ZIRP 2017

Logistics & Sustainable Transport

INTERNATIONAL CONFERENCE ON TRAFFIC DEVELOPMENT, LOGISTICS & SUSTAINABLE TRANSPORT

NEW SOLUTIONS AND INNOVATIONS IN LOGISTICS AND TRANSPORTATION

Organizers

University of Zagreb
Faculty of Transport and Traffic Sciences

University of Maribor
Faculty of Logistics

Univerza v Mariboru

University of Pardubice
Jan Perner Transport Faculty

1st - 2nd June 2017
Opatija, Croatia

ZIRP 2017

Logistics & Sustainable Transport

INTERNATIONAL CONFERENCE ON TRAFFIC DEVELOPMENT, LOGISTICS & SUSTAINABLE TRANSPORT

NEW SOLUTIONS AND INNOVATIONS IN LOGISTICS AND TRANSPORTATION

1st – 2nd June, Opatija, Croatia

URL
http://www.fpz.unizg.hr/zirp-lst/

Publisher
Faculty of Transport and Traffic Sciences
University of Zagreb

ISBN 978-953-243-090-5

NEW SOLUTIONS AND INNOVATIONS IN LOGISTICS AND TRANSPORTATION

1st – 2nd June, Opatija, Croatia

MORANA IVAKOVIĆ, mag.ing.traff.[1]
E-mail: morana.ivakovic@mmpi.hr
SAŠA ŠOLMAN, Ph.D.[1]
E-mail: sasa.solman@mmpi.hr
DAMIR PAJ, mag.ing.traff.[1]
E-mail: damir.paj@mmpi.hr
[1] Ministry of Maritime, Affairs, Transport and Infrastructure Republic of Croatia
Prisavlje 14, HR-10000 Zagreb

WAREHOUSE PROCESSES OPERATOR'S PERFORMANCE EVALUATION LITERATURE OVERVIEW

ABSTRACT

The ways in which the warehouse processes are performed directly affects the efficiency of the flow of goods in the supply chain. This paper will explore the basic features of warehouse processes, from technical and technological, organizational and the warehouse processes operator effectiveness point.

Paper provides recent research in the field, specified methods of operator's performance evaluation, enhanced impact on the efficiency on the supply chain performance and describes the analysis of human resources utilization in warehouse processes.

KEY WORDS

warehouse processes; warehouse operator; work efficiency; literature overview

1. INTRODUCTION

Human resources management in the supply chain represents commonly significant factor in the success of business companies. Competence and quality structure of employees directly influences the increased competitiveness of business, reduces costs and achieves lower price levels for services provided within the supply chain [1].

Successful and competitive qualified companies in the global environment give the increasing importance to human resources management with a variety of methods including the selection of employees, continuing education and training, professional seminars, training courses, team building and other forms of raising the level of knowledge and motivation of employees. From the foregoing it follows that the essential function of human resources in the supply chain is to quickly and efficiently find optimal solutions for connecting different transport modes in a continuous process of transport, warehouse operations and other operations from the initial to the final point of goods delivery [1].

Human resources management, as a category in company's business, gets more important because it encourages the development of production, warehouse process operations, distribution and marketing activities. Existing and planned level of employment should be managed in a way to achieve maximum effect in the business with minimum cost and a high level of satisfaction of all participants in the production, transport and distribution process as well as meeting the needs and desires of consumers [2].

Processes which occur in warehouses are of large importance for the circulation of goods throughout the supply chain. Warehousing itself refers to taking care, transportation, loading, unloading, packing and processing of goods between the production and consumption for commodity and other various functions. According to authors Bartholdi and Hackman [3], the warehouse process of order picking takes 70% of time and 55% of costs which makes it a significant process in a warehouse.

The aim of this paper is recent research review of reference authors in the field of operator's performance evaluation, and models that are applied in this area at the global level. A review of research will include the, overview of terms and settings related to the specific characteristics and problems of managing warehouse process operations primarily with technical, technological and organizational point of view, and will state the final guidelines for further research.

2. KEY FUNCTIONS OF HUMAN RESOURCES IN THE SUPPLY CHAIN

According to [1] and [4] one of the key factors for optimal performance of the transport operations, transshipment, storage and delivery of goods to the consumer are the employees who carry out these operations. The fundamentals of management and human resources planning are:

- well-organized supply chain
- uniformity of procedures
- recruitment
- level of education
- motivation
- remuneration for work

Human resources planning in the supply chain is a complex process due to the dynamic and spatial dimension realization of transport process. Authors [5] stated that planning is an integral part of the overall business of the company, and it can be seen as a long-term (strategic), medium term (tactical) and short term (operational planning).

For the concept of human resource management authors [4] used different terms, such as human capital, intellectual capital etc. According to [2] the link between human resources management in the supply chain system, reflects in order to increase the total created value of the product or service while success in achieving this goal is the difference between the value that the product or service has to the customer and the value of resources spent.

Authors [6] state that in the supply chain system and connecting all its components, human resources have one of the key roles because they realize the set tasks, and this affects the organization of the process, uniformity of procedures, level of education, motivation, teamwork, and a host of other factors. According to [7] and [8] in Republic of Croatia many companies give the increasing importance to human resources management because in line with scientific and technical research the quality staff contributes competitiveness and business performance.

The key functions of human resources in the supply chain according to [1] and [6] can be divided into several stages where in each of them the human factor affects the dynamics and the way the logistic processes work:

Collection and processing of offers for transportation represents the administrative tasks of communication with various operators at local, regional or national level.

Organization of transport requires knowledge of the capacity and performance of vehicles, and the choice of transport routes.

Transport process requires highly qualified and trained staff for handling and managing the transport vehicles.

Delivery or goods to the end user represents administrative chores and physical delivery of goods.

At the global level specific research in field of human resources were carried out mainly in the industrial sector, while the research of these issues in the transport field were carried out as part of general research. For the research of the human resources problem different methods and models are structured with the largest portion oriented towards top management and managers. The authors [9] describe the possible application of mathematical methods in human resources management. They

propose business analysis based on the dynamics, the existing procedures and environment dynamic that continuously affects the business flow. The choice of mathematical models essentially depends on the input parameters and the narrow field of research and includes Markov chains, stochastic, linear and goal programming. Unlike purely mathematical modeling approach, the authors in [10] describe that human resources management should be observed from an organizational aspect, segmented into modules, and suggest the need for measuring the outcomes in the various systems on the market. The proposed model of human resource management is viewed from two aspects, unique and pluralistic approach defined by interest groups.

Further studies included the proposal of the authors in [11] for the implementation of information systems for human resources management in the supply chain in the form of modules ERP (Enterprise Resource Planning). ERP systems are information systems that consist of integrated software applications and include modules for planning, sales and production.

Research related to human resources management in businesses that are participants in supply chains include those of the authors in [12], which highlight the need for the identification and selection of qualified professionals in supply chain managing. They propose different methods of evaluating competence, optimization possibilities in organizing their own business structure and function within the supply chain, creating procedures, and development of criteria based on the analysis of the observed business structure.

Authors in [13] examine market changes in terms of the demand increase, and the impact and uncertainty of goods delivery from the suppliers. They expand the issues of responsibility of certain functions within the supply chain, and propose strategic and long-term relationships with subjects within the supply chain. The paper presents four case studies with the benefits of the application of human resource management on four levels, including the resources utilization.

By using a comparative method, the authors in [14] represent the specificity of differently successful supply chains in different markets in terms of resource planning.

3. WAREHOUSE PROCESSING

The warehouse process involves activities: receiving, storage, order picking and shipping of goods. Each activity consists of actions executed by the operator, they are in its basic form: receiving (receiving transport means, preparation of transport means for unloading,); storage (stock keeping unit (SKU) positioning at the storage location,); order picking (taking orders, collecting SKUs, positioning the cargo in the shipping zone), shipping (control of consolidated orders, positioning the cargo on the transport means). Depending on the function of individual warehouse systems, warehouse work may include additional activities such as labeling, value-added services, packing, cross docking and similar [15] [16] [17], and it is shown in Figure below.

