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THE IMPACT OF NEW IT ON FORKLIFTS ON SCM

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Abstract: Problems related to efficiency and other performance measures functioning of SC are very wide spread. They can be generated by various causes, and the area of information is one of the particularly vulnerable. At the global level, this problem has been largely explored. Therefore, the application of new solutions in the field of micro activities is directed at the individual members of the SC. The work of forklifts, as equipment that is almost indispensable in realizing intralogistics activities here can be of significant impact on the functioning of the SC. For this reason, the application of new IT solutions for forklift is becoming a place of significant research. This paper presents some possibilities of applying IT in forklifts as well as assessment of the achieved effects
Keywords: IT, SCM, forklifts

1. INTRODUCTION

The term *supply chain (SC)* is met in literature since 1980s, but his precise definition still doesn't exist. That is the consequence of complexity and variety of specter where SC is met – based *on type and characteristics of products, industry type, target market, politics and supply resources, number of members and their impact on the operation of the supply chain, their geographical position, size, function and role in the SC, ways of realization of information, materials and financial flows, etc.).* Within numerous definitions, we can see that SC covers the exchange of goods and information in logistics processes that starts with the procurement of raw materials to delivery of finished products and/or services to the end user; thereby all the suppliers, service providers and users must be connected in order so that SC can be effectively operated (Stocs and Lambert (2001), Chorpa and Mendl, (2004), Simchi-Levi, Kaminsky, and Simchi-Levi (2009) et al., Glosary of SCM Council…).

Without going into the issue of definitions, it can be concluded that the research in the field of SC so far mainly dealt with the analysis of its functioning at the global level. SC is analyzed in terms of the functioning of all its members. Considering their mutual relations, the analysis included the realization flows between them ranging from procurement of raw materials to the realization of end user's demand. In principle, global analysis of one SC doesn't give us full insight into elementary activities within its members, such as suppliers, manufacturers, storage facilities, wholesale, retail stores, etc. For example, for inventories in SC, analysis are made on global level (location of warehouses, inventory level in SC, inventory management), for production systems (production type, flexibility of production technology etc.) (Sohn and Lim, 2008, Pulevska-Ivanovska and Kaleshovska, 2013).

Successful functioning of one SC is so important, that today it is not enough to only analyze global functioning of members and their mutual connections in that domain and to follow the flows of materials, information and finances. Having in mind that competition on the market is getting stronger, from aspect of one, for example, factory, it is necessary to overview and improve internal processes, so that SC could exist and could improve its competitive ability (Marinagi, Trivellas and Sakas (2014)).

Therefore, in recent years, increasing attention is paid to the elementary logistics activities in the field of intralogistics in terms of the functioning of the SC. In these activities of intralogistics, a conventional forklift is today still an typical device as one of the key **m**aterials **h**andling **e**quipment (MHE). Due to the large number of tasks that it realizes, it could be noted that the quality of its rational functioning is of high importance for the performance and competitive stability of the SC.

Forklift is the tool that is constantly being improved in various areas (engine, working speed, costs, safety...). One of the areas with huge improvements is areas of IT (information technologies) usage on forklifts and their impact on SCM (Supply Chain Management). So the aim of this paper is to show the importance of current and introducing new IT solutions related to the usage of forklifts in some of logistic activities within SCM.

Having all that in mind, this paper has several sections besides introduction. After the introduction, second section describes mutual relationship between information, information technologies and SCM. Third section of this paper analyzes characteristics and potential problems that occurs during classic exchange of information with forklift driver. It is introduction to the fourth section that deals with analysis of usage of new IT, that allow improvement of work of some of the members of SC, in which forklift executes material handling activities (MHA) (storage, production objects, distributive centers...). Fifth section, conclusion, has observation related to above-mentioned problem, but also ways of future researches related to usage new IT in SCM.

2. SCM AND IT

The key of successful SCM is information. Information is being collected, processed and tracked since 1980s, when the term SC was used for the first time (Chopra and Mendl, 2004). At the time, information was in paper form with characteristics of being late, delay, errors, missing data etc. Today, the flow of each information must be allowed between all members in SC whether it is products or services. All members of SC (procurement, production, transportation, storage, wholesale, retail) have important information. Availability and accessibility of information is key to value added creation in SCM, and aiming competitive advantage of SCM on the market (Moharana, Murty, Senapati and Khuntia, 2011). The information that are usually gathered, analyzed, processed in almost every domain of SCM are related to: inventory level, sales, tracking orders, production plan and program, production capacity etc. It is clear that the quality and other parameters related to information (accuracy, timeliness, completeness, connectivity, the way it is presented / available, availability, compatibility, transparency, security and others) are very important, but they are not the object of research in this paper.

