

# **The Impact of ERP Systems on Logistics (The Case Study of Logistics Services Sector in the Republic of Bulgaria)**

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## **ABSTRACT**

Nowadays, logistics industry plays an extremely important role in the development of the economy and society and is one of the largest growing industries in the world. In order to sustain in the highly competitive market logistics enterprises are forced to speed up their processes, reduce their costs and improve their performance. Enterprise resource planning (ERP) systems represent important information technology investment options and have a huge potential to improve business performance. Therefore, our paper is focuses on understanding the challenges and benefits of ERP systems applications in the logistics enterprises. The main objective of our article is to investigate the impact of ERP application on different aspects of business processes in logistics sector. In order to achieve this objective a survey was carried out via a closed interview questionnaire across logistics services enterprises in the Republic of Bulgaria. The results provide empirical evidence that the application of the ERP systems in logistics has the most beneficial effect on the following areas: transport management and documentation, accounting and sorting and distribution. At the same time the ERP is considered cost-effective and it could replace human effort of approximately 60 to 80%. Based on the study, it was found that the application of ERP systems leads to increased cost efficiency and respectively to better overall performance of the logistics enterprises.

*JEL Classifications: D22, L86, L87*

*Keywords: logistics industry, enterprise resource planning*

## I. INTRODUCTION

Every business has its own set of methods, products and services that makes it different. Nowadays, logistics industry is one of the largest growing industries in the world. More than 90% of transportation and trade is carried via shipping and logistics. The logistics industry, which exhibited great development during recent years globally, is defined as the lifeblood of the all economies (Sezer and Abasiz, 2017).

Moreover, logistics industry plays an extremely important role in the development of the economy and society and has a great impact on growth and employment. The logistics industry directly employs around 11 million people and accounts for about 10% of gross domestic product (GDP) in Europe Union (EU). Effective logistics systems are fundamental for the European companies' ability to compete in the world economy. Logistics account for 10–15% of the cost of a finished product for European Union companies<sup>1</sup>.

The main fundamental logistics services include transportation, customs clearance, storage, handling, insurance, packaging, stocks and inventory management, customer relations management and customer specific services. These services increased the significance of the logistics industry and thus, the industry became the sector with the highest share in services sector in several countries (Sezer and Abasiz, 2017).

However, such a huge business faces similar operational problems and challenges as they grow. In their daily routine expenses like labor cost, material cost, freight cost, fuel cost, follow up with clients for payments, maintenance cost, assets, import export duties, high valuation asset tracking, maintaining stock records of materials, record of damaged goods, etc. leads to implementation of Enterprise Resource Planning (ERP) in an organization<sup>2</sup>. By using an ERP system, an enterprise can plan, execute and control effectively and efficiently its logistics resources and processes.

Logistics integration is crucial for an organization as it creates opportunities to cut costs, increase revenues and improve utilization of assets thereby allowing organizations to avoid duplication of resources and giving them an opportunity to improve their profits (Folinas and Daniel, 2012).

Global trends such as the higher popularity of e-commerce, development of small and medium-sized enterprises, higher activity of exporters, technological progress, increasing competition and higher user demands have forced business organizations to supply products beyond their national boundaries. Hence, the role of logistics is to provide time and place utility of the products to customers. At the same time business organization are striving to attain competitiveness. The focus of organizations has shifted to supply chain, and to deliver value for money for their customers. Logistics plays an important role in the process of delivering value (Otsetova and Dudin, 2018).

Enterprise resource planning software links various applications that facilitate the flow of information within an organization, making it a powerful tool for logistics. The ERP software allows the logistics enterprises to manage their business functions like product distribution and staff maintenance, and provides companies with valuable data at every stage of the supply chain. The integration of logistics system's processes and resources is a key element of an ERP system. An ERP system is an integrated enterprise computing system that is designed to automate the flow of material, information and financial resources among all functions within a logistics company on a common database. Through an understanding of the challenges associated with the implementation

of an ERP, logistics companies can achieve sustainable competitive advantage (Su, and Yang, 2010).

This study focuses on understanding the challenges and benefits of ERP systems applications in the logistics enterprises. The main objective of this article is to investigate the impact of ERP application on different aspects of business processes in logistics sector. In order to achieve the abovementioned, aim a survey was carried out via a closed interview questionnaire across logistics services enterprises in the Republic of Bulgaria.

There have been numerous researches in the field of ERP and its advantages. Our focus is to bring out how important is the implementation of ERP into logistic industry. Therefore, we bring out how beneficial can be ERP on different business processes in logistics.

The paper is organized in three parts. The first section reviews the ERP systems and in particular the benefits of application of ERP systems in logistics industry. The following section introduces the theoretical framework and the methodology of our study. The “Results and Finding” section presents the results of the online interview questionnaire conducted among some of the management staff of the registered logistics enterprises on the territory of the Republic of Bulgaria. The last section briefly presents the conclusions, limitation of the present study and suggestions for future research.

## II. THEORETICAL FRAMEWORK AND METODOLOGY

Presumably, ERP systems must manage production, supply chain, sales, finance and accounting. It is software built as an integrated system on a modular basis, covering all processes in one business enterprise. The biggest contribution of the ERP systems is the ability to communicate between these modular bases and their databases in real-time to prevent non-optimal decisions, also the companies don't have to implement a full-scale system but only some selective modules or functional areas (Gupta, M., Kohli, A., 2004). In the beginning the ERP systems were used for inventory control, then the focus shifted to material resources planning (MRP) which led to further emerging of other modular basis to cover areas such as marketing, finance, human resources and so on. In the new millennium the ERP systems shifted to the so called extended ERP to exploit technological advances in the areas of Internet and electronic commerce. This time the focus is on making an organization's extended networks of suppliers and distributors more effective by improving the quality of communication and interaction between enterprises (Gupta, M., Kohli, A., 2004).

According to some researchers (Petkov, 2015), nowadays, there are three key areas covered by the ERP systems:

- Customer Relationship Management (CRM) - which allows the management to consolidate all customer information, making it available to all departments of the company as needed. CRM monitors all stages of marketing and sales customer relationships until after sales;
- Supply Chain Management System (SCM) - a Supply Chain Management System that helps manage the processes of delivery of production materials, incl. transportation, storage and inventory management;
- Human Resource Management System (HRMS) - incorporates all aspects of personnel management when performing tasks in the organization.

Other researchers (Gindeva, 2012) claim that ERP is intended for organizations that develop products in a dynamic environment. It provides an opportunity to synchronize and closely link organizational units and to facilitate their access to the necessary information. Allows full transparency of the work of everyone inside and outside the organization involved in a product development and implementation of a project. Optimal interaction, acceleration and optimization of processes are achieved on the basis of complete and yet controlled access to information.

On the one hand, the in the field of providing services such as logistics there is a need to be given additional credentials to the employees. This implies giving more freedom, knowledge and empowering employees to make their own decisions about the tasks assigned to them. It could be in the form of self-managed work teams, quality groups, enrichment of the work process, management participation groups, training and provision of information, enabling individuals to carry out their tasks independently and in the absence of strict control. In many cases, only a specific employee makes the necessary arrangements for the provision of a logistics service, without direct control by management, which also implies mutual trust between management and staff. The downfall is that the organization could lose customers when certain employee leaves. In this case, it is assumed that the new employee wouldn't be an equivalent to the old one, because there are many other influencing factors on the employee-consumer relationship, and especially the building of trust between the two parties, which is a basic prerequisite for retaining customers in the services. The usage of ERP systems and databases is supposed to cover up for such a situation.

On the other hand, logistics need to improve the process of their implementation, which can be achieved by creating an appropriate database for their transport units, sales process, customs clearance, storage, handling, insurance, packaging, additional services and more. There are ERP systems fulfilling some of these requirements but a full operational system hasn't been developed yet.

According to many authors (Folinas and Daniel, 2012; Helo and Szekely, 2005; Kannan Govindan, T.C.E. Cheng, Nishikant Mishr and Nagesh Shukla, 2018) there are six benefits of implementing ERP in logistics companies:

- Vendor/Customer Portal: ERP software comes with a vendor/customer portal which allows secure login to the account to know the status of all the logistics, especially in a bid. All the communication is integrated and updated via SMS or email.
- Optimize Inventory Control: Managing inventory is a vital task for any logistics business. ERP implementation enables the logistics industry to view requests, orders, deliveries and sales, from a centralized location. Logistics businesses can use these tools to handle inbound and outbound orders and to determine out-of-stock inventory. It even speeds up the order to dispatch time.
- Scheduling Maintenance: Transport vehicles and infrastructure are assets that need to be maintained timely. The maintenance of assets needs to be planned well and regularly as it can affect the business to a certain extent. ERP software gives us total control of all the key processes.
- Improves Distribution: ERP also speeds up distribution times. It enables freight companies to manage their distribution flow accurately. It allows suppliers,

drivers, distributors, and retailers to be on the same page by sending real-time information about traffic, customer addresses, etc.

- Real-Time Tracking: In transit, vehicles need to be tracked on a real-time basis to update the customers. This helps a logistics business with valuable business intelligence.
- Staff Management: ERP is an excellent tool when it comes to workforce management. As such, the freight operators can manage work hours, break times with the help of the software, and get information to assess the performance of staff. It even provides additional security options such as data backups for staff, payroll, attendance, etc.

All the aforementioned benefits are very important for every industry, but sometimes such a system could cost a lot of money especially for the small and medium enterprises. Moreover, in logistics people are considered as very important asset because they could make fast decisions, which are critical in many cases. It is peculiar to distinguish the possible benefits, the level of substitution of technologies and human effort in the respected field. For this reason, our research is focused on two major constructs – the technology/human effort substitution and time management/saving. Hence, we designed a questionnaire interview and collected the data online due to the COVID-19 situation. The survey was conducted from 1 of April 2020 to the end of June 2020. The managers of logistic companies in the Republic of Bulgaria are the main unit of the study and we asked one thousand to participate in our interview research. It was conducted in two stages – first to define the key areas covered by ERP systems in Bulgarian logistics companies and second to determine the assumed level of substitution of technology/human effort and time saving.

In the first group of questions, are the ones correlated with the usage of ERP systems, its category and size of the company.

The second group consists questions about the perceived substitution of human resources with ERP systems for that purpose we used Likert scales, percentage degree and man-hours. Firstly, for the Likert scales we used a ten-degree one with “completely disagree” being the worst possible choice and “completely agree” being the best one. There are two questions with that scale – about the possible substitution of human labor and cost-effectiveness. Secondly, the percentage degree of substitution is also a 10-degree one with the idea of rounding the numbers so it is 10%, 20%, 30% and so on. Finally, the man-hours question is based upon the 40 hours per week for individual worker.

The third group of questions correlates with the possible benefit for human resources and the implementation of ERP systems. They involve perceived benefit for new employees, the area in which the system is helpful and to state other possible outcomes for them. We added one question here to ask the respondents if it is difficult to find new employees on the labor market. For the purpose we used again a 10-degree Likert scale, but this time it was reversed – 1 being “very easy” and 10 being “very hard”.

### III. RESULTS AND FINDINGS

Logistics enterprises in the Republic of Bulgaria operate in a highly dynamic global business environment as digitization is going deeper in all business activities and the needs and expectations of people evolve and grow. New technologies are enabling greater

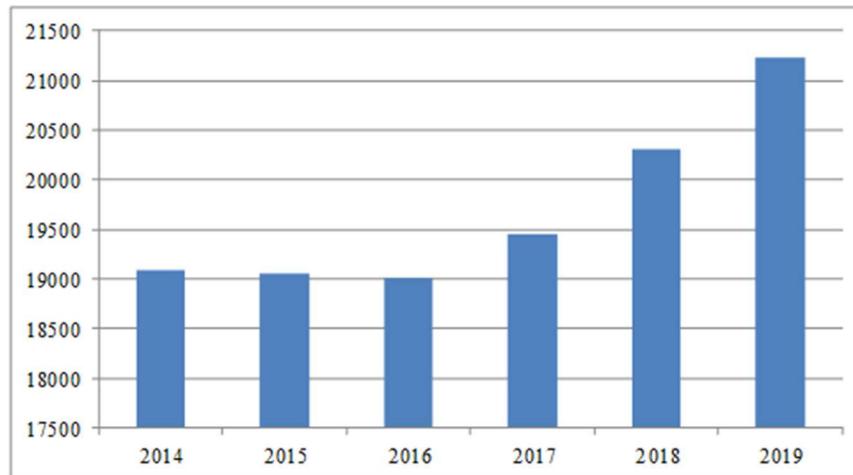
efficiency and more collaborative operating business models. They are also reshaping the marketplace in ways that are only now beginning to become apparent. New entrants, whether they are start-ups or the industry's own customers and suppliers, are also causing changes in the sector.

