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BIG DATA CONCEPT IN THE FOOD SUPPLY CHAIN: SMALL MARKETS CASE

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Abstract

The strategies of competitive advantage are changing dramatically because of high technology development. The data size in the world is multiplying rapidly - the amount of information in the world doubles every 12 months. Therefore, the authors analyzed Big data in the food supply chain. The methodology used in the paper consists of a review of global competitiveness reports and secondary data analysis together with document-based literature synthesis; a competitiveness maximