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IDENTIFICATION OF THE INTERFERENCE IN THE INVESTMENT PROCESS DURING THE REALIZATION OF A SHOPPING CENTRE – A CASE STUDY

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During the planning and controlling of the construction process, most attention is focused on risk analysis, especially in the context of final costs and deadlines of the investment. In this analysis, the primary and most significant concern is the proper identification and quantification of events, which on a certain level of probability may affect the development process. This paper presents the result of a risk analysis for a particular building object, made after completion of the investment and accepting it for use. Knowledge of the planned values and the actual investment process allowed for the identification of the events and their effects that in this case have significantly disrupted the investment process. The limited total cost of the investment project in question had a considerable impact on the progress of the project execution. Despite three transitions of administrative procedures, the opening date of the shopping centre was delayed by only three weeks.

Keywords: investment process, risk analysis, adverse events, investment planning, a case study

1. INTRODUCTION

The investment process is a series of coordinated technical, legal, technological, organizational and financial activities, which leads to the implementation and exploitation of the planned investment

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at a certain time and with limited financial resources (11). For the investment to be a success it is important to properly prepare the preliminary stages – with focus on the preparation of the construction works. The decisions made at these stages may affect the entire investment process both in substantive and financial terms. In this analysis, the complexity and sustainability of the investment were taken into account. A sequential link between the effects of decisions and actions, the development of work at all stages and the impact of the diversity of legal and technical aspects causes a series of random factors affecting the entire investment process. Throughout the successive steps of the investment process, events disturbing the planning works may occur; they depend on the function and location of the construction work and on the experience of different participants of the investment process, as well as many other factors. Early identification of these events, anticipation of the potential adverse effects and their inclusion in the planning works may effectively increase the scheme credibility of physical, temporal and financial schedules developed at different stages of the process (12, 13). The best way to identify these risk factors is an analysis of the execution on completed investments. Thus, specific conditions and adverse events, which have occurred during the planning and performing stages, should be considered. Keeping in mind that each of the works has an individual and unique nature, and a number of conditions for its implementation (4), and the results obtained are useful for future risk assessment of similar objects (8-10). In this paper, the planning and implementation of a large retail complex are presented. Moreover, identification of the main interferences of the planned work, their effects and methods applied in order to limit them were noted.

2. CHARACTERISTICS OF THE BUILDINGS

The idea of a commercial shopping centre came into being in 2011. A project of four large-scale commercial buildings in the area of almost 11 hectares in the suburban part of one of the cities of the Masovian voivodship was intended to be implemented by the Developer in cooperation with target customers (2). This paper focuses on one of these buildings – a Sport Store. This is a single-storey, slab-on-grade building with a maximum height of 9.50 m. The building has a rectangular shape with the external dimensions of 51.04 x 70.49 (m). The building comprises of: a Sport Store with a market hall and an exhibition area, a base – unloading zone, an office and a social space. The facility will be constructed on an area of 3097.10 square meters. In addition, it is predicted that 100 people will be employed in the Sport Store. The budget of the projected Sport Store is estimated at 7,360 thousand PLN. The investment is financed by private resources, thus the selection procedures

of the designer and the contractor are made in the absence of the Public Procurement Act, which simplifies and reduces the decision-making process. The store building has a framework structure with a crosswise arrangement of the structural form at intervals of 15.15 m. The span of bays is 19.00 m. The truss of the main hall is a steel-framed construction with steel columns restrained in the foundations and a steel lattice truss, as well as a roof bracing in the roof plane and vertical bracings in the extreme and central spaces between the columns. The foundation walls of the commercial hall, and the administrative and social part to the height of 0.5 m, are made from a reinforced, concreted still plate, insulated (from the outside) and coated with mineral plaster. The ceilings above the technical and cash register spaces are made of ferro-concrete. The external walls are made using a layered structure technology – masonry, rigid with concrete or a steel frame. The internal walls are made in a reinforced concrete frame filled with silicate blocks on a cement-lime mortar, and thus the walls are adapted to the requirements of fire protection. Furthermore, in the building there are also plasterboard partitions on a metal stud framing. The roof is covered with a PVC roof membrane. The elevation of the building is made of metal facing. Moreover, the building is equipped with mechanical ventilation, air conditioning and heating installation, electricity, water supply, sanitary and storm sewers. The facility is fully accessible for people with disabilities.

