19h International Research/Expert Conference
"Trends in the Development of Machinery and Associated Technology"
TMT 2015, Barcelona, Spain 22-23 July 2015

IMPLICATIONS OF E-LOGISTICS APPLICATION

Ljerka Luić
Karlovac University of Applied Sciences
Meštrovićeva 10, Karlovac
Croatia

Igor Milić
Karlovac University of Applied Sciences
Meštrovićeva 10, Karlovac
Croatia

ABSTRACT
In order to meet the demands of modern business, traditional logistics has been increasingly relying on the application of information and communication technologies, has shifted toward a modern form, and has been transformed into e-logistic by assuming the characteristics of electronic business. Research studies of implications of e-logistic application have confirmed its considerable support in sustainable development and reverse logistics, and in detecting any defects that must be taken into account in its application. In the field of mechanical engineering industry, there have been more and more examples of successful introduction of e-logistics solutions to commercial production processes, but a huge space of its application still remains unexplored. The potential fields for application of e-logistics in mechanical engineering, and its implications for ecology and sustainable development, are described and presented in the paper, analyzed from the micro and macro aspects based on systematic analysis of the available resources.
Keywords: e-logistic, ecology, sustainable development, reverse logistics

1. INTRODUCTION
Combination of e-trade, e-business and information communication technologies (ICT) created e-logistics, performance of logistic operations by means of information technologies, defined for the purpose of this paper as a set of Internet supported activities focused on delivery of a required product, of adequate quality and quantity, to the right place at the right time, with minimum expenses.
In 1983, the United Nations established the World Commission on Environment and Development (WCED) with the task to examine the "accelerated destruction of human environment and sources of raw materials, and the effects of such destruction on social and economic development" [1]. The WCED Report defined sustainable development as "development mode that fulfils the needs of present generation without compromising the ability of future generations to fulfil theirs" [2]. This definition is one of rare definitions of sustainable development generally accepted also in the logistical terminology.
As a part of environmentally conscious initiatives, reverse logistics has taken considerable attention both from academicians and practitioners. Rogers and Tibben-Lembke defined reverse logistics (RL) as "the process of planning, implementing and controlling the cost effective flow of row materials, in-process inventory, finished goods and related information from the point of origin for the purpose of recapturing value or proper disposal". [3]

2. IMPLICATIONS

Research studies of implications of e-logistics application have confirmed the claim that e-logistics plays a significant role in the field of ecology, sustainable development and reverse logistics, as elaborated in this paper from the micro and macro aspects.

2.1. Ecology

Human awareness of the impact on ecosystem is increasingly developing and its effect on the global market is getting stronger. End users become increasingly aware of the fact that certain methods of production have an exceptionally adverse impact on the environment, that certain raw materials are running short, that certain companies are changing micro climate with their exploitation of resources and they also become increasingly aware that through their own choice of products they are changing the demand on the micro market and actually deciding which companies would survive and which must change their business policy.

Many companies still use logistics as means of supply of certain materials or product to a specific location at minimum expense. While some companies are waiting for legal provisions governing the limits of potential environmental impact, others are one step ahead and are turning to environmentally acceptable logistics. By means of navigation systems and GPS (***Global Positioning System***) equipment, most efficient routes are selected, and the entire course of transport is software-optimized. In that way, the route travelled by empty means of transport is shortened and thereby environment pollution with exhaust gases is reduced with the side effects including also reduced energy consumption, longer lifecycle of the means of transport, less waste and in the end, lower overall expenses.