The customer is the initiator of the functioning of the entire system of business and all economic activities. Therefore, it is important to respect the characteristics of customer's demands in order for SC to survive, but also to strengthen its position in the increasingly demanding competitive environment. Customer requirements are rapidly changing on a daily basis, which causes the appropriate IT. The usage of modern IT presumes exchange of information between all the members in chain, despite his complexity (Fasanghari, Roudsari and Chaharsooghi, 2008). Modern IT are characterized by presence of complex and huge data bases. That allows better quality of decision making in all segments of SCM, but also faster and more efficient answers to customer's requests. That is the consequence of the fact that even the information in micro-activities can be important for SCM.

All mentioned above resulting in the lot of IT solutions on the market that are more and more adapting to execute the customer's request. Modern IT in SCM have a significant impact on the shortening of product life cycle, faster customer response, reducing the time from the moment of occurrence of requirement to its fulfillment, better forecasting, reducing inventory levels. (Sohn and Lim, 2008).

Lately, from aspect of IT the usage of internet is getting more important. The development of internet, and other and more modern IT and their evolution led to the transformation of traditional SCM to e-SCM (Pulevska-Ivanovska and Kaleshovska, 2013). From 2000 there is huge increase of usage of internet (Chorpa and Mendl, (2004)). That also generated requests for improving modern IT, with the aim of to maintaining and improving market competitiveness. Internet allows easy access to information, good availability, choosing the right/good strategic partners and creating strong relationships within SC, and the choice of appropriate technology business for the SC members. At the same time, new software solutions were developed and adopted which created preconditions for faster capital turnover and higher economic benefits compared to traditional SCM.

Modern IT are lately becoming very important in terms of analyze of activities that are carried out at the local level, or within each of the members of the SC. To achieve more efficient and cost-effective operations for some SC members is sometimes very important to have information about what is happening in the context of material flow, for example. within a given production system, warehouses, DC,... as a member of SCM. In that context, relation forklift – SCM can be very important. Because of the wide range of options of information exchange between the forklift driver and forklift fleet management system, the following sections give shorter analysis of the characteristics in this area.

3. CHARACTERISTICS AND POTENTIAL PROBLEM IN SCM IN CLASSIC INFORMATION EXCHANGE WITH FORKLIFT DRIVER

Lately, it is evident that there is constant development of new solutions related to the construction of MHE with the cyclical realization of

demands in intralogistics. One group of these equipment are forklifts. Depending on needs and potentials of SCM members, various forklifts with different technological and technical characteristics are being used. But, classic counterbalanced forklift with counterweight and manual control is still vastly spread and used in realization of material flows and handling in many factory plants, distribution centers, warehouses and others. There are many reasons for that, and primary ones are (compared to "new", more sophisticated and automated solutions): less investment costs, more flexibility, simplicity of implementation and others. There are also some disadvantages as consequences of workforce engagement (drivers with appropriate training). This is primarily related to problems in staff scheduling that work in more shifts, finding a replacement in the event of sickness, unplanned absences, etc. In some situations, these problems can be solved by some organizational measures or by outsourcing.

Despite all type of potentially usable solutions for mentioned problems, the problem of offline information exchange between forklift driver and forklift fleet management system remains present (Martin, H. 2002). In dynamic working conditions, in classic IT forklift driver must permanently (physically) accept demand(s) for task realization (series of tasks) and to inform appropriate person (service) upon realization. That increases unproductive time (delays) in forklift's work. Problem(s) are potentially present in other situations that forklift driver can meet. For example, if the driver did not understand the requirements of the task, some errors could occur because of the subjective and/or objective reasons, such as: the picking of goods on the wrong location, wrong picked unit, errors in order-picking (delivery of wrong goods), wrong place of putt-off, etc. The consequences of these errors are not limited only to working place of forklifts (plant, warehouse, etc), but can also cause series of problem for other members within SC. These problems are related to delays of delivery, supplies of inadequate goods, the necessity of subsequent (usually emergent) delivery, requirements for the realization of reverse flows, etc., and all consequences that result from them.