Logistics performance indicators both in international trade and domestically are central to the economic growth and competitiveness of our countries. Logistics connects firms to domestic and international markets through reliable supply chain networks.

Bulgaria has an important geographical position and plays an important role in transportation and trade between Europe and Asia. Five Pan-European Corridors pass through the country. The country has good opportunities to become a major distribution centre for international companies in the European and Asian markets (Evtimov, 2011).

The Bulgarian logistics services industry consists of about 21223 companies both large and small, which have combined annual revenue of about 12,5 million BGN for 2019. The industry has seen steady growth in the last ten years (Figure 1).

**Figure 1**  
Number of the Logistics Operators in Bulgaria (2014-2019)



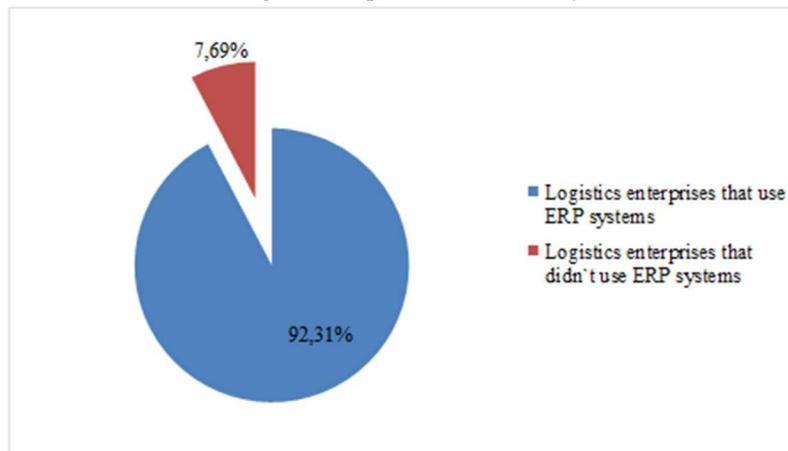
Source: National Statistical Institute, Republic of Bulgaria

For the period 2014 - 2019, the number of registered logistics operators in Bulgaria continues to grow, from 19084 registered operators in 2014 to 21223 in 2019 (which is more than 11% growth). The combined effect of these circumstances intensifies the competition in the logistics sector in the Republic of Bulgaria. Managers of the logistics enterprises understand the importance of offering services with high quality and deliver every package on time and in perfect conditions. In the conditions of digital economy and dynamic and highly competitive market the Bulgarian logistics enterprises need to adjust themselves quickly to new turbulent environment. To be competitive logistics enterprises need to have the ability to flexibly adjust the logistics workflow process, operations and information flow. To do this they have to deal with external and internal partners in a global logistics chain and huge amount of a data and information that must be available on time. As a consequence, logistics operators in the country should strive

to increase the efficiency of their internal and external processes and to improve their business performance. One of the tools for increasing the efficiency and quality of logistics processes is the application of ERP in the management of the logistics enterprises.

To define the usage of ERP systems in Bulgaria, we asked managers of logistic enterprises to participate in online interviews due to COVID-19 pandemic situation. Unfortunately, only a few (13) did, while the others refuse because they were overwhelmed with cross-border situations and other issues connected with COVID. However, we think that managers' responses should be considered with higher value and therefore the results should be made public. Nearly 93% of them claim to use ERP systems or 12 of the interviewed (Figure 2).

