COMPARISON OF TRENDS IN RISK MANAGEMENT THEORY AND PRACTICES WITHIN THE CONSTRUCTION INDUSTRY

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Abstract: This study considered the problem of understanding and use of risk management methods in construction projects and their representation in the literature and their practical application. Research of trends in risk management was conducted using studies from the EBSCO database that were published in the period from 1999 to 2015. The focus included the development of two terms, namely traditional and holistic approach to risk management as well as to uncertainty and opportunity management. The trend of leading standards in the field of project management, PMBoK and ISO 31000 indicated full support for the modernization of risk management that focused on the risks as well as potential opportunities in the project. The findings also revealed that the global practices continued to lack awareness of risk management and its benefits for project goals. A similar situation was found in Croatia by observing project management practices in two case studies, namely Project Zagrebačka obala in Rijeka and a Project of SEECEL Zagreb. Primarily, the lack of education and communication between experts are important issues requiring attention in practice and academics. It is necessary to gradually introduce standards over time to prepare for progress in managing uncertainties and adopting more holistic approaches.

Keywords: risk management, literature review, traditional approach, holistic approach, trends

USPOREDBA TRENDOVA IZ UPRAVLJANJA RIZICIMA U TEORIJI I PRAKSI U GRAĐEVINARSTVU

Sažetak: U ovom radu razmotrena je problematika razumijevanja i korištenja metoda upravljanja rizicima u građevinskim projektima te njihova zastupljenost u literaturi i praktičnoj primjeni. Istraživanje trendova provedeno je koristeći radove iz EBSCO baze podataka, objavljene u razdoblju od 1999. do 2015. godine. Pri tome se najviše pažnje obratilo na razvoj pojmova tradicionalnog i holističkog pristupa upravljanju rizicima te upravljanja neizvjesnostima i prilikama. Stav vodećih standarda s područja upravljanja projektima, PMBoK-a i ISO 31000, u potpunosti podržava modernizaciju upravljanja rizicima, usmjeravajući pažnju ne samo na rizike, već i potencijalne prilike u projektu. S druge strane, istraživanje je pokazala kako je svjetska praksa još uvijek slabo upoznata s osnovnim koracima upravljanja rizicima. Sličnu situaciju u Hrvatskoj potvrdile su dvije studije slučaja, provedene na projektu Zagrebačke obale u Rijeci te projektu SEECEL na Kajzerici. Primarno bi trebalo poraditi na edukaciji, zatim na komunikaciji stručnjaka i akademske zajednice te postepenom uvođenju standarda kako bi, kroz određeno vrijeme, bili spremni napredovati prema području upravljanja neizvjesnostima i holističkom pristupu.

Ključne riječi: upravljanje rizicima, pregled literature, tradicionalni pristup, holistički pristup, trendovi

1 INTRODUCTION

A project can be defined as a temporary endeavor with clearly specified goals that are characterized by project phases, deadlines, and use of a large number of different types of limited resources. It consists of a complex system of activities that should be coordinated and managed to achieve project goals. Managing the projects essentially involves balancing project goals, alterations, risks, and limitations during a project life cycle [1].

Risk is an integral part of each project phase, and thus risk management is an essential part of the decision-making process at every stage of a project. The success or failure of a project largely depends on the approach to possible risk in which the appearance of risk could affect productivity, quality, deadlines, and/or project cost. Traditionally, risks were managed intuitively with the goal of dealing with the consequences. Today, the use standards and methodologies, such as PMBoK by PMI or ISO 31000, allows for a possibility to proactively manage risks. That is, although it is not possible to eliminate risks, they can be reduced, transferred, accepted, or avoided.

Risk as defined by PMBoK [2] is an uncertain event or condition that, if it occurs, has a positive or negative impact on the project objectives, or as stated by ISO 31000 [3], it is an effect of uncertainty on objectives. Thus, risk is not explicitly defined as a negative event but as an opportunity. Managing risks in projects involves the art and science of identifying threats and/or opportunities and finding and applying appropriate responses to unexpected events during the lifetime of the project by considering project goals. An open minded perception of risk allows the state-of-art or holistic understanding of project risks with criterions that are completely contrary to the traditional risk approach. The main consideration of this study involved the problem of understanding and using risk management methods in construction projects given their representations in literature and in practical applications with stress on the distinctions between risk management in theory and practice as well the use of traditional and holistic approaches. Is the acquired theoretical knowledge of project management really used to manage real life projects?