An example of environmentally aware e-logistics is the use of ICT technologies instead of hard-copy administration. In an ideal case, by elimination of all paper-based transactions, the emission of greenhouse gases would be reduced by 0.25% [4]. However, it should be taken into account that in that case much more computers are used which require energy and create non-biodegradable waste. From the environmental aspect, the role of e-logistics is quite complex and needs to be observed, studied and resolved from multi-dimensional aspect. Special attention should be paid to management education. For cause of the large number of technical and technological innovations in the field of automotive industry in the recent years appears permanent education of existing staff but also next to in the field of transport that will represent the basis for improvements in terms of problem solving protection of human environment and transport sector in general. [5]

2.2. Reverse logistics

Differences between forward and reverse logistics are presented in Table 1. [6,7]

Table 1: Differences between forward and reverse logistics [6]

Forward Logistics	Reverse Logistics
Forecasting relatively straightforward	Forecasting more difficult
One to many transportation	Many to one transportation
Product quality uniform	Product quality not uniform
Product packaging uniform	Product packaging often damaged
Destination/routing clear	Destination/routing unclear
Standardized channel	Exception driven
Disposition options clear	Disposition not clear
Pricing relatively uniform	Pricing dependent on many factors
Importance of speed recognized	Speed often not considered a priority
Forward distribution costs closely monitored by accounting systems	Reverse costs less directly visible
Inventory management consistent	Inventory management not consistent
Product lifecycle manageable	Product lifecycle issues more complex
Negotiation between parties straightforward	Negotiation complicated by additional considerations
Marketing methods well-known	Marketing complicated by several factors
Real-time information readily available to truck product	Visibility of process less transparent

There are two valuable reasons for application of reverse logistics. The first reason is legislation, more precisely the European Commission Distance Selling Directive, guideline issued by the European Commission aimed to protect customers. The other reason for the use of reverse logistics is customer

satisfaction. According to Gartner Group, customers return 36% products purchased in e-trade. This represents a significant cost for companies but also a significant number of customers that need to be satisfied with an additional service of receipt of the goods they are dissatisfied with.
The future of reverse logistics is in narrow connection with e-logistics as overall communication between the customer and the seller takes place online with no need for calling customer service. According to Gartner Group, the cost of average return of goods by electronic means is $4.75, and the cost of the return involving a call to the customer service is $25 [8]. E-logistics and reverse logistics are so closely interrelated that recently the term reverse e-logistics has appeared.

2.3. Sustainable development

Generally speaking, sustainable development refers to development of economy, care for environment and care for society but avoiding mutual adverse effects of such activities. Economy should develop without endangering the environment but fulfilling the needs of the society. Environment is protected but still there is enough space left for economic development. The idea of sustainable development is the protection of environment and natural resources with (balanced) economic growth fulfilling the needs of global population. Of vital importance for the sustainable development is screening of the situation and comparison with certain parameters to determine the sustainability level. As all information constantly pass through databases already located online, a small step remains to finding the required information and their comparison with the parameters. In this way, the logistician obtains fast view of the actual situation and may quickly adapt the system to be as close to self-sustainability as possible.

3. RESULTS

Analysis of application of e-logistics in the contemporary business implies the thesis that e-logistics does not represent an ideal solution in terms of ecology and sustainable development from the perspective of application of reverse logistics and use of ICT technologies. Along with its positive effects, it also brings certain adverse implications on the environment as elaborated below.

a) Fuel and energy: Electronic exchange of information and online transactions reduce the needs for transport and thereby increase the efficiency of operations. Deficiency of e-business is an increased use of computers spending significant amounts of energy.
b) Procurement: Electronic procurement most frequently has no effect on environment. Electronic exchange of information on B2B principle may favour the promotion of environmentally aware suppliers and by use of e-procurement tools bring them increased competitiveness on the market of raw materials which as consequence may draw certain suppliers to neglect entirely the sustainable development for the purpose of maintenance of their own competitiveness.
c) Transport: Due to noise and emission of toxic gases, the transport is a significant factor of environmental impact. E-logistics increases the usability of transport capacities, but also opens the possibility of purchasing raw materials from the other end of the world at favourable prices. Shipment of such raw materials significantly increases the air transport and transoceanic transport and thereby increases the need for delivery vehicles for delivery of goods purchased online.
d) Storage: As e-logistics favours connecting of several storage functions in a single warehouse, warehouses are growing larger which has an adverse impact on spatial micro locations.
e) Waste: E-logistics reduces waste from excess inventories or obsolete inventories, which is obviously its positive impact. Besides, it enables the monitoring of returns of unwanted goods and opens the doors to trade in unwanted goods (e-auctions). The fact should not be ignored that the use of electronic signature reduces the quantity of office waste, reducing the consumption of paper and ink necessary for performance of certain logistic operations. It is beyond doubt that e-logistics contributes to a faster entry of new products on the market and faster use thereof, but the use of such products also ends faster and the waste is created faster. Besides, return of undesired goods enabled through e-trade brings certain losses to companies. In order to reduce losses due to damages in transport, the companies use much more materials for packaging which has direct adverse effect on the eco system.

