

THE MANAGEMENT OF LOGISTICS PROCESSES IN A CONSTRUCTION ENTERPRISE WITH THE USE OF B2B OPTIBUD SYSTEM

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Abstract

The efficiency of logistics processes is still a current problem in construction companies. Many construction companies do not achieve the required level of efficiency of these processes, because they are not well managed. Barriers that hinder the effective management of logistics processes in construction enterprises are mainly caused by the high complexity of the processes, the large number and diversity of participants who are involved in the various stages of the processes implementation, different locations of the construction sites, and the diversity of building materials and equipment used at the construction site. The high demands that the investors have concerning tight schedules for construction works contribute to the fact that there is a necessity to ensure very good organization and management of logistics processes. One of the tools that can contribute to the improvement of the efficiency and effective management of logistics processes are modern IT systems, such as B2B, which are integrated with ERP systems. This was confirmed by a research carried out by a Polish company OPTeam SA.

The purpose of this article is to present the concept of the management of logistics processes in the B2B OPTIbud system that was created as a result of the implementation of a research project entitled: "The prototype innovative and technologically advanced OPTIbud B2B platform, supporting the management of construction processes through the integration of data and information from multiple sources," funded by the National Centre for Research and Development under the INNOTECH path Hi-Tech.

Keywords: Logistics processes in the construction industry, management of logistics processes, the efficiency of logistics processes, B2B system integrated with ERP

1. INTRODUCTION

The analysis of the market of the software providers in Poland shows that there currently is a gap in IT systems dedicated to the construction companies that integrate the internal and external logistics processes. The complexity of logistics processes in construction companies results from the fact that companies implement them in cooperation with other participants, taking into account the high demands that are before the investors. Research conducted by OPTeam SA and previous experience which result from the cooperation with construction companies indicate that there is a market demand for advanced B2B systems which are able to support the effective implementation of investments in co-operation with many partners and integrate the activities carried out in the company office with those that are held at the construction site. As part of the implementation of logistics processes, construction companies use different IT systems and applications equipped with various functionalities based on different IT technologies. Therefore, the B2B system that supports logistics processes in a construction company should be a solution in which the ERP system is treated as a database layer and is easily integrated with the special logistics applications, e.g., GPS.

In construction companies and investments, there is a need to introduce modern organizational forms and the logistics management concepts [1] that are based on undertaking the activities that cover planning, organizing, controlling, and monitoring of the logistics processes in a distributed environment in such a way that the construction project successfully ends. In particular, it is important to minimize the costs of construction processes, improve the quality of logistic service with timeliness, maximizing the added value and optimizing the management of information, human, financial, material, equipment resources. This statement implies that,

for an effective management of logistics processes, it is necessary to know and to understand the mechanisms that govern them and to have good supporting tools to which B2B systems belong.

This article presents the concept of the management of logistics processes in the B2B OPTIbud system that integrates the internal and external processes relevant to the current conditions for the implementation of construction projects.

2. THE ESSENCE OF LOGISTICS PROCESSES MANAGEMENT IN A CONSTRUCTION COMPANY

The business activity of a construction company covers a wide range of problems related to the design and implementation of construction projects. Regardless of what type of a construction project is being implemented, the following business processes are identified: preparation of the investment, investment planning, project implementation, the process of delivery, the process of testing and controlling, marketing activities and investor service, the company management processes, the process of personnel, finances, resources, and risk management [2], [3]. Parts of these processes belong, in the strict sense, to logistics processes, and some of them are assisted logistics activities.

Thus, logistics in the construction industry is the ancillary activity in relation to the core business, thus understanding of logistics is different from other industries. The common definition is that logistics is a strategic management function that synchronizes organizations in the supply chain, and involves the cost-effective and efficient storage and movement of goods, services, equipment and people from origin to point of use. The construction industry's interpretation is that it has a dual purpose. Primarily construction logistics is about ensuring the efficient management relating to transportation, storage and distribution of people, materials and equipment on site, which is consistent with accepted definitions of logistics, but construction logistics also provides a support role for the site, which includes responsibility for security cleaning, safety, welfare (site accommodation), community relations, emergency evacuation and first aid [4].

The implementation of logistics processes in the construction industry are affected by the following factors: legal requirements (e.g., construction law, public procurement law), design documentation, health and safety rules, human factors, the impact of the environmental and weather conditions on the course of construction works [5], the involvement of subcontractors, the geographical diversity between the company office or headquarters and the construction site, the involvement of various kinds of construction equipment and means of transport, building materials, systems of delivery, finances, and the requirements of the investor. As a result, the logistics processes in the construction industry are characterized by a high degree of organizational and executive complexity. They support the construction works on the site, the scheduling of works, the co-operation of the company with subcontractors, shipping, and the administration of the database of construction equipment and machinery. Their functionality should ensure a smooth communication and flow of information between the company and the construction site and business partners. One of the factors that significantly affect the logistics processes is the pace of construction works, which is dependent on cooperation with subcontractors, suppliers, investors, weather conditions, and the decisions of administrative bodies. In addition, the logistics processes in the construction industry are at high risk of disruptions resulting from the impact of those factors.

To sum up, at the operational level in a construction company, the following logistics processes are implemented: customer service, purchasing, delivery, storage, and distribution of natural raw materials and building materials, cooperation in the field of logistics with chosen companies, and the control of the flow of materials and information [6]. At the strategic level in a construction company, logistics processes concern mainly the following activities [7], [8], [9]:

- Integrating the logistics in a strategic planning structure in the enterprise.
- Formulating the logistics strategy type and defining its place in the overall strategy of the company.
- Developing the project's implementation and control of logistics strategy.
- Determining the strategy of the organization of logistics in a company.

Therefore, it can be concluded that companies achieve greater management efficiency of logistics processes in two ways, namely, by ensuring their operational efficiency and using it for the purpose of strategic activities.

3. RESEARCH METHODOLOGY

The functionality of IT systems dedicated to construction companies, which is available on the domestic market in order to develop the concept of architecture of standard and specialized functionalities of B2B OPTIbud system, was the first stage of R & D works. For this purpose two surveys were conducted.

The general survey was designed to investigate what systems and tools are most commonly used in the Polish construction companies (see Fig. 1). The study involved 611 companies from all over the country. In total, complete or partial responses has been given by 405 construction companies.

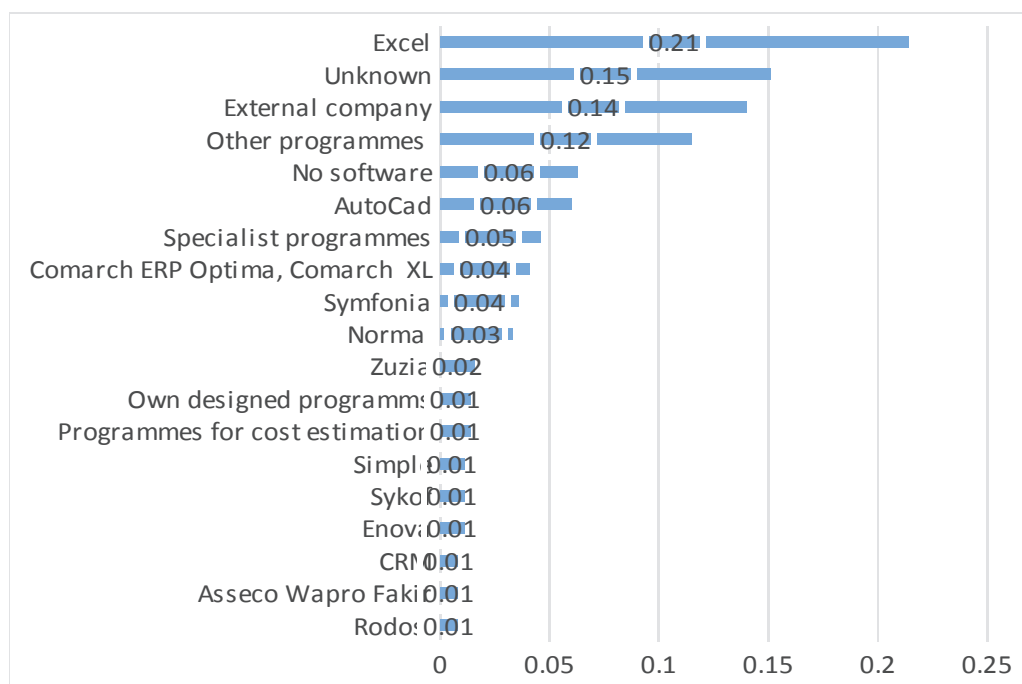


Fig. 1 The systems and IT tools used during the implementation of construction projects by construction companies

A comprehensive analysis of data from the preliminary study made it possible to identify how IT systems are used by construction companies and in what way they support the management of logistics processes.

Then, a detailed questionnaire that included 60 questions was sent to a group of 10 medium-sized construction companies. Based on the results, modules that will support individual activities and sub-processes within the construction process were defined. These include "Administrator," "Tenders and Offers," "Budgeting and scheduling," "Construction Site Manager Panel," and "Equipment and Transport base," while taking into account geolocation "Documents Flow," "The Book of Reports," and "Transport".

4. FUNCTIONALITIES OF B2B OPTIBUD SYSTEM AND LOGISTICS PROCESSES MANAGEMENT IN A CONSTRUCTION COMPANY

The research carried out by OPTeam SA and the experience gained by the IT software implementation provided for construction companies lead to a conclusion that B2B system should be equipped with elements which synchronized actions that reflect the specificity of logistics processes as part of the implementation of

construction undertakings that have stages implemented both inside and outside the enterprise (see **Table 1**).