This study included a status review of risk management through standards, PMBoK and ISO 31000, and studies published in the EBSCO database in the period from 1999 to 2015 with a conclusion involving comparisons and trends in risk management publications over the specified time period to address the fore-mentioned question. Findings include contain significant information for all project stakeholders, investors, contractors and even users of the future structure, as they as part of the project are directly exposed to risk and its consequences. Results from the literature were tested with two case studies of currently active projects in Croatia, "Zagrebačka obala", Rijeka and a Project of SEECEL in Zagreb. It is expected that these findings will motivate key stakeholders to devote sufficient time and energy to risk management to accomplish superior project goals.

2 STATUS REVIEW OF RISK MANAGEMENT

In this study, conclusions about the status of risk management, in theory and practice, and its approaches are based on findings of previous studies conducted in Pakistan [4] and United Kingdom [5]. Most of the participants were experts in the field of civil engineering or members of the Construction Industry Institute and PMI's Construction Industry Community of Practice.

The next two sections will explain the process and definitions of risk and risk management and distinctions between schools of risk research in conjunction with the main characteristics of both the traditional and holistic approaches. A comparison of methods used in Pakistan with those in UK will show the direction of risk approach development in practice, while the guidelines given by PMBoK and ISO 31000 will display theoretical recommendations.

2.1 Definition of risk and risk management

PMBoK [2] defines risk as uncertain event or condition which, if it occurs, can have positive or negative impact on one or more project goals such as scope, cost, schedule, and quality. Risks arise from uncertainty present in every project. Known risks are those risks that are recognized and analyzed, and thus it is possible to plan and prepare

a response. If the risks cannot be proactively solved or are unknown, then it is necessary to anticipate and provide a risk reserve.

PMBoK provides five steps to manage risks - planning, identification, analysis, responding, monitoring, and control of project risks. In Standard's fifth edition, each step was upgraded with appropriate guidelines for opportunity management. Another standard, termed as ISO 31000, defines risk as an effect of uncertainty on objectives, wherein the effect signifies deviation from expected in positive or negative way by accepting the possibility of existing opportunities. ISO's guidelines for risk management include systematic application of methods for communication and consultation, risk assessment, monitoring, and review of risks as well as documenting data and creating reports for stakeholders as shown in Figure 1.

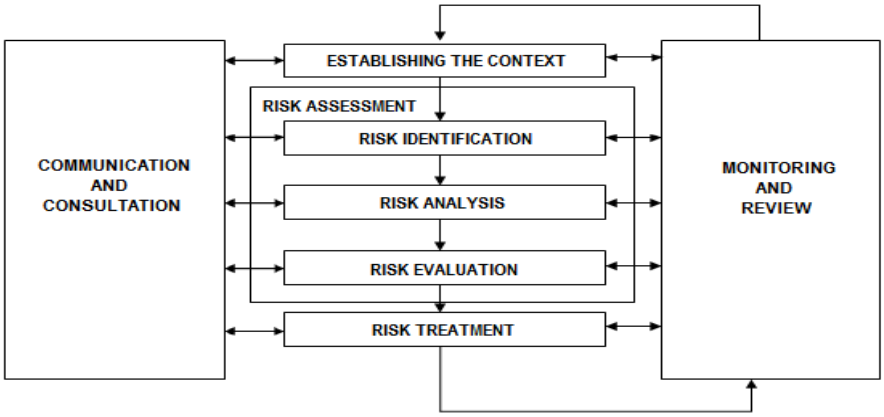

Figure 1 Risk management process [3]

The risk management process begins with establishing the context, setting project and / or organizational goals, specifying internal and external parameters that should be taken into consideration, and determining the scope of other processes and management criteria. Additionally the risk management process stresses on the importance of communication between all stakeholders in all the project phases [3]. Planning involves the process of defining activities that will be conducted during risk management and keeping stakeholders on track with project advancement. This phase does not require particular changes for opportunity management, but it is important to include techniques oriented on opportunities in the risk plan. Given that opportunity management is not a common practice, it is recommended to stress the intention of managing both risks and opportunities in the plan [2, 6].

