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RISK MANAGEMENT ON THE EXAMPLE OF RAILWAY INFRASTRUCTURE INVESTMENTS

A b s t r a c t: Railway infrastructure investments are really complex, demanding and time consuming processes. Two main parties take part in them – The Employer and The Contractor. The role of each of them is broadly described in the article. All main risks, to which they are exposed, are listed and commented. There are mentioned among others necessity of providing funds, tender procedures, law changes, materials ordering, safety, deficiency of workers, subcontractors and construction machinery. Consequences of materialize of risks are also pointed. Methods of the risk management, which either are used or could be imposed, are presented in the last part of the article

K e y w o r d s: Risk Management, Railway, Infrastructure, FIDIC, Moderating of Risks

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INTRODUCTION

Railway infrastructure investments are really complex, demanding and time consuming processes. They need involvement great amount of people: blue-collar workers, managers, engineers, inspector, clerks. All the affair for pleasant journeys by train for passengers. Two main parties take part in such investments – The Employer and The Contractor. The role of each of them is broadly described in the article. All main risks, to which they are exposed, are listed and commented. Necessity of providing funds, tender procedures, law changes, materials ordering, safety, deficiency of workers, subcontractors and construction machinery are mentioned. Consequences of materialize of risks are also pointed.

Methods of the risk management, which either are used or could be imposed, are presented in the last part of the elaboration. The main purpose of the

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article is to analyse problems and risks faced by companies in railway sector and then propose possible mitigation measures for them. The greater understanding of the problem and solutions presented in the paper can improve the entire investment process. Consequently, savings and acceleration of the construction process can be achieved. The paper is written mostly basing on personal observations and experience of the author. Additionally, the idea of the paper is to call interest in railway problems among academic environments dealing with management issues. It could bring significant improvements in both areas: railway sector and risk management.

1. THE SPECIFICS OF THE RAILWAY INFRASTRUCTURE INVESTMENTS

According to the recent research, 76% of responders pointed that construction investments are the most risky considering the risk of delays (Leśniak, 2010, p. 6). Investment processes of construction or modernization the railway infrastructure consist of two main parties: The Employer and The Contractor. The Company, that wants to build railway line and pays for it is the first one mentioned above. National infrastructure manager, controlled by the government, fulfils this function in most countries. The Company, that builds the railway line on command of The Employer is the second participant of the process. The role of The Engineer must be also mentioned. It is the company, that supervises The Contractor on behalf of The Employer. The Engineer investigates whether The Contractor uses proper materials in the right way. Regulations between all parties are detailed described by the specific Contract Conditions called FIDIC. FIDIC is the International of Consulting Engineers founded in 1913 to consult and promote engineering industry. There are several variations of this Contract Conditions depends of specifics of an object to build. The Red FIDIC and The Yellow FIDIC are the most common and the most frequently used. There is one basic difference, which varies them. The Contractor is given the technical documentation in the red version and his only task is to do construction work as had been designed. The Employer is responsible for hiring a design office and gaining project much earlier. The yellow version is significantly different. In this case, The Contractor gets only general guidelines and parameters in the functional and utility program. Based on them, he is obliged to accomplish the technical documentation and do the construction work later on (Bunni, 2005, p. 241-266, 461-483). Dependencies between The Employer and The Contractor in described above two versions of The Contract Conditions are broadly shown in figures 1 and 2.

Figure 1. The Red FIDIC Contract Conditions – own elaboration.

