

## Analysis of the Impact of the Level of Partnering Relations on the Selected Indexes of Success of Polish Construction Enterprises

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The aim of this paper is to prove, on the basis of research studies, that construction enterprises which create stronger partnering relations with other construction enterprises, suppliers of materials and/or suppliers of building machinery and/or investors, are more successful on the market. The first stage of the research consisted of the existing literature on the subject, i.e. concerning other research on the partnering relations of construction enterprises. There is a lack of research on this subject in Poland and the neighbouring countries. Next, the author elaborated her own model of partnering relations using 14 parameters and based on multi-criteria analysis of the phenomenon of partnering. She elaborated her own method of assessing the partnering relations of a construction enterprise with four essential transactors in its environment, as well as a simplified method of assessment of a construction enterprise's success. According to this method, the success of a construction enterprise is assessed by means of the following three indexes: index of the competitiveness of bids, timely completion of tasks, performance quality index. A further stage was to prepare a project of questionnaire research and conduct questionnaire-based interviews in construction enterprises in a selected region. The research results were elaborated using the author's own method of partnering relation assessment, the simplified method of assessment of an enterprise's success and, next, the mathematical correlation model and the linear regression model. The research was conducted with the participation of 147 experts – representatives of medium-sized and large construction enterprises which employ more than 50 workers and are based in the Malopolska Voivodship, Poland, the said representatives being owners, managers or building site managers of such enterprises. In most researched cases the result shows that the linear correlation between the level of partnering relations of a construction enterprise and the success index are significant. The highest regression significance level for the index of the success of a construction enterprise is shown in relation to indices of timely performance and quality performance. These indices are in direct relation to the level of the partnering relations of a construction enterprise. Partnering relations with the suppliers of machinery and equipment ensure the timely performance and high quality of supplies, which entails that the construction enterprise is capable to deliver investment projects in a timely manner and ensure high quality of deliveries. The lowest regression significance level is

shown by the index of the competitiveness of bids. The index of the competitiveness of bids is in relation to the number of bidding procedures won by the enterprise. In the event of bidding procedures, the investor may not establish partnering relations with construction enterprises. This is why the index of the competitiveness of bids does not directly depend on the level of partnering relations of the enterprise. The index may depend on these relations only indirectly. Construction enterprises which maintain partnering relations at high levels are characteristic also of high quality and timely performance indices, and hence, such enterprises are perceived to be reliable and trustworthy, which increases their chance to win bidding procedures. The research analysis confirms the hypothesis formulated above and explains the need for the development of partnering relations between construction enterprises on the business-to-business market.

Keywords: *partnering relations, partnering, construction enterprise, indexes of success.*

### Introduction

In its report of 1991 entitled "In Search of Partnering Excellence", Construction Industry Institute proposed the following definition: "Partnering is a long-term commitment between two or more organizations for the purposes of achieving specific business objectives by maximizing the effectiveness of each participant's resources. This requires changing traditional relationships to a shared culture without regard to organizational boundaries. The relationship is based on trust, dedication to common goals, and an understanding of each other's individual expectations and values. Expected benefits include improved efficiency and cost effectiveness, increased opportunity for innovation, and the continuous improvement of quality products and services" (CII 1991, p. IV). The report is based on 27 case studies concerning partnering co-operation in the USA. In the same year 1991, The Associated General Contractors of America defined partnering co-operation as "a way of achieving an optimum relationship between a customer and a supplier. It is a method of doing business in which a person's word is his or her bond and where people accept responsibility for their actions. Partnering is not a business contract but a recognition that every contract includes an implied covenant of good faith" (AGC 1991, 2). The former

definition, given by CII, describes "strategic partnering" while the latter, by AGC, defines "project partnering". In construction industry one can apply a short-term partnering approach, i.e. partnering co-operation in a single construction project, or a strategic partnering approach, which is a long-term process extending over several investments. What is important is that project partnering constitutes the first step towards long-term co-operation, i.e. strategic partnering. Analysis of relevant literature allows the author to note that, in the subject of partnering relations, one can distinguish several themes and that this phenomenon is developing in some countries better than in others. The largest number of studies have been produced in the USA, Great Britain, Australia and Hong Kong. There are more analyses of project partnering than of strategic partnering.

Most publications are the fruit of research on an assessment of the application of partnering in the implementation of particular construction projects. For example, in their analysis of the construction of clean rooms in Canada, Shields and West (2003) emphasize how innovative the partnering approach is. The success of this project was due to the relationship between the employees, who treated the task as a challenge, which allowed for developing mutual trust. According to Franke and Grebenc (2008), the construction of the BMW World building in Munich was possible only thanks to the adoption of the partnering approach. The success of partnering co-operation is also described by Eriksson and Nilsson (2008) in the construction of a pharmaceutical factory in Sweden. The investor in question reduced stress on price and on his own authority, and facilitated the relations based on trust and co-operation. The results of other research (Chan, Chan, Ho 2003) show that improved relations and communication between project participants as well as feedback in cases of emergency changes in the project and its implementation are the crucial advantages of applying the partnering approach. Research by Baxendale and Greaves (1997) show that most of the general contractors in Great Britain either apply or intend to apply the partnering approach with their subcontractors as they see its advantages with regard to cost reduction and improvement in service quality. Data analysis based on over 400 construction projects commissioned by the Construction Department in Texas also reveals that the partnering approach allows to control the costs and the time of implementation of a construction project (Gransberg, Dillon, Reynolds and Boyd 1999). Drexler and Larson (2000) examined the stability of relations between the participants of 276 construction enterprises in the USA, mainly between the investor and the contractor. A practical study of strategic partnering was made by Kaluarachchi and Jones (2007) on the basis of the monitoring of a large project consisting of the construction of twelve housing estates by Amphion Consortium in Great Britain. Strategic partnering is also the subject of study of the choice of long-term subcontractors in South Korea (Eom, Yun and Paek 2008).