Risk identification is a process of risk assessment that could impact project development and success. It includes several possible techniques such as brainstorming, Delphi method, interview, cause analysis, SWOT analysis, and presumption analysis. The first four techniques correspond to common techniques, but last two techniques are specialized to investigate larger scope of possible events. Furthermore, SWOT analysis observes a project from the perspective of possible strengths, weaknesses, and opportunities and threats, and identifies a wider scope of uncertainties including ones from organization or project itself, while presumption analysis assumes positive scenarios of project development and evaluates its validity, based on identified risks [2, 3].The next step involves risk analysis that can be conducted by qualitative, quantitative [2] or semi-qualitative methods [3]. The use of qualitative methods allows the prioritization of identified risks by estimating the probability and impact or quality of information by developing Risk Breakdown Structure with a probability and impact matrix that is designed both for threats and opportunities. Additionally, PMBoK suggested modeling and simulations using probability distributions to conduct quantitative analysis, while the performance of ISO in Annex B provided a list of qualitative, semi-qualitative and quantitative analysis methods such that the managers can decide which was the most suitable for their project. All the listed techniques were considered appropriate to determine both risks and opportunities, though sensitivity analysis presented through a tornado diagram visually provided the best and most understandable results.

Risk evaluation involves comparing the level of risk found during the analysis process with risk criteria established when the context was considered. Based on this comparison, managers can make decisions about risk

treatment [3].Planning risk response is dependent on analysis results. Strategies focused on answering threats include avoiding, transferring, mitigating, or accepting risk based on the importance of risk for achieving project goals and cost effective solutions. Recently, types of risk responses were expanded to include opportunity management that fully acknowledges the possible existence of uncertainty in which the impact on project goals is positive. The strategies include exploiting, enhancing, accepting, and sharing opportunities, based on the situation and project appetite [2]. The selection of the best risk response is based on balancing the cost and complexity of the implementation of the procedure with respect to possible benefits and considering legal restrictions, social responsibility, and protection of the natural environment [3]. Finally, a constant and repeatable step in managing risks involves monitoring and control, which includes the implementation of response strategies, tracking identification, residual and secondary risks, as well as identifying new risks and response strategies, if necessary. Key inputs for monitoring and control include a risk register that is supplemented after each phase or change in risk management. Monitoring may result in a modification of risk or project management [2]. Though both standards serve as a guide for quality project and risk management, there could be slight differences between their forms and guidelines as given in PMBoK and ISO 31000. PMBoK offers all possible methods that could provide good results, while ISO 31000 suggests using proven methods based on good practice and concepts approved by experts. PMBoK considers creating and updating risk register as the most important "side activity" of risk management, while ISO stresses out the importance of establishing a context of the project and constant communication between the project stakeholders. In PMBoK, the risk evaluation process is part of the risk analysis, but ISO defines it as an independent step between analysis and making decision with respect to risk treatment / response. Similar to PMBoK, ISO 31000 suggests treatment for both negative and positive uncertainties with the options of avoiding risk, giving up on the activity that can trigger the threat for project success; accepting or increasing uncertainty such that the opportunities and benefits can be used; removing source of risk; changing the probability that risk will occur; and modifying the consequences of uncertain events; sharing risk with other stakeholders by contracts or financing [3].

2.2 EBSCO database–review of risk management practices

Risk research can be generally categorized into two schools, namely, risk as an objective fact and risk as a subjective construction, and these categories differ in terms of risk definitions, methods of analysis, and recommended risk management [7]. The school of the objective approach defines objective existence of risks, which means they can be monitored and the observed, likelihood of their appearance and impact on project goals can be calculated using quantitative analysis methods. The school of the subjective approach considers risk as a subjective construction, dependent on perception, context, and personal preferences of manager. Estimation of risk is based on the subjective opinion as opposed to objective information and it uses qualitative methods of analysis, where the starting point indicates sources of risk created as a personal judgment of the manager or stakeholders [7]. Traditional understanding of risk is a result of the objective approach in which a holistic understanding attempts to combine the best attributes from both schools. The traditional approach to risk management identifies it as inevitable in which it arises due to a particular event with pure risk whose consequences are hardly predictable and mostly negative for project development and success and should be removed as quickly as possible [8, 9]. Holistic approach interprets risk as a result of uncertainty developed from different sources such as mistakes, inaccuracies, additional changes, lack of knowledge or ambiguous information and suggests using rational and creative skills in combination with formal and standard techniques that are used to identify and understand the entire spectrum of uncertainties [10, 11]. Risk management covers three basic but complex processes of identification, evaluation, and analysis and the response to project risks. Identification of risks and its sources should include the work of an entire project team, and thus it is considered as the most important step of risk management. It is necessary to recognize possible external risk factors [12] specifically economical, financial, legal or political factors, although they cannot be managed and can instead be monitored. With respect to internal factors [12], it is necessary for relations between coworkers, management, or construction risks to be completely under control of stakeholders and project management team. The third category consists of risks of force majeure [12], like weather, earthquakes, or wars that were assigned with an appropriate likelihood and risk amortization. The most commonly used tools for

