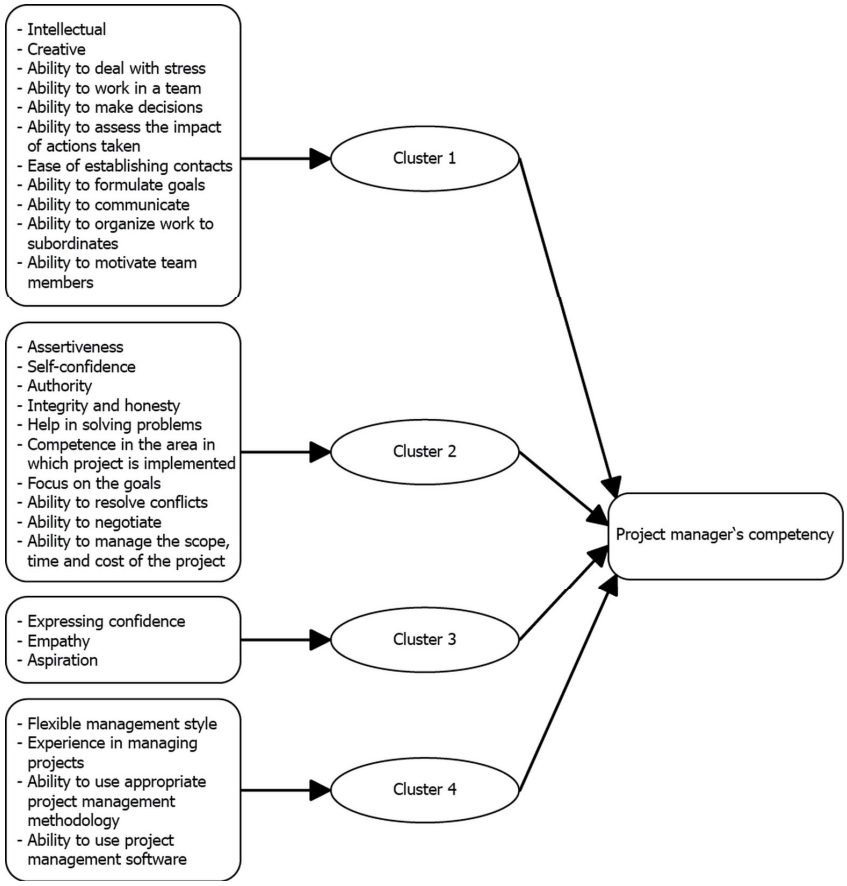

Fig. 3. Construction project managers' competencies model.

Clusters, revealed through data analysis, and included in them features of a successful project manager in construction industry have proven a complexity of competency issue and its modelling. Formed clusters do not include features that can be described explicitly as attitude, management skills or knowledge. None of them shows "pure" attributes of a generic, behaviourist or cognitive approach either. What clusters show is the interdependencies and correlation between attitude and abilities/skills? Clusters show personal attributes that are the basis for the development of managerial skills (cluster 1) and those that are supportive in management of team and people management. Only the features included in cluster 3 (cognitive approach) and 4 (generic approach) seem to be in line with restricted definitions of competency. However, further analysis, using structural equation modelling, will determine their impact on the project manager's effectiveness. It is possible that formation of those two clusters (3 and 4) is caused by rejection of characteristics included in them. Respondents may indicate little contribution of these features in construction project manager competency.

5. Conclusion

In a paper a model of construction project manager's competency is proposed. The reason for that research is a strong dependence of project's success on the project manager's abilities. For data analysis clustering method was chosen. On the basis of variables characterizing the respondents clustering has allowed a broader understanding of relationship between personal skills, knowledge and abilities of construction engineers on managing capability. Reduction of the model dimensions enabled the identification of four factors affecting the construction project managers' competency: basic managerial skills, interpersonal abilities supporting managerial skills, emotional intelligence, and formal skills.

Contents of the second cluster, combining interpersonal characteristics and project managers' abilities that are closely related to emotional intelligence, seem to confirm the findings of Boyatzis [2]. Those results are an effect of exploratory data analysis method and its advantage.

The results confirm the involvement of described in the literature definitions of competence (the behaviourist, the generic and the cognitive) but does not determine which ones have the greatest impact on the competence of construction project managers.

Presented results can be used by HR departments in construction companies while creating paths of project managers' professional development and by individuals, the engineers in charge of construction projects in the process of their personal development.

The model is dynamic and industry dependent. Therefore the proposed characteristics can change and moreover vary depending on industry and project's characteristics i.e.: time, budget, scope, novelty, and pace. Additional, variables influencing model include: geographical location of implementation and project environment accompanied by economic conditions, legal requirements etc. Further research, extending and improving proposed model with the inclusion of mentioned relationships is recommended.

Next step, expanding presented results, is the model validation and testing using statistical methods and data acquired. The aim of extended analysis is to establish influence of identified measures on construction project managers' competencies model.

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