Information Systems (IS) play a major role in developing and sustaining competitive advantage in the global marketplace. The Logistics Information System (LIS) is part of the information system of the organization that is integrated in the supply chain and is correlated with the partner organizations. [9]

Contemporary information communication technologies and logistic information systems based thereon become strategically significant in domain of e-logistics application. Information technology obviously significantly changes competitive prospects of all activities, products and services and affects all activities we are engaged in, what we do and not only how we do it. [10] Contents of this paper shows the significance of application of ICT technologies in domain of e-logistics, shown through their positive and negative impact on the overall eco-economic system.

4. CONCLUSION

E-logistics may significantly contribute to the sustainable development and assist in development of environmentally aware industry. On one hand, its application reduces the quantity of waste, increasing the efficiency of inventories management but at the same time more hazardous electronic waste is produced on the other hand. On one hand, e-logistics successfully manages the transport and optimizes the quantity of traffic and on the other hand, it causes more air and maritime traffic. These premises imply the conclusion the e-logistics does not offer a single solution of sustainable development. Inside e-logistics, there is still enough space not studied but also an area for further application of ICT and mobile technologies. The implication of their application in e-logistic represent a challenge for further research, particularly in the field of social - sociological aspect as a significant factor of sustainable development.

5. REFERENCES

[1] United Nations Department of Economic and Social Affairs, Report of the World Commission on Environment and Development, United Nations,New York, USA, 1987.

[2] World Commission on Environment and Development, Report of the World Commission on Environment and Development: 'Our Common Future', United Nations, New York, 1987.

[3] Tibben-Lembke R.S., Rogers D.S.: Going Backwards: Reverse Logistics Trends and Practices, University of Nevada, Reno Center for Logistics Management, 1998.

[4] Sarkis J., Meade L.M., Talluri S: E logistics and the natural environment, Supply Chain Management: An International Journal, Vol. 9 Iss: 4, pp.303 - 312, 2004.

[5] Baxhaku B.I., Naser B. Lajqi N.B., Lajqi S.B.: Ecology and road transport in Republic of Kosova, 14th International Research/Expert Conference ”Trends in the Development of Machinery and Associated Technology” TMT 2010, Proceedings ISBN 1840-4944, Mediterranean Cruise, 2010

[6] Tibben-Lembke R.S., Rogers D.S.: Special feature-reverse logistics, Differences between forward and reverse logistics in a retail environment, Supply Chain Management: An International Journal, Vol. 7, No. 5, pp. 271-282, 2002.

[7] Gülsün B., Bıyık G., Özgen D.: Reverse logistics: a survey, 10th International Research/Expert Conference ”Trends in the Development of Machinery and Associated Technology” TMT 2006, Proceedings ISBN 9958-617-28-5, Barcelona-Lloret de Mar, Spain, 2006.

[8] Richardson H.L.: Logistic in Reverse, IndustryWeek, The Penton Media Building, Cleveland, USA, http://www.industryweek.com/planning-amp-forecasting/logistics-reverse (2015-05-22)

[9] Seker S., Özgürler M.: Multi criteria decision making for logistics information system selection, 13th International Research/Expert Conference ”Trends in the Development of Machinery and Associated Technology” TMT 2009, Proceedings ISBN 1840-4944, Hammamet, Tunisia, 2009.

[10] Luić Lj.: Information Systems - Business, Logistics and Health Information Systems, Karlovac University of Applied Sciencs, ISBN: 978-953-7343-27-9, Karlovac, Croatia, 2009.