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Original Research Article

DELAYS IN EXECUTION OF BUILDING PROJECTS AND THEIR FINANCIAL CONSEQUENCES FOR CONTRACTORS - POLISH VIEW

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A b s t r a c t

The execution of building projects should be planned in a realistic time, at the assumed cost and quality, and take into account the risk of the contract parties. However, even the best-planned construction projects are exposed to the risk of delays. The article reviews causes of delays in the construction projects identified both in the world and in Poland. The consequences of delays, regardless of the responsible party, should be clearly spelled out in the contracts. Financial penalties for delays are commonly used in agreements for construction works, and their level, according to the presented analyses, is usually higher in the public than in the private sector. Attention has been also paid to the few models presented in the literature that make it possible to predict delays and prevent their effects. It seems that this is an interesting direction for further research.

Keywords: delays in construction, construction contracts, execution of works, financial penalties

1. INTRODUCTION

Manuscripts A successful completion of a construction project means that it is finished within the cost budget [16,30], in time [13,17], according to the quality plan [33,35], is delivered safely [5,12] and with the use of modern effective technologies [23,36]. Much of the work related to facility building involves environmental impact assessment [39,41,42], selection of the best building materials [27], optimization of energy efficiency [25,34,38] and proper management of the life cycle of the facility [26,29]. The execution of building projects, even those perfectly planned and organized, carries a risk of unforeseen problems and events which can delay the works and then result in their untimely completion. Delays in construction works are a common and frequently recurring problem in the implementation of construction projects [40]. For the investor, a delay may mean inability to obtain benefits of the investments at the scheduled time. For the contractor, this may mean higher than planned costs of works.

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In extreme cases this can lead to a situation in which, instead of the planned profit, the contractor incurs losses.

In terms of the cause, the delays can be divided into two groups [19]: justified or unjustified, and the responsible party can be the investor or the contractor. Justified delays are usually caused through the fault of the investor and are subject to compensation. This can be a result of changes introduced during the execution of works or errors made at the design stage. Extending the time needed to prepare the author's supervision or providing replacement material solutions may be a setback for the execution of works. Modifications of earlier findings are further reasons leading to possible delays. Overdue payments payable by the investor may slow down the progress of construction or even suspend it. There can also be delays which are justified but are not subject to compensation, and are not a responsibility of any of the parties. In these cases, the contractor is authorized to extend the deadline for completion but does not receive remuneration for it. This group can include adverse weather or changes in legislation and other random events. The consequences of unforeseen changes in weather or even natural weather disasters may include interruption of works carried out, damage to work completed or destruction of equipment. Random cases certainly comprise theft and failures of the construction equipment used, occurrence of archaeological excavations etc. Some of them force time-consuming procedures to be carried out.

Unjustified delays are those where the responsibility usually rests with the contractor. In such cases, however, the contractor is not authorized either to extend the project deadline or to receive a salary. Contractor-dependent factors are associated primarily with the availability of resources, proper organization, supervision and the contractor’s experience, which all affect the probability of making executive errors.

It is worth mentioning that for a smooth construction process, the relations between the various participants in the project are very important. Limited or inadequate flow of information between the investor, contractor and designer, frequently occurring conflicts, difficult and lengthy negotiations can also cause delays.

Signing of a contract initiates the implementation of the construction project. All assumptions regarding the costs, quality and time should be clearly defined between the parties. Disputes and misunderstandings between the parties can be reduced by appropriate and equitable provisions of the agreement. That is why it is so important to properly construct the content of the contract, which protects the interests of the participants in the construction process. The contract should include provisions covering the subject of the contract, detailed obligations of the parties regarding the performance of works, provisions concerning the procedure in the event of non-performance or undue performance of the contract, and related securities and contractual penalties. Building contracts, as standard, contain provisions defining contractual penalties for the delay in contract completion as well as in removing defects and faults. For the investor, contractual penalties often become compensation for the costs of defects and faults as well as the lost profit which could not be earned due to the delays.

The aim of the paper is to indicate the causes of delays in the execution of a facility construction together with the possible financial consequences for the contractor resulting from contractual provisions. The financial aspects of construction delays are the element of novelty the paper's considerations, not widely discussed in the literature.

2. CONSTRUCTION DELAYS - RESULTS OF PREVIOUS RESEARCH

2.1. Reasons of construction delays

In the 1970s, in the United States [4], the first results of research on the delay causes in the execution of construction works were published. The authors identified seventeen factors causing delays. These included: weather conditions, availability of workforce, participation of subcontractors, changes in the design documentation, quality of the design documentation and others. Further studies were conducted in other countries. As a result of the literature analysis it is possible to choose the factors that were most important in the selected countries.

- in Saudi Arabia [1]: suspension of work by the investor; the contractor's lack of experience, slow decision-making by the investor.
- in Malaysia [32]: ineffective planning, poor quality of on-site management, the contractor's insufficient experience
- in Hong-Kong [24] – lack of resources to finance in the vestment, unforeseen land conditions, offers that were under-priced in relation to the works' real value.
- in United Arab Emirates [8] lengthy document preparation process; shortage of manpower, slow decision-making by the investor.

Finally, more than a hundred factors were indicated in the literature on the subject and their grouping was introduced [19]. One of the first and simplest division into 3 groups was proposed in [37]. The first group consisted of input factors (human labour, material, equipment), the second - internal environment (investor, designer, contractor) and the third - unpredictable factors (e.g. weather conditions, legal regulations). The most extensive division covering 10 groups was proposed in [40]. The grouping is shown in Fig.1. Other examples of divisions can be found in [8].

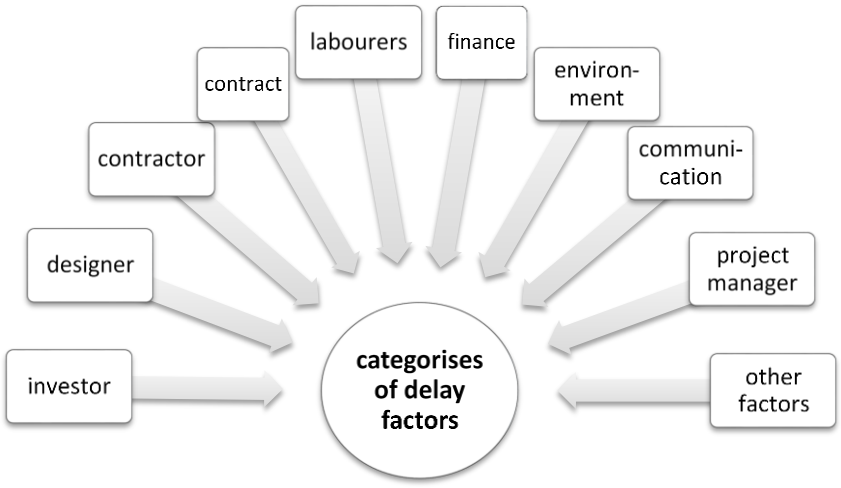

Fig. 1. The most detailed grouping of delay factors. Source: based on [40]

One of the first studies on the causes of delays in Poland was published in 2010 [18]. The aim was to learn the opinion of selected construction process participants. The managers were selected - in this case the Engineers acting as the contract managers under the FIDIC conditions. It should be emphasized that in the opinion of 65% of the Engineers participating in the research it is the contractor who is responsible for the delays.

Subsequent publications concerned the reasons of delays in the assessment of other parties to contracts: investors and contractors. In [9] the authors were interested in the investors' opinions, whereas in paper [2] the contractors' opinions were analysed. The results covering the three most important causes of delays identified in each group are summarized in Table 1.

Table 1. The most important reasons of delays of construction Design-Bid-Build projects execution according to research conducted in Poland. Source: based on: [2,9]

Reasons of delays in D-B-B projects	
according to investors	according to contractors
1. errors in the design documentation, 2. low quality of labor, 3. bad weather conditions.	1. errors in the design documentation, 2. poor cooperation between the investor and the contractor, 3. bad weather conditions.

It is worth noting that exactly the same factor, errors in the project documentation, was indicated as the most important in the research conducted in Poland among the participants of the investment process. In the case of an investment in the traditional design-bid-build system, the design stage is separated from the construction stage. The investor first orders the preparation of the project documentation and then, after its completion, seeks a contractor for the construction works. In this situation, the investor is responsible for delivering the (design) project and should pay special attention to its correctness and appropriate quality. At this point, attention should be paid to the reasons for delays in Design & Build projects. Design & build delivery method reflect the concept that contractors offered clients a complete "package," in contrast to the comparatively fragmented traditional arrangements of design-bid-build, whereby clients have separate agreements for design and for construction. In the D&B system, a single contractor is entrusted both design works and implementation where one contractor is responsible for both stages: design and construction works. Such research was undertaken in [20, 21]. Searching for the causes of delays in the design stage, out of the 27 proposed factors, the following were considered most important: indecisiveness in making decisions by the investor, prolonged approval procedures, failure to meet contractual deadlines for the preparation of design documentation by the contractor. The reasons of delays in the execution stage of Design & Build projects were: incorrect calculation of a tender offer, lack of competent contractor staff, lack of contractor experience. The list of causes of delays in the Design & Build projects is presented in Table 2.

Table 2. The most important reasons of delays of construction Design & Build projects execution according to research conducted in Poland. Own study based on [20,21]

Reasons of delays in D & B projects	
in a design stage	in a build stage
1. indecisiveness in making decisions by the investor, 2. prolonged approval procedures, 3. failure to meet contractual deadlines for the preparation of design documentation by the contractor.	1. incorrect calculation of a tender offer, 2. lack of competent contractor staff, 3. lack of contractor experience.

2.2. Methods of delay analysis

As shown above, many studies on construction delays focus on identifying and evaluating the delay factors. The lack of proposed models and tools for forecasting delays in contract performance and for assessing the probability of their occurrence is noticeable.

Some of the Polish publications present the possibilities of applying various methods to analyse delay-causing factors. In [6], the authors applied the Dematel method to search for the cause-and-effect chain for the identified climatic, technical and organizational factors in a selected construction project. As a result of the analysis, it was found that the group of undoubted causes of delays for the case study included two factors: T (ambient temperature significantly below the typical level) and SO (intensive snowfall and long-term retention of a substantial snow cover). These factors had also the greatest impact on the other identified factors.

In [9] factor analysis was used to study delays in the implementation of construction works. It is one of the basic methods of multivariate data analysis, the purpose of which is to interpret the structure of relationships between many variables. As a result of its application, four basic groups of delays reasons in construction were identified: (1) attributable to the contractor, (2) attributable to the investor, (3) external, related to the market and institutional environment, (4) external, resulting from the investor's interactions with the public administration. The factors identified in the analysis of the empirical data partially coincide with the a priori classifications that can be found in the literature on the subject.

The authors of [20] tried to group factors using cluster analysis. The method belongs to multidimensional analyses that enable grouping of objects. It is based on an internal division criterion. Appropriate procedures create groups of objects whose number is not predetermined. The results of the analysis indicated three groups: Group 1 - factors independent of the participants of the construction project. Group 2 - factors dependent on both parties of the contract. Group 3 - factors dependent on the contractor - related to the contractor's lack of experience and poor preparation for the execution of works.

In [3] a method was proposed of predicting delays in the completion date of expressways and motorways in Poland using the artificial neural networks (ANN). MLP-type neural networks were used, which predicted the date of the works completion at the output. This is one of the first delay forecasting models proposed in the Polish literature.

Among the latest foreign works on forecasting delays, it is worth highlighting those employing machine learning to build predictive models. In [11], the authors developed two machine learning models in order to facilitate accurate project delay risk analysis and prediction. The evaluation results indicated that the naïve Bayesian model provides a better predictive performance. Artificial intelligence has been widely used in [7]. A multilayer high performant ensemble of ensembles (stacking) predictive model was developed to maximize the overall performance of the EMLA (ensemble machine learning algorithms) combined. To build the model the following were used, analysed and evaluated: Decision Tree, Random Forest, Adaptive Boosting (CART), Gradient Boosting Machine, Naive Bayes. Results from the evaluation metrics proved that ensemble algorithms are capable of improving the predictive force relative to the use of a single algorithm in predicting construction projects delay.

Analysing the literature, we can notice a lot of interest in delay factors all over the world, but there are no models or tools to forecast the size of delays in construction.

3. CONTRACTUAL PENALTIES - FINANCIAL CONSEQUENCES OF DELAYS TO CONTRACTORS

The provisions of Polish law, in particular the Civil Code [15], distinguish between two types of delays: ordinary delay or qualified delay. An ordinary delay is the result of the debtor's failure to fulfil the obligation within the specified period, which, pursuant to art. 476 is a consequence of circumstances for which the debtor is not responsible. A qualified delay is the failure to fulfil the obligation, most often on the part of the debtor and caused by circumstances attributable to the debtor [28]. Delays encountered in the course of construction works are both ordinary delays and qualified delays. The party responsible for qualified delays in the case of construction works may be both the contractor and the investor. Incurring liability for delays in construction works significantly depends on the provisions contained in the contract between the contractor and the investor. Depending on them, the risk related to the execution of works may be divided between the parties in different ways. A well-prepared contract will reasonably maintain a balance between the requirements and interests of the parties and fairly divide the risks, hazards and responsibilities related to the execution of the works.

Contracts for construction works always include provisions on penalties for the contractor delays in relation to the date of works completion or removing defects and faults by the contractor. Legal provisions on contractual penalties are contained in Articles 483 and 484 of the Civil Code [15]. They specify the rights of the contracting parties to include a reservation according to which damage resulting from non-performance or improper performance of a non-pecuniary obligation will be redressed by payment of a specified sum (Article 483 § 1 of the Civil Code) [15]. In addition, the contractual penalty is due to the creditor in the agreed amount, regardless of the amount of the damage suffered (Article 484 § 1 of the Civil Code) [15]. It applies only to non-cash obligations, such as construction works.

The contractual penalty serves many functions. The first is the compensatory function [33]. Article 483 § 1 of the Civil Code [15] states that the damage resulting from non-performance or improper performance of a non-pecuniary obligation will be repaired by paying a specified amount [31]. The above function is linked with a repressive one. It is applicable only when the damage suffered by the party is lower than the amount of payment indicated in the contract as the contractual penalty. The compensatory function of contractual penalties is connected with their simplification role [10]. Their task is to help the creditor to enforce the amount of damages through legal proceedings on general terms in accordance with Art. 471 et seq. of the Civil Code [15]. One should also mention the stimulating function which consists in mobilizing and reminding the party that the subject of the contract is duly performed. By stipulating contractual penalties in the contract one party is sure that the other, accepting the obligation, will duly perform the subject of the contract, while being aware of the additional costs incurred otherwise.

Reservations of contractual penalties are defined both for private sector contracts and on the public procurement market. The contracting authority determines the catalogue and the amount of contractual penalties, which is open and may concern e.g. untimely performance, improper performance or non-performance [14]. In the case of public procurement you can find provisions that specify exactly by virtue of what title the amount of contractual penalties can be included in the contract. Interestingly, the Report of the Office of Public Procurement [31] on the functioning of contractual penalties in public procurement indicates that for construction works the main reason for imposing contractual penalties was the failure to perform all or part of the subject of the contract within the specified time limit (59%).

In [22], the authors conducted an analysis of contracts in terms of the provisions regarding contractual penalties resulting from delays. In the first stage, 20 contract templates in the area of public procurement were analysed. In the case of the private sector, 15 selected contracts were investigated. These were contracts concluded between the general contractor and subcontractors as well

as agreements signed between the investor and the contractor. In each of the analysed contracts there was a clause containing provisions on contractual penalties. Penalties for delays and the levels of these penalties are presented in the Table 3.

Table 3. Description and scope of contractual penalties. Source: [22]

		The range of the amount of the contractual penalty	
No.	Description of the contractual penalty	Public sector	Private sector
1	For the contractor's delay in relation to the completion date of the works	– percentage range: 0.05 - 1.00% of the gross contract amount for each day of delay, – amount range: PLN 300 -500 per day	– percentage range 0.05 - 0.50%
2	For the delay in removing defects and faults	– percentage range: 0.05 - 1.00% of the gross contract amount for each day of delay, – amount range: PLN 500 - 700 per day	– percentage range 0.05 - 0.30%

As a result of the research, it was found that in the public sector [22]:

- the penalty for delay in performance of the contract was most often (45% of cases) defined as 0.2% of the gross amount of the contract for each day of delay;
- contractual penalty for delay in removing defects and faults during the guarantee and warranty period was most frequently given in the amount of 0.3% of the gross amount of the contract.

While, in the private sector [22]:

- the penalty for delay in performance of the contract was most often defined as 0.2% (27% of cases) or 0.05% (27% of cases) of the contract amount (net or gross).
- contractual penalty for delay in removing defects and faults was most commonly recorded in the amount of 0.05% for each day of delay (34% of cases).

In contracts performed pursuant to the Public Procurement Law the contracting authorities specified the amount of contractual penalties not only as a percentage but also as an amount. In private sector contracts it is common practice to record penalties payable as a percentage of the total contract sum. According to the analysis, the percentage levels of fines in the case of the public sector are higher than in the private sector.

4. SUMMARY

Taking into account the number of studies conducted worldwide on the causes of delays in construction works, it can be concluded that the problem of delays is a common phenomenon. In Poland, the main factors causing delays include errors in project documentation, poor cooperation between the investor and the contractor, unfavourable weather conditions or the contractor's lack of experience. Consequences of delays in the implementation of construction facilities concern in particular the contractors. They are contained in construction works contracts and regard, in particular, penalties for the contractor's delays in the completion of the works and in removing defects and faults. Penalties are always included in construction contracts but the analysis shows that the percentage levels of fines in the public sector are higher than in the private one. When analysing the literature we find very few

models or methods proposed by researchers to facilitate forecasting delays in construction. However, models enabling the forecast of the causes or the size of the contract delays would be very useful for practitioners, limiting the negative effects of this phenomenon on the construction industry. This is certainly an interesting direction for further research in delay analysis.

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