Since modern business conditions are less tolerant for such errors, various ways for their rationalization and/or elimination were searched for. Studies were conducted in various areas (automation, computerization, etc.). Particularly interesting area is related to the IT segment whose one segment of usage will be shown in the next section.

4. NEW IT FOR COMMUNICATION WITH FORKLIFT DRIVER

The domain of development and usage of IT in logistics and SC is very pronounced in recent decades. It is reflected in the implementation of a number of technical innovations that provide the preconditions for a more efficient and rational realization of the number of processes in the field of logistics. Some of them are practically an indispensable part of equipment (GPS, ITS….), and new communications provided their even more intensive usage. Especially we today cite a variety of applications for mobile phones and tablets that provide range of amenities for users in the domain of finding the desired location, availability of equipment, etc (Mauer, 2015).

This trend is slowly transferred into the field of intralogistics where the implementation of above mentioned solutions is more and more met. In the field of work of forklift driver, there is a significant number of problems related to the information exchange about the tasks that he should realized or have realized. The usage of various IT could be met with their solving. Modern solutions are met by the name of *paperless* and on-line/open-loop (Martin, H., 2002) technology. The key aim of this technology is to speed up, simplify and secure the information exchange between forklift driver and management system where forklift operates (for example, WMS in warehouse systems).

Various solution for this information exchange are present in praxis, and the typical ones are those based on terminal built in the forklift cabin (Figure 4.1). The task assignment is realized by showing on the display, and the driver confirms the acceptance of information (via keyboard, touch screen...) and start to the task realization.

Picture 4.1 Some elements of IT equipment on forklift (Mauer, 2015)

The task can contain more information, and the basic ones are: pick-up location, type and shape of goods to be picked and the put-of place. Eventual additional confirmations on realization of partial

activities could be realized by scanning appropriate bar code (Figure 4.1, detail on the left side) etc.

The management system can be equipped with additional capabilities that make the preconditions for the increase of forklift work rationality. Applications can contain routing models for optimization of movement of forklift; tracking time engagement in real time and need for potential intervention like increase of safety at work (obstacles on aisles, routes crossings etc), planning periods of planned maintenance or intervention to malfunction problem on forklifts etc. In order to increase flexibility and efficiency, mobile printer that are equipment add-on could be seen as part of IT equipment (Figure 4.2).

Figure 4.2 Mobile printer on forklift (Mauer, 2015)

5. CONCLUSION

It is very important that all members of SC are using IT. This paper has shown only one segment of this usage that deals with information exchange between forklift driver and forklift fleet management system.

Integrated systems of tracking of forklifts activities are being offered lately. The demands for transport and handling activities are automatically optimized by routes and are assigned onto appropriate resources, independently from forklift type.

By rule, logistics managers lack important parameters related to transparency (for example, he doesn't have information about when is the unproductive time for forklift and amount of it). It is important to define clear difference between the time that this equipment spends on work and period that it doesn't realize the demands (Mauer, 2015). Modern IT provides the solution of these problems in the domain of SCM. The basics for further information are gained through such data analysis that allows huge savings in costs. The planning interval for service and maintenance of forklifts is enabled, in order to minimize its unproductive time.

In combination with mobile applications, all elements of work process of forklift are available/displayed in details (it is possible to re-arrange tasks, so that “proper” forklift is at the proper time at the proper place in order to deliver goods for further processing). That allows better process of integration between all in-plant transporting equipments, which is the consequence of usage of *paperless* technology. Some researches shows that this procedure makes preconditions to increase the productivity of forklift up to 30%. Further implementation of modern IT in SCM provides the possibility to increase ecological efficiency, safety, economical efficiency and many other advantages resulting from it.

We can see that the question of investments for implementing modern IT is present as serious problem in the series of SME (as members of SC). According to literature, it was seen that ROI for fleet of up 10 forklifts is about 14 months. From that reason, the usage of suitable methods of analysis and forecast is very important and depending on place and role of concrete member of SC.

The directions for future research in this field are numerous. Some of them deal with implementation of modern IT in all segments of business of all members of SCM. In the scope presented in this paper, usage of described technologies provides transparency that allows members of SC the insight in realization of micro-activities even within certain members of SC where the tasks are being realized by forklifts with driver. All this provides information to SC users/members that can be very important for making operative and tactical decisions. This allows better productivity and all other advantages coming from it.

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