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THE PERCEPTION AND MANAGEMENT OF RISK IN LITHUANIAN CONSTRUCTION COMPANY

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Abstract. Risk analysis and management is nowadays a critical factor to successful construction project management, as construction projects tend to be more complex, dynamic, always unique, and competition increasingly tougher. Risk management helps the project participants – client, contractor, consultant, and supplier – to meet their commitments and minimize negative impacts on construction project scope, cost, schedule (and quality, as a result). The benefits of the risk management process include identifying and analyzing risks, and improvement of project management processes and effective use of resources. This paper reports the research that aimed to discover how Lithuanian contractor perceives the significance of the construction projects risks it faces and the extent to which it employs risk response tactics.

Keywords: Risk management, risk analysis, construction company.

1. Introduction

Beyond any doubt, the current economic crisis had a significant impact on the Lithuanian construction and real estate sector. These events also had a significant effect on the construction companies' behaviour. Competition between companies of the construction sector has increased. This increased pressure to improve quality, productivity and reduce costs, and the need for project strategies and management that can appropriately and effectively manage project risk.

Risk management is one of the nine knowledge areas (i.e. integration management, scope management, time management, cost management, quality management, human resource management, communications management, risk management, and procurement management) propagated by the Project Management Institute (PMI 2008). Furthermore, risk management in the construction project management context is a comprehensive and systematic way of identifying, analyzing and responding to risks to achieve the project objectives (ICE 2005; PMI 2007). The benefits of the risk management process include identifying and analyzing risks, and improvement of construction project management processes and effective use of resources.

Construction projects can be unpredictable. Risk and uncertainty can potentially have damaging consequences for the construction projects (Flanagan and Norman 1993; Mills 2001). Therefore nowadays, the risk analysis and management continue to be a major feature of the project management of construction projects in an attempt to deal effectively with uncertainty and unexpected events and to achieve project success.

Construction projects are always unique and risks raise from a number of the different sources (Oyegoke 2006; Pheng and Chuan 2006). Construction projects are inherently complex and dynamic, and involve a lot of participants (Sterman 1992; Uher and Loosemore 2004). Different participants with different experience and skills usually have different expectations and interests (Dey and Ogunlana 2004). This naturally creates problems and confusion for even the most experienced project managers and contractors.

Risk management helps the key project participants – client, contractor, consultant, and supplier – to meet their commitments and minimize negative impacts on construction project performance in relation to cost, time and quality objectives.

The current economic downturn and challenges in a highly competitive Lithuania's construction sector require contractors to manage risks by themselves. Consequently,

one of the largest construction companies in Lithuania was selected to examine contractors' attitude towards risk management. This paper reports the research that aims to discover how contractor perceives the significance of the construction projects risks it faces and the extent to which it employs potential risk responses.

2. Literature overview

Managing risks in construction projects has been recognized as a very important process in order to achieve project objectives in terms of time, cost, quality, safety and environmental sustainability (Zou *et al.* 2007).

The risk analysis and management techniques have been described in detail by many authors (Ahmed *et al.* 2007; Chapman 2001; Chapman and Ward 2003; Mbachu and Nkado 2007; Smith *et al.* 2006). A typical risk management process includes the following key steps: risk identification, risk assessment, risk mitigation, and risk monitoring (Wysocki 2009). Risk identification is an important step in the risk management process, as it attempts to identify the source and type of risks. It includes the recognition of potential risk event conditions in the construction project and the clarification of risk responsibilities (Wang and Chou 2003). Carbone and Tippett (2004) stated that the identification and mitigation of project risks are crucial steps in managing successful projects.

Many approaches on risk classification have been suggested in the literature for effective construction project risk management. Tah and Carr (2000) categorized risks into two groups in accordance with the nature of the risks, i.e. external and internal risks. Combining the fuzzy logic and a work breakdown structure, the authors grouped risks into six subsets: local, global, economic, physical, political and technological change.

Generally two broad categories, namely, qualitative and quantitative analysis are distinguished in literature on risk assessment. Quantitative risk analysis attempts to estimate the frequency of risks and the magnitude of their consequences by different methods, such as the decision tree analysis, the cost risk analysis and Monte Carlo simulation (Modarres 2006). Qualitative risk analysis attempts to rank the risks into high, medium and low, depending on two criteria: the severity of impact, and the probability of the event occurring (Ahmed *et al.* 2007).

There are four alternative strategies – risk avoidance, risk transfer, risk mitigation, and risk acceptance, for treating risks in a construction project. As stated by Hillson (1999), risk mitigation and risk response development is often the weakest part of the risk management process. The proper management of risks requires that they be identified and allocated in a well–defined manner. This can only be achieved if contracting parties comprehend their risk responsibilities, risk event conditions, and risk handling capabilities (Perera *et al*. 2009).