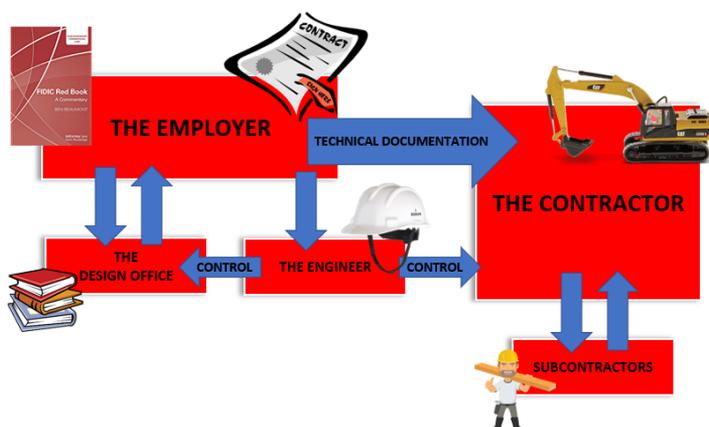
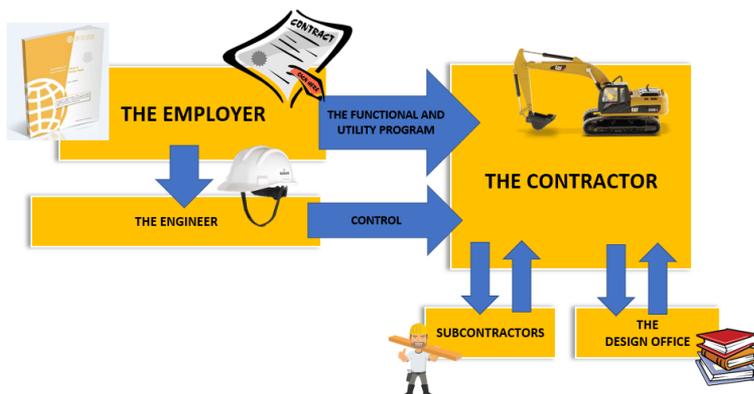


Figure 2. The Yellow FIDIC Contract Conditions – own elaboration.



This very first example of possibility of conducting railway investments shows that some certain risks might be divided between participants of the entire process. Responsibility for execution of the technical documentation is the first subject of divisions. There are some pros and cons of this two attitudes. The Contractor is able to start works immediately after signing The Contract in the red version. He does not have to design and acquiring all of building permissions. However, the risk of faulty and improper documentation rests on The Employer. The Contractor might have basics to claim more financial resources or time to finish the whole project when anything is incorrectly designed. This is because of additional works, which had not been considered by designers. The risk of creating proper technical documentation is on the side of The Contractor in the yellow version, who cannot therefore have objections to project solutions. On the

other hand, it often leads to delays of completing the whole investment or even of starting essential construction works. This situation may occur if there are some problems of gaining administrative decisions or land expropriations.

Another risks, which could be divided between The Employer and The Contractor are mentioned and described in the following chapter.

2. THE DIVISION OF RISKS

The necessity of providing financing of the investment and the proper choosing of The Contractor should be mentioned among the most important risks on the side of The Employer. The first one is essential to sign any Contract. Any agreement can be signed without securing of funds earlier. Additionally, every project needs a conditional amount of money for unforeseen extra expenses like for example an unexpected week subsoil or cable collisions. Funds might come from various sources as governmental money, EU funding, loan from national or European bank, own resources and others (Ehlers, 2014, p. 5-19), but gaining them is the trouble of The Employer. Finding the responsible and reasonable Contractor is another issue. Obviously, The Employer needs to act according to the public procurement law. The tender procedure must be transparent and justice. Equal rules and identical treatments must be employed for every company, which applies for The Contract. The appropriate Contractor ought to have potential (workers, construction machinery, knowledge, know-how, possibilities) to execute the entire scope of the entrusted construction process. This is especially important in the context of more and more familiar situations when Contractors quit the construction site or go bankrupt. This brings huge problems for The Employer. A new Contractor, who will finish the project, must be quickly found. It is still possible, but generates delays and extends inconveniences for passengers. Among other main risks consequences of force majeure, natural disasters or changes in legal regulations and technical specifications should be pointed. For example, The Contractor would claim an extra time to finish The Contract when the government passed a new law introducing an additional national day off work. The Contractor would also claim an extra money when a new work tax was imposed. It is because this kind of occurrences could have not been predicted on the day of signing The Contract. Of course, the risk of exercising the investor supervision is also up to The Employer. Having done acceptance of works the new stage is coming, namely, the safe exploitation and the proper maintenance of the railway infrastructure.