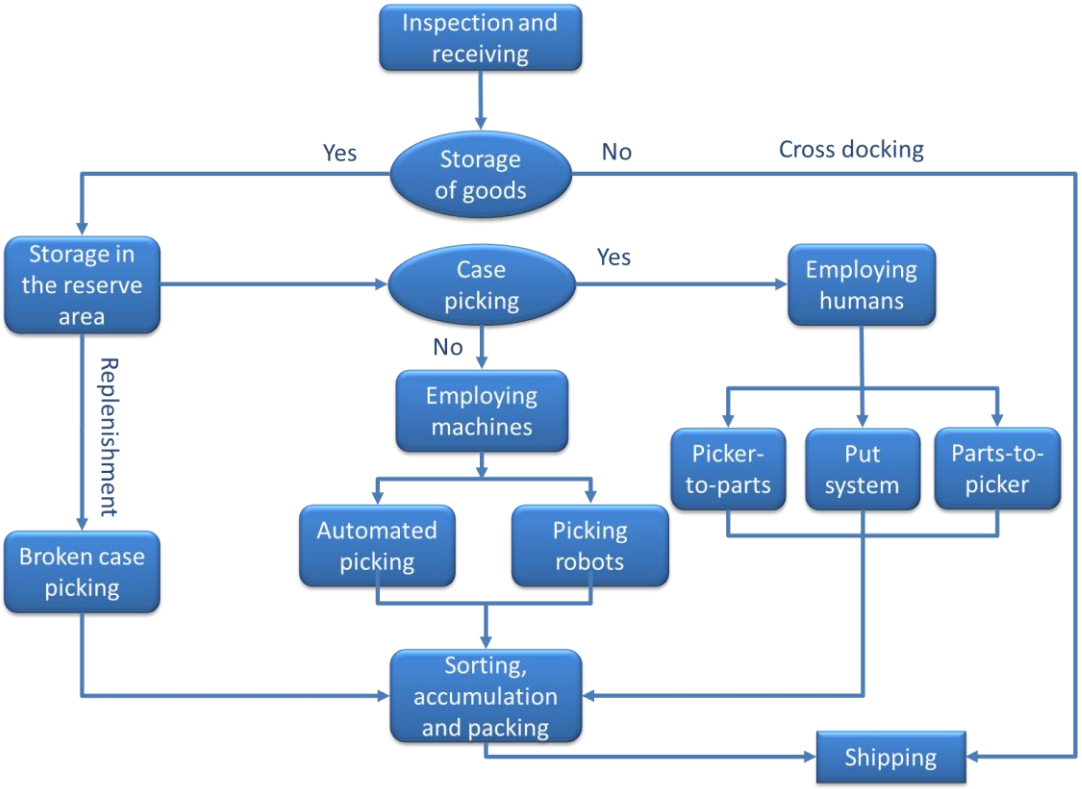

Figure 1 – Typical warehouse processes
Source: [15]

Goods which usually enter as units of a larger scale, go through reorganization submitted to repackaging that results with units of a smaller scale.

In this kind of warehouses, operations which are done daily are tied with human performance and greatly depend on it. The smaller the handling unit, the greater the handling cost. Smaller units require more labour and much more processing to be delivered. Precisely, pallet manipulation at a warehouse directly influences the time used for picking. This results with accurately collected units which are then forwarded to the next process [18].

3.1. Receiving

First in line of warehouse processes is receiving of goods. This process does not take as much time as picking, which is shown onwards, but it is as relevant as any. Especially, if incorrect put-away occurs and causes errors in further processing [19]. The process of receiving can begin with the notice of the goods arrival. This permits the warehouse to prepare, to schedule inbound operations so there are no uncoordinated events. With arrival, unloading begins after which units are put away with accurate documenting before.

If there is necessity for labelling, this process occurs before goods are put away. In every warehouse a place must be preordained for these actions. If there is no such place, but it is known that some of the arriving products must be labelled, a temporary place must be determined.

Products typically arrive in a warehouse in larger units, as it has been mentioned before, on pallets. If pallets are not arranged homogeneously they have to be broken down into separate cartons [3]. It is necessary for receiving that the method of delivery is compatible with the unloading equipment in the receiving warehouse. Otherwise, the need for additional equipment arises [18]. Altogether, the process of receiving accounts for only 10% of the operating costs in a typical warehouse, but it is supposed to be reduced by the use of Radio-frequency Identification (RFID) [3].

