

# Establishing the project portfolio management in the construction company

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**Abstract.** The principal production activity of construction companies is centralised on the investment and construction projects executed on various construction sites. In the pursuit of using the potential accumulated in the means of production, construction companies start to manage a number of projects implemented concurrently. Therefore, a project portfolio is a key challenge for the strategic management of modern construction companies. There is a way to deal with the multi-project phenomenon called the project portfolio management. At this level, specific features of construction production have to be taken into account. An efficient selection of the project portfolio, treated as the project portfolio management maturity, allows reducing the risk associated with investing in projects, by creating a combination of expenses on a number of projects. The strategies accepted by an organisation determine the project portfolio to the implementation according to some specific requirements (scope, deadlines, cost, quality). Disruptions of meeting these requirements generate the risk associated with concrete projects, and the configuration of the project portfolio, i.e. a number of projects implemented parallelly, their distribution in time and space, produces the risk connected with resources vital to the project execution. Results of a survey conducted among 100 Polish construction entrepreneurs, regarding the problems of establishing the project portfolio management, were presented. Majority of respondents indicated a profit margin as the most important factor in the selection of the project. A number of projects executed in one year, in individual groups of the surveyed enterprises, varies. Large companies usually execute up to 5 projects at the same time. In turn, small and micro-sized enterprises are mostly involved in 6-20 projects in one year. The research revealed that the most frequently indicated criterion for selecting the project portfolio in the construction industry is the availability of workforce. Subsequently, the availability of materials and equipment were indicated in the second and third place. All factors of production, i.e. human resources, materials, equipment as well as financial resources, become sources of the risk in projects, as it comes to a chance to obtain or substitute them. The summary includes a conclusion of the considerations, containing a specification of criteria for selecting the project portfolio in a construction company.

## 1.Introduction

Construction companies getting involved in the execution of investment and construction projects must consider the relation of success with the effects of the projects as only a successful course of the project guarantees a return on investment of the costs of the resources engaged for construction contracts. It also contributes to creating a good image of construction companies enhancing their market position. Companies building their brand based on project execution success require adaptive



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management which involves integrating people, processes and technologies in a way which would make it possible to relate the activity of the enterprise to the current needs of the projects [1].

The enterprises usually concurrently execute a few investment and construction projects, often considerably dispersed across the area. Those are structures with a permanent location, over the period of erection which requires individual management of the construction site, liquidated after the completion of construction works. There is a necessity of an ongoing translocation of the production resources from the bases of the construction company into respective construction sites and from one construction site to another. The location of respective projects affects the course of logistics processes as well as the results in difficulties of the stable employment of people with the qualifications required, which is the source of personal risk. It makes the construction companies' project portfolio management difficult and causes downtimes and increases the construction works costs.

Investment and construction projects are executed as complex processes, namely the construction processes made up of various working processes related to one another technologically and organizationally. The key objective is to produce a ready structure or construction element (e.g. a prefabricated element) [2].

The project portfolio is, developed based on the strategies assumed, a set of projects accepted for execution compliant with specific requirements (scope, deadlines, prices, quality). Disturbances in fulfilling specific project objectives generate a risk related to specific projects and the configuration of the portfolio, namely the number of projects, their distribution in time and space, pose threats related to the resources indispensable for their execution.

Project management in terms of project portfolio mostly refers to the distribution of the enterprise activity in the execution of projects as a function of time. The selection of the project portfolio, considering the schedules of completion of respective tasks should consider maximising the use of the company resources. One can enumerate e.g. having specialist equipment the use of which in respective projects depends on project execution schedule. In the construction company involved in investment and construction projects, the use of construction machinery (construction cranes, diggers, etc) depends on project execution schedules [3].

The execution of construction processes requires a successive supply of production resources, which requires a combined organizational approach to production logistics (current logistics service of production processes) and supply logistics (external supplies of raw materials, materials, semi-finished products and prefabricated elements) and waste collection [4].

Production resources, including own and foreign resources for the execution of the project portfolio and quantitative relations across the projects, must be considered in the course of project portfolio development. They are all production factors, including: human resources, material resources, equipment as well as financial resources. Elements of risk related to production factors can be considered in terms of the possibility of their acquisition and substitutability.

A variation of the method of compensating for risk is the risk compensation method. It assumes that it is possible for one kind of risk to be compensated by another (not always various kinds of risk get accumulated; they can cancel one another). Then the total risk gets reduced. It also refers to the selection of the project package with risk negatively correlated in time.

The enterprise project maturity is found when the enterprise successes are considered concurrent with the successes of the projects executed and the enterprise can take care of developing an effective project portfolio.

To enhance the degree of maturity in managing the projects in the area of project environment, one must establish the organizational structure to support project management, which is related to separating an organizational unit for project management known as the project management office. The key project objectives include strategic objectives which are proportional to the general vision of project management. Project managers should have the knowledge of plans, objectives different than own projects. It would allow for better coordination of the interactions between projects. Developing general project management awareness, one must seek the participation of sponsors in specific projects and to do their best for support of the process managers related to project management [5].

Construction company management requires mostly establishing the relations between the objectives of the company and the objectives of the investment and construction projects ensuring benefits to both. Looking for that consensus should consider the project risk and the enterprise risk and, mostly, their effects [6].

## **2. Investment and construction project portfolio management in terms of enterprise project maturity**

One must note that developing the enterprise project maturity level is multidimensional. Observing the operation of the organizations which see their success in an efficient course of project execution, seven basic enterprise project maturity dimensions can be formulated and referred to as:

- human resources project maturity,
- technical infrastructure project maturity,
- organizational culture project maturity,
- organizational structure project maturity,
- project management project maturity,
- project portfolio management project maturity,
- organizational management project maturity.

Project management project maturity is most evident from the potential possibilities of selecting a competent project team. What is most important are the skills of risk management, according to the plan involving a search for the methods of protecting yourself against various kinds of risk identified for the project, as well as defining the methods of the active risk control. The project risk management strategy should foresee the necessity of creating reserves (risk capital) which can have a decisive effect on the rate of return of the project and which are important for taking decisions on their execution. The key element of the strategy of getting secured against risk is investing in projects for which the expected rate of return is higher than the costs of capital increased by the risk-related mark-up.

On the other hand, project portfolio management project maturity is seen from the selection of internal development projects with the criterion of economic efficiency, using the enterprise resources in external projects and a possibility of evaluating the project portfolio efficiency.

N. Eidsmoe [7] differentiated five levels of project maturity of the enterprise on which he located 17 degrees of maturity growth. He placed the project portfolio management problems on the fourth level stating that the enterprise reaches that level of project maturity when a balanced project management program in the company is efficient. He enumerates the maturity growth degrees to be as follows:

- Project Management Certification Program,
- High-Level Project Management Maturity,
- Portfolio Management.

Project maturity increases with the increasing flexibility of connections of the organization elements with the environment and with respective projects. The fields of project maturity are shown in Table 1.

**Table 1.** Fields of project maturity in respective dimensions [4]

Item	Enterprise project maturity dimension	Fields of project maturity
1.	Human resources	a). mental readiness for facing innovative challenges
		b). capacity for accepting changes
		c). team working skills
2.	Technical infrastructure	a). readiness for supporting innovative tasks
		b). capacity for technical service for various projects
		c). developing an IT system for project-based management
3.	Organizational culture	a). organizational culture openness
		b). operating universal organizational culture artefacts
		c). tolerance of different organizational cultures
4.	Organizational structure	a). organizational structure flexibility
		b). placing projects in organizational structure
		c). clear relations of the project and routine sections
5.	Project management	a). project team member competences
		b). project risk management plan development
		c). project risk capital development
6.	<b>Project portfolio management</b>	<b>a). Selection of internal development projects with the criterion of economic efficiency</b>
		<b>b). using the enterprise resources in external projects</b>
		<b>c). possibility of evaluating the project portfolio efficiency</b>
7.	Organization management	a). readiness for innovative projects
		b). capacity for cooperation with other entities
		c). introducing project-based management philosophy

A high level of project maturity is possible thanks to the operation of the project portfolio management process. Project portfolio management stages and supporting methods are provided in Table 2.

In the process, one must note a risk which can reach the sizes posing a threat to the security of the organization. And, as such, it requires a reaction. The key element of the strategy of getting secured against risk is investing in the projects for which the expected rate of return is higher than the costs of

the capital increased by risk-related mark-up. The concept can be applied for portfolio investments. Then one can distribute the investment-related risk by creating a combination of inputs for a series of projects.

For each enterprise one must precisely define the portfolio of risks which can have a negative effect on financial results. The bases for it are always the traditionally defined risks generally related to various areas of the economic activity. Risks can be classified according to various cross-sections and divided by analysing the period they refer to into long- and short-term risk.

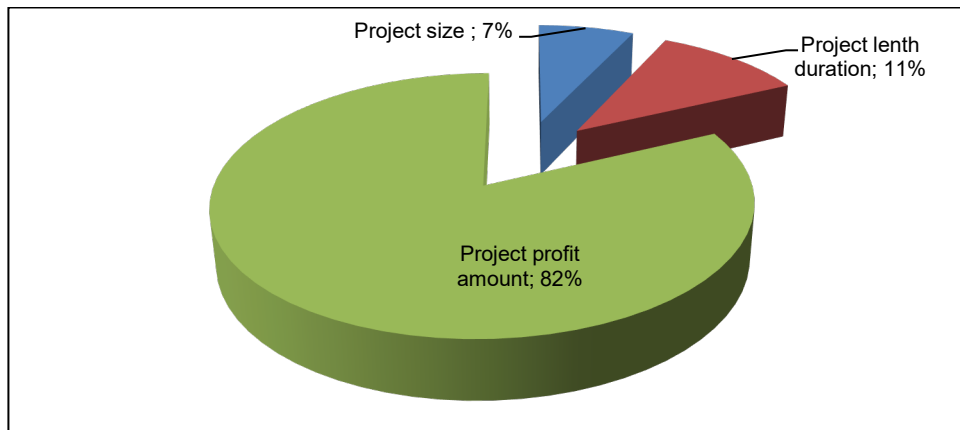
**Table 2.** Methods of project portfolio management at respective project portfolio management process stages [8]

Project portfolio management stage	Methods	Method type	
		Quantitative	Qualitative
Portfolio project identification	heuristic methods		x
	strategic compliance method		x
	project distribution matrix		x
Portfolio project evaluation, selection and hierarchy	project valuating by factor ranking	x	x
	portfolio valuating by a comparison in pairs		x
	financial portfolio project profitability evaluation methods	x	
Project portfolio compensation	matrix of project compliance with the strategy		x
	benefit-risk matrix		x
	portfolio analysis and visualisation matrix methods	x	x
Active portfolio project execution and control	matrix of project coverage with a human factor	x	x
	Schedule performance index	x	x
	cost performance index	x	
	Multi-criteria decision analysis method	x	x

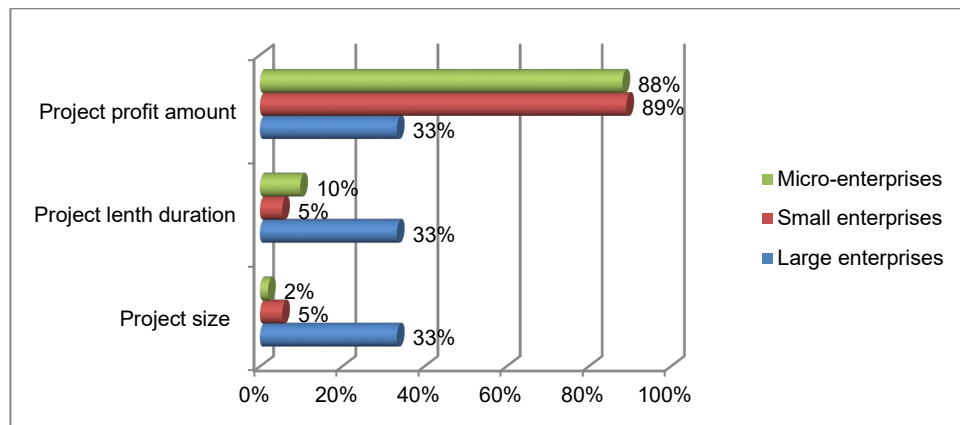
### 3. Project portfolio development in the opinion of Polish entrepreneurs

The opinions of Polish construction entrepreneurs on formulating the project portfolio can be presented according to the study described in another publication [9]. Surveys were made in the sample of 100 construction entrepreneurs, including 12 representatives of large enterprises, 37 - of small enterprises and 51 - of micro-entrepreneurs.

The respondents indicated their preferences in terms of the selection of investment and construction projects. Figure 1 shows that most entrepreneurs (82%) consider the amount of profit as the key project selection criterion. Figure 2 demonstrates how the preferences of the project selection criterion get distributed in the respective enterprise groups.