3. INVESTMENT PROCESS

3.1. STAGES OF THE INVESTMENT PROCESS INCLUDED IN THE ANALYSIS

All actions associated with the preparation and completion of the project could be improved by determining a logical sequence of the main partial products of the process, which arise from the moment of conceiving the investment idea to the final touch – the finished civil structure. The execution of the building project can be divided into the following four stages:

- Pre-design (conceptual stage),
- Tender design (tendering stage),
- Construction (implementation stage),
- As built (operation stage).

In the literature there are also more detailed divisions of stages than those listed above (4, 11). In this analysis, the following stages of investment process are proposed:

- the stage of investment plans, in which analysis of investment profitability, land purchase, and basic parameters of the investment are conducted,

- the stage of project assumptions on behalf of the Owner; in this stage the basic limits of the project are considered,
- the design process management stage; this process should be seen in close connection with the evolution of the investment costs,
- the pre-project planning stage; during this process the project documentation for the technologies and the organization process are established, the supply of materials is prepared and the selection of Contractors is done, etc.,
- the construction stage (implementation), where good coordination of work, safety of all works process, monitoring of operational costs and progress of the works have to be ensured,
- the stage of building handover for use, which addresses matters related with the acceptance of works, removal of defects, etc.,
- the stage of exploitation and maintenance of the building; the stage of renovation and maintenance planning, and the management of building use, etc.

In this paper, two of the four stages are presented – the conceptual and implementation stage, and in accordance with a more detailed division of the four stages – the analysis stage, the assumption stage, the construction stage and the stage of building handover for use. This analysis focuses on the comparison of the operational assumptions with the real course of project implementation. The principal parameters for the evaluation of the obtained effects are: the planned and achieved time, and the cost of the investment.

3.2. PRE-DESIGN STAGE

In this stage the main issues include:

- economic analysis of the investment profitability and decisions undertaken prior to project implementation,
- land buyout for the design investment – this stage was difficult to plan due to the time and costs; the area of the planned investment is comprised of 36 undeveloped plots in total, with various states of land ownership, e.g. ownership right, perpetual usufruct right and continued succession. In total, more than 10,000 m^2 of land for the planned investment of the Retail Park were bought.
- environmental permit – the waiting time for the decision after the deposit of the required documents is regulated by law. Accordingly, during the conceptual stage, this time should

be considered in the preliminary schedule. At this stage, a complementing list of documents should be made.

- decision on zoning approval – this is another document necessary for obtaining of the construction permit. The complexity of the investment forced to clear the parameters for each of the designed buildings, the technical structure and the road infrastructure in the zoning approval. Consequently, the City Council received six projects applying for one building permit including the following data: reconstruction of an electro-energy network; reconstruction of electro-energy line; construction of a tank and installation of storm water pumps for the Retail Park and the associated road network; construction of service roads and roundabouts; construction of a viaduct; construction of four commercial facilities and an advertisement pylon.
- decision on land development, resulting in additional requirements by the administration including additional work of the participants in Projects and the extension of deadlines. In such large and complex investments, it is necessary to adopt time delays in the schedule for the possibility of extending the administration procedure. In particular, this will allow reducing the losses correlated with time-lags in the schedule.
- building permit documentation – the Authority shall give an opinion within 65 days upon the receipt of a valid application. This decision may be appealed within 14 days of its adoption by all interested parties; if not, then the building permit becomes valid. In this case, after the decision was agreed upon by the Design (Documentation) Coordination Team, all volumes of the construction documentation of the residential/commercial/industrial buildings were filed in. At least one building permit for 4 residential/commercial/industrial buildings (including the analyzed Sport Store) was issued. While awaiting the decision, the Owners in terms of their own area and facility prepared the execution documentation and a technical control report, which contained a technical risk analysis. Based on the construction and executory projects, the risk analysis was performed for the purposes of insurance policy valuations. Moreover, the tender and contest documentation were launched in order to select the General Contractor for implementation of the investment.
- replacement building permit design (Z1) – in the presented case, the budget deficit demanded application of the replacement design. The Management of the Company executing the construction of the Sport Store ordered some changes to limit the expenditures and the reduction of the shopping area to a minimum retail space.