Risk transfer means the shift of risk responsibility to another party either by insurance or by contract. Wang and Chou (2003) reported that contractors usually use three methods to transfer risk in construction projects: (1) through insurance to insurance companies; (2) through subcontracting to subcontractor; and (3) through modifying the contract terms and conditions to client or other parties.

Construction projects can be managed using various risk management tolls and techniques. Ahmed *et al.* (2007) reviewed techniques that can be used for development of risk management tools for engineering projects. Techniques for context establishment, risk identification, risk assessment and treatment were provided. Application of risk management tools depends on the nature of the project, organization's policy, project management strategy, risk attitude of the project team members, and availability of the resources (Dey and Ogunlana 2004). del Cano and de la Cruz (2002) presented PUMA (Project Uncertainty MAnagement), a generic project risk management process that has been particularized for construction projects from the point of view of the owner and the consultant who may be helping the owner. This hierarchically structured and flexible process can also be adapted to the needs of the contractor or other project participants.

Risks and uncertainties, involved in construction projects, cause cost overrun and schedule delay (Wang and Chou 2003; Wysocki 2009). As stated by Baloi and Price (2001), poor cost performance of construction projects seems to be the norm rather than the exception, and both clients and contractors suffer significant financial losses due to cost overruns.

Baloi and Price (2003) determined the most critical risk factors affecting construction cost performance. The authors stated that global risk factors pose more challenges to contractors, which are less familiar with them. The authors introduced a fuzzy decision framework for a systematic modelling, analysis and management of global risk factors affecting construction cost performance from contractor's perspective and at a project level.

Many authors have reviewed problems on time performance in construction projects (Assaf and Al–Hejji 2006; Aibinu and Odenyinka 2006; Baloi and Price 2001). Aibinu and Odenyinka (2006) investigated and assessed the causes of delays in building projects in Nigeria. The nine factor categories evaluated include: client–, contractor–, quantity surveyor–, architect–, structural engineer–, services engineer–, supplier–, and subcontractor–caused delays, and external factors (i.e. delays not caused by the project participants). Finally, ten overall delay factors were identified, namely: contractors' financial difficulties, client' cash flow problems, architects' incomplete drawings, subcontractors' slow mobilization, equipment breakdown and maintenance problems, suppliers; late delivery of ordered materials, incomplete structural drawings, contractors' planning and scheduling problems, price escalation, and subcontractors' financial difficulties. The authors pointed the poor risk management as one of the principal delay factors and concluded that actions and inactions of construction project participants contribute to overall project delays. According to Baloi and Price (2001), the construction contractors highlight that delay in payments is common both in private and public projects, with the public sector being the

worse defaulter. Moreover, most types of contracts presume compensation clauses for delay in payments, but clients rarely agree to pay the interests due to the contract. The Cost–Time–Risk diagram (CTR) presented by Aramvareekul and Seider (2006) is a new project planning and management technique that helps project managers consider project risk issues while monitoring and controlling their project schedule and cost performance in one diagram.

Ward and Chapman (2008) concluded that stakeholders are a major source of uncertainty in construction projects. Wilkinson (2002) found that project management companies need to overcome problems in their relationships with other professionals on the project team and with the client.

According by Zaghloul and Hartman (2003), there is no possibility to eliminate all the risks associated with a specific project. All that can be done is to regulate the risk allocated to different parties and then to properly manage the risk. Chapman and Ward (2008) argue that the contract choice decisions are central to both stakeholder management and the management of risk and uncertainty. The authors proposed an integrated approach based on a balanced incentive and risk sharing (BIARS) approach to contracting as well as a best practice approach to risk management in terms of the whole project life cycle.

The review of the literature revealed a wide range of risk types and sources in construction projects, and that various risk management methods and techniques can be employed in the management of construction projects in order to control potential risks.

3. Research methodology

A questionnaire containing three sections was developed to facilitate data collection. The first section includes the respondents' opinion on the risk factor in terms of its probability and impact to overall construction project success. The second section includes the respondents' opinion on the risk consequences for construction project performance measures as well as the risk assessment and response practices. The third section aims to collect the background information of the respondents, e.g. their age, gender, position, education, work experience and professional background.

The questionnaire was distributed either personally or via e–mail to 40 members of top and middle management in the construction company during February through March 2008. A sample of 40 practitioners received the questionnaire and 38 valid questionnaires were returned for analysis with a response rate of 95 %.