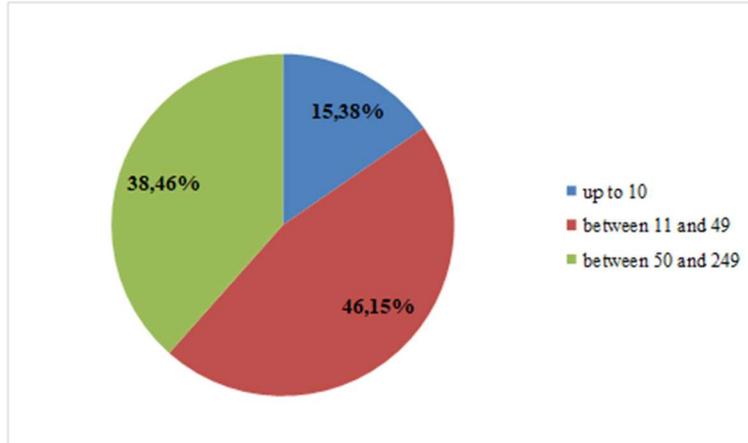
**Figure 2**  
Percentage of Enterprises that use ERP Systems



All the respondents are from small and medium-sized enterprises. Nearly 39% of all managers covered in the interview are in charge of medium-sized enterprises with 50 to 249 employees. The other 53,85% of the respondents are of small sized logistics enterprises with employees up to 50, 15% of which meet the criterion for micro enterprises (Figure 3). The results indicated that small and medium-sized enterprises in logistics industry are very active in implementing ERP systems. This shows the willingness of these organizations to be more competitive, efficient and customer-friendly. ERP systems are increasingly seen not only as intra-organizational integration efforts but also as playing an important role in inter-organizational integration, such as in supply-chain management and e-commerce which in conditions of digital economy is more relevant than ever.

**Figure 3**

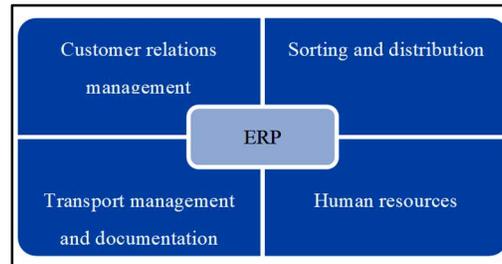
Distribution of Survey Respondent Enterprises based on Type of Enterprises by Business Size



The used ERP systems cover different aspects of the business processes going on in the respected organizations. In correspondence with the aforementioned six main ERP system benefits for logistics our research respondents confirm on the following aspects: customer relations management, sorting and distribution, transport management and documentation, accounting and human resources (Figure 4).

**Figure 4**

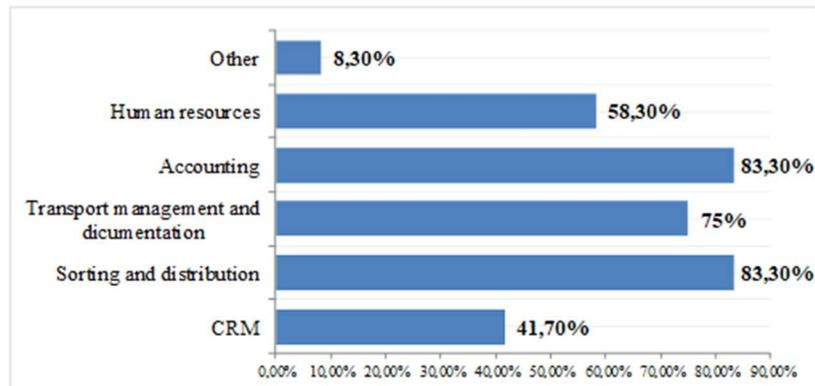
Areas Covered by ERP Systems in Logistics Industry



Based on these findings we have developed the next questions using the four aspects as main dimensions.