Not all of the case studies arrive at conclusions that are unequivocally positive for partnering co-operation. Bresnen and Marshall (2000) analyse data from 9 medium

and large construction enterprises in Britain. They note that partnering did not guarantee more favourable prices or working time and that the main problems concerning integration in a project and in the very construction continued. However, they emphasize that there was a considerably smaller number of misunderstandings when partnering was applied. Misunderstandings and the resulting complaints are analysed by Kululanga et al. (2001). Wood and Ellis (2005) examined the opinions of several dozens of project managers employed by a major British contractor. It turned out that early optimism in the partnering approach is suppressed by practical details, mainly the financial ones. Mason (2007) analyses the experiences of specialized contractors in Britain and concludes that, despite the partnering approach, little has changed in the state of knowledge of specialized contractors; he suggests that it is necessary to change the negative perception of partnering by such contractors. Dainty, Briscoe and Millett (2001) present the perspective of subcontractors (small and medium enterprises), their mistrust and scepticism within the existing relations in the supply chain. They suggest that a change in the attitude must come from various sources, including the education of contractors in the construction industry. The role of subcontractors is also discussed by Arditi and Chotibhongs (2005). A publication by Eriksson, Nilsson and Atkin (2008) deals with the subject from the perspective of an investor. The authors investigate the opinions of eighty-seven investors in Sweden in order to identify the critical barriers to partnering. Latham (1994) points out that what is important are the relations between the contractor and the subcontractor. If these are partnering relations, they will facilitate the implementation of a construction project and bring advantages to the investor. There are numerous analyses conducted on the Far East markets. Phua and Rowlinson (2003 and 2004) deal with the construction industry in Hong Kong. Research was also done by Kwan and Ofori (2001) on 77 Chinese construction enterprises in Singapore. A work by Koraltan and Dikbas (2002) states that in Turkey the main obstacle to partnering is restrictive regulations concerning construction contracts, especially public commissions. Similar problems are described by Ng, Rose, Mak and Chen (2002), who examine the development of partnering in construction projects commissioned by the Australian government. Partnering in public projects is also analysed by Glagola and Sheedy (2002).

The authors of numerous publications undertake to analyse the very process of partnering, i.e. to determine its characteristics and their hierarchy. One of these works (Yeung, Chan, Chan, Li 2007) presented an elaborated partnering performance index based on the Key Performance Indicators used for the assessment of the success of partnering projects. As a continuation of this research, Yeung, Chan and Chan (2008) determined the appropriate quantitative indices. Eriksson and Pesämaa (2007) propose and test a sequential model of partnering procedures used by investors. A unique assessment system was elaborated by Cheung, Suen and Cheung (2003). This is an automatic monitoring system called the Partnering Temperature Index. Another assessment system for project

partnering was presented by Bayliss, Cheung, Suen and Wong (2004). On the basis of implementation of partnering in a project by an enterprise in Hong Kong, they list a set of effective tools of partnering co-operation. Beach, Webster and Campbell (2005) assess the progress of the British construction industry in partnering approach implementation. Finding the critical success factors of partnering was the goal of some other research in Hong Kong (Chan et al. 2004). A similar task was undertaken by Chen and Chen (2007), who examined the success factors of the partnering co-operation in a project in Taiwan. Critical success factors are also analysed on the data from China (Tang, Duffield and Young 2006). Quality management is the subject of a work by Bubshait (2001). This author compares quality management and partnering, concluding that these two strategies are mutually complementary. Bubshait emphasizes that partnering is a method of cost and conflict reduction in a project. Nyström (2008) presents a quasi-experimental method of partnering approach assessment based on data obtained from the participants of 20 construction enterprises. Cheng and Li (2004) propose their own model of partnering which aids its implementation in a project. A key work on the theory of partnering in the construction industry is a book by Bennett and Jayes (1998); it describes seven pillars of partnering. Among works which refer to this book is e.g. Bresnen (2007).

Several publications regard trust as the crucial factor of successful partnering. A work by Cheung, Ng, Wong and Suen (2003) contains several definitions of trust, describes its role, identifies the sources of the lack of trust and suggests some methods to develop trust. The data come from the analysis of a railway project in Hong Kong. The first of the above-mentioned authors (Cheung 2007) also writes about the inadequacy of classical construction contracts in the context of trust and partnering. The role of trust and co-operation is also stressed by Kumaraswamy, Ling, Rahman and Phng (2005). A work by Lazar (2000) examines the categories of trust. Sociology, economics and mathematics are used in relation to construction industry in the works which make use of game theory and the so-called "prisoner's dilemma". Sacks and Harel (2006) propose an economic model of game theory in relation to trust in partnering projects. Wong, Cheung and Ho (2005) examine the development of trust in a construction project as the "prisoner's dilemma". Nyström (2008) uses Wittgenstein's concept of family resemblance to define the concept of partnering. Partnering is graphically represented by Nyström as a "partnering flower". The work by Pryke (2004) makes use of social network analysis. Information exchange in a partnering construction project is discussed by such researchers as Drejer, Vinding (2006) or Chan, Cooper, Tzortzopoulos (2005). Bresnen and Marshall (2000) made a review of problems encountered by partnering enterprises, and analysed some of them with the use of social sciences and organization theory.