3.2. Put-away

Every SKU in a warehouse has its own location, determined in advance, whether the positioning is predefined or random. Precisely, there are several storage policies. A predefined storage policy prescribes a particular location for SKU to be stored, but random policy leaves the decision to the operator. Both of these storage policies can be used in some warehouses. Furthermore, a class-based storage system allocates zones to specific product which is based upon products turnover rate as ABC zoning. Another storage policy includes correlated storage of family groups, that is, storing products at nearby positions if they are often required simultaneously [20].

This step in the process is of large importance. It can reduce time defined for picking and in the end decrease total duration of outbound processes. For put-away the inventory management needs to be correct and up to date. It must be known at all times what storage locations are available, how much weight they can bear, etc. In this case, the secondary inventory management must be managed, not of products, but of locations in order to know everything mentioned. After the product is placed on its location, the storage location should also be scanned to record where the unit has been placed. This kind of information will be of use when it is needed to pick orders [3].

There are several options for inbound SKU. First is inbound into high-density storage like drive-in racking, next is inbound into standard wide aisle reserve slots such as upper levels. The last is inbound into pick slots which are ground-level wide aisle racking. The latter is represented in a small amount of products with no current stock [19].

Put-away process may require a large amount of work because SKUs must be moved over significant distances to their storage position. Put-away accounts for approximately 15% of warehouse operating costs [3].

3.3. Order picking

The process of order picking in a warehouse involves selecting and gathering specified amount of right SKUs in accordance with the order and it is composed of lifting, moving, picking, putting, packing, and other related activities [21].

During the order picking process, the orders are generally assigned to several pickers or picked by individual warehouse worker. Further, order picking can be manual or automated. In manual order picking, the picker gathers units from their locations and then transports them to a packing area.

In the case of automated picking, that is, automated storage and retrieval systems, system retrieves one or more unit loads and places them to a picking station. After that, the picker takes products on orders, and the remaining items on the unit loads are transferred to storage again [21]. The picking systems classification is also shown in Figure 1.

3.4. Packing

The process of packing can be demanding because every previously picked unit is generally handled separately. At this time, the process of checking the picked order is also required and convenient and there is less chance for errors to occur. Order accuracy is a crucial measure of service to a customer. If inaccurate orders make it to the customer, there will appear new expenses such as returns, which are expensive to handle. This process must be dealt with caution and awareness. The basic task of packing is to prepare goods for further transportation by any carrier in a way that does not affect shipping costs in a negative manner. If there is a complication with picking orders, there will be complication with packing. Precisely, if all items from the order are not positioned at the same time at a packing area, it is likely that the shipment will be delayed or/and costs will increase. The shipment can be sent partially resulting in higher costs [3].

3.5. Shipping

The process of shipping is the final process amongst warehouse processes. After packing and preparing units for shipping (consolidation), the first step is loading into transportation mean with the assumption that the shipping methods have been previously arranged. This process is not as complex and generally includes less labour than mentioned before, although there can be some additional activities if the product is being staged before being loaded [3]. Also outbound zone can include control, which will often occupy at least one warehouse worker to provide the activity. Depending on the warehouse information system, control can be done manually or using a scanner.

4. WAREHOUSE PROCESSES OPERATOR'S PERFORMANCE ANALYSIS LITERATURE OVERVIEW

Warehouse systems are objects intended for temporary and safe disposal, storage, preparation and issuing of goods. They are a part of the process of the supply chain which plans, implements and controls the efficient and effective flow of storage of goods, services activities added value and related information between the point of origin and the point of consumption in order to fulfill customer requirements. The capital and operating costs of warehouses represent about 22% in the USA and 25% in Europe of the logistics costs. Therefore, improvements in the planning and control of warehousing systems can contribute to the success of any supply chain [22].

The set of all manipulation of goods in the warehouse represents a warehouse process, and organizational activities and operations related to the fulfillment of the warehouse, represents a warehouse system.

