TECHNICAL TRANSACTIONS | **CZASOPISMO TECHNICZNE**
CIVIL ENGINEERING | BUDOWNICTWO
2-B/2014

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ANALYSIS OF METHODS FOR ASSESSING PARTNER RELATIONSHIPS IN CONSTRUCTION PROJECTS

ANALIZA METOD OCENY RELACJI PARTNERSKICH W PRZEDSIĘWZIĘCIACH BUDOWLANYCH

A b s t r a c t

In the world of literature, only a few methods for assessing partner relationships in construction project have been described. This paper analyses five of them. Methodology is discussed as well as the advantages and disadvantages of each individual method. On this basis, the guidelines for the development of a comprehensive system of assessment and control of partner relationships have been summarised.

Keywords: project partnering, construction industry, assessment methods

S t r e s z c z e n i e

W światowej literaturze przedmiotu opisanych zostało zaledwie kilka metod oceny relacji partnerskich w przedsięwzięciu budowlanym. W artykule dokonano analizy pięciu z nich. Omówiono metodologię oraz wskazano zalety i wady poszczególnych metod. Na tej podstawie zestawiono wytyczne do opracowania kompleksowego systemu oceny i sterowania relacjami partnerskimi w przedsięwzięciu budowlanym.

Słowa kluczowe: partnerstwo w przedsięwzięciu, budownictwo, metody oceny

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1. Introduction

It can be stated in a simplified way, that a partnership, in contrast with competition, is characterized not by struggle but by cooperation. This is a new trend in the approach to the realization of construction projects. Divergent interests are being replaced by the will to share common success in completing construction projects. Companies work together, with the goal of achieving the target result and mutual benefits." [1] Maintaining partner relationships in the implementation of construction projects brings a number of benefits, such as reducing disputes, improving communication, increasing productivity and reducing the time and cost of the project, as indicated by [2, 3]. It was therefore necessary to create a system for the assessment of construction projects partner relationships in construction in order to maintain them at the highest possible level and to control them. In recent years, a series of works on this subject have been published [4–11]. Crane et al. [4] provided guidelines for the selection of measures of partnering in such an assessment system. Lo et al. [5] used a balanced scorecard to determine strategic objectives, which are the measures of the effectiveness of a partnering. However, they do not present actual assessments of partnerships. Some publications, such as [6, 7] show examples of methods for assessing partnerships, however, these are limited to the designation and monitoring of measurements and indicators. On the other hand, [8–11] present complete assessment methods for partner relationships in construction projects, including synthetic indicators connecting all studied measurements. Of these studies, only [10] is a domestic (Polish) study on this subject. The article presents an overview of the various methods and their analysis in terms of advantages and disadvantages, in order to develop a comprehensive method for the evaluation and control of partner relationships in construction projects in the future.

2. Analysis of methods for assessing partner relationships in construction projects

2.1. A questionnaire-based, monthly assessment of partner relationships

A practical way of monitoring partnerships in a project is presented in an article by Bayliss et al. [7]. It shows how problems were dealt with during the execution of a contract for the construction of high-speed rail in Hong Kong. Prior to monthly review meetings, the project participants filled out questionnaires, which assessed thirteen measures of partnering (Table 2) using a five-point scale. Thus the assessments were averaged for individual measures and compared with the previous ones. During the meetings, the assessments of the measures were discussed.

This method requires the organisation of regular meetings of the project participants. Basing the final assessment on the subjective feelings of the participants of the project may cause significant discrepancies in assessment. Also, the method does not allow for designating a synthetic indicator for the overall assessment of the partnership, and only 13 partial assessments without specifying the weight of individual measures. On the plus side, however, it should be noted that the monthly meetings are an opportunity for open communication between the participants of the project, allowing them to develop a better partner relationship.

2.2. Partnering Temperature Index

An automated system for evaluating partnering in construction, utilising a web platform, was created by Cheung et al. [8] For assessing the relationship they used eight measures of partnering recommended by the New South Wales Public Works Department (NSWPWD) of Australia (Table 2). Project participants make a five-point assessment of the achievement of project objectives in view of the individual measures of a partnering; this usually takes place at the end of the month or before each partnering review meeting. Data collected in this way is reported to the project manager, who can review it in the form of aggregated tables and charts. The system provides the ability to track the Partnering Temperature Index for both the specific measures (Measure PTI), calculated as the average rating of individual participants in the project and for the entire project (Project PTI), which is the average of all Measure PTIs. Automatic partnering assessment system PTI enables individual selection of the studied measures by adding new or deleting existing ones, and giving them the desired degree of validity.

An important advantage of the system created its ability to enable project participants to assess partner relationships in their own time and place. In addition, the automated system will calculate both Measure PTIs and Project PTI by itself, which also helps to reduce the time required to process the data collected. The resulting platform is a tool which can help the project manager in assessing and managing relationships in the project. However, he still has to indicate the analysed measures of partnering and the level of their validity, which on one hand allows the assessment method to be easily be adapted to the individual conditions of the project, and on the other hand it requires the manager's knowledge and experience with regard to partnering. Similarly to the method analysed earlier, the assessment using a five-point scale is also intuitive.