Such changes were classified as significant changes in the construction project and required preparation of a replacement building permit design.

Table 1. The consolidated statement of changes in subsequent building projects in PLN [2]

Initial project budget	**Market value basic PB**	**Market value after changes Replacement PB1**		**Market value after changes Replacement PB2**	
7,368,797	**1,272,219**	**483,716**		**13,521**	
Construction work	6,111,016	5,409,513		5,031,318	
Sanitary installations	670,000	549,000		531,000	
Electrical installations	1,015,000	899,000		838,000	
Advertisement	119,000 + 250,000	119,000 + 250,000		119,000 + 250,000	
Project and contract management	665,000	626,000		613,000	
Object 2,500 m – basic PB		Object 2,000 m – replacement PB 1		Object 2,000 m – replacement PB 2	
Ground transport and stabilization	750,000	Ground transport and stabilization	343,000	Vestibule removal	200,000
Utex layer	100,000	Surface reduction	430,000	Building lowering	70,000
Storm water devices	60,000	North road width reduction	60,000	Building relocation	120,000
Attic	50,000	Floor sheet-metal plates	90,000	Transformer and MV power grid station reduction	60,000
Trespa extra 100 m^2	65,000	Aluminium joinery	7,503	Storage and social area reduction	45,000
Roof coating	40,000	Advertisement reduction	25,000		
FM Global elevation	40,000	Solid waste disposal facility	13,000		
Heat recuperation	20,000	Replacement design	180,000		
Steel construction	80,000				
LAN network	610,000				
RACK	10,000				
Kitchen	25,000				
Opeco advertisements	55,000				
Solid waste disposal facility	30,000				
Sum of additional costs	**1,335,000**	**Total savings**	**788,503**	**Total savings**	**495,000**

– Replacement building permit design (Z2) – Additionally, after having a legally effective building permit PnB Z1, the request for PnB (including an area of 10 ha and 4 residential/commercial/industrial buildings) division was made. The main goal of this request was the new land subdivision, which allowed the Owners to gain independence with regard to decisions on administration procedures related to the construction and acceptance

of the investment, as well as the possibility to amend the changes within the individual plots without consent from the other co-Owners and without suspension of investment realization. As in the previous case (PB Z1), the changes were ordered to reduce the expenditure. Once again, change of the development area was made – a vestibule was removed from the front of the shop entrance, the building height was reduced by 0.8 m, the building localization on the plot was changed, and the lines of energy, sewage and water supply were reduced. Moreover, the storage and social spaces were reduced and the conditions of power connections were changed, therefore the transformer station and the MV power grid station were decreased. These changes extended the savings offset (Table 1) and execution of work within the available budget.

Coordination of the process of construction based on the primary building permit was related to maintaining a single site logbook and putting all the responsibility for the entire investment on a single Construction Manager. This situation turned out to be problematic with regard to logistics, because regardless the fact that the construction involved a whole group of highly specialized engineers, all the responsibility was put on a single Construction Manager. Moreover, it was symptomatic how frequently the delays in the organization of one Owner may block other building permits. According to the documentation submitted the second time, the replacement design project was very successful. Also, this allowed for changes to the Project, which produced budget savings without limits of the construction works in accordance with the first building permit.

3.3. CONSTRUCTION STAGE

The construction of the Sport Store was planned for 130 days. The construction works with deadlines of individual task execution were described in the updated schedule. The technical part of the Project was not difficult to implement by the Contractor. The most important aim of this stage was conducting building acceptance testing and obtaining permission for using the constructed Object. Consequently, the actions undertaken in this stage were as follows:

- Owner's construction acceptance – should be held before the State building inspections. The aim was to improve the authorization process of inspections and remove the weaknesses and gaps, which might withhold the authorizations or permissions in expected terms.
- State building inspections – in this investment the inspections were conducted by the State Sanitary Inspection, the State Fire Service and the National Inspection for Environmental Protection. Information about the audits by the State Sanitary Inspection was provided after

the completion of construction and before authorization to use. During the inspection, water samples for the tests were collected. The test results of the audit did not show any deviations from general standards. The State Sanitary Inspection did not issue a decision objecting the Sports Shop opening on the anticipated opening date.