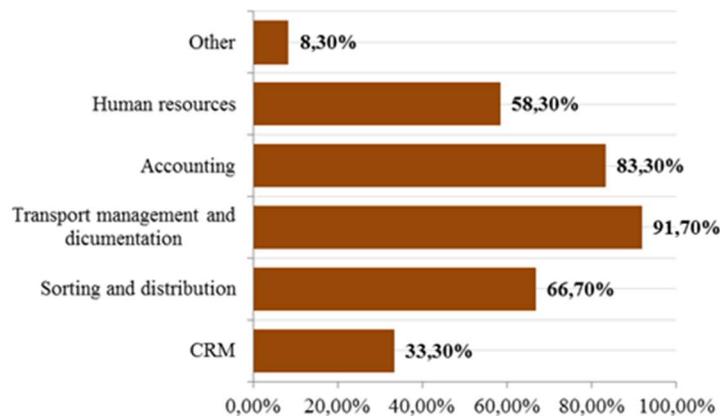
All the managers were asked to point out in which areas they are depending on ERP system. We used multiple-choice question; therefore, the distributed percentage of answers is more than 100. The three top responds are sorting and distribution (83%), accounting (83%) and transport management and documentation (75%) as shown at Figure 5. These results are logical due to the specifics of the given service provided by the organizations picked for the analysis. Especially, the transport management and documentation, which are key for the logistics.

**Figure 5**  
Areas Covered by ERP systems



The multiple-choice question was used in order to investigate the areas where the ERP used is most beneficial. According to the respondents the most beneficial ERP system application is again in transport management and documentation with 91.7% and the second one is accounting with 83.3% followed by sorting and distribution – 66.7% (Figure 6).

**Figure 6**  
Answers of the Question in “*In which areas the ERP used by your company is most beneficial?*”



Moreover, the managers were asked to point out a specific ERP that would be most useful for logistic purposes and it was again connected with transport and distribution control.

On the other hand, one of the most appreciated outcomes from ERP is that it saves time and working hours for employees. It is a critical issue, especially, when it is difficult to find suitable employees in the labor market. The logistics field requires people who have a specific education, qualification, set of skills and could work under high amount

of stress. Nowadays, it is very hard to find people corresponding to these requirements. Half of the managers depicted in our research confirm it is challenging to find the right personnel in the labor market of the Republic of Bulgaria. Thus, the importance of ERP systems would grow in the near future for the organizations working in the field. Moreover, the demand for logistic services has grown rapidly due to the spread of the pandemic of COVID-19. In correlation to that, we have asked a series of questions for the substitution of human resources by ERP. In some research, the substitution of human resources by ERP is defined as post-implementation impact of ERP on work and working life in organization (Wickramasinghe and Karunasekara, 2012).

The first couple of questions are Likert scale questions to examine the perceived level of substitution of human resources and ERP systems. The majority of the respondents (around 60%) are agreeing with different degree of confidence that ERP could replace human effort in the respected field. As good as this sounds it has a downfall expressed with the loss of jobs in this economics sector. Moreover, with the next question we aimed to determine more specific degree of the aforementioned substitution. The results are distributed as follows (Table 1).

**Table 1**  
Degree of substitution

Degree of substitution	Number of Respondents	%
10%	0	0
20%	0	0
30%	0	0
40%	1	7,69%
50%	2	15,38%
60%	2	15,38%
70%	4	30,77%
80%	2	15,38%
90%	2	15,38%
100%	0	0

As evident, the managers perceive a really high amount (between 60 and 80%) of possible substitution of work force with electronic systems and databases. Thus, making it clear that in the near future the management of logistics companies would be dependent on ERP technologies. Leading either to loss of jobs in the field or to additional requirements for hiring new employees. By increasing labor productivity, the ERP systems enable the normal course of processes in logistics companies to be carried out with less human resources. At the same time, new information and communication technologies create new employment opportunities in logistics industry. The integrated effect of the human-technology replacement and the current pandemic conditions is going to complicate the labor market situation.

