

# WAREHOUSING IN LOGISTICS – MAIN REVIEW OF BULGARIAN RESEARCH CONTRIBUTION

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**Abstract:** *Logistics and supply chain management are becoming more and more important, and the reason for that is the transformation of the markets and the need for accurate management of material flows. For overall business success it is now very important to understand the elements of the logistics systems and especially warehousing and transport. The article is focused on the research experience of warehousing in Bulgaria. The research method is based on using online bibliographic systems, registers and other information services and reveals potential warehousing research areas.*

**Keywords:** *warehousing, logistics, research.*

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## 1. INTRODUCTION

In order to carry out their activities, business organisations have to manage material flows in one form or another. This is also the reason for the growing importance of logistics, which, as a subject of management, encompasses material flows and related information and other flows [1, p. 14], the goal being to ensure effective movement of the former within the supply chain. The main objective of logistics is to ensure tangible, material flows that have a visible presence in reality, that are real, and the question is how to ensure their movement to the location where they are needed. These material flows are characterised by having a place of origin and a destination point. In essence, this is a supply chain, starting with unprocessed raw materials and ending with the end customer using the finished products. The supply chain links many companies together [2]. It is, in essence, a system involving many organisations linked together, and they all function to ensure the movement of material flows from their place of origin to the place of consumption. This system consists of different subsystems, the most important being warehousing and transportation. They are part of the logistics system foundations [3], and are of particular interest for several reasons. Firstly, they can be identified and analysed at different stages of movement of material flows—supply, production and distribution—and secondly, the costs associated with their implementation represent a significant proportion of overall logistics costs. Under the current conditions of increased competition, they are becoming a potential topic for scientific and applied research as it attempts to find new solutions for better management and related expense reduction.

There are other arguments regarding the importance of these systems, related to the analysis of the logistics system. One of the classical approaches to analysing those systems considers them a cluster of points and links because material flows are not constantly on the move, and they often need to be stopped for one reason or another. In this case, the logistics system is seen as a set of points in which material flows stop their movement and the links between them are interrupted [4, p. 25]. The cluster of points includes warehouses and processing facilities, while transportation belongs to the cluster of links. Warehousing as a complex of activities is par-

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ticularly necessary for the organisation's operations related to sales forecasting [5]. Warehousing, including materials handling and packaging, is a particularly important part of integrated logistics [6, p. 39], and its absence from a logistical system is unthinkable because a number of related activities would not be feasible and thus its absence would compromise the functioning of the whole system. Essentially, warehousing is a subsystem of logistics related to the provision of conditions for material flow management activities, such as storage [7]. Warehousing, which is essentially performed in storage facilities, plays an important role in the logistics system and cannot be explained with a single definition. This, in turn, implies defining warehouse systems within a broader frame in the context of the logistics system.

Warehousing systems are complex and they need to be considered from both economic and technical points of view. Therefore, finding a unified definition is difficult. In general, the warehouse is defined as: a large building where raw materials or manufactured goods can be stored prior to their distribution for sale [8]. Warehousing definition can be upgraded because they have a much more important role in logistics [6, pp. 380–381]. This suggests the possibility of looking at the economic importance of warehouses at both the logistics level in the organisation and in the context of the supply chain. For this reason, a number of authors define warehouses in different ways, emphasising their importance from a different point of view. Despite the disparities, economic views can be pooled around the fact that a warehouse is primarily a place where the main warehouse activities, including the receipt of product, storage, shipment, and order picking, are carried out. Warehousing is a conscious and purposeful activity in the storage of inventories that ensures a normal flow of production processes and consumption [9, p. 10]. In respect to their technical nature, warehouses are complex facilities, providing conditions for carrying out these activities. Successful storage management can only be achieved with synchronisation between these economics and technical aspects. Therefore, a number of aspects related to the technical design, operational and organisational structure, and the corresponding coordination [10] should be linked to the design of the storage systems. Prioritising one way or the other may lead to irrational use of the organisation's resources. It is clear that the components of the warehouse should be organised in order to ensure a cost-effective and efficient movement of delivery and orders [11] among supply chain partners.

These definitions do not declare the essence of the warehouses because they also play an additional role in the functioning of the logistics system, and it is not correct for them to be seen as an expense factor simply because material flows come to standstill at the warehouse.

Warehouses have important functions that increase the efficiency of the logistics system and improve customer service, which can lead to more benefits than expenses. The functions of the warehouses are directly related to the way they are used for logistics purposes and can be conditionally divided into the following groups [1], [3], [6], [12]:

- Storage of raw materials and products;
- Consolidation of material flows;
- Breaking and bulk of material flows;
- Product finishing and product customisation postponement;
- Product mixing;
- Cross-docking;
- E-commerce order fulfilment;
- Sorting;
- Reverse logistic centres.

Warehousing is definitely not only storage of material flows. All of the discussion above represents an argument that warehousing is an important research area that is part from the logistics systems. That is why the research scope could not be defined tightly, which supposes differentiation of the warehousing research topics by many criteria, and this explains why the current paper cannot reveal all of the aspects. For the current paper it is possible to define that the research purpose is to evaluate the main part of the research paper in the field of warehousing in Bulgaria as well as to summarise the current status of the research and to define possible areas for future works.

