

WAREHOUSE MANAGEMENT IN THE ASPECTS OF DIFFERENTIATION IN A LOGISTIC MARKETPLACE

Anna Wiśniewska-Salek

Czestochowa University of Technology, Poland

Abstract: This paper presents the technical innovation in warehouse management in companies and how this area of company operation is currently developing. There is a trend among the most forward-looking organizations in the industry to create new profit centers and bring on new value-added services.

Keywords: warehouse management

1. Introduction

Technological advances in various domains of life is a significant factor which determines changes in business management approach. Managers who manage logistics processes find it important to enhance warehouse management. According to Polish Standard a *warehouse is a functional and organizational unit whose aim is to store material goods (stock) in a separated area of warehouse building according to a predetermined technology, equipped in appropriate equipment and technology, managed and served by a team of workers* [1.].

A warehouse is a place in a logistics system where a company stores or keeps raw materials, semi-finished goods or final goods for varied periods of time. In the 1990s warehousing focused on issues other than presently; it played a strategic role in case of long-term storage. Warehouses tasks included ensuring possibility to maintain the level of inventory which corresponded with 60-90 days cycles of replenishment with a previously determined value of turnover. Modern warehouse, with popularised concept of Just in Time in 1980s and 1990s, logistics partnership and logistics supply chain is used for short-term storage. It is characterized by high level of stock turnover, with particular focus on goods flow rate. Short lead times resulting from ever-higher requirements by customers cause necessity of a detailed analysis of warehousing processes, which results in continuous redesigning and automation of warehouses and facilitates completing of orders and reduction in logistics costs [2.].

One of key elements in supply chain is warehouse where, in order to improve efficiency of operations, automated warehousing equipment and software are connected so as to reach highest possibly efficiency. Growing costs of storage cause necessity to focus efforts on appropriate use of place and time of workers in the warehouse. Rational management of the whole capacity of a warehouse, reduction in unproductive time of search for products enable storage of materials in proper and safe way.

From logistics point of view, warehouse management focuses in particular on:

- warehouse facilities, which together with the equipment bring opportunities of proper storage of goods;
- organization and decision structures connected with external and internal transport;
- optimisation accounts, which are connected with selection of storage locations or warehouse area management.

The elements listed above play an important role for optimal results in warehouse management, which ensures necessary level of customer service and facilitation of the whole logistics activities within the business.

2. Technical innovation in warehouse management

Problem of storage and its methods is an issue which is frequently discussed by managers. Insufficiency of area in warehouses caused by application of the most popular, however least efficient, method of storage with static shelves is also left without solutions and forces radical solutions which are reduced to purchase or renting of a new warehouse. Proper location of each area of a warehouse, enables finding reserves, frequently unnoticed so far, in its higher regions. Such opportunities are brought with lift-based system which enables storage of incomparable amounts of items with minimally used space, without rise in costs of 'air storage' [2.].

An alternative for static shelves is implementation of e.g. system of vertical storage (Shuttle XP), where equipment reach as far as 30 m in height and they store goods (raw materials) on shelves and move within the system with the speed up to 2.3 m/s. Industrier vertical carousel system, where maximal load of shelves amounts to 650 kg and maximal total capacity 18.35 tons with simultaneous very quiet work of the machines is another alternative solution [2.].

A considerable advantage of both systems is their operation on the basis of 'goods to employee' principle. It consists in activities which are initiated by an employee pressing the button or reading the barcode with the scanner. This system delivers demanded shelves with contents chosen by an employee to an ergonomically located access window. Automated system reduces employees' tiredness and time for collection of goods and enables rise in work efficiency and reduction of excessive, and cost-generating number of operators [2.].

Depending on the type of the performed activities, warehouses are run in various links within supply chain. From the point of view of production companies, goods flow rate in terms of storage and retrieval is essential while in trade companies warehousing management requires properly equipped warehouses where long-term storage is possible [3.].

In case of modernization of warehouses the attempts to minimize inventory according to Just in Time principle should be made. In general, Just in Time means supplying products according to customer requirements in terms of price, quality, supplies service using necessary time, materials, workforce and energy. Such formation of warehouse processes obviously requires remodelling of the whole system of warehouse management so that implementation of JIT principle is possible.

Stages in implementation of warehouse management are as following:

1. Analysis of business processes within the company;
2. Formulation of expectations of implementation results;
3. Selection of an experienced implementation partner;
4. Delegating competent employees to cooperate with the partner;
5. Reaching sufficient level of communication with the partner;

6. Common preparation of a detailed project of the system and determination of implementation stages;
7. Selection of a system and equipment which fulfil the assumed functionality;
8. Assessment of efficiency and possible modifications;
9. Trainings for the team [4.].

At every stage in the process, transaction and item status, timing and rule-based exceptions need to be visible to the supply chain partners.(Fig. 1.)

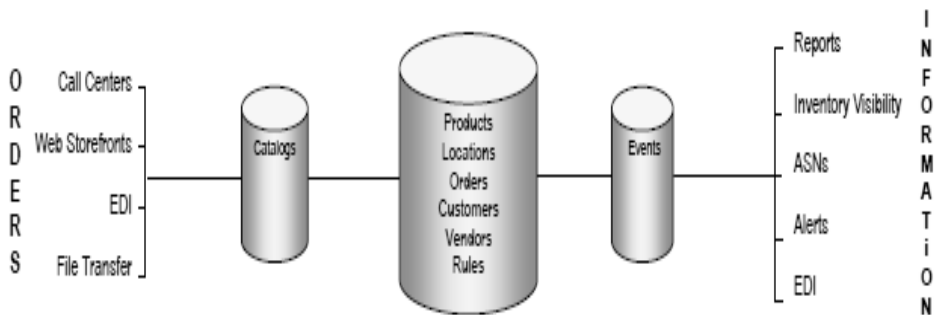


Fig. 1.

Source: Value Added Warehousing, Cadre Technologies 2006

The most important intersystem communication channel is the Internet, followed closely by interfaces to other companies' systems via EDI, XML.

In order to level the possible problems in the area of distribution logistics it is necessary to optimise warehousing and distribution processes with formation of distribution channels where considerable role is played by MM (Material Management) and SD (Sales and Distribution) modules. Considering optimisation of inventory for selected types of goods it is essential to determine proper amount/size of storage which ensures lack of delays and disturbances in timely supplies at the maximal profits. Optimal use of warehouse area depends on current capability to store at the planned level.

Properly planned logistics and organization of goods arrangement enables automation of warehousing processes. Application of appropriate numbering for identification of warehouse area sectors, system of barcodes or RFID system enable direct recognition and registration of any changes, which is connected with possibility of automated stocktaking.

In practice, Just in Time concept enables using integrated IT systems which assist logistics management, also including warehouse management [5.].

Efficient management system must be adapted to business strategy, one of the conditions of its efficiency is very strong relationship with corporate structure and as well as with ERP programmes within the company. Automated identification is preceded by analysis processes so as to determine goals to be reached by a company with consideration of available means and time of execution. While choosing a system of warehouse management one should bear in mind that a system means mainly equipment whose selection is conditioned by e.g. skills of the employees operating the equipment as well as by opportunities to couple it with the equipment for automated identification [4.].

ERP is an industry term for the broad set of activities supported by multi-module application software that help a manufacturer or other business manage the important parts of its business, including product planning, parts purchasing, maintaining inventories, interacting with suppliers, providing customer service, and tracking orders. ERP promises one database,

one application, and one user interface for the entire enterprise, where once disparate systems ruled. Taking information from every function it is a tool that assists employees and managers plan, monitor and control the entire business. A modern ERP system enhances manufacturers' ability to accurately schedule production, fully utilize capacity, reduce inventory, and meet promised shipping dates.

ERP can also include application modules for the finance and human resources aspects of a business. Typically, an ERP system uses or is integrated with a relational database management system (Microsoft SQL Server, ORACLE, etc.) The deployment of an ERP system can involve considerable business process analysis, employee retraining, and new work procedures.

Well-thought use of equipment with high parameters of integration quality determines utility of equipment for automated identification. Efficiency of data exchange depends on compatibility of equipment with superior systems of ERP or WMS type in a logistics process. The quality, which defines the aspect of efficiency of communication, completeness or appropriateness of data with suitable data exchange rate is intrinsically connected with stability and safety of data exchange. One of the solutions in this area is middleware i.e. intermediary software which connects systems with equipment. This type of software is used for communication of user applications with databases or other servers and services. Using middleware facilitates creation of new applications since it makes it independent of the type of database. Presently, development of multi-layer application models causes that middleware is growing in its importance.

Efficiency of logistics processes is affected by various activities realized through application of middleware systems. Their tasks include:

- data exchange;
- operating the equipment;
- communication with ERP system;
- managing emergency situations.

Essential elements during designing of integration of equipment for automated identification, automated data collection and remote operations include:

- defining and determination of the goals to be reached through implementation of the solution as well as all key parameters (level of errors, average time per operation) and comparison of the predetermined goals with primary status;
- present and future form of the process;
- application of automated identification;
- media for communication;
- functionality of superior system;
- strategy of integration with superior system;
- scope of employees powers;
- cost and functionality of equipment;
- safety and efficiency requirements [4.].

3. Analysis of use of modern systems for support of warehousing according to Aberdeen Group survey [6.]

Survey by Aberdeen Group carried out among American businesses indicate that many companies use various systems for support of warehousing. As results from Fig. 2., most of them employ systems of automated identification by means of barcodes. Barcodes have become a particular 'industrial standard' but only 41% of businesses declare using this technology in their warehousing structure.

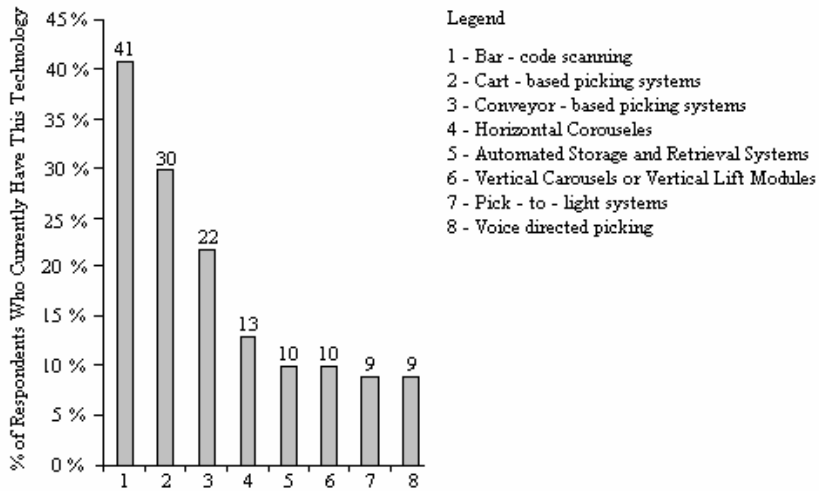


Fig. 2. Warehouse Automation Equipment Adoption Rates
 Source: self study on the basis of Aberdeen Group survey, January 2007

Automation of warehouses in order to obtain possibly highest efficiency with possibly smallest area is an activity which significantly impacts ability of further adaptation of warehouse area; it is remarkable that, apart from barcodes, merely over 25% of all businesses declare using other individual technologies. This fact proves that, despite a number of automated technologies of equipment and automation variants which are offered to companies, the frequency of their use in warehousing processes is still relatively low.

However, as presented in comparison in Fig. 3., many entities plan implementation of modern solutions for warehouse management support. Most of the companies plan implementation of the system of picking shelves operated by workers, voice-directed, and development of this system into pick to light shelves which have automated equipment installed on the face of shelves and integrated with IT warehouse management system. This enables preparation of orders without necessity of use of documents, which involves reduction in the number of errors resulting from manual warehouse control.

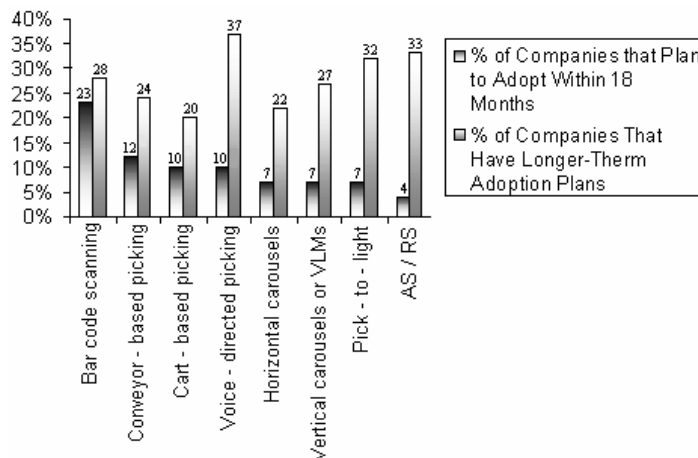


Fig. 3. Warehouse Automation Adoption Plans
 Source: self study on the basis of Aberdeen Group survey, January 2007

On the basis of the data contained in the table above one can observe that the investigated companies are cautious to implement innovation of automated warehousing and long-term plans in this area are quite conservative. High percentage of companies are planning using Internet and Extranet to transfer information within warehouses and other links in supply chains.

4. Conclusions

As results from economic practice, more and more companies which have warehouses within their logistics systems start to employ modern solutions form automated support of warehousing processes. This indicates growing awareness that facilitation in this area impacts on efficiency of the whole system, particularly in these entities which operate according to Just in Time principle. Modern solutions in this area, however, are still expensive and thus a number of companies are planning relatively slow progress, predicted to be reached in a longer time perspective. It seems that the part of businesses will make decisions on using specialized service providers being a third party in a chain (third-party logistics) for whom modern warehousing solutions make up core activities and they can become a competition for slow, evolutionary changes implemented in production and trade companies.

References

- [1.] **Polish Standard PN-84/N-01800** Gospodarka magazynowa, terminologia podstawowa (Warehouse Management, Fundamental Terms)
- [2.] COYLE J.J., BARDI E.J., LANGLEY JR, C.J.: **Zarządzanie logistyczne (Logistics Management)**, PWE, Warsaw 2002
- [3.] **Efektywne składowanie w automatycznych magazynach (Effective Storage in Automated Warehouses)**, Spedycja - Transport - Logistyka Nr 9/2007
- [4.] ABT S.: **Logistyka w teorii i praktyce (Logistics Theory and Practice)**, AE w Poznaniu, Poznań 2001
- [5.] JACYNA M.: **Dobra spoina systemu (Good System Fusion)**,
- [6.] WARTECKI A, SPISAK-SPISACKA R.: **Informatyczne wspomaganie zarządzania gospodarką magazynową w aspekcie zasady Just in Time (IT Support of Warehousing Management in the Aspect of Just in Time Principle)**, Logistyka Nr 1/2007
- [7.] Aberdeen Group, January 2007
- [8.] **Warehouse Automation—What’s Really Working For Pallet, Case, and Piece-pick Operations**, A Comprehensive Look at Bar Coding, Pick to Light, Voice, Conveyors, Carousels, and AS/RS
- [9.] NAWROT S.: **Kody kreskowe w magazynie (Barcodes in Warehousing)**, Eurologistics: Raport Systemy Automatycznej Identyfikacji