The realization of activities is influenced by various parameters such as the resources organization (warehouse space, transportation/manipulative means and warehouse operators), the expected amount of inventory, value added services, user requirements, etc. [23] [24]. Organization of resources directly affects the effectiveness and efficiency of the supply chain [24]. The effectiveness implies the ability to meet the requirements of warehouse systems with pre-defined objective, which is the same rating achieved results in relation to its objectives. Terminology effectiveness is a term superior to efficiency and is measured by metrics (set of standardized measures, ways of measurement and interpretation of measurement results) of three categories objectives evaluation: (1) performance operations which according to [25] performance is a way of performing the observed action, including quantification of the same process; (2) the accuracy of order fulfillment and (3) utilization of warehouse space. Efficiency relates to evaluation of actions within the goals of effectiveness, and the data are obtainied by following analysis: performance operation (the number of received, order picked, stored and dispatched SKUs, the number of manipulations in a specified time period); accurate orders fulfillment (accuracy in the order picking of SKUs, accuracy in a given time delivery of orders); utilization of the warehouse area (the impact of SKU positioning on the activities of order picking, storage and replenishment). The effectiveness of a storage system from a financial aspect is by connecting labor cost with operations, the fourth category by the reference authors, substantially excluded from the primary analysis. The objective evaluation of resources is the optimal relationship of efficiency and effectiveness. the fourth category by the authors of reference substantially excluded from the primary analysis. The main objective of resources evaluation is the optimal relationship between efficiency and effectiveness [26].

The number of studies have been conducted a on the topic of warehouse performances evaluation, while most of the proposed models focuses on individual performance measures, such as the often analyzed period of order picking, especially in terms of shortening transport times. Integrated assessment models of overall warehouse performances are rare, and this area is processed in the form of preliminary research [27]. Subsequently the authors in [28] emphasize that the delivery on time, accurate order picking, labor turnover, inventory capacity, the neccesary time from recieving to

storage and distribution costs are the key factors in analyzing warehouse performances in order to achieve efficient warehouse management performances. Baker and Canessa [29] as the efficiency criteria emphasize on time delivery of ordered goods, as soon as possible, delivery accuracy and delivery without damage. Tsui and Chang in [30] and [31] point out that the positioning of the transport means to a specific ramp determines the recieving and shipping efficiency. In their work they have developed a bilinear program to calculate/determine a sample for receiving and shipping, and the positioning of the transport means on entry and exit ramps to the obtained results. The result of the proposed model is time saving which allows the operator to determine the optimal solution for the transport means positioning. Model can also be modified as required. Gue [32] proposes a model based on the "look-ahead" algorithm for the scheduling of transport means positioning according to a ramp specification. The simulation program using look-ahead algorithm showed a 15% lower labor costs due to the time required for receiving and shipping. Bartholdi and Gue [33] discusse the problem of overloading the entry and exit ramps in crossdock warehouse in order to optimize the shortest time of order picking and waiting time. According to [34] the guidance are related to the definition of the optimal warehouse layout. In the paper they limit the decision variables and include the configuration of entry and exit ramps, pallets form, height of pallet racks, and the size and layout of shipping zones.

Previous studies related to the activity of receiving among others include [35] where the authors point out that a systematic approach to optimizing the warehouse system depends on the receiving. The reception mode may be that the person in receiving prints the actual amount of received goods regardless of the documentation, bar code (each packing is scanned by barcode reader), direct receiving (directly sending the received goods in the warehouse area) and cross docking (stacking goods and shippement without storage) [15] [16] [17]. Activity of recieving according to the authors is crucial for the effective functioning of the warehouse, where they point out the key criteria as the aim to increase the productivity: define periods for receipt of transportation means; abolish the control at the receiving point; plan and provide an accurate and efficient storage of inventory; use the cross docking method. Cross docking can be defined as a continuous flow of goods from receiving to shipment, which eliminates the need for conventional storage. The primary role of the warehouse is the coordination of input and output flows and not storage of goods. At the same time it means reducing the time and number of manipulations that goods pass between receiving at the cross docking terminal and shipping. In the cross docking system igoods are mostly shipped in larger quantities (one pallet to more) which minimizes the manipulation of individual unit, the use of forklift trucks and other transport-handling means.

5. WAREHOUSE OPERATORS WORK EFFICIENCY EVALUATION

The economy is stressing the need for resources evaluation because of the often limited capacity of resources and tight deadlines for orders delivery. Evaluation of resources in the warehouse system refers to the management of the warehouse operators and equipment according to the criteria: (1) cost control of resources; (2) provision of the necessary capacity of resources; (3) defining the time required to execute a specific action [36].