It seems like huge amounts of risks are put on The Employer. However, the other side, Contractor, is also at various risks. Deficiency of workers is the very first problem. This applies to both executives and blue-collar workers. According to the report of the editorial office of one of the internet portal till 2025 in Poland,

1,5 million of workers will be missing in infrastructure sector (www.rynekinfrastruktury.pl). At the same time, availability of construction machinery such as excavators, loaders, cranes, trucks is very low. Finding subcontractors is another demand. Subcontractors are companies hiring by The Contractor to realize some specific kind of works such as building platforms and traction network, assembling of elevators or doing telecommunications works. Above issues are caused by very large number of railway infrastructure investments. Lack of workers or construction machinery can lead to delays. Not to be neglected is that because of this deficiencies hiring workers or subcontractors and renting machinery are becoming automatically more expensive. Ordering materials is another not easy matter. Not only the price are increasing, but also the waiting time for delivery is long. Furthermore, The Contractor is responsible for safety on construction site and organization training for employees. Every accident at the construction site is associated with difficulties for The Contractor. Additionally, the insurance for the whole project must be paid. Trials and final tests must be done at the end of The Contract. After the acceptance of works by The Employer, The Contractor must provide a guarantee and remove defects by the time specified in the contract.

Some risks might be divided between either The Employer or The Contractor depending on the type of Contract (Red or Yellow FIDIC). For example, it can be responsibility for making technical documentation as described in the chapter 1 or gathering data about the field conditions, where the construction works are about to begin.

The risks of each parties of the investment process are shown in figure 3.

Which can be consequences of materialize of risks for each party? First of all, unfinished investment, dug up construction site and lack of possibility to train movement means problems for The Employer. As a result, passengers will be dissatisfied and the opinion of railway will fall down among the society. For The Contractor failure means contractual penalties and difficulties in gaining new orders. It can cause bankruptcy of the Company in extreme cases. The article published by one of railway portal about an Italian company called Astaldi can be pointed as an excellent illustration of this problem (www.rynek-kolejowy.pl).

3. THE POSSIBILITY OF MODERATING OF RISKS

In the scientific approach to the risk management five stages are pointed as following: identification of risk, assessment and analysis, development of strategies to reduce risk and respond to risk, implementation of the risk management plan, review and correction of risk assessment (British Standard, 2009, p. 24). This approach is shown in figure 4.

Figure 3. Risks of each parties of the investment process – own elaboration based on self-experience and (Skorupka, 2008, p. 5-6).



There is no doubt that proper methods of the risk management must be used in such complicated processes as railway investments. The bigger investment is, the bigger provision for the risk must be included according to the research (Dziadosz, 2015, p. 6). Methods of the risk management, which either are used or could be imposed, are presented in this chapter

Figure 4. Risk management (www.pei.com)



The Employer has some tools to minimize the risk of entrusting The Contract to company, which would not be able to finish it successfully. The Employer may request potential Contractors to show the experience of completed contracts in the past. There could be some specific demands like The Contractor must have an experience in building infrastructure investment valued for example 2 billion euro over last 10 years. Similar demands could be also in relation to The Contractor's personnel – for example the construction manager should have been on similar position for last 5 years and should hold building licence. Moreover, every bidder is obliged to pay a security deposit to take part in the tender, which is returning after all procedure unless the company which made the best offer denied signing the contract. The security deposit passes to the benefit of The Employer and the tender is repeated in this case. These treatments allow to exclude weaker companies from the tender procedure and only the best offers are considered. Electronic auctions are another way to decrease the risk of The Employer. A few companies which gave the best offers are invited to take part in the bidding and competitive who will give the lowest price. These practice can lower the price event about 20% comparing to the best price before bidding. Thanks to that The Employer has more money for unforeseen expenses or for another investments. The requirement of a proper performance guarantee is another way of securing The Employer's interests. The Contractor has to pay from 10% to 30% of the total value of the contract at the beginning. This guarantee falls for the benefit of The Employer in case of The Contractor's failure or goes back to The Contractor when all job is completed. Having chosen The proper Contractor for possible the lowest price, controlling and monitoring of work progress is the