the identification of possible risks include brainstorming, site inspections, interviews with stakeholders, and reviews of documentation from similar and finished projects. With respect to risk evaluation and analysis, the point of the process involves discovering parts of the project threatened by risk, likelihood of risk, and its impact on project goals by using qualitative or quantitative methods. Impact of risk can be described as the product of likelihood and its positive or negative consequences for a project. Qualitative analysis uses a manager's subjective estimations based on experience and information from finished projects. Its results can be presented descriptively or numerically by using a risk matrix, which is also based on empirical values of likelihood and consequence of risk. Research conducted in 2011 [13] indicated that the best qualitative analysis method appropriate for prioritizing risks was the AHP (Analytic Hierarchy Process). It is the most complete method that can easily adapt to new situations in a project because it enables changes in analysis results by considering alterations in a project and its environment. There are two types of quantitative analysis methods, namely deterministic and probabilistic methods. The deterministic approach is mainly used in the construction industry [4] and involves using estimated value of probability and consequences of risk to calculate the expected value of risk impact. However, it does not consider uncertainties typical for construction projects. Probabilistic methods allow the management of risks with respect to project costs, schedule, and scope by considering uncertainties that cannot be precisely defined, and the apropos risk likelihood and impact are expressed through a probability distribution. The results of these methods are highly accurate and enable proactive reactions on risks involved in the project from the beginning, although they demand additional knowledge.

Results of the risk analysis help in determining the type of risk response that is most suitable for an existing problem. Thus, two basic characteristics are defined, namely risk and cost of risk response, which are proportional, and higher risks are connected with more expensive responses, but cost can be reduced if it is paid sufficiently in advance [1]. As stated in the literature, risk response includes four types of possible reactions, namely avoidance based on preventive strategy, and reduction, transfer, or acceptance of risk based on reactive strategy. The risk management process does not end with the selection of the response but continues through monitoring and control. A previous study [4] cited that the two most common methods for monitoring risk included incident investigation and risk inspection, and both methods were used only after the risk already appeared, and this made the methods counterproductive and disabled the development of the risk management system.

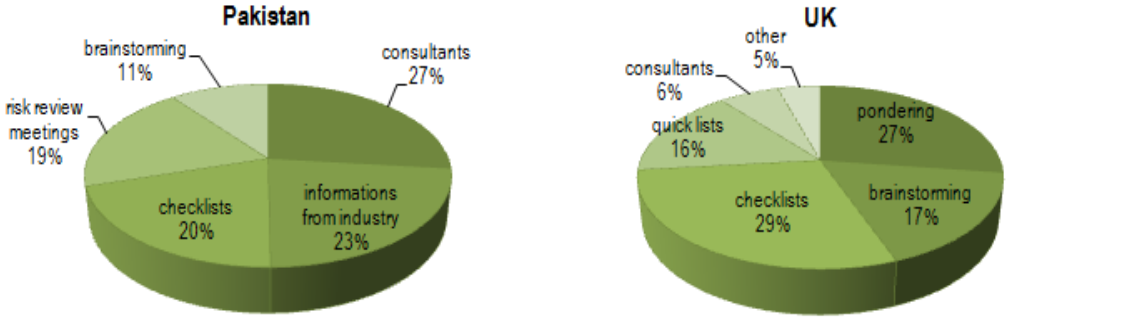

Figure 2: Comparison of risk identification methods used in Pakistan and UK [4] [5]

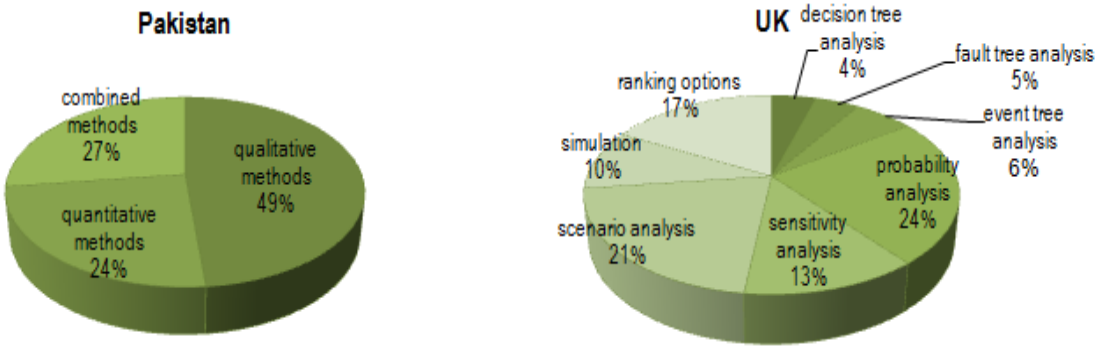

Figure 3: Comparison of risk analysis methods used in Pakistan and UK [4] [5]

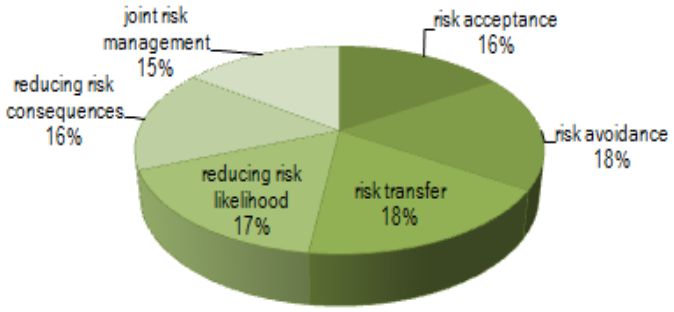

Figure 4: Risk response methods used in the construction industry in Pakistan [4]

Research conducted in the Pakistani construction industry [4] indicated that managers mainly relied on the help of consultants, while team work in form of brainstorming was least used in identifying risks as shown in Figure 2. The most frequently used analysis techniques (Figure 3) involve qualitative methods based on estimation, intuition, and experience of managers, while in contrast, sensitivity analysis is hardly used. The joint risk management strategy occupies the lowest position in terms of practical use as shown in Figure 4, and it is considered as the future of risk management by extant research. It implies contracting risk allocation such that all stakeholders can take part and help with managing risks even after the formal assignment of responsibilities. Research conducted in Hong Kong [14] indicated that investors and managers were more likely to accept this strategy when compared with contractors and engineers. Results of research that was conducted in the UK five years prior to the study in Pakistan indicated that managers mostly relied on their own knowledge and experience to achieve the best results. As shown in Figure 2, when these results were compared to those of the study conducted in Pakistan, the findings indicated that the probability analysis performed in the UK scenario was one of probabilistic methods that exhibited the same percentage as the combination of all the quantitative methods used in the study conducted in Pakistan. This signified a significant breakthrough in the development of modern risk management. The post-mortem analysis (PMA) method was indicated to present an easier and more thorough identification of risks by extant research. The PMA is conducted when a project reaches milestones or is completed to create a database for future projects and to analyze errors and omissions [15]. The development of a risk register is a step towards the quality assurance of future risk management processes. This consists of data from finished projects that is used for a more accurate evaluation and estimation of consequences from possible risks for future projects. Research conducted in international companies showed the existence of risk register in 67% of examinees, while 78% of the examinees already developed appropriate IT systems [16]. An understanding of risk among managers shows their willingness to progress from traditional towards holistic perception of risks.

Different understanding of risks (holistic or state-of-art approach) consist of rational and creative skills of individuals combined with standard and formal techniques to identify and interpret an entire spectrum of uncertainties and to develop strategies to avoid or minimize the impact on project goals. It is necessary to understand that risk is not the consequence of an event but instead is a repercussion of uncertainty created from different sources such as mistakes, inaccuracies, and changes in or lack of knowledge. Managing uncertainties represents a step between traditional and pure holistic approach to risk management. It eases the stringency of traditional approach and changes the understanding of risk from a threat to that of an uncertainty by linking it to possible opportunities instead of merely to potential dangers [17].

2.3 Rends in risk management publications over the period between 1999 and 2015

The last forty years have witnessed progressive developments in risk management that continue to-date. During this time, science has established schools of objective and subjective approaches to risk analysis with the changing and evolving perceptions of risk in academic circles and in practice. Traditionally, risks were managed intuitively, and the goal involved dealing with the consequences. Today, managers use modern methodologies, standards, traditional approach, and holistic approach to proactively respond to project uncertainties. In 2013 in Finland [10], research on trends in risk management was conducted using literature published between 2000 and 2012 in four

leading professional publications for project management, namely International Journal of Project Management (IJPM), Project Management Journal (PMJ), Journal of Construction Engineering and Management (JCEM), and IEEE Transactions on Software Engineering (TSE). The results indicated the manner in which representation of topics with respect to risks in projects continually grew and contributed to the development of risk perception among scientists as well as in practice [7].

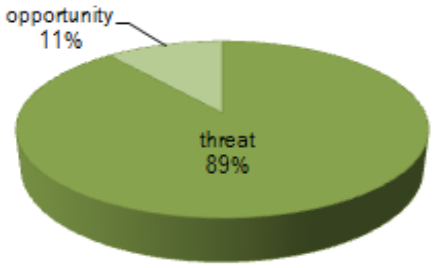

Figure 5: Perception of risk in professional literature published between 2000 and 2012 [10]

The uncertainty term was not adopted in extant literature as shown in Figure 5. These results were explained by using the profit curve in which the negative impact of increased costs involved in a project grew at a significantly faster rate than the corresponding positive impact from additional earnings. This caused managers to focus more on removing threats than on pursuing opportunities [10]. Opportunities usually develop from complex uncertainties and require managers to deploy holistic observations of a project to identify opportunities at the right time [18].

The traditional approach continues to be widely used around the world due to its characteristics such as solid structure and a defined framework of risk management processes. This is especially valid in scenarios in which the experience of managers in managing project risks and necessary knowledge is limited to a relatively small range of individuals. The traditional approach considers risks as threats, while the holistic approach encourages opportunity management and considers the entire project environment prior to taking any action. Therefore, it could be considered that the holistic approach is considerably more challenging than the traditional approach because it requires significantly increased knowledge and experience in managing risks. This in turn allows managers to take a step back prior to the commencement of a project and look at the bigger picture and thereby identify uncertainties and their potentials. Managing uncertainties creates a bridge between the two mentioned approaches. It mitigates the firmness of the traditional approach and changes the risk term to an uncertainty term while continuing to not consider risk management as an artistic discipline in which the use of probabilistic estimations and analysis can be sources of project insecurity and failure.

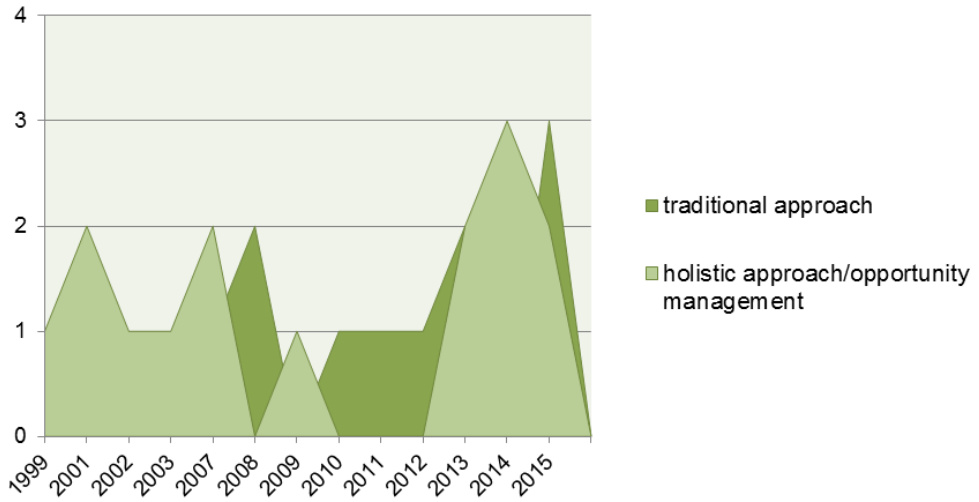

Figure 6: Review of the traditional and holistic approaches in extant literature between 1999 and 2015

In 2016, research was conducted on 26 papers published in extant scientific literature within the EBSCO database with respect to risk management to compare the share (including terms, methods, and applications) of the traditional approach when compared with that of the holistic approach. For example, each study that investigated methods to manage uncertainties was categorized in favor of the holistic approach. As shown in Figure 6, both approaches were almost equally represented in the extant literature, and this indicates movement in theory towards the use of advanced and comprehensive techniques. Such trends are supported by leading standards such as PMBoK and ISO 31000.

3 CASE STUDIES

3.1 Project of Zagrebačka obala, Rijeka

A project involving the renovation and construction of Zagrebačka obala commenced in 2012, and its development is planned in three phases. The net project worth corresponds to 300 million Euros in which the first phase of implementation that is currently in progress involved a cost of approximately 70 million Euros. The completion is scheduled for 2018.

The investor involved is Lučka uprava Rijeka, and the project was financed by the World Bank with a guarantee by the Croatian Government. It is estimated that the entire project will be completed in 2022.