Table 1 The matrix of connections of B2B OPTIbud system functionalities and the management of logistics processes

Stage in logistics management	Module	The characteristics of functionalities	Tasks and/or logistics processes
Programming	Administrator	System administering, system parametrization, interface, giving authorization; and combining tasks and actions, starting specific events in a process, creating alerts in a system	Initiating of logistics processes
Designing	Tenders and Offers	The automatic reading of tenders from the website of the office of public orders; registration of tenders and building a knowledge database regarding tenders; preparation of quotations and the creation of a file for a given construction processes/project for the accepted bids; storing of the most important information necessary for settlements with the investor	Initiating of logistics processes
Planning	Budgeting and Scheduling	The creation of budgets for the construction projects the company carries out on a chosen level of detail; a reading of cost estimation from the most popular programs for cost estimation	Estimating and controlling of the costs of logistics activities
Implementation	Construction Site Manager Panel	Supervision over project documentation; assigning costs and other resources to appropriate budget items of construction being carried out; a possibility to inspect the contracts entered into with the investor and subcontractor; scheduling and settlement of the work time of workers on construction sites; the registration of work progress in a project; recording and monitoring used materials on a construction site	Supply management Production management Management of logistics on a construction site
Accomplishment	Equipment and Transport base	Handling of equipment base; the registration of renting lighting and having equipment as well as electric tools with cost recording; assigning the names of people to equipment and transport means that they are responsible for as well as the information on technical inspections and insurance; the settlement of work time of equipment in relation to a given budget and limits based on the rates assigned to given equipment; the settlement of work time of the means of transport; scheduling of the work time of equipment and construction crews; the creation of a report that calculates the amount of the environment tax based fuels used; settlement of fuels	Logistics of the transport
Accomplishment	Transport	Register of orders (freight forwarding, transport, delivery, trans-shipment) and organizing the transport of goods, creating routes, and generating orders with all most important information (e.g., date of issuing, loading, status, employer, load, quantity, route, loading and reloading). This module will be equipped with RFID technology and a GPS system, making possible the control of the location of the equipment and its operation constantly and in real time (route, discrepancies, malfunction, engine work, refueling).	Logistics of the transport

Designing Planning Implementation	Documents Flow	Keeping records of letters and all documentation which is received or sent by the company; archiving documents, demands, offers and material orders (service of the flow of document path); cost invoice flow (describing documents, projects, preparing tenders, obtaining orders/projects (registration of issues, tasks, allocation of tasks to be implemented); the control of the timeliness of issues/orders, duties; and, the modelling of business processes	The flow of data and information resulting from the implementation of logistics processes
Monitoring	The Book of Reports	Gathering in one place all available statistical reports in the system that are necessary to conduct business activity; creating reports and analysis based on information entered into the system; analyses divided into fields/modules; graphical presentation of data	Analysis and assessment of the implementation of logistics processes

Source: Based on Report 1 from the research "The prototype of an innovative and technologically advanced OPTIbud B2B platform that supports the management of construction processes through the integration of data and information from multiple sources," OPTeam SA, 2014. [10]

The matrix of the connections of functionalities in the B2B OPTIbud system and logistics processes management show that, in order to implement logistics processes in a construction company and make the management effective, the IT solutions are very helpful, because their functionality reflects particular stages of their implementation, and it provides a smooth communication between the registered office of a company and the construction site and actions of the entities cooperating with it.

5. CONCLUSION

The effective management of logistics processes has an important meaning for a right implementation of investment performance made by construction companies. It functions as part of a subsystem that supports the processes of the implementation of the main objective of a construction company, which is a building investment, through the integration of all activities related to an effective, successful, and beneficial flow of necessary goods. Therefore, one may state that one has to decide about the logistics management, its effectiveness not only on a strategic level but also on the operational level, in a stage of building and construction works, taking into account the size and terms of orders and delivery, and taking into account the logistics costs.

Generally, the construction investment process may be defined as a chain of activities where their implementation causes the achievement of a specific purpose, e.g., building or modernizing an object. Therefore, a construction investment is a sequence of activities that should be performed with the use of various resources to achieve the desired purpose. Generally, two types of resources are distinguished and defined as follows:

- Active resources (technical means) have specific possibilities of action, and they are not used in a process of an operation implementation (e.g., machines, devices, team of people, etc.); and,
- Passive resources (material means) are used during the implementation of an operation as a result of using the active resources (e.g., fuel, material resources, and prefabricated elements).

The research indicates that the B2B OPTIbud system should be not only a tool that supports the implementation of building processes but also the implementation of logistics processes. It can help to achieve the complex management of construction projects from tenders and offers through negotiations, estimations of costs, scheduling, record keeping, the management of the equipment base and transport, monitoring the

realization of the conformity of the construction process with the cost estimate settlement of the work time and goods and the settlement of the whole project and its final analysis.

ACKNOWLEDGEMENTS

The paper presents the part of R&D project called "The prototype of an innovative and technologically advanced OPTIbud B2B platform that supports the management of construction processes through the integration of data and information from multiple sources", funded by the National Research and Development Centre under the INNOTECH program, Hi-Tech path.

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