To sum up, the review of literature from the countries other than European ones shows that – although partnering as a strategy in construction industry is relatively new – its concept has already spread over very different and often very distant parts of the world. Because this is a new

approach – particularly novel in construction industry, where competition is deeply rooted, as noted by numerous authors – those enterprises which implement partnering encounter a whole range of problems. No wonder then that, apart from optimistic works which promote project partnering as well as strategic partnering and describing the advantages of this approach, a number of studies point to various problems, both internal (concerning project participants) and external (e.g. legal) ones, which partnering enterprises have to face. Many authors argue that partnering in construction industry is an interdisciplinary phenomenon. All works mentioned in the present paper have one common characteristic; namely, none of them claims that partnering is an unsuitable approach for construction industry. All predict that partnering will develop in future.

What needs to be mentioned here are the author's own papers on the subject. A full review of models in which partnering has a key part as well as her own model of partnering relations in construction industry were presented in 2008. Barriers to creating partnering relations by Polish construction enterprises as well as advantages of using the partnering approach in construction industry are also described (2008b). The characteristics of a construction enterprise's activity on the market are also shown. While it is true that Kapliński, Werner, Kosecki, Biernacki and Kuczmariski (2002) point to a relation between a construction enterprise and the microenvironment as one of three basic research topics related to the organization and management of construction enterprises, there are few other publications concerning partnering relations in European countries. However, this new trend is already visible in works on marketing. For instance, an article by Virvilaite (2008) focuses on a new concept in marketing, namely relation marketing. Long-term relations between an enterprise and its client, based on trust and client satisfaction, constitute a new trend present in Lithuania. Although published results of European research on the subject concern other fields than the construction industry, they are nevertheless worth being mentioned here. Research by Zvireliene, Buciuoniene, Skudiene, Sakalas (2009) on relation marketing (internal relationship, relationship with customer and relationship with supplier) showed that the analysed companies overlook the importance of the relationship enhancement with the other key stakeholders: suppliers and, in particular, employees. Moreover, the strong internal relationship correlation with the relationship with suppliers and customers suggests that companies should seek to develop internal relationships in order to establish long-term relationships with suppliers and customers. Auruskeviciene, Kuvykaite, Skudiene, (2007) discuss the aspects of relationship and transactional marketing integration. Others author, Korsakiene (2009) presents a novel approach to relations with clients. According to that author, the management of client relations is a relatively new discipline and that in practice it leads to an enterprise's long-lasting market success.

A work by Jasilioniene, Tamosiuniene (2009) investigates the evaluation of customer relationship system efficiency by applying the total cost of ownership

approach. These authors state that ongoing measurement of customer relationship system benefits guarantees that an enterprise achieves strategic goals and receives the advantages it expects. An article by Urbanskiene, Zostautiene, Chreptaviciene. (2008) analyses the client relation management system. It shows the support of customer's (either organisations or individual persons) and supplier's (such as an industrial organisation or a service organisation) relationship based on trust, commitment, dependence, cooperation, power distribution, communication, etc. as well as the development of customer's loyalty. Salciuviene, Auruskeviciene, Lee (2009) state that personal customer values are essential in order to gain a better understanding of customers and their retaining behaviour that leads to long-term relationships and, consequently, to long-lasting profits.

In his paper (2008), Kapliński discusses the applicability of scoring methods in construction industry and presents methods (for instance, Altman's index), which may be applied in order to assess the financial condition of a construction enterprise. Kapliński makes a note that Z-score index should be adjusted to economic conditions of a given country, or even to an industry. Examples have been selected among construction companies listed on Warsaw Stock Exchange. Methods of assessment of construction enterprises' financial condition are discussed by Ginevicius, Podvezko (2006). Polish authors Meszek and Polewski (2006) analyse some aspects of working capital in a construction enterprise and discuss the profiles of selected construction enterprises in the aspect of working capital formation and their strategies of management when applied to working capital. The three articles mentioned above are mentioned in the present work because its aim is to analyse the influence of partnering relations on a construction enterprise's success – and it is the financial indexes that are among the measures of this success. However, in her own research the author of this article resigned from direct application of economic indexes to assess the success of a given enterprise when it became obvious (at the preliminary stage of research) that enterprises which are not obliged by the law to disclose relevant data to the public are also unwilling to reveal these data to researchers.

**Research problem:** the influence of the level of partnering relations on selected indexes of success of construction enterprises in an analysed region.

**Research aim:** verification of the hypothesis that the construction enterprises which have partnering relations on a higher level also have higher indexes of market success than the enterprises whose partnering relations are on a lower level.

**Research methods applied:** analysis of literature on the subject, the author's own method of assessing the partnering relations of construction enterprises with four transactors on the market using a set of 14 parameters assessed on a five-point scale, the author's own, simplified method of assessing an enterprise's success by means of three selected indexes, her own questionnaire research done in construction enterprises in a selected region, the mathematical correlation model and the linear regression

model. Calculations and figures were made using the MatLab software.

The methodology of analysing the influence of partnering relations on selected indexes of a construction enterprise's success is presented in Figure 1.

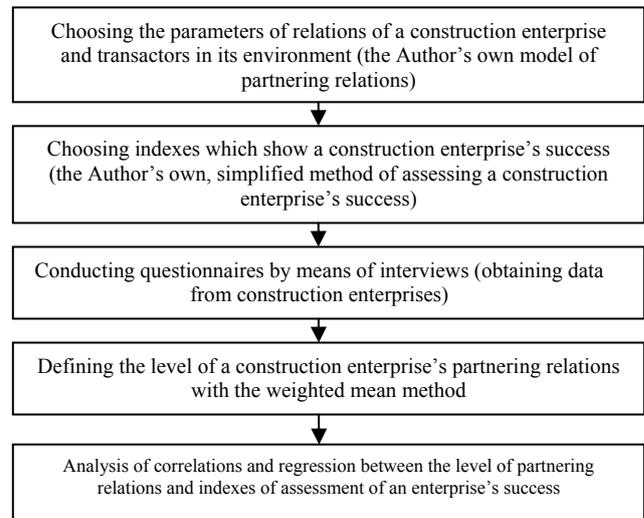


Figure 1. Methodology of research on the influence of partnering relations on selected indexes of a construction enterprise's success

### Research model of partnering relations between construction enterprises

Partner co-operation on the business-to-business market is based on partnering relations between enterprises. The notion of a partnering relation has not been defined, nor has it been described using numerical measures in literature. In everyday practice, the notion is used intuitively. The three key features of partnering relations which are strongly emphasised in all studies about partnering relations are: long-lasting relation, common goals of partners and mutual trust. The author of this article poses the question of what criteria create a relation between construction enterprises a partnering relation on the business-to-business market as opposed to traditional market relations, and describes these relations using 14 parameters (see Table 1 below).

Systems grading of the levels of relations may be found in professional literature. Otto (1999) by reference to Kotler (1994) distinguishes and discusses 5 levels of relations, namely: basic ("Bare bones"), reactive, accountable, proactive and partnership. Webster (1992), when discussing the evolution of links between the supplier and the recipient of supplies, starts his considerations with relations based on single transactions, and continues through repetitive transactions, long-lasting links and partnering relations to strategic alliances. Similarly, Hutt and Spec (1998) distinguish and discuss various levels of relations between the seller and the buyer on the business-to-business market, starting with exchange based on a single transaction through repetitive transactions, long-lasting relations and partnering up to exchange based on close co-operation set forth by a contract, i.e. a strategic alliance.

The author assumes that relations may be classified according to a 5-score scale ranging from 1 meaning traditional relations to 5 – partnering relations. She describes the extreme (top and bottom) points of the scale in a qualitative manner (see Table 1 below) and then proposes that the aforementioned fourteen parameters be used for the purpose of the assessment of partnering relations between construction enterprises. The experts from construction enterprises used those fourteen parameters and assigned relevant values thereto on a 5-score scale to assess relations with four entities in their environment. As the 5-score scale was used in the questionnaire and statistical methods for the calculation of the research results, the partnering relations of construction enterprises could be shown quantitatively.

Table 1

**Parameters describing relations between construction enterprises in the traditional and the partnering approach**

Parameter	Traditional relations	Partnership relations
1. The basis of ordering	Choice based on the lowest price	Price is not the most important. Holistic approach and choice of partner based on, among others, partner's high quality of services and relations, ability to solve problems
2. Number of suppliers	Large, suppliers compete with one another	Limited to best partners
3. Approach to service quality control	Buyer performs inspection every time when goods are received	Quality control performed by supplier. Buyer trusts a proven partner
4. Cost division	Buyer keeps cost savings so supplier hides them. Win-lose strategy	Precise definition of share in costs, profit and risk related to contract execution. Win-win strategy
5. Adaptation to market changes	It is the buyer who determines response to changing market conditions	Buyer and supplier together plan their actions and elaborate their plan of adaptation to market changes
6. Participation in enterprise's new offer	None	Active, common effort towards constant improvement of services
7. Mutual relations	Purely formal, commercial, based on contracts	Often informal, based on trust. Cooperation of partners
8. Way of communication	Minimal, limited to orders and complaints	Open, frequent, initiated by both parties
9. Information sharing	Limited information flow	Information exchange. Open, quick information flow
10. Conflict solving	It is the buyer who solves conflicts	Solving conflicts together. There is a mechanism of conflict solving.
11. Standards, rules of behaviour	No common rules. Different aims. Lack of flexibility	Common values and aims. Partners' flexibility concerning procedures, standards and habits
12. Frequency of contact	Single contacts	Frequent, permanent contact and permanent relations
13. Approach to issues concerning quality	Focus exclusively on technical quality of product	Complex approach to quality issues. Quality of relations is important
14. Trust	Lack of trust in business	Visible trust

**The simplified method for the assessment of success of a construction enterprise**

The notion of an enterprise's success is a very complex issue. One may point to numerous, different parameters testifying to an enterprise's success. The author of the article undertook to assess several construction enterprises (rather than a single entity), based on data collected in the course of interviews. Hence, the number of indices showing whether a given enterprise is "good" and successful on the market could not be too large. The number and type of indices was selected with a view to the purpose and nature of the author's own research. In order to determine which construction enterprise in the set of the interviewed enterprises is relatively "better" or "worse" than others. For the purpose of research the author has developed a simplified method for the assessment of an enterprise, based on three indices showing the success level of a given enterprise. The definitions of the three indices along with the description of goals attained by a given construction enterprise due to maintaining the index at a high level have been rendered in Table 2 below. It was assumed that the values of parameters to be used in order to set the indices for enterprises covered by the research would be the values generated in a year preceding the year of the research.

Table 2

**Indices of Success Selected for the Purpose of the Assessment of a Construction Enterprise**

Index name	Index definition	Goals attained by the enterprise
Index of the competitiveness of bids	(The number of bids placed / the number of bids won by the enterprise) · 100% Percentage of the number of orders resulting from placing a bid in the total number of bids	Effectiveness of bids developing
Timely completion of tasks	(The number of tasks completed in a timely manner / the number of all tasks delivered) · 100% Percentage of the number of tasks reported to be ready for take-over on or before an agreed deadline in the total number of all tasks delivered.	Proper management of time and abiding by deadlines in the course of the performance of construction projects
Performance quality index	(The number of tasks delivered without faults / the total number of tasks delivered) · 100% Percentage of the number of tasks delivered without faults in the total number of all tasks delivered.	Proper quality of performed tasks

**Research procedure**

The author conducted the research on partnering cooperation in construction industry in 2008 in the area of the Małopolskie Voivodship (the area of which was selected randomly). A questionnaire based method was used. The questionnaire based research methods and their applicability to construction industry enterprises are discussed in the manual (Radziszewska-Zielina, 2006). Research using this method, as time-consuming and laborious as it may be, is the most useful in practice where

the researched problem is such as the one discussed herein. A direct conversation with a respondent provides a better opportunity for the researcher to approach the respondent (an expert from a construction enterprise in this case) and to motivate him to participate in the research and give answers to all questions in the questionnaire, than in the case where another research method (a survey, for instance) were used. The method selected by the author ensures that data obtained from the research is of high quality, whilst in case of other methods (including a survey) problems occur with incomplete or unreturned questionnaires. The only disadvantage of the selected method is that it requires considerable effort. The address database of all medium-sized and large construction enterprises in the selected voivodship was purchased. It was assumed that the research will be exhaustive, covering the whole population. The size of the researched population, i.e. the number of all medium-sized and large construction enterprises in the selected voivodship did not exceed 180. However, 147 representatives (being owners, managers or construction site managers) of medium-size and large construction enterprises (employing more than 50 employees) from the selected voivodship eventually took part in the research. The research sample may be considered large. It might be attempted to prove that the results of the research in the selected region are representative for the whole country. The selected voivodship is a typical and medium-sized region: neither very rich nor very poor, without the capital of the country located on its territory. For the purpose of the paper and the simplicity of discourse, whenever, further in the paper, the results of research in the Małopolska voivodship are referred to, the author of the article will talk of Polish construction enterprises, referring in fact only to construction enterprises in the selected region, rather in the whole country.

### Research results

The hypothesis formulated above and stating that the higher the level of partnering relations of a construction enterprise with four key transactors on the business-to-business market (suppliers of materials and/or construction machinery, subcontractors, general contractors, investors, contractors managing projects in lieu of investors), the more successful such a construction enterprise is on the market. Construction enterprises which enjoy partnering relations at a higher level are more successful on the market than enterprises which have partnering relations at a lower level. The hypothesis testifying true shows that the development of partnering relations by construction enterprises is necessary. In order to try the hypothesis, an analysis of the interrelation between an enterprise's success indices and the assessment of its partnering relations was carried out. It was assumed that the value describing the level of partnering relations of a construction enterprise is the weighted mean of values describing the level of partnering relations between a construction enterprise and the four key transactors. The value describing the level of partnering relations between a construction enterprise and a selected key transactor is the weighted mean of the

values of the fourteen parameters describing relations with that transactor. The assessments of significance of parameters, provided by experts from construction enterprises, may not be used directly as weight coefficients, because the values of such assessments are not within the range of 0 to 1 and their sum does not equal 1. Hence, the values of assessments of the significance of the fourteen partnering relation parameters (ranging from 1 to 5) were converted into fourteen weight coefficients  $w_{i,j}^{(wei)}$  (ranging from 0 to 1) according to the following formula:

$$w_{i,j}^{(wei)} = \begin{cases} \frac{x_{i,j}^{(wei)} - \min_{j=1,\dots,m} \{x_{i,j}^{(wei)}\}}{\sum_{j=1}^m x_{i,j}^{(wei)}} & \text{for } \min_{j=1,\dots,m} \{x_{i,j}^{(wei)}\} \neq \max_{j=1,\dots,m} \{x_{i,j}^{(wei)}\} \\ \frac{1}{m} & \text{for } \min_{j=1,\dots,m} \{x_{i,j}^{(wei)}\} = \max_{j=1,\dots,m} \{x_{i,j}^{(wei)}\} \end{cases} \quad (1)$$

where:

- $x_{i,j}^{(wei)}$  - the value of the assessment of significance of a subsequent  $j^{\text{th}}$  parameter in relation to the subsequent  $i^{\text{th}}$  construction enterprise,
- $m$  - the number of partnering relation parameters.

Now, the assessment of the level of the partnering relation  $\bar{x}_i^{(k)}$  of a subsequent  $i^{\text{th}}$  construction enterprise to a subsequent  $k^{\text{th}}$  transactor is expressed by the following formula:

$$\bar{x}_i^{(k)} = \frac{1}{m} \sum_{j=1}^m x_{i,j}^{(k)} \cdot w_{i,j}^{(wei)} \quad (2)$$

where:

- $x_{i,j}^{(k)}$  - assessment of  $j^{\text{th}}$  parameter of relation to  $k^{\text{th}}$  entity by the expert from the subsequent  $i^{\text{th}}$  construction enterprise,
- $m$  - the number of partnering relation parameters.

As it was mentioned above, the level of partnering relations in a construction enterprise is the weighted mean of the assessments of partnering relations with particular transactors. Analogously to the assessments of the significance of the relation parameters, the assessments of the significance of the transactors cannot be used directly as weight coefficients. That is why the assessments of the significance of particular four transactors (on the scale from 1 to 5) were converted into four weight coefficients  $w_{i,j}^{(wei-tra)}$  (on the scale from 0 to 1) using a formula analogous to (1).

Now, the assessment of the level of the partnering relation  $\bar{x}_i$  of the  $i^{\text{th}}$  construction enterprise is expressed by the following formula:

$$\bar{x}_i = \frac{1}{p} \sum_{k=1}^p \bar{x}_i^{(k)} \cdot w_{i,k}^{(wei-tra)} \quad (3)$$

where:

$p$  – number of transactors.

Points representing each construction enterprise are marked in Figures 2, 3 and 4. The  $x$  coordinate of the point shows the level of partnering relations of a construction enterprise, while the  $y$  coordinate shows the value of a selected success index of the enterprise. Regression analysis was carried out for the data determined in this way. For the purpose of adjusting the straight line to the set of points, the least square method was used. The formula of the linear regression function is as follows:  $y = ax + b$ . The  $a$  and  $b$  linear regression coefficients and the  $r$  correlation coefficient were determined. The measure of correlation in the case of two quantity variables measured at scale or product intervals is the Pearson correlation which assumes values within the range of  $[-1,1]$ , (where  $-1$  means absolute negative correlation,  $0$  – lack of correlation and  $1$  – absolute positive correlation, expressed in the following formula:

$$r = \frac{\frac{\sum_{i=1}^n X_i Y_i}{n} - \left(\frac{\sum_{i=1}^n X_i}{n}\right) \left(\frac{\sum_{i=1}^n Y_i}{n}\right)}{\sqrt{\left(\frac{\sum_{i=1}^n X_i^2}{n} - \left(\frac{\sum_{i=1}^n X_i}{n}\right)^2\right) \left(\frac{\sum_{i=1}^n Y_i^2}{n} - \left(\frac{\sum_{i=1}^n Y_i}{n}\right)^2\right)}} \quad (4)$$

The determination of the degree of an enterprise's success coefficient in relation to partnering relations was tested by the determination of the  $R_w^2$  coefficient assuming values in the range of  $[-1,1]$ , and  $F$  statistics with  $F$  Snedecor's Distribution:

$$R_w^2 = 1 - \frac{\sum_{i=1}^n (y_i - \hat{y}_i)^2}{\sum_{i=1}^n (y_i - \bar{y})^2} \quad (5)$$

$$F = \frac{R_w^2}{1 - R_w^2} \cdot \frac{n - m}{m - 1} \quad (6)$$

$$\hat{y}_i = a \cdot x_i + b \quad (7)$$

where:

$y_i$  – assessment of a selected index of success of a subsequent  $i^{\text{th}}$  construction enterprise,

$x_i$  – assessment of partnering relation of a subsequent  $i^{\text{th}}$  construction enterprise,

$\hat{y}_i$  – determined value of the index of success of a construction enterprise, based on the level of partnering relations and the regression coefficient,

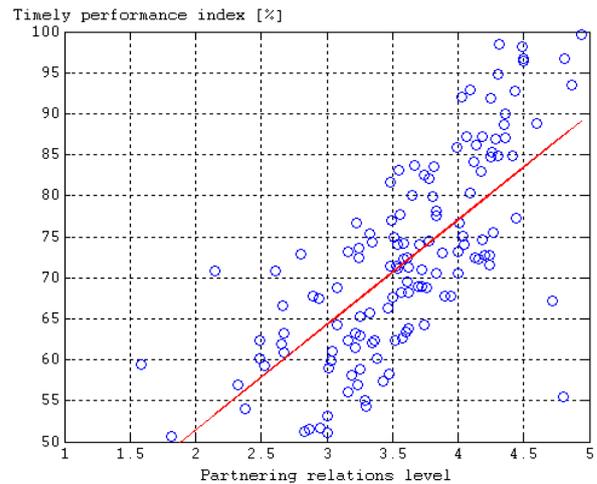
$\bar{y}$  – average of  $n$  assessment values of a selected index of success of a construction enterprise,

$a, b$  – determined regression coefficients,

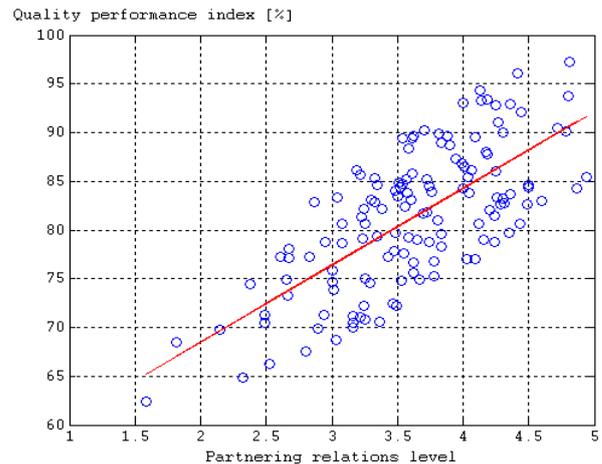
$n$  – the number of construction enterprises,

$m$  – the number of variables subject to analysis (in this case  $m = 2$ ).

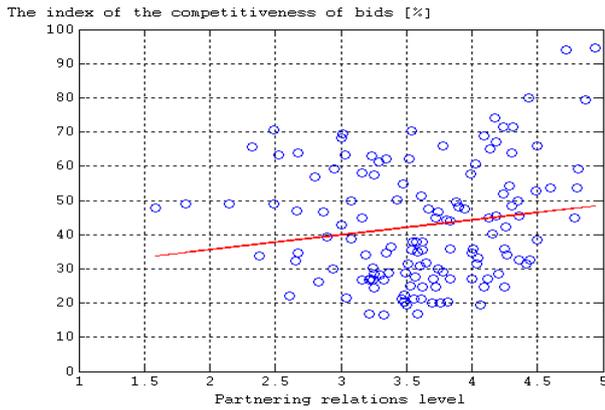
It is assumed that where the  $p$  significance level (i.e. the probability that the zero hypothesis is rejected when, in fact, the hypothesis testifies true) is lower than  $0.05$ , then the zero hypothesis claiming that there are no relations between variables must be rejected and an alternative hypothesis claiming that such relation exists, needs to be adopted. In such an event, it might be right to claim that such relation exists in at least 95 out of 100 cases. Now, where the  $p$  significance level is greater than  $0.05$ , it is assumed that there are no grounds for the rejection of the zero hypothesis.



**Figure 2.** Linear regression between the level of partnering relations of construction enterprises in Poland and the timely performance index



**Figure 3.** Linear regression between the level of partnering relations of construction enterprises in Poland and the quality performance index



**Figure 4.** Linear regression between the level of partnering relations of construction enterprises in Poland and the index of the competitiveness of bids

Table 3

**Linear regression coefficients, correlation coefficient, F Snedecor Test, significance level in relation to the level of partnering relations of Polish construction enterprises and a given index of success of the enterprise**

Index	<i>a</i>	<i>b</i>	<i>r</i>	<i>F</i>	<i>p</i>
Index of timely performance	12.793	25.920	0.676	111.420	0.000
Index of quality performance	7.870	52.801	0.705	130.790	0.000
Index of the competitiveness of bids	4.348	26.933	0.161	3.526	0.062

The correlation index assumes the value of 0.676, which shows that there is a strong positive correlation between variables describing the level of partnering relations and the timely performance index. Where the value of one of the variables rises, then the value of the other variable also rises. Construction enterprises with a level of partnering relations higher than that of other enterprises are characteristic of the timely performance index higher than the one which other enterprises may show. With regard to the aforementioned variables, the probability of committing an error is lower than 1% and the zero hypothesis claiming that there is no relation between variables representing the partnering relations level and the timely performance index may be rejected, and an alternative claiming that such relation exists may be adopted. The formula of the linear regression function assumes the following form in the case of these variables:  $y = 12,79x + 25,92$

The correlation index assumes the value of 0.705, which shows that there is a strong positive correlation between variables describing the level of partnering relations and the quality performance index. Construction enterprises with a level of partnering relations higher than that of other enterprises are characteristic of the quality performance index higher than the one which other enterprises may show. With regard to the aforementioned variables, the probability of committing an error is lower than 1% and the zero hypothesis claiming that there is no relation between variables representing the partnering

relations level and the quality performance index may be rejected, and an alternative claiming that such relation exists may be adopted. The formula of the linear regression function assumes the following form in the case of these variables:  $y = 7,87x + 52,8$

The correlation index assumes the value of 0.161, which shows that there is a weak positive correlation between variables describing the level of partnering relations and the index of the competitiveness of bids. Construction enterprises with a level of partnering relations higher than those of other enterprises are characteristic of the index of the competitiveness of bids higher than the one which other enterprises may show. With regard to the aforementioned variables, the probability of committing an error is lower than 6% and the zero hypothesis claiming that there is no relation between variables representing the partnering relations level and the index of the competitiveness of bids may be rejected, and an alternative claiming that such relation exists may be adopted. The formula of the linear regression function assumes the following form in the case of these variables:  $y = 4,35x + 26,93$

### Conclusions

Detailed analysis of the relevant literature in the world has shown that partnering and partnering relations in the construction industry are a new, increasingly popular research trend mainly in the USA, Britain, Australia, and Hong Kong. In Europe, there are very few publications on the subject. The author of this article fills this gap with her own research.

The aim of the present Author's research was to verify the hypothesis that the construction enterprises which have partnering relations (described by the author by means of 14 parameters with 4 transactors on the business-to-business market, assessed on a five-point scale) on a higher level achieve a larger market success than those whose partnering relations are on a lower level. The success of construction enterprises was analysed in a simplified way, limited to its three basic indexes.

In most (namely 2/3) researched cases the result shows that the linear correlation between the level of partnering relations of a construction enterprise and the success index is significant. The highest regression significance level for the index of the success of a construction enterprise is shown in relation to the indices of timely performance and quality performance. These indices are in direct relation to the level of the partnering relations of a construction enterprise. Partnering relations with the suppliers of machinery and equipment ensure the timely performance and high quality of supplies, which entails that the construction enterprise is capable to deliver investment projects in a timely manner and ensure high quality of performance. The lowest regression significance level is shown by the index of the competitiveness of bids. The index of the competitiveness of bids is dependent on the number of bids won by the enterprise. In the case of bidding, the investor may not establish partnering relations with construction enterprises. This is why the index of the

competitiveness of bids does not directly depend on the level of partnering relations of the enterprise. The index may depend on these relations only indirectly. Construction enterprises which maintain partnering relations at high levels are also characteristic of high quality and timely performance indices, and hence, such

enterprises are perceived to be reliable and trustworthy, which increases their chance to win bids.

The analysis described above proves that the formulated hypothesis is true and shows that the development of partnering relations on the business-to-business market by construction enterprises is necessary.

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Elžbieta Radziszewska-Zielina

#### **Partnerystės santykių lygio įtaka Lenkijos statybos įmonių parinktiems indeksams**

Santrauka

Savo pranešime „Partnerystės tobulumo paieška“ statybos pramonės institutas pasiūlė tokį apibrėžimą: „Partnerystė yra ilgalaikis susitarimas tarp dviejų ar daugiau organizacijų siekiant tam tikrų verslo tikslų maksimaliai panaudojant kiekvieno dalyvio išteklių efektyvumą. Santykiai yra grindžiami pasitikėjimu, ištikimybė bendriems tikslams ir kiekvieno individo siekių bei vertybių supratimu. Laukiamą naudą sudaro didesnis našumas, kaštų efektyvumas, didesnė inovacijų galimybė ir nuolatinis produktų ir paslaugų gerinimas.“ Tais pačiais metais Amerikos asocijuotieji statybos atstovai partnerystę apibrėžė taip: „Būdas pasiekti optimalius santykius tarp vartotojo ir tiekėjo. Tai metodas, kaip plėtoti verslą, kuriame asmens pasaulis yra jo arba jos ryšys, kai žmonės prisiima atsakomybę už savo veiksmus. Partnerystė nėra verslo kontraktas, bet pripažinimas, kad kiekvienas susitarimas yra geros valios legali sutartis.“ Pirmasis apibrėžimas reiškia „strateginę partnerystę“, o antrasis – „projektinę partnerystę“. Statybos pramonėje galima taikyti trumpalaikės partnerystės požiūrį, t. y. bendradarbiavimą vykdant kurį nors statybinį projektą arba strateginės partnerystės požiūrį, kuris yra ilgalaikis procesas apimantis keletą investicinių projektų. Išanalizavus atitinkamą literatūrą, galima teigti, kad kalbant apie partnerystės santykius galima išskirti keletą temų. Šis reiškinys vienoje šalyse plėtojasi geriau, kitose silpniau. Didžioji tyrimų dalis buvo atlikta JAV, Didžiojoje Britanijoje, Austrijoje ir Hong Konge. Tai yra naujas požiūris, ypač statybų pramonėje, kur ypač giliai išsiskynusi konkurencija. Tos įmonės, kurios praktikoja partnerystę, patiria daugybę problemų. Nenuostabu, kad, nepaisant optimistinių darbų, kuriuose remiama projektinė partnerystė ir strateginė partnerystė, daugelyje darbų aprašytos įvairios problemos – tiek vidinės (projektų dalyviai), tiek išorinės (pvz., legalios) – su kuriomis susiduria įmonės. Daugelis autorių nurodo, jog partnerystė statybos pramonėje yra tarpdisciplininis reiškinys. Visi šiame straipsnyje paminėti darbai turi vieną bendrą bruožą, t. y. nė viename iš jų neteigiama, kad partnerystė yra netinkamas požiūris statybų pramonėje. Visuose tvirtinama, kad partnerystė ateityje plėsis. Tyrėjai pateikia modelius, kurie atspindi partnerystės santykius statybų pramonėje, taip pat trukdžius, kurie riboja jų įgyvendinimą statybų pramonėje (Radziszewska-Zielina, 2008). Mažai yra darbų, kuriuose aptarta partnerystė Europos šalyse. Tačiau ši naujoji kryptis atsispindi rinkodaros darbuose. Pavyzdžiui, R.

Virvilaitė (2008) kalba apie naują sąvoką rinkodaroje, t. y. apie santykių rinkodarą. Ilgalaikiai santykiai tarp įmonės ir jos klientų, pagrįsti pasitikėjimu ir kliento pasitenkinimu, rodo naują kryptį Lietuvoje. Mokslininkai pabrėžia santykius tarp statybos įmonių ir mikroaplinkos kaip svarbiausią veiksnį statybinių įmonių valdyme.

O. Kaplinski (2008) rašo apie įvertinimo metodų taikymą statybos pramonėje ir pateikia metodus, kuriuos galima taikyti vertinant finansines sąlygas. Tyrėjas pastebi, kad vertinimo indeksas turi būti taikomas pateiktos šalies sąlygomis arba atskirai įmonei.

Šio straipsnio tikslas yra iširti poveikį, kurį daro partnerystės ryšiai Lenkijos statybų įmonėms. Analizė yra paremta duomenimis, kurie gauti atliekant tyrimą interviu metodu ir anketomis. Idėjos panaudoti ekonominius rodiklius, vertinant tam tikros įmonės sėkmę, buvo atsisakyta visuomenei paaiškėjus, kad kai kurios įmonės nėra įpareigosotos atskleisti atitinkamų duomenų, taip pat ir tyrėjams. Santykiai gali būti suskirstyti į penkias grupes. Viena iš paskelbtų hipotezių teigiama, kad kuo aukštesnis partnerystės ryšių lygis, tuo sėkmingesnė yra statybinės organizacijos veikla rinkoje. Tos statybų įmonės, kurios palaiko gana aukšto lygio partnerystės ryšius, sėkmingiau vykdo rinkos operacijas, negu tos įmonės, kuriose partnerystės santykiai yra gana žemo lygio. Tyrimai parodė, kad partnerystės santykiai statybinėse organizacijose yra labai svarbūs ir naudingi. Buvo išanalizuota priklausomybė tarp įmonės sėkmingos veiklos ir jos partnerystės santykių. Išvada – partnerystės santykiai statybos įmonėse yra vertybių sistema, kuri parodo partnerystės lygį tarp statybinės įmonės ir jos partnerių.

Daugeliu tyrimų atvejų buvo pastebėta, kad koreliacija tarp statybinės įmonės partnerystės santykių lygio ir sėkmės indekso yra labai dideli. Aukščiausių statybinės įmonės sėkmės rodiklių rodo jos aktyvi ir kokybiška veikla. Šie rodikliai tiesiogiai susiję su statybinės įmonės partnerystės santykių lygiu. Partnerystė tiekiant mechanizmus ir įrengimus užtikrina aukštos kokybės tiekimo procesą laiku, vadinasi statybinė įmonė sugeba vykdyti investicijų projektus ir užtikrinti tiekimo kokybę. Konkurencingų pasiūlymų indeksas atliekant tyrimą buvo mažas. Šis indeksas priklauso nuo bendro pasiūlymų skaičiaus. Vykstant susitarimams dėl pasiūlymų, investicijos gali ir netapti statybinės organizacijos partneriu. Taigi konkurencingų pasiūlymų indeksas tiesiogiai priklauso nuo partnerystės santykių lygio. Ši priklausomybė gali būti tik netiesioginė. Statybos įmonės, kurios palaiko aukšto lygio partnerystės santykius yra apibūdinamos kaip patikimos, todėl jos turi daug galimybių laimėti daugelį pasiūlymų. Tai rodo, kad partnerystės santykių plėtojimas tarp statybos įmonių yra būtinas.

Atliekant šį tyrimą buvo taikyti šie metodai: specialios literatūros panaudojimas, autoriaus sukurtas metodas, skirtas statybos įmonių partnerystės santykiams įvertinti, anketos parengimas ir pritaikymas, koreliacijos modelis ir linijinis regresijos modelis.

Raktažodžiai: *partnerystės santykiai, partnerystė, statybos įmonė, sėkmės rodiklis.*

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