- The State Fire Service inspections audit was carried out twice, due to the lack of connection to the power grid during the first inspection. During the first audit, all systems and devices were checked; at that time electrical power was supplied by a generator. This action generated additional costs, but they were lower than the delay in bringing the new buildings into use. On completion of the inspection, if the building has a connection with the national power grid, another control will be carried out. Significant deficiencies were not revealed in any of the audits. This helped in avoiding delays in obtaining necessary permits.
- During the audit of the National Inspection for Environmental Protection, all the required documents and the test results were properly prepared, thus the regulatory authority raised no objections.
- Occupancy permit – during construction acceptance, all the State services made use of the possibility to carry out the inspections. To improve the process, the Owner and other relevant persons involved in the Project were present at the site. The controlling parties did not input any convictions or sanctions on the investment after the inspections. This gave the Owner the possibility of attaching the declaration of no objection from the State services to the application for the building permit. The whole procedure of legal permission for using the constructed Object was conducted without any disturbing effects.

4. ANALYSIS OF THE INTERFERENCES AND THEIR IMPACTS

Many schedules were developed in the analyzed investment process. In connection with the decisions taken, the Schedule was reworked several times. Three schedules mentioned in this report are as follows: the preliminary Owner's schedule (HIK), the executive Owner's schedule (HIR) and the detailed Contractor's schedule (HW). Considering the space limitations of the report, the Schedules are not fully presented. Table 2 shows the basic differences between the schedules. The general schedule for the primary points was prepared during the pre-design stage (HIK). The schedule for implementing the major investment contained only 30 tasks, which began with a documentation process and ended with the opening of the Sports Store. The Schedule is an overview display of the entire investment and was focused on formal and legal questions.

Table 2. The schedules comparison [2]

	Schedule details	Reasons of differences
Preliminary Owner's schedule (HIK)	Number of schedule tasks: 30 Number of building permit: 1 Preparation of formal documentation: 42 days Formal procedures: considered Tender procedure: 32 days Building permit: 2013 -01 -01 Initiation of the investment: 2013 -01-09 Execution period: 130 days Scope of works: did not consider Completion of works: 2013 - 07 -09 Investor delivery: 10 days Acceptance procedures: considered Store opening: 2013-09-16	– schedule purpose, – stage of schedule preparation, – budget deficit and need for cost reduction, – changes in the scope of works, – changes in project documentation, – Owner changes, – need for retendering, – necessity for repetition of the administration procedure, – double expectation for replacement decision of building permit.
Executive Owner's schedule (HIR)	Number of schedule tasks: 38 Number of building permit: 3 Preparation of formal documentation: 42 days Formal procedures: considered Tender procedure: 32 days +30 days Building permit: 2013 -01 -01 Replacement building permit 1:2013 - 04 22 Replacement building permit 2: 2013 - 08 -09 Initiation of the investment: 2013 - 02 -25 Execution period: 130 days Scope of works: did not consider Completion of works: 2013 - 08 -23 Investor delivery: 10 days Acceptance procedures: considered Store opening: 2013 -10 -31	
Detailed Contractor's schedule (HW)	Number of schedule tasks: 130 Number of building permit: 3 Preparation of the formal documentation: did not consider Formal procedures: did not consider Tender procedure: did not consider Building permit: 2013 -01 -01 Replacement building permit 1:2013 -04 -22 Replacement building permit 2: 2013 - 08 -09 Initiation of the investment: 2013 - 02 -25 Execution period: 125 days Scope of works: considered Completion of works: 2013 - 08 -23 Investor delivery: 58 days Acceptance procedures: considered, expanded Store opening: 2013 -10 -31	

The executive Owner's schedule (HIR) was based on the preliminary Owner's schedule (HIK) and constituted its development. Accordingly, any discrepancy in relation to the estimates was entered in the execution of the Owner's schedule. Finally this schedule was extended by 38 tasks. The interferences which had significant influence on the changes in the executive Owner's schedule (HIR) as compared to the preliminary Owner's schedule (HIK) were as follows:

– purpose and preparation of the schedule: the HIK was created during the project's concept

preparation stage; whereas the HIR was created throughout the entire process and after running into the first difficulties,