main task of The Employer. Execution of works in accordance with the schedule and with technical specifications should be systematically checked. The using of materials with appropriate properties also ought to be checked. The establishment of teams to monitor every single project is a good practice. This teams should be controlled by headquarters. Such a solution allows intervention by the Management Board of The Employer when anything goes wrong (Chapman, 2003, p. 253-361).

The Contractor has also some tools to minimize risks which rest on him. Keeping employees is the most important matter especially in the context of the deficit available workers on the job market. It seems that a good premium system, based on effects of the performed job is the best and the most justice idea to keep employees in the company for long time (Lewandrowski, 2018, p. 7-10). Working conditions, working hours, benefits system, atmosphere are also very important. Additionally, employees ought to have a possibility to self-develop in job in the form of training in the field of technical staffs, soft skills and principles of health and safety at work. The last topic is especially important. Awareness of security threats at construction site can cause fewer accidents, which simultaneously means lower costs for The Contractor. The Contractor can decrease the risk of the delay in materials supplies concluding framework agreements with the manufacturers and providers. The long term and beneficial cooperation between The Contractor, subcontractors and suppliers of construction machinery is also desirable.

In addition to above mentioned ways to moderate risk next two ones might be really effective. They can solve two big issues, which have appeared recently.

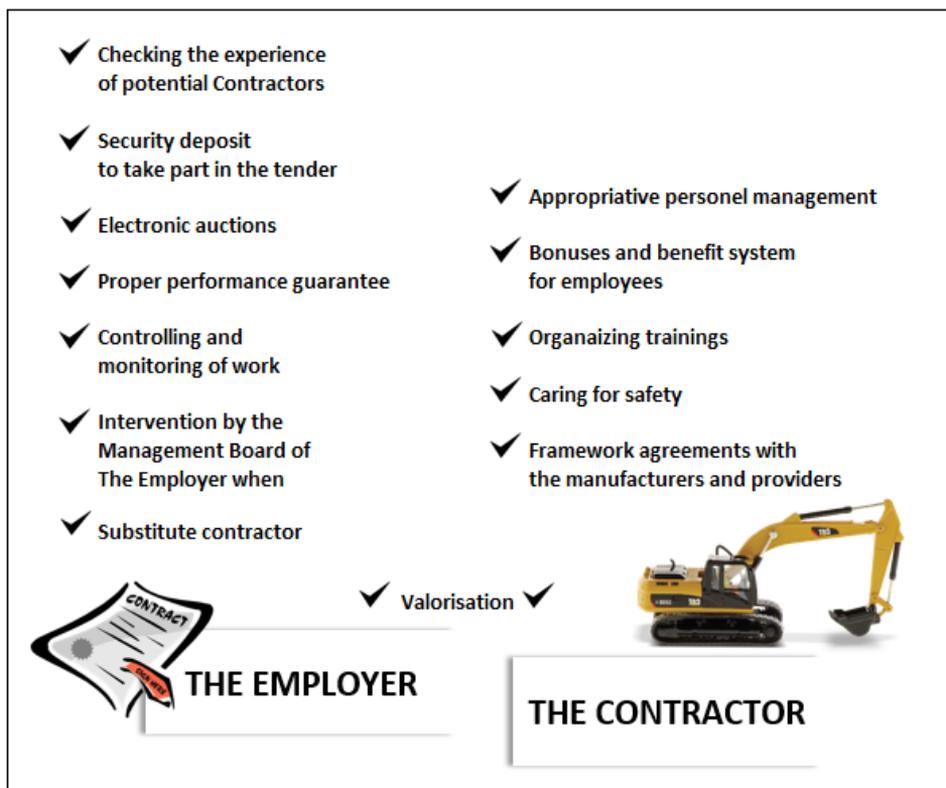
The first one is rising prices of materials and services. They are very often unlikely to predict at the moment of creating a valuation of the contract at the stage of submitting the offer (www.rynek-kolejowy.pl). The valorisation divides risks of changing prices among both The Employer and The Contractor. Statistical data about prices are being collecting monthly. Consumer price index (CPI), labour cost and prices of such a material as steel, aggregate, copper, cement and fuel are considered. Then the valorisation factor is calculated and included in every invoice of The Contractor. The invoice value is multiplied by the value greater than 1,0 when prices increases and The Contractor gets more money. At the same time, there is possible that prices decreases. Then the valorisation factor is less than 1,0 and the invoice value is reduced.