Referenced literature highlights the different approaches for evaluation of resources performance such as benchmarking, simulation modeling and analytical models [27]. According to the authors [37] the evaluation of resources in a particular warehouse system is carried out with the analysis of the observed warehouse system by processes recording and measuring the time required for the certain activities, which is determined by standardization.

By calculating the current resource efficiency of individual activities the optimal management of the observed system can be defined. When providing standard it is relevant that the action of the observed activity according to the norms can be defined by an average trained and average fast operator [25]. This is shown in Table 1. [38] where for e.g. order picking typically accounts for about 55% of warehouse operating costs; and order picking itself may be further broken into travelling,

searching, extracting and additional activities such as paperwork. Measuring performance when watching a particular warehouse facility for e.g. for order picking process, should be systematically divided and measured within the working hours per warehouse operator for a specific activity within the process per order. When evaluating it is also necessary to define the reference sample.

Table 1 – Order picking time

Activity	Order picking time [%]
Traveling	55
Searching	15
Extracting	10
Paperwork and other activities	20

Source: Made by the authors according to [38]

Previous studies regarding warehouse operators work efficiency evaluation has been conducted by a number of authors, and this applies to the observation of a single process, while on the macro level this has not been observed. The author in [39] classifies around 130 indicators used to evaluate the effectiveness of the warehouse such as storage surface, the storage volume, pallet racks, number and characteristics of the ramps, number of pallets per hour, pallets per square meter and working hours. In their work, authors [40] represent a software tool that allows you to select the warehouse on the following criteria: the possibility to control temperature; the possibility of dangerous goods storage; distance from the main roads, railways and waterways; types and number of handling means. According to [41] the method for warehouse processes evaluation is performed according to the criteria: (1) Number of orders per hour (number of order picked/packaged orders in relation to the total number of working hours in the warehouse); (2) the number of lines per hour (number of order picked/packaged lines in relation to the total number of operating hours in the warehouse); (3) the number of units per hour (number of order picked/packed units in relation to the total number of running hours of the warehouse); (4) cost per order (total cost of storage in relation to total number of orders shipped); (5) cost of sales share (total storage costs in relation to the total number of orders shipped).

Research activities on which to focus research for warehouse operators work efficiency evaluation is in process of receiving because the existing models and methods of standardization on which they are based, have significant drawbacks and do not take into account all factors. In studies related to the above it is necessary to put the focus on:

- type of transport means,
- type of SKUs in receiving (box, pallet, single package)
- type of SKUs in storage,
- type of equipment in the warehouse,
- the type of SKUs for order picking and,
- shipping method that affect the performance of the entire warehouse process.

Methods for standardization referred to in the preceding considerations are not optimal for warehouse operators work efficiency evaluation in the field of receiving activity, and require systematic analysis of the present methods, or precision for receiving activities. Based on the results of analysis it should be noted which method will be best suited for performance evaluation with the processing of goods, it is necessary to explore the possibilities of processing and development of valuation models supplemented with criteria, which would allow the application for obtaining better results of performance evaluation.

6. CONCLUSION

In the global environment the business of the company requires certain approaches to management of processes in the supply chain, starting with the planning of each step of goods processing where warehouse processes are included.

Modern technologies condition the highest level of communication and implementation of information systems for the preparation and realization of supply chain.

Research of human resources management in warehouse processing, with particular emphasis on supply chains were carried out mainly in the context of general studies in scientific, industrial and service sectors but with no detailed methodology of warehouse performance evaluation for each warehouse process activity.

In order to achieve greater competitiveness and profitability of companies in the supply chain it is also necessary to develop a strategic research demonstrating operational plans and performance of each warehouse activity.

The general approaches and methodologies that are proposed and overviewed in paper lack user friendly implementation for evaluation of each warehouse worker or specific activity performance.

The application should be visible from:

- degree of organization,
- existing processes analysis,
- uniformity of procedures,
- measurement of the warehouse worker efficiency
- observed process efficiency

With systematic approach it is necessary to separate the key parameters that directly affect the flow of complete supply chain with the technological and organizational point of view, where technical and technological aspect includes evaluation of warehouse processes and operations.

The organizational aspect involves defining the existing procedures, documentation, supporting information systems, and the level of employees education. In two of these aspects it is necessary to establish a direct and measurable impact of warehouse worker at the efficiency of observed warehouse.

Also, from the aspect of human resources scientific research training of personnel involved in the supply chain primarily results also with the optimal organization of the flow of goods and reduces the number of working operations, thus achieving efficiency of the chain system directly increasing profits. Mentioned is applicable also on warehouse processing.

Research activities according literature review on which to pursuant further research on warehouse operators work efficiency evaluation due to the lack that existing methods have is to develop a methodology that will be on the macro aspect take into account criteria such as

- type of transport means,
- type of SKUs in receiving (box, pallet, single package)
- type of SKUs in storage,
- type of equipment in the warehouse,
- the type of SKUs for order picking and,
- shipping method that affect the performance of the entire warehouse process.

REFERENCES

[1] Ballou, R.: Business logistics/Supply Chain Management, 5th ed., New Jersey, Prentice-Hall, 2004.
[2] Bowersox, D.; Closs, D.; Bixby Cooper, M.: Supply Chain Logistics Management, second edition, McGraw-Hill, New York, USA, 2007.
[3] Bartholdi JJ, Hackman ST. Warehouse and distribution science, The Supply Chain and Logistics Institute. Atlanta: School of Industrial and Systems Engineering; 2011.
[4] Mathis, R. L., Jackson, J. H.: Human Resource Management, South-Western College Pub, Nashville, Tennessee, USA, 2007.
[5] Bahtijarević-Šiber, F.: Management ljudskih potencijala, Golden marketing, Zagreb, 1999.
[6] Waters, D.: Logistics, An Introduction to Supply Chain Management, Palgrave Macmillan, 2003.
[7] Ivaković, M., Babić, D., Bajor, I.: Focused Human Resource Management in Logistics Centers, Logistics Centers International Scientific Book, Institut Jana Pernera, pg. 34-45, 2008.
[8] Jurčević, M., Ivaković, M., Babić, D.: The Role of Human Factors in Supply Chains, Proceedings of the 12th International Conference on Transport Science, ICTS – 2009, Faculty of Maritime Studies and Transport, Portorož, Slovenia, 2009.
[9] Price, Wl., Martel, A., Lewis, Ka.: A Review of Mathematical Models in Human Resource Planning, Omega, The International Journal of Management Science, Volume 8, Issue 6, pg. 639–645, ISSN: 0305-0483, 1980.
[10] Lapina, I., Maurane, G., Starneca, O.: Human Resource Management Models: Aspects of Knowledge Management and Corporate Social Responsibility, Procedia - Social and Behavioral Sciences, Volume 110, pg. 577–586, ISSN: 1877-0428, 2014.
[11] Hoch, J., Dulebohn, J.: Shared Leadership in Enterprise Resource Planning and Human Resource Management System Implementation, Human Resource Management Review, Volume 23, Issue 1, pg. 114–125, ISSN: 1053-4822, 2013.
[12] Harvey, M., Richey, G.: Global Supply Chain Management: The Selection of Globally Competent Managers, Journal of International Management, Volume 7, Issue 2, pg. 105–128, ISSN: 1075-4253, 2001.
[13] Feisel, E., Hartmann, E., Giunipero, L.: The Importance of the Human Aspect in the Supply Function: Strategies for Developing PSM Proficiency, Journal of Purchasing and Supply Management, Volume 17, Issue 1, pg 54–67, ISSN: 1478-4092, 2011.
[14] Hult, G., Ketchen, D., Cavusgil, S., Calantone, R.: Knowledge as a Strategic Resource in Supply Chains, Journal of Operations Management, Volume 24, Issue 5, pg 458–475, ISSN: 0272-6963, 2006.
[15] The Handbook of Technology Management, Supply Chain Management, marketing and advertising and global management, Hossein Bidgoli 2010, (The Encyclopedia of Operations Management: A Field Manual and Glossary of operations management terms nad concepts Napisao/la Arthur V. Hill), (Warehouse Management: A Complete Guide to Improving Efficiency and Napisao/la Gwynne Richards, 2011)
[16] J.A. Tompkins et al., Facilities Planning (sec. ed.), J. Wiley and Sons, New York 1996
[17] Ivaković, Č., Stanković, R., Šafran, M.: Špedicija i logistički procesi, Fakultet prometnih znanosti u Zagrebu, Zagreb, 2010.
[18] Richards G. Warehouse management: a complete guide to improving efficiency and minimizing costs in the modern warehouse. London: Kogan Page; 2014.
[19] Habazin, J., Glasnović, A., Bajor, I.: Order Picking Process in Warehouse: Case Study of Dairy Industry in Croatia, PROMET – Traffic&Transportation Scientific Journal on Traffic and Transportation Research, Vol 29, No 1 (2017) ISSN 0353-5320.
[20] Mendes P.: Demand driven supply chain: a structured and practical roadmap to increase profitability. Berlin: Springer Berlin Heidelberg; 2011.
[21] Lee. JA., Chang, YS., Shim, H., Cho, S.: A study on the picking process time. Procedia Manufacturing. 2015; 3:731-738.