- When the tender was terminated and accurate analysis of the market situation was obtained, the predicted investment costs were about 8,640,000 PLN. This meant that the excessive deficit relative to the approved budget in HIK of 7,368,797 PLN was observed. This forced the Owner to revise the proposed project, including planning of savings. The application of the following amendments resulted in carrying out the following steps: budget deficit → cost savings → changes in the scope of works → changes in the design documentation → amendment of building permit.
- Changes in the design documentation caused repetition of the tender and selected administrative procedures within 30 days. Accordingly, the planned time for the tenders in HIK extended and in HIR increased to 32 +30 days.
- Before performing the construction stage, the land was purchased as several plots, which were subsequently merged into a single plot. This resulted in the necessity to conduct the authorization process for all facilities into a single permit. In order to avoid any possible negative effects, the request for a replacement design project was lodged on 22 April 2013. According to the schedule, the administration procedures were expected to take approximately 65 days.

It should be noted that the increase in the length of the execution time was caused by the necessity of carrying out building permit procedures three times and not once, as preliminarily assumed. This process took 65 days for the decision plus 14 days for the validation, thus in total gave 79 days. Based on the above statements, it can be concluded that a 158 days delay will be noted. However, thanks to a skilful project management, the administration procedures were carried out parallel to the execution of works based on a previous decision. This provided the opportunity to minimize the delay and to submit the announcement of the completion of construction works one month after the validation of the second replacement decision regarding the building permit. Finally, the opening of the Sport Store was fixed for October 31st – six weeks later than originally scheduled. The detailed contractor's schedule (HW) setting out in greater detail the implementation/realization of the Sport Store constituted the development of the executive Owner's schedule (HIR) with the work ranges of particular contractors. This schedule was the most precise and consisted of 130 tasks. The scheme of WBS sub-division included: land preparations works for the construction site, construction of market hall, construction of energy networks, electric works, construction of roads and car parks. The detailed contractor's schedule based on the global schedule

considered the replacement of building permits. Formal and legal issues associated with the investment were rejected; accordingly the schedule was focused on the technical, technological and organization issues. On February 25th 2013 the building site was made available. After this date, all planned construction works were executed. Not all works were completed in accordance with this schedule. However, this did not pose a huge problem, because the inter-branch collisions were taken into account. The most significant in the efficient development of the construction works was their coordination with the current building permit and verification of the timeliness of their performance. Operational coordination was based on the monitoring of the current status of scheduled milestones (mentioned in the Owner's schedule). Progress reports confirming the execution of certain works were updated.

5. CONCLUSIONS

The execution of a building project requires a series of interlocking technical, formal and legal activities. As a result of these activities, a construction facility is carried out, which has to comply with quality requirements and has to be implemented within the deadlines and limited financial resources. Changes in the planned costs usually imply changes in the works schedule, and conversely – not adhering to the relevant deadlines generates extra costs. However, even sufficient knowledge about the investment and commitment of the competent employees does not guarantee implementation with points accepted at the project planning stage. In practice, changes may always arise, but their influence and range may vary (7). The differences between the planned and conducted works do not necessarily lead to the failure of the entire investment process. On the other hand, it is usually reflected in the total cost, deadlines, and affects the efficiency of investments (3). Sufficient time for appropriate investments planning, good indication of the risks that may arise throughout the process, as well as preparing scenarios and resources to find effective solutions, may notably reduce future difficulties and possible financial losses (1.5). Based on the conducted analysis of preparation and implementation of the described project, the course of this process was different from the initial assumptions concerning cost and time. The technical and technological factors had a lower impact on the difficulties in the construction stage than the initial assumptions of the planning stage and the formal and legal requirements. The fundamental difficulty of this situation was the very limited Owner's budget and the lack of the reserve amount. The Owner had to restrict the scope of the works, introduce the changes in the project design and obtain a revision of the building permit, mainly because of an optimistic estimation of the costs at the preliminary

planning stage and the lack of extra funds. On the one hand, additional cost and necessary delays (changes in design, decision expectation, and new tenders) were generated; on the other hand it affected the deadlines of significant works. Another factor that had direct influence on the practical completion inspection was the need to obtain a separate building permit. Without this permission, it was not possible to authorize the inspection and obtain a legal permission for using the constructed Object within the required time limit. Fortunately, obtaining of this permission did not influence the progress of works, and the opening date of the shopping centre was postponed only three weeks beyond the deadline within the declared budget.