The second big threat is situation when The Contractor quits the construction site. Then, there is a necessity to choose a new one, but it must be done with respect to the public procurement law. The whole procedure takes time, in which anything happens in field. However, there is a possibility for The Employer to protect him for such an eventuality. This is possible if earlier a tender for a so called substitute contractor had been executed. That can be one or more compa-

nies, which are ready to continue works when the basic Contractor is not able to do so himself.

All of described ways to moderating risks are depicted in figure 5.

Figure 5. Moderating risks in railway infrastructure investments – own elaboration.



Five features of the successful company are required to meet all that risks. There are: ability to adapt to changing conditions, continuous improvements and innovations, defined goals, teamwork, social integration and collaboration (Serpella, 2014, p. 7-8).

SUMMARY

The first chapter of the article describes two parties, who take part in investment processes of construction or modernization the railway infrastructure: The Employer and The Contractor. The first one is the company, that wants to build railway line and pays for it. The second one is The Company, that builds the

railway line on command of The Employer. The Contract Conditions called FIDIC – regulations between all parties are detailed described.

The next part of the article presents all main risks to which either The Employer or The Contractor are exposed. There are mentioned among others necessity of providing funds, tender procedures, law changes, materials ordering, safety, deficiency of workers, subcontractors and construction machinery. Consequences of materialize of risks are also pointed.

The third part of the article presents methods of the risk management, which either are used or could be imposed. Improvements have been proposed in such issues as tender procedures, investments surveillance, employees management, training, safety, commercial relations with subcontractors and suppliers, valorisation and idea of substitute contractor. Moreover, five stages of risk management are mentioned.

The article shows problems and risks faced by companies in railway sector and possible mitigation measures for them. Thanks to them the greater understanding of the risks specific in railway infrastructure industry can be achieved. Additionally, presented solutions can improve the entire investment process. Consequently, savings and acceleration of the construction process can be gained.

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ZARZĄDZANIE RYZYKIEM NA PRZYKŁADZIE KOLEJOWYCH INWESTYCJI INFRASTRUKTURALNYCH

Zarys treści: Kolejowe inwestycje infrastrukturalne są bardzo złożonymi, wymagającymi i czasochłonnymi procesami. Biorą w nich udział dwa główne podmioty: Zamawiający i Wykonawca. Role i zadania każdego z nich szczegółowo opisano. Wszystkie główne ryzyka, na które są narażeni zostały wymienione i wyjaśnione. Są to między innymi konieczność zapewnienia finansowania, procedury przetargowe, zmiany prawa, zamówienia materiałów, deficyt pracowników, podwykonawców i maszyn budowlanych. Przedstawiono konsekwencję zmaterializowania się ryzyk. W ostatniej części artykułu zaprezentowano metody zarządzania ryzykiem, zarówno te które są stosowane jak i te które mogą być wprowadzone.

Słowa kluczowe: zarządzanie ryzykiem, kolej, infrastruktura, FIDIC, mitygowanie ryzyka