## 2. METHODOLOGY OF THE RESEARCH

The evaluation of the Bulgarian research contribution was based on a literature review in the field of warehousing in logistics. For data collection different approaches were employed, including the use of different information services to identify the main publications for the period of the last five decades. For data collection were mainly used the COBISS Platform (Co-operative Online Bibliographic System and Services) supported by the National Library that covers data about books, articles, etc. (nearly 425,000 books, 410,000 articles, 40,000 journals, 1,000 CDs/DVDs, etc.) [13], the national books register [14] and also the informational registers provided by some of the Bulgarian universities as well as bibliographic reports prepared by the library information service.

The main filter for the searches was the publications should be mainly by Bulgarian authors, or over 50%. The used keywords for the searches were: warehousing, warehouse/s, logistics, storage, and their relevant combinations (and their translation into Bulgarian). The scope of the research covered only scientific items such as books, textbooks, articles, dissertations. Periodical papers were not covered.

Research indicators used in the article to evaluate the Bulgarian research contribution in the field of warehousing were: publication format, publication scope, timeframe of the research and authorship.

## 3. RESULTS AND DISCUSSION

The results of the research are based on several hundred publications meeting the chosen criteria and these results were the reason to extend the search string during the research. Nevertheless, the search results provided significant data and a variety of books, textbooks, articles, and dissertations were studied in detail. The main findings could be classified and discussed in four main research indicators.

**Publication format** – for this indicator the paper covers books, conference papers, scientific articles, monographs and dissertations. From the research data it is possible to conclude that the warehousing topic is studied mainly in two directions. The first one is research tightly related to the warehousing problems such as warehousing in the different sectors of economics, or warehousing of a specific material flow. The second alternative is to research the warehousing problems in the context of the logistics systems. A typical example here is to study the logistics practices in Bulgaria, and one of the covered subtopics is warehousing as part of the overall logistics system, as well as the transport, inventory management, customer service, information systems etc. Unfortunately, most of the publications review warehousing indirectly; most of them are focused on logistics and supply chain management problems and this reveals potential

for additional research in the warehousing area. This is possibly the main reason why, for the quantitative measurement of the research format, it is possible to conclude that most of the research publications are conference papers, books and textbooks.

Another important result that could be mentioned is the *data warehousing* which is a specific scientific area in the field of informatics, but during the searches for the string *warehousing* there were mixed results and it was to necessary apply additional filters.

**Publication scope** – warehousing is an interaction between economics and technical problems and this is reflected in the scope of the research papers. They could be classified into these main categories: economics issues concerning warehousing, technical problems related to warehousing, architecture problems of the warehouse buildings, warehousing in military systems, and law problems concerning warehousing. According publication scope indicator it is not possible to make any significant conclusion about the share of any of the different publication types. Regarding the scope, it is possible to say that quantitative research methods based on questionnaire data are not very popular approaches, and this fact reveals potential for future works.

**Time frame** – before the Second World War a significant number of the works are related to the military problems of warehousing. After that, maybe because of the change of the structure of the industry in the country, there is an increase in works related to warehousing of different products [15], [16], [17] etc. After that there is a positive trend in the research for economics-related works, and this is a result of the growing importance of the logistics in the business and in the science but unfortunately in most of these works warehousing is reviewed in the context of logistics systems. During the period 2010-2018 there is a positive trend in monograph research papers and text books related to business logistics, logistics systems and different logistics sub-systems, which could be explained by the overall world growth of research in this field.

Another important evolution stage that we can mention is the appearance of topics at the end of the 70s related to high storage systems, automated warehousing and digitalisation [18]–[20] which indicates importance for building knowledge fundamentals for developing and using high effective warehousing systems in the country.

**Authorship** - Another research indicator is the authorship and the number of authors of the scientific papers. The current model for scientific collaboration is that most publications have one to three authors. There is a potential for expanding the interdisciplinary scope of the research practices by involving different specialists.

During the research it was found that there is a difference in the scientific works by the used language. Most of the authors, especially in the last two decades, have published works not only in Bulgarian. The practice now is to focus on publishing journal articles and conference papers focused on specific warehousing and logistics problems also in other languages, mainly in English.

#### 4. CONCLUSION

In general, it is possible to conclude that warehousing problems have their research fundamental basis but they have huge potential for future works. In modern practice the warehousing systems are studied mainly as part of the logistics systems as systems related to storage of selected material flows - in general works cover mainly economics and technical issues. Their role in the

national economy in the general logistics model—where the main participants are the manufacturing and trade companies and the supporting ones are logistics service providers—could be studied in more detail in the future with quantitative methods and case studies. This fact also reveals different opportunities for future international works in many directions, such as warehousing practices in logistics and in supply chain management, and comparison of these with the leading international organisations to evaluate the differences. Also, there is a gap in the interdisciplinary works which could be considered as a potential area for improving warehouse efficiency in logistics practice.

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