The project will include constructing a container terminal in the area of the existing port based on columns and using gravel piles for stabilization purposes. The first phase consists of the construction of the quay with a length of 400 meters and a setting of 49 caissons that were placed in an area of 5.5 hectares. The project was developed by an Italian consortium of contractors and four design companies bound together by a joint venture partnership. Construction supervision and consulting activities were conducted by a Croatian firm, Investinženjering l.t.d., in a joint venture partnership with a Dutch firm, RHDHV. Rights and obligations of the investor and contractor are regulated by the FIDIC Yellow Book Conditions of Contract for Plant and Design–Build while the relationship between the investor and supervisors is governed by the Service Agreement.

With respect to the risk management, the contract does not require the implementation of certain standards.

Risk management on the project is conducted using the principles of the traditional approach with a focus on potential threats for successful project realization and finding a way to reduce or eliminate these potential threats. In this case, the project involved surveillance since the implementation phase, which made impossible to consider opportunities, why complete focus was on project risks. Methods used to identify risks included brainstorming, checklists, meetings, and evaluations based on experience. The use of these methods supported the results of surveys conducted in Pakistan [4] and UK [5], which pointed out that brainstorming and checklists constituted the most common identification methods. The main risk identified by the managers corresponded to the settlement of the seabed. Risk analysis was conducted using exclusively qualitative methods in which the estimation of risk impact was based on knowledge, experience, and intuition of engineers. Quantitative methods and probability analysis were completely ignored.

Table 1 Qualitative analysis of possible risk

Source of risk	Risk	Initiator of risk	Consequence of risk	Likelihood of risk	Risk impact	Actions for risk mitigation
Geological composition of the ground	Settlement of the seabed	Soil changes under the influence of the load, construction methods are not adjusted to geomechanical and geological conditions	Caving and declining of built structures and potential damage to vessels and goods	Great	Major	Identification of risks on time, adapting methods, and / or plan of construction

This supported the results from the study conducted in Pakistan [4] on the significant dominance of qualitative methods over quantitative analysis methods. The lack of education of professional staff dealing with the issue of risks was not the reason. Instead, the actual reason was attributed to the lack of education of other stakeholders who were unable to interpret and understand the results obtained by the probabilistic analysis. Given that the main

project threat involved a geotechnical issue (Table 1) caused by poor soil composition, the risk response was oriented towards the mitigation of risk and its possible negative impact on project goals. Therefore, the cost of the first phase will increase, and additionally, significantly higher costs of damage, remediation or rebuilding caused by the realization of risk will be eliminated. Risk management on this project could be considered as an example of good practice.

3.2 Project SEECEL, Kajzerica

Construction of SEECEL commenced in January 2015, but the initial phases and preparations commenced a few years earlier in 2012. The total value of the project was 29 million Euros of which it is projected that 21 million Euros will be spent on the construction of the object, and the remaining 8 million Euros will be used for modern equipment. A land parcel was obtained from the City of Zagreb at no cost. The project is completely financed by European Union funds, and its completion is scheduled for summer 2016. The main investor is the Ministry of Entrepreneurship and Crafts, and the construction work is performed by Zagrebgradnja l.t.d. in cooperation with a series of contractors. Surveillance and consulting is conducted by Extructa l.t.d. with the rights and obligations of the investor and contractor regulated by FIDIC Yellow Book Conditions of Contract for Plant and Design - Build.

The investment includes the construction of an object with an underground garage and six overhead floors with a plan area slightly larger than 4900 m2 and a gross floor area of approximately 17500 m^2. As part of the entrepreneurial center, there is a center for learning and training, a center for expertise and excellence, offices, accommodation facilities for students, a restaurant, an underground garage, and an innovation park, which is designed in the facility environment.

In a manner similar to the previous project, the surveillance commenced with the beginning of the project execution, and thus it was necessary to reduce the management of uncertainties to managing risks and threats.

Risk management was performed using the principles of the traditional approach. Implementation of certain standards was not required, but guidelines from ISO 31000 were used for the official reports and administration.

Generally, a risk management plan for this project did not exist, and the contractor applied elemental management methods while supervisors used slightly more sophisticated and structured methods. For risk identification, brainstorming, evaluations and internal methods of Extructa l.t.d. were used to obtain a list of possible risks, stating the sources and initiators of risk, likelihoods, and suggestions for response. The usage of these methods was again in favor of extant research results [4, 5] that listed brainstorming and listing of risks as leading methods of risk identification. It was estimated that the most serious project risks corresponded to postponing the project completion and the lack of technological and financial capacities of the contractor.