[22] Baker. P., Canessa, M.: "Warehouse design: a structured approach." European Journal of Operational Research (Elsevier) 193, no. 2 (March 2009): 425–436.
[23] Hompel, M., Schmidt, T.: Warehouse Management: Automation and Organisation of Warehouse and Order Picking Systems, 2007.
[24] Vaggelis. G., Wenrong L., McFarlane, D., Hyde J.: Product Intelligence in Warehouse Management: A Case Study (Warehouse Management Excellence: Maximizing Resources and Efficiency, 2010.
[25] Neely, A. D., Gregory M. J. & Platts, K. W.: "Performance Measurement System Design: A Literature Review and Research Agenda", International Journal of Operations and Production Management, Vol. 15, No. 4, 1995.
[26] Vivek; Sehgal: Enterprise Supply Chain Management: Integrating Best-in-Class Processes, 2009.
[27] Jinxiang Gu: THE FORWARD RESERVE WAREHOUSE SIZING AND DIMENSIONING PROBLEM, School of Industrial and Systems Engineering Georgia Institute of Technology December 2005
[28] Berg J.P van den.: "A literature survey on planning and control of warehousing systems." IIE Transactions (Springer Science+Business Media) 31, no. 8, 751-762, August 1999.
[29] Baker, P., Canessa, M.: Warehouse design: A structured approach. European Journal of Operational Research 193 (2), 425–436, 2009.
[30] Tsui, L. Y., A microcomputer based decision support tool for assigning dock doors in freight yards. Computers & Industrial Engineering 19 (1-4), 309–312, 1990.
[31] Tsui, L. Y., Chang. C.-H.: An optimal solution to a dock door assignment problem. Computers & Industrial Engineering 23 (1-4), 283–286, 1992.
[32] Gue, K. R.: The effects of trailer scheduling on the layout of freight terminals. Transportation Science 33 (4), 419–428, 1999.
[33] Bartholdi III, J. J.; Gue, K. R.: Reducing labor costs in an LTL crossdocking terminal. Operations Research 48 (6), 823–832, 2000.
[34] Thomas, LM., Meller, RD.: Developing design guidelines for a case-picking warehouse, International Journal of Production Economics, Volume 170, Part C, pg. 741-762, 2015.
[35] Richards G.: Warehouse Management: A Complete Guide to Improving Efficiency and Minimizing Costs in the Modern Warehouse, Second Edition, New Delhi, Kogan Page Ltd, ISBN 978-0749469344, 2014.
[36] Ilies L.: Turdean, A., Crisan, E.: WAREHOUSE PERFORMANCE MEASUREMENT – A CASE STUDY,
[37] Wiegmans, B. W.: Intermodal Freight Terminals: an Analysis of the Terminal Market / B. W. Wiegmans, E. Masurel, P. Nijkamp // Research Memorandum. Amsterdam, Free University, 14 p.,1998.
[38] Frazelle, E. H.: World-Class Warehousing and Material Handling. GA: Logistics Resources International, Atlanta, 1996.
[39] Krauth, E., Moonen, H., Popova, V. & Schut, M.: Performance Indicators in Logistics Service Provision and Warehouse Management, 2005.
[40] Colson, G. & Dorigo, F.: "A Public Warehouse Selection Support System", European Journal of Operational Research, Vol. 153, No. 2, 2004.
[41] Hill, John M.: Warehouse Performance Measurement, Esync, Chicago, 2007.