The Likert scale was selected to obtain the probability of the risk factors in construction project that are identified in the literature review. A 5 – point Likert scale was adopted, where 1 represented "rare", 2 "occasional", 3 "somewhat frequent", 4 "frequent", and 5 "very frequent". Likewise, the Likert scale was selected to obtain the impact of the risk factors in construction project that are identified in the literature review. A 5–point Likert scale was adopted, where 1 represented "very low", 2 "low", 3 "moderate", 4 "high", and 5 "very high".

The 50 % of the respondents have more than 15 years experience in construction/project management or working knowledge of construction/project management activities. Of the 38 respondents in the full study, site managers comprise 29 %, project managers 26 %, other position senior managers 21%, civil engineers 16 %, and designing engineers 8 %. Based on work experience and employment position, it was inferred that the respondents have adequate knowledge of the activities associated with construction project risk. This makes them as reliable and credible sources of information which is crucial to satisfy the research goal.

The procedure, findings, and relevant discussion of the analyses are detailed in the following section.

4. Survey findings

As outlined in Section 2, risk factors on construction projects can be split into two major groups: (1) Internal risks, which fall within the control of clients, consultants and contractors; and (2) External risks, which include risk elements that are not in the control of key stakeholders.

The potential risk sub–factors were adapted from studies by Baloi and Price (2003), Chapman and Ward (2003), Kartam and Kartam (2001), Lahdenperä (2009), Majamaa *et al.* (2008), Mbachu and Nkado (2007), Mitkus and Trinkūnienė (2008), Perera *et al*. (2009), Pinto *et al.* (2009), Ševčenko *et al.* (2008), Tah and Carr (2000), and Yang *et al.* (2009).

In order to illustrate the respondents' opinions regarding the importance of analysed risk factors, an average was calculated for each factor. Next, the Kendall coefficient of concordance *W* (Savić and Vučković 2004; Zavadskas *et al.* 2001) was calculated to test the reliability of the responses, and significance testing was based on the Chi–square distribution at the 1 % significance level. The *W* coefficients were calculated for each defined group of risk factors created by the analysis perspectives.

The 32 % of the respondents are between the ages of 40 and 49, 21 % are between 30 and 39 years old, 26 % are between 20 and 29 years old, and 21% are 50 years old and over. The majority of the respondents (89 %) are male employers, and 11 % are male employers. The 50 % of the respondents work in construction projects 15 years and over, and the value of these projects is 10 and 50 million LTL (1 EUR = 3.4528 LTL). The majority of the respondents (82 %) have university education, 13 % have some college education, 3 % have high school/Pre–University education, and 3% have secondary education. Of the 38 respondents, site managers comprise 29 %, project managers 26 %, other position senior managers 21 %, civil engineers 16 %, and design engineers 8 %.

The respondents agree as regards the external risks impact, what can be judged by values $W = 0.183$; $\chi^{2'} = 34.669$ ($\alpha = 0.01$). As regards the assessment of the internal risks probability, the respondents also agree what can be judged by values $W = 0.157$; $\chi^2 = 41.667$ ($\alpha = 0.01$). The identified external risks according to their

potential effect on construction project objectives were ranked. The top five important external risks identified are: (1) Statutory; (2) Energy crises; (3) Natural forces; (4) Inflation and interest rate; and (5) Fiscal policies. Overall assessment of risks of the internal project constrains is reflected in Fig 1. Overall assessment of risks of the internal project constrains is reflected in Fig 1.

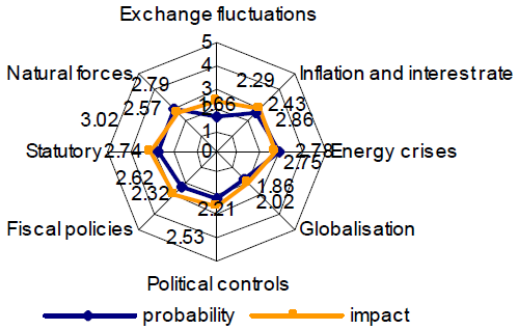

Fig 1. Assessment of risk of the project characteristics (external risks)

The respondents agree as regards the internal risks impact, what can be judged by values $W = 0.072$; $\chi^2 = 19.211$ ($\alpha = 0.01$). As regards the assessment of the internal risks probability, the respondents also agree what can be judged by values $W = 0.105$; $\chi^2 = 20$ ($\alpha = 0.01$). The identified internal risks according to their potential effect on construction project objectives were ranked. The top five important internal risks identified are: (1) Level of complexity/technology; (2) Specified quality levels; (3) Size of project; (4) Labour and material shortage; and (5) Site characteristics. Overall assessment of risks of the internal project constrains is reflected in Fig 2. Overall assessment of risks of the internal project constrains is reflected in Fig 2.