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Tab. 2. The schedules comparison

Tab. 2. Porównanie harmonogramów

IDENTYFIKACJA ZAKŁÓCEŃ PROCESU INWESTYCYJNEGO PODCZAS REALIZACJI OBIEKTU HANDLOWEGO – CASE STUDY

Słowa kluczowe: proces inwestycyjny, analiza ryzyka, zdarzenia niepożądane, planowanie inwestycji, case study

STRESZCZENIE:

W artykule przedstawiono w wielkim skrócie proces planowania i realizacji dużego obiektu handlowego oraz wskazano główne czynniki zakłócające planowany przebieg robót, ich skutki oraz zastosowane rozwiązania w celu ich zminimalizowania. Rozpoznanie, przewidzenie ewentualnych skutków oraz uwzględnienie ich w planowanym przebiegu podobnych prac w przyszłości może znacząco podnieść wiarygodność opracowywanych na poszczególnych etapach procesu inwestycyjnego harmonogramów, zarówno rzeczowych, czasowych jak i finansowych.

Obiektem badawczym jest sklep sportowy, który wchodzi w skład wspólnie realizowanych czterech wielkopowierzchniowych budynków handlowych na obszarze prawie 11 ha w podmiejskiej części jednego z miast województwa mazowieckiego. Jest to jednokondygnacyjny, niepodpiwniczony budynek o maksymalnej wysokości 9,50 m. Obiekt ma kształt prostokąta o wymiarach zewnętrznych 51,04 m na 70,49 m. W budynku mieści się sklep sportowy z halą sprzedaży i powierzchnią ekspozycyjna, zapleczem, strefą rozładunku oraz częścią biurową i socjalną. Powierzchnia zabudowy wynosi 3097,10 m^2.

Tematyka artykułu obejmuje dwa z czterech etapów procesu inwestycyjnego, mianowicie: przygotowania inwestycji oraz jej realizację, a w oparciu o bardziej rozbudowany podział cztery fazy – fazę analizy, fazę założeń, fazę budowy i fazę przekazania do użytku. Badania skupiały się na porównaniu przyjętych założeń z faktycznym przebiegiem realizacji. Głównymi parametrami służącymi do oceny uzyskanych efektów był planowany i osiągnięty czas i koszt.

W analizowanym procesie, tak jak podczas realizacji większości inwestycji, powstało wiele harmonogramów, które dynamicznie się zmieniały w związku z podejmowanymi decyzjami. W artykule przytoczone zostały dane z trzech z nich: harmonogramu inwestorskiego koncepcyjnego (HIK), harmonogramu inwestorskiego realizacyjnego (HIR) oraz harmonogramu wykonawczego (HW).

W fazie przygotowania, przez Inwestora przygotowany został ogólny harmonogram uwzględniający tylko podstawowe punkty bazowe (HIK). Cały harmonogram tak dużego przedsięwzięcia zawierał zaledwie 30 zadań, rozpoczynając od kompletowania dokumentacji, a na otwarciu obiektu kończąc. Stanowi on poglądowy obraz całej realizacji i skupia się przede wszystkim na zagadnieniach formalno-prawnych. Harmonogram inwestorski realizacyjny (HIR) bazuje na stworzonym uprzednio harmonogramie inwestorskim koncepcyjnym (HIK) i stanowi jego rozwinięcie. W związku z zaistniałymi podczas realizacji rozbieżności w stosunku do wstępnych założeń został on rozbudowany o kilka dodatkowych punktów i całość skupia 38 zadań. Najważniejsze zdarzenia, które miały wpływ na zmiany pomiędzy harmonogramem inwestorskim koncepcyjnym (HIK) i realizacyjnym (HIR), wynikały z wzrostu planowanych kosztów (z około 7, 37 do 8,64 mln PLN, czyli o około 17%). Zmusiło to Inwestora do przygotowania zmian w projekcie łącznie z planowanymi oszczędnościami zmniejszającymi koszty do wcześniej planowanego poziomu, co spowodowało sekwencję niezbędnych, dodatkowych działań: deficyt budżetowy → redukcja kosztów → zmiana zakresu robót → zmiany w dokumentacji projektowej → zmiana pozwolenia na budowę → konieczność powtórzenia przetargu. Drugą poważną przeszkodą była konieczność wystąpienia o dodatkową zmianę pozwolenia na budowę ze względu na podział całego centrum handlowego na poszczególne budynki, umożliwiającą wykonanie niezależnych odbiorów.