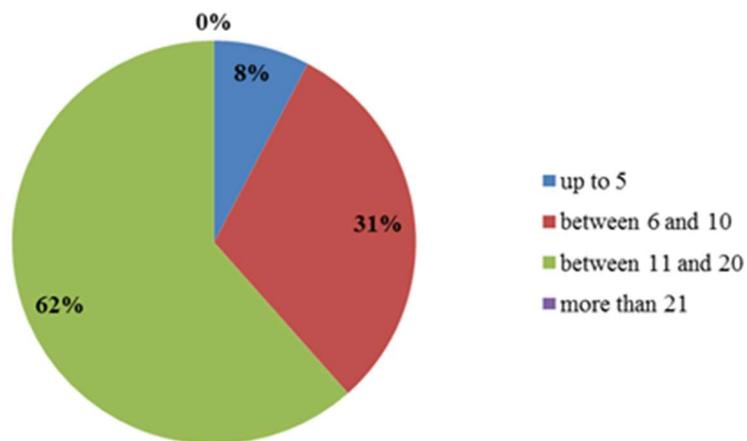
The application of ERP in logistics industry tends to favor same technical practical skills of employees. In many researches this situation was defined as “skill-biased technological change” (Dachs, 2018). Technical skills are highly relevant in logistics companies. Then technological skills are defined as “the know-how needed to build IT

applications using available technology and to operate them to make products or provide services” (Mata, Francisco J., et al., 1995).

The logistics activities require processes that incorporate a continuous flow of information among the all agents involved in the supply chain to coordinate and execute the whole process efficiently. Achieving this goal takes effort from the employees in developing technological skills. The research on the logistics sector in UK indicated a growing problem with the skills levels of the existing workforce. The main skills gaps in the logistics sector were reported to be technical or practical skills or job specific skills, planning and organization skills, customer-handling skills, problem-solving skills and communication skills (Winters et al, 2014 and UKCES, 2014a). It can be concluded that in the near future, as a result of the substitution of human effort by ERP, the requirements for employee will increase. The availability of technical skills in employees will be increasingly appreciated. In such situation, the managers of Bulgarian logistics enterprises will face the challenge of hiring new workers or providing additional training to those already employed.

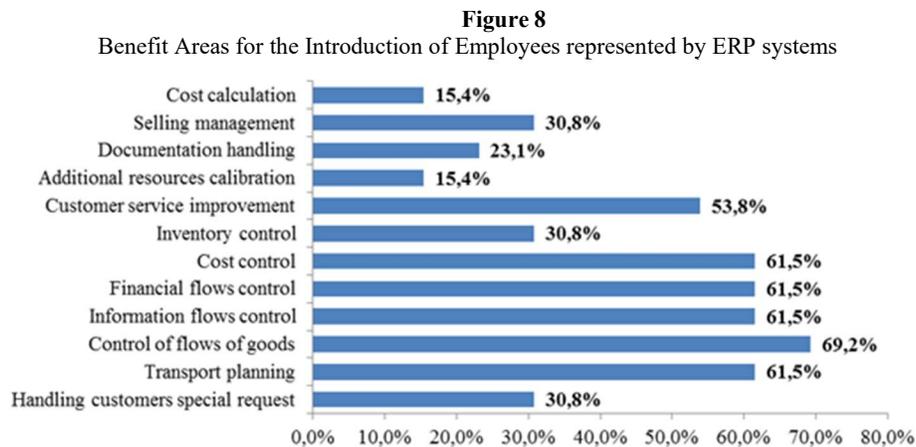
On the other hand, the positive result of implementation of ERP systems is for the management because it saves resources. In the case of small and medium enterprises, the cost-effectiveness is of a critical importance for their sustainable development, hence, the possibility to save resources and human effort is highly valued. Managers depicted in our study were asked to evaluate how many man-hours per week the ERP systems are saving. The concept is to estimate the saved time on regular weekly basis of 40 working hours per person. The results show that the majority of interviewed managers state that the application of ERP systems save between 11 and 20 man-hours of work (Figure 7). 31% of the respondents state that the ERP systems save between 6 and 10 hours per week per person and only 8% of respondents indicated less than 5 hours.

**Figure 7**  
Man-hours per week that the applications of ERP systems in logistics companies saving  
(Corresponding to 40 hours per week/person)



Managers categorically declare that the application of ERP systems leads to increased cost efficiency and respectively to better overall performance of the logistics enterprises.

Finally, we examined the possible benefit for the new employees from the ERP systems. One of the milestones in hiring new people is their suitability for the working position and the way any organization deals with the introduction to the workspace. The logistics is a very intensive field and new employees have to get on the track quickly so the help of the informational systems could be vital. All the managers interviewed confirm it. Taking the aforementioned four areas covered by the ERP systems for logistics (Figure 4) and the specifics of new employees' trainings we have simplified them into new categories. These categories give us further understanding for the most relevant needs of the industry in Bulgaria. As the results show the perceived benefit areas for the introduction of employees according to the most of the managers are: control of flow of goods, information flow control, financial and cost control, customer service (Figure 8).