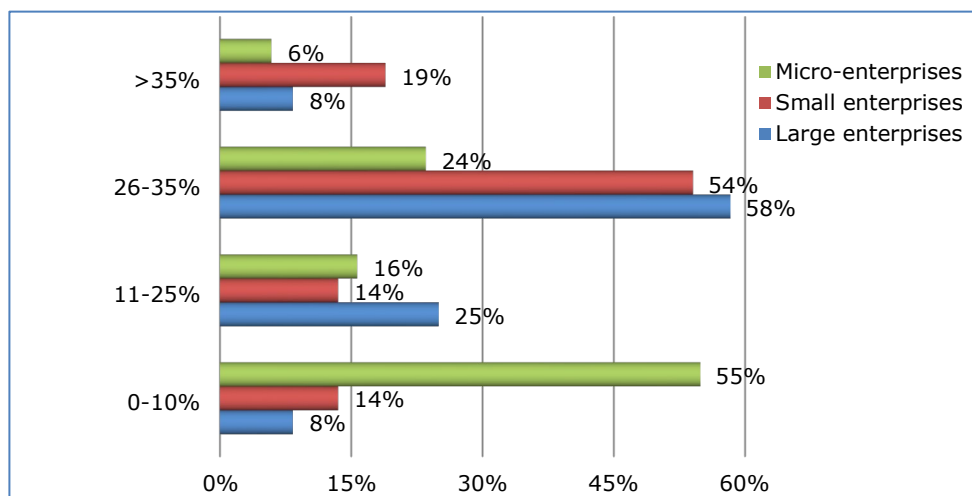


**Figure 1.** Dominant project selection factor [9]



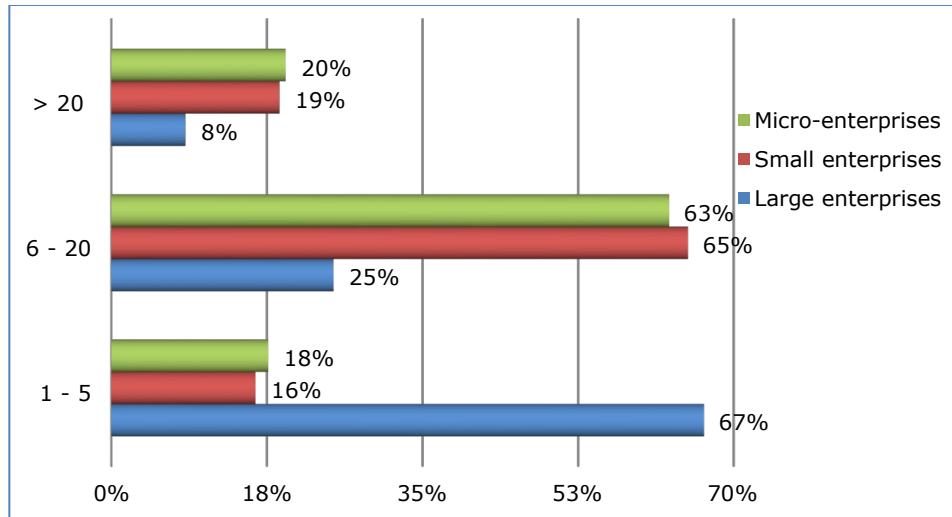
**Figure 2.** Dominant project selection factor in respective enterprise groups [9]

The respondents’ responses to the question on the financial project risk noted in respective enterprise groups are given in Figure 3.



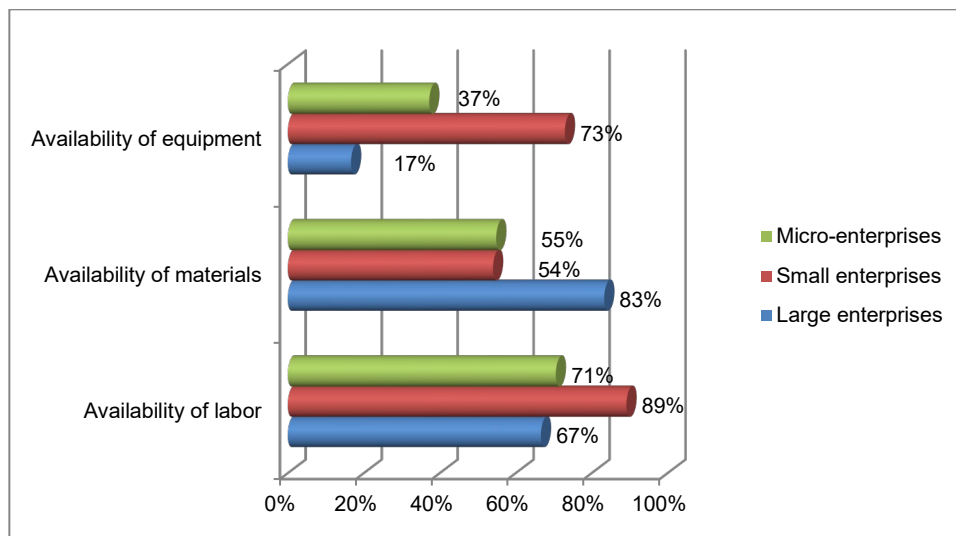
**Figure 3.** Financial project risk in respective enterprise groups [9]

The respondents also indicated an approximate number of projects executed per year. The number in respective enterprise groups is given in Figure 4.