Harmonogram wykonawczy (HW) obrazujący szczegółowo realizację całego Sklepu Sportowego stanowił rozwinięcie harmonogramu inwestorskiego o zakresy robót poszczególnych wykonawców. Był on najbardziej szczegółowy, zawierał 130 zadań, a schemat podziału WBS obejmował prace związane z przygotowaniem terenu inwestycji, budowę hali sprzedaży, wykonanie instalacji, roboty elektryczne, realizację dróg i parkingów. Powstał on na bazie harmonogramu ogólnego uwzględniającego oba zamienne pozwolenia na budowę, przy czym wyłączono z niego zagadnienia formalno-prawne, skupiając się na aspektach technicznych, technologicznych oraz organizacyjnych. W rzeczywistości nie wszystkie prace zostały wykonane zgodnie z tym harmonogramem, jednak nie stanowiło to dużego problemu, szczególnie, gdy nie dochodziło do kolizji międzybranżowych, których udało się uniknąć. Zasadnicze znaczenie w sprawnym przebiegu robót budowlanych miała koordynacja wszystkich prac z obowiązującym w danym okresie pozwoleniem na budowę i kontrola terminowości ich wykonania. Odbywała się ona na podstawie monitorowania kamieni milowych całej inwestycji, przyjętych wcześniej w harmonogramie inwestorskim. Na bieżąco sporządzane były również protokoły przerobowe, stanowiące potwierdzenie wykonania określonego zakresu robót.

Z przeprowadzonej analizy przebiegu przygotowania i realizacji opisanego obiektu wynika, że proces ten odbiegł od początkowych założeń, zarówno pod względem finansowym, jak i czasowym. Zasadnicze trudności na etapie wykonywania robót budowlanych wynikały jednak nie z czynników technicznych czy technologicznych, a głównie przyjętych założeń na etapie planowania oraz wymogów formalno-prawnych. Podstawową trudność sprawił ograniczony budżet Inwestora oraz brak zabezpieczenia kwoty rezerwowej. Zbyt optymistyczne oszacowanie kosztów na wstępnym etapie planowania oraz brak możliwości zwiększenia nakładów na inwestycję zmusił Inwestora do konieczności ograniczenia zakresu robót, wprowadzenia zmian projektowych i wystąpienia o zmianę pozwolenia na budowę. Generowało to dodatkowe koszty i niezbędne przerwy (wykonanie zmian projektowych, oczekiwanie na decyzje, nowe przetargi). Drugim czynnikiem, który szczególnie wpłynął na wydłużenie czasu realizacji inwestycji, była konieczność wydzielenia odrębnego pozwolenia na budowę analizowanego obiektu. Bez jego uzyskania nie byłoby możliwości przeprowadzenia niezbędnych odbiorów i uzyskania pozwolenia na użytkowanie w wymaganym terminie. Oznacza to, że zasadnicze wydłużenie czasu realizacji inwestycji zostało spowodowane koniecznością przeprowadzenia procedury uzyskania pozwolenia na budowę aż trzykrotnie, a nie jak zakładano jednokrotnie. Za każdym razem postępowanie administracyjne trwało 65 dni, a po wydaniu decyzji należało poczekać 2 tygodnie na jej uprawomocnienie. Dzięki umiejętnemu zarządzaniu projektem procedury administracyjne prowadzone były równolegle z realizacją robót możliwych do wykonania na podstawie wcześniej wydanej decyzji. Pozwoliło to zminimalizować opóźnienie i złożyć zawiadomienie o zakończeniu robót zaledwie miesiąc po uprawomocnieniu drugiej zamiennej decyzji o pozwoleniu na budowę. Ostatecznie, otwarcie sklepu nastąpiło sześć tygodni później niż pierwotnie planowano, a budżet został utrzymany na zakładanym poziomie.