Unfortunately, our open question giving the managers the opportunity to state which are the others possible benefits for new employees from ERP systems, got only one answer – time management. This is correlated with the saving of labor hours per person that we asked before and it constitutes for the benefit of the personnel. If the employee has a better time management, he or she could have more time available to respond to customer issues leading to higher results for the organization.

#### IV. CONCLUSIONS

Based on the finding of our study the main areas covered by ERP systems in logistics industry in Republic of Bulgaria were identified. The areas where the ERP used is most beneficial were also investigated. The results show that the application of the ERP systems in logistics has the most beneficial effect on the following areas: transport

management and documentation, accounting and sorting and distribution. This contributes as a confirmation for previous researches in the area.

The impact of application of ERP systems on human resources was also examined. On the one hand, the ERP is considered cost-effective and it could replace human effort of approximately 60 to 80%. Moreover, most managers depicted in this research paper claim that ERP saves up to 20 man-hours per week labor. This means that ERP systems would have huge effect for the logistics field in the near future and would lead to new requirements for people who want to work there.

On the other hand, ERP is considered very helpful when it comes to introduction of new personnel. It is assisting them in a lot of the everyday work and could play a pivot role for time management. Another possible outcome is for the managers, who do not have to assign someone to help new employees for a long period of time – only for the time needed to get to know the ERP system and control.

In summary, the results show that the ERP systems are not simply a technology but rather strategic tools for better business performance of enterprises in logistics industry.

## V. CONCLUSION

The current research provided an empirical analysis for the three crucial aspects of financial management represented by green supply chain management practices, competitive advantage and financial performance. The adoption of these critical aspects of financial management all combined in one model differentiates the current work from the previous studies and highlights a significant contribution to the literature. Three main questions have been considered: 1) What are the most common green supply chain management practices? 2) What are the effects of the green supply chain management practices on the competitive advantage? and 3) What are the effects of the green supply chain management practices on the financial performance that are moderated by the competitive advantage? Specifically, the three most common green supply chain management practices (suppliers' partnerships, lean manufacturing, and customers' expectations) have been retrieved through an inclusive review of the literature.

In line with other relevant studies (Awasthi and Kannan, 2016; Chen et al., 2013; Omkareshwar, 2013), significant relationships among the three most common green supply chain management practices, competitive advantage construct, and financial performance construct was reported. Similarly, the research reported significant relationships among the suppliers' partnerships construct, the lean manufacturing construct of the green supply chain management practices, and the competitive advantage construct. Moreover, consistent with other studies (Awasthi and Kannan, 2016; Chen et al., 2013), these two green supply chain management practices have significant effects on the financial performance construct that are strengthened through moderation of the competitive advantage construct. These vital findings enable production managers from significantly enhancing the profitability of companies without harming environmental aspects, and hence, to support the sustainability development.

On the other hand, the current research failed to find significant relationship between the customers' expectations construct of the green supply chain management practices and the competitive advantage construct. Similarly, there was no significant effect of the customers' expectations construct on the financial performance construct

that is moderated by the competitive advantage construct. Additionally, this insignificant relationship and effect are unsupported by previous key studies which is an indication for the need of further investigations. Finally, it is important to mention that the findings of this research were relevant to the manufacturing companies in the Kingdom of Bahrain and so they may not be compatible in other far countries.

### LIMITATION AND FUTURE RESEARCH

We acknowledge that there are several limitations of our research. One of the limitations is the low response rate to our survey and the small sample size. The other limitation is the survey cover only small and medium-size logistics enterprises.

Future work could continue to examine the impact of ERP systems and their application for logistics companies with larger sample size as soon as the global pandemic is over.

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### ENDNOTES

1. <https://ec.europa.eu/jrc/en/research-topic/sector-economic-analysis>, European Commission's science and knowledge service
2. <https://www.handex.co/benefits-of-implementing-erp-systems-in-the-logistics-industry/>

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