**Figure 4.** Number of projects executed per year in respective enterprise groups [9]

Figure 5 provides the respondents' indications in terms of essential criteria for the development of the portfolio of projects executed in respective groups of construction enterprises.



**Figure 5.** Essential criteria for developing the portfolio of projects executed in respective groups of construction enterprises [9]

The literature review and practical experience of the authors facilitate formulating the model list of external project portfolio selection criteria in a construction enterprise, which can be specified as follows:

- A. **Group of criteria including the resources indispensable for the execution of investment and construction projects**
  - Criterion of the availability of qualified production labour,



- Criterion of the availability of qualified engineering and technical personnel,
  - Criterion of the availability of qualified managerial personnel,
  - Criterion of the availability of construction materials,
  - Criterion of the availability of construction equipment,
  - Criterion of the construction site camp,
  - Criterion of the financial capital held,
  - Criterion of technological knowledge (“know-how”).
- B. Group of criteria including the project portfolio management strategy**
- Criterion of the strategic objectives of project portfolio in the enterprise,
  - Criterion of the evaluation and selection of qualified portfolio projects,
  - Criterion of balanced investment and construction project portfolio,
  - Criterion of the possibilities of portfolio results monitoring,
  - Criterion of a possibility of correction of the course of portfolio components to achieve the desired results.
- C. Group of criteria resulting from the enterprise project maturity**
- Criterion of experience on the construction market,
  - Criterion of the specificity of the projects executed in the past,
  - Criterion of the number of projects per portfolio in the past,
  - Criterion of knowledge development and sharing experience across project teams,
  - Criterion of susceptibility to risk in the project and at the enterprise level.
- D. Group of criteria resulting from the relationship of the enterprise with the environment**
- Criterion of cooperation with other construction enterprises,
  - Criterion of cooperation with managing organizations,
  - Criterion of cooperation with local government,
  - Criterion of cooperation with construction administration,
  - Criterion of cooperation with job agencies,
  - Criterion of cooperation with real estate agencies and advertising agencies.

#### 4. Conclusions

The construction company potential built determines the possibility of the company taking a specific position in the structure of investment and construction projects.

Taking the decision on the selection of projects, one can use the analysis of sensitivity to investigate how the risk changes depending on the changes in various parameters. For example, investigating the financial risk, one must analyse the structure of cash flows for respective project selection variants (types and their execution in time). The highest items of revenues and expenditures must be provided as variants in terms of quantity and price parameters or both parameters simultaneously.

Usually, only a few projects generate the biggest share of the sales revenues. However, it does not mean at all that they have the greatest share in generating the gross profit. To investigate the effect of respective projects on generating profit, one must introduce the cost calculation for specific projects with the highest share in the sales revenues. The information can be used to build the production structure variants.

The construction production course efficiency is affected by the level of enterprise project maturity. It is enhanced by introducing the enterprise design thinking, namely reorienting the philosophy of the organization management towards the project-based management, namely in terms



of executed and potential projects. When planning, organizing actions, motivating employees and controlling the processes in the project, it is thus necessary to consider the factors ensuring both the success of the projects and affecting the achievement of the objectives of the enterprise, the project task executor. The project-based management can be treated as an organization management method which, for the execution of the innovative projects, accepts the project structures and their existence as being a part of the organization culture.

One must also note that at the enterprise level, there accumulate all the risks of manufacturing, auxiliary and supporting processes and additionally the organization management processes. In the construction sector, one must highlight the importance of the managerial processes at the organization level, resulting from the fact of the enterprises getting engaged in the external investment and construction projects. The project portfolio accepted for execution, especially the construction works schedules, have a high impact on the evenness of the use of the enterprise resources and thus their productivity and financial results of the business activity.

An elevated financial risk of construction companies is due to the difficulties in solving the problems of the operation of the sector-specific jobs and organizational processes.

An adequate development of the project portfolio facilitates the use of the risk compensation method involving a parallel execution of the various projects. The higher the number of projects, the less risky the enterprise activity. Losses related to the failure of some projects are compensated with the profits from the “successful” projects.

Interestingly, the bigger the enterprise, the greater its possibilities of using that effect. Small enterprises much less considerably can operate following the risk compensation method. They have neither the adequate financial resources nor the production potential. In the countries with a developed market economy, such companies often use the insurance system, even though the risk insurance is becoming more and more expensive there.

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