Table 2 Qualitative analysis of possible project risks

Source of risk	Risk	Initiator of risk	Consequence of risk	Likelihood of risk	Risk impact	Actions for risk mitigation
Poor dynamics of decision making, ability of the contractor	Delay in project completion	Investor, contractor	Financial difficulties and extension of the deadline	Great	Major	Proactive decision making
Global financial crisis	Technological and financial ability of the contractor	Contractor, investor	Extension of deadlines and delays	Great	Very high	Settling liabilities (investor) and better organization of work (contractor)
Mismatch between the expectations of the investor and project documentation	Excessive additional work	Investor, contractor	Increase in costs and duration of the construction process	Middling	Major	Involve design experts and timely control of executed works
Weather conditions	Force majeure	Nature, natural phenomena	Additional work, cost increase, and delays	Middling	Major	Monitoring and control of weather conditions

Currently, the project began experiencing the negative impact of the risks that were a consequence of insufficient technological and financial capability of the contractor that resulted in delays in project completion (Table 2).

With respect to the response, the most frequently used method involved the avoidance of risk. Both the investor and contractor were advised to initiate certain activities prior to the scheduled dates or as soon as the necessary conditions were created. An example included the certification of installed equipment or obtaining required permits. Additionally, investor interests involved paying the contractor for works performed prior to the legal deadline. Thus, dynamics of the works could proceed as planned and the possibility of delays would be reduced. With respect to the given information, it was concluded that this project could be considered as a good example of bad risk management practice. There was a visible difference in the approach to risk between the two stakeholders, namely the surveillance personnel and the contractor. The surveillance personnel did not include the use of modern methods that focused on opportunity management, but instead performed the selection of possible risks and proposed solutions to mitigate the negative impact of risks. The contractor did not manage risks at all but was faced with the risks after the risks occurred. The lack of interest of the stakeholders with respect to ensuring the project success was evident, and this again was the result of the lack of knowledge and poor integration of theory and practice that is prevalent in the construction industry

4 CONCLUSION

Project risk management is a very complex and layered task, which has a significant impact on the success of project goals. It is based on knowledge and experience and communication and mutual understanding among stakeholders that sometimes necessitates significant additional investments. Methods based solely on intuition or ignoring the existence of risk in complex conditions in which projects are developed do not constitute satisfactory management methods. Managing risk is a difficult task that is avoided or performed with a minimal effort by individuals, and this often results in delays and losses. An initial step towards quality risk management involves adopting a traditional approach and the use of standards, such as PMBoK and ISO 31000, which provide a stable framework and precise steps such that managers can gain the experience and knowledge necessary to progress towards the application of the holistic approach. Typically, investigations of practices and trends in risk management with respect to this issue are conducted in poorly developed countries, and thus there is a scarcity of information related to quality practices. Most of the results indicated that risk perception progressed from a pure threat to a perception of potential opportunity or at least to one involving uncertainty. A typical occurrence involves experts with considerable practical experience but considerably poor knowledge with respect to the modern theory of risk management who use their own version of the holistic approach to manage opportunities and observe broader impacts on the project without the ability to specifically define the approach used. Both traditional and holistic approaches follow guidelines given by standards and emphasize the importance of communication and cooperation between stakeholders by introducing new forms of contracting, learning from past projects, or creating a management model primarily based on the communication among project team members. The situation is slightly different in practice. Usually, the definition of risks makes it possible to infer the amount of knowledge possessed by the individuals as well as the approaches preferred by them. The results of the study are shown in Figure 2 and Figure 3, and they indicated that managers often tend to use simpler methods of risk identification and analysis that do not ultimately provide completely objective and clear results and also do not reveal the entire spectrum of possible impacts on project goals. Such methods do not provide insights into the bigger picture in contrast to other methods, such as probabilistic techniques, which can direct a manager to explore the possibilities and consider opportunity management. With respect to Croatian practice, it largely corresponded with the results of a study conducted in Pakistan. The practice was reactive, occasional, inconsistent, informal and unstructured. The main cause for this condition was attributed to inadequacies in the education of all project stakeholders, and it was not sufficient for a particular team member to be familiar with the importance and principles of risk management. Generally, it is vital to establish quality connections between theory and practice to improve the philosophy of risk management by using legal provisions to make risk management an obligation for every project. The traditional approach includes the essence of project management, and thus it is an inevitable choice at the beginning of risk

management usage. However, it is important to gradually improve the traditional approach by increasingly accounting for stakeholders and their impact on project goals to attain the philosophy of opportunity management or the holistic approach. The essence of holistic approach involves exploiting opportunities and expending effort in understanding the project environment to obtain optimal results. The existence of good quality examples indicates that it is necessary to work on the education of and communication between experts in practice and academics. It is necessary to gradually introduce standards over time in order to progress towards managing uncertainties and adopting more holistic approaches.

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