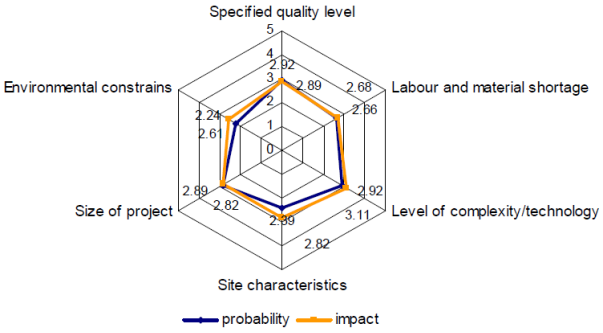

Fig 2. Assessment of risk of the project characteristics (internal risks)

The risk management perceivers are the project participants, and a contractor is any entity which has the power to influence project decision making directly. Related to experience, only 11 % of the respondents affirmed that they have experience in risk management. Most of them are project manager and have more than 15 years experience; it proofs that the relationship between risk perception and experience of respondents. And even 34 % of the respondents affirmed that they have no experience in risk management, while 55 % of the respondents affirmed that they do not have enough experience in risk management. And 97% of the respondents answered that risks must be managed at the early stages of the construction project.

In terms of the sources and providers of the data and information required in the risk analysis, the most frequently used technique is experiential or documented knowledge analysis with 92% of the respondents' agreement (Fig 3). And the project documentation reviews (63 %), project team brainstorming (45 %), and analysis of other information resources (39 %) are frequently used in the risk assessment. Only 26 % of the respondents use experts' judgement and historical information analysis (16 %) in the risk assessment.

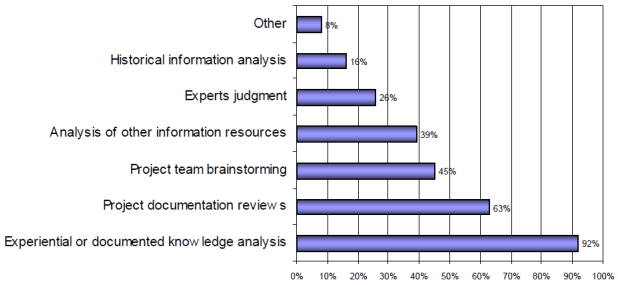

Fig 3. Risk analysis practices in construction projects

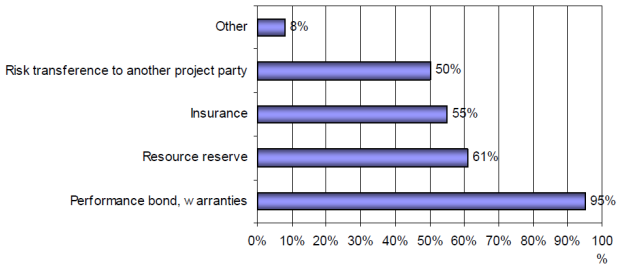

Fig 4. Risk response techniques employed for construction projects

In terms of the risk response tools and techniques, the most frequently used tool is performance bonds and warranties with 95% of the respondents' agreement (Fig 4). And the some resource reservation (61 %), insurance (55 %), and risk transference to another project party (50 %) are frequently used risk response techniques.

Conclusions and recommendations

Risks and uncertainties are naturally inherent in the construction sector and negatively affect the cost, schedule and quality performance of construction projects. Risk management is an important part of construction project management, and it involves risk identification, risk assessment, risk mitigation, and risk monitoring and control. Systematic risk management encourages the construction company to identify and quantify risks and to consider risk containment and risk reduction policies. Construction companies that manage risk effectively and

efficiently enjoy financial savings, and greater productivity, improved success rates of new projects and better decision making.

Unfortunately, the survey results show that the Lithuanian construction company significantly differ from the construction companies in foreign countries in the adoption of risk management practices. To management the risk effectively and efficiently, the contractor must understand risk responsibilities, risk event conditions, risk preference, and risk management capabilities. The lack of experience makes it very difficult to change Lithuanian contractors' attitude towards risk management. Nevertheless, the construction companies need to include risk as an integral part of their project management. The survey results revealed that senior management and site managers need to be knowledgeable of project management as well as possess risk management skills to ensure successful project results.

In construction project risk management, risks may be compared by placing them on a matrix of risk impact against a probability. Mitigation options are then derived from predefined limits to ensure the risk tolerance and appetite of the construction company.

The risk management framework for construction projects can be improved by combining qualitative and quantitative methodologies to risk analysis, as well as using the multiple criteria decision making, and the scope of this approach can be focused to the internal sources such as contractors and consultants.

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