2.3. Partnering Performance Index

A computer model for measuring and analysing partnering in construction projects was created by Yeung et al. [9] who formulated a Partnering Performance Index (PPI), which consists of seven Key Performance Indicators (KPIs). These indicators, as well as their validity, were selected during the four Delphi questionnaire survey rounds, carried out among construction experts in Hong Kong which are listed in Table 2. Here the research team conducted five structured face-to-face interviews with field experts and two of Delphi questionnaire survey rounds in order to establish measurable Quantitative Indicators (QIs), which should be taken into account when assessing KPI, and used the theory of fuzzy sets to set Quantitative Requirements (QRs) corresponding to the assessments in a five-point scale. On the basis of the model developed, the PPI computer system was created.

The use of QI and QR allows for solving the problem of the subjective assessment of the project participants. With the use of the Internet, the system provides rapid data collection. This solves the problem of geographical barriers while maintaining low costs. The computer system also reduces the risk of human error, as the data is entered directly by individual participants connected with the project and processed automatically. However due to the diverse characteristics of projects, some restrictions in the system may be apparent. Different values of QR and QI are appropriate for application depending both on the nature of the project and the environment in which it will be implemented. Therefore, it becomes necessary to adjust these values to each particular type of project.

2.4. Project Partnering Volition

The method of assessment is based on the theory of fuzzy sets using AHP analysis, which was presented in work by Chen and Wu [11]. It assumes gathering a team of experts dealing with partnering in the project. Each of them is assigned an influence factor according to their competence, knowledge and experience. The method involves assessment of Project Partnering Volition (PPV) using three parameters: critical factor index (CFI), project management performance (PMP) and participant satisfaction (PS). The team determines the scale of assessments for each value and fuzzy membership function describing the assessment. Then, measures which will be evaluated, are identified. These measures are combined into sections, and thus the CFI takes a hierarchical form. In the example, nineteen measures are proposed, divided into four sections. The exact list of measures is shown in Table 2. The experts then assess the individual measures, indicating: a precise numerical value, a possible range of numerical values, a linguistic term, or a fuzzy number subject. They also define the weighting coefficients for individual measures and sections. Expert assessments are aggregated, and then the fuzzy assessments are determined for the CFI. Assessments for PMP and PS are determined in a similar way. Using parameters determined in this way, the PPV is determined first in fuzzy form, and then as a numerical value.

The advantage of the method presented is the ability of the expert to choose the assessment method of the studied measures. The assessment is based on the knowledge and experience of experts, which reduces the risk of misjudgement. This method, however, is complicated and requires the appointment of a team made up of people with extensive knowledge and experience both on partnering, as well as the theory of fuzzy sets.

2.5. Fuzzy expert system controlling partner relationships (Conrel)

The author developed an expert system for assessing and controlling partner relationships in a construction company, in the context of a strategic partnering. [10] The purpose of this system is to improve the assessment indicators of construction enterprises by raising the level of partner relationships with entities collaborating on the institutional market. The task of the expert system designed is to determine each entity and for each of the 14 measures of the relationships (Table 2) and recommendations for supporting the decision-making system for any construction company, whether the relationships are to be maintained, modified or changed immediately. The next task of the system is to choose the measure of the relationships that should be changed in the first place, because they reduce the efficiency of the company's operations. The decision as to whether the relationship should be maintained, modified or changed immediately, for each of the measures, is made by an expert system on the basis of an analysis of the validity of the measure, and evaluate its impact on company success. In turn, the choice of a particular entity of a measurement to be improved in the first place is made on the basis of the analysis of all input parameters.

The advantage of the method is the control of the improvement of a partner relationship, which is missing in other methods discussed. The system was developed in the context of strategic partnering, so that it would be necessary to adapt the analysed measures for assessment and control of relationships in a construction project.

3. Comparison of the described methods

Chapter 2 presents the methods for assessing partner relationships available in literature. They can be divided into two methods based on statistics, those using the theory of fuzzy sets for assessment. Table 1 summarises the methodology of described techniques and their advantages and disadvantages. Table 2 lists the measures of the partnering in individual methods.

Each of the partnering assessment systems presented involves obtaining information about relationships by filling out questionnaires by the participants of the project. Both in the case of PPI, as well as expert system assessments are set arbitrarily by one person, who reduces the costs associated with it. The PTI and PPI methods use Internet sourced data, which allows for filling out the questionnaires at any time and place. Only the expert system, in addition to the two methods above, has a system that automates the calculations. Fifteen of the tested measures are repeated at least in two of the described methods (Table 2). The PTI method allows for changing both analysed measurements, as well as their validity. In the case of the PPV method, the analysed measurements can also be customised according to the needs. It is similar in the case of the monthly questionnaire-based assessment, but this method does not assume the determination of an aggregate assessment of the partnering, but only a partial assessment of individual measures. With the PTI and PPV methods, the expert system and the monthly questionnaire assessment, a key role is played by the subjective assessment of the participants of the project, which is questionable, since the same status of a given measurement can be evaluated at a different level, by different people. With this in mind, the PPV expert system uses fuzzy logic for the assessment. An attempt to objectify the assessments was used in the PPI method, through the introduction of QIs, which should guide the participant during the assessment. They are also supplemented by QR, in a way creating a grading scale for them. This approach allows for the reduction the subjectivity and differences in the assessments of different projects. Among the described systems, only the expert system allows for the assessment and control of the partner relationship in a construction project.

It is therefore worth considering the development of a comprehensive method based on the following guidelines:

- Selection for assessment of 15 measures present in at least two of the described methods (measures in bold in Table 2),
- Method supplemented by an IT system (as in PTI, PPI, Conrel),
- Assessment made by a single expert (as in PPI and Conrel),
- Method determining the synthetic indicator for all the studied measures (as in PTI, PPI, PPV and Conrel),
- The ability to add and change the studied measures (as in PTI, Conrel),
- Method extended to the control of partner relationships (as in Conrel),
- Control complemented by quantification of the benefits of using the partnering approach used for the cost and duration of the project (not present in current methods).

Table 1

Advantages and disadvantages of methods for assessing partnering source: (own work)

Names of authors	Method name	General characteristics	Advantages	Disadvantages and limitations
Roger Bayliss, Sai-On Cheung, Henry C.H. Suen, Shek-Pui Wong	Questionnaire-based, monthly assessment of partner relationships	Assessment of 13 measures using a five-point scale. Assessment of measures as the arithmetic average of ratings of the project participants	– The opportunity to develop partner relationships on the occasion of monthly meetings – Involving all project participants in a discussion on improving partner relationships – Adaptability	– The need to organise regular meetings – The method is based on subjective assessments by the project participants – Failure to determine the validity of individual measures analysed – No synthetic indicator for all attributes analysed – Involvement of a large number of project participants
Sai On Cheung, Henry C.H. Suen, Kevin K.W. Cheung	Partnering Temperature Index (PTI)	Measures rated using a five-point scale. Measure PTIs as an arithmetic average of project participants' ratings. Project PTI as a weighted average with the Measure PTIs	– The possibility of assessment via the Internet – Automatic calculation of indicators – The ability to adapt the number of measures analysed and their validity to the project	– Selection of measures and their validity requires the manager's knowledge and experience – The method is based on subjective assessments by the project participants – Involvement of a large number of project participants
John F.Y. Yeung, Albert P.C. Chan, Daniel W.M. Chan	Partnering Performance Index (PPI)	7 evaluated KPIs. Each KPI correspond to QI and QR. Project manager gives the value of QIs. Value of QIs are converted to assessment using a five-point scale in accordance with the accepted QRs. PPI is a weighted average of these assessments	– The use of QIs and QRs eliminates the problem of subjective assessments by the project participants – The possibility of assessment via the Internet – Automatic calculation of indicators – No need of involvement of a large number of project participants	– The need to adjust the monitored QIs and QRs to the specifics of the project and the environment in which it will be implemented
Tung-Tsan Chen, Tsung-Chiang Wu	Project Partnering Volition (PPV)	The method uses the theory of fuzzy sets and AHP analysis. Rule database	– The ability to verbally identify the studied factors – Assessment is carried out by competent persons	– Complicated method – Requires the appointment of a team of experts – No IT system
Elżbieta Radziszewska-Zielina	Fuzzy expert system controlling partner relationships	The method uses the theory of fuzzy sets. It provides assessment and control of partner relationship	– In addition to assessment, the system helps control partner relationships – No need of involvement of a large number of project participants	– Need for training in the use of the specially developed Conrel IT system – Used for strategic partnership

Table 2

Measures of a partnering in various methods (own work)

	A questionnaire-based, monthly assessment of partner relationships	Partnering Temperature Index	Partnering Performance Index	Project Partnering Volition	Fuzzy expert system controlling partner relationships
Trust	X		X	X	X
Information sharing	X				X
Communication	X	X	X	X	X
Cooperation and mutual relations	X				X
Standards and rules of behaviour	X				X
Quality	X	X	X	X	X
Safety	X	X			
Financial security	X			X	
Job satisfaction	X				
Resources	X			X	
Waste minimization	X				
Third parties' needs	X				
Dispute resolution	X	X			X
Time		X	X		
Cost		X	X	X	
Environment		X			
Contract relations		X			
Top management commitment			X	X	
Innovation and improvement			X	X	
Dedicated team				X	
Flexibility to change				X	X
Long-term perspective				X	
Partnership formation at design stage				X	
Good cultural fit				X	
Company wide acceptance				X	
Questioning attitudes				X	
Clear understanding				X	
Consistent with objectives				X	
Technical expertise				X	
Equal power/empowerment				X	
Basis of order placement					X
Number of suppliers					X
Approach to service quality control					X
Cost division					X
Participation in the enterprise's new offer					X
Contact frequency					X

4. Conclusions

In the world of literature, only a few methods for assessing partner relationships in construction project have been described. This article analyses five of them. Methodology has been discussed as well as the advantages and disadvantages of individual methods. Because there is no comprehensive method for assessing and controlling partner relationships in construction projects, guidelines for its creation have been developed. The development of this system is in progress and will therefore be the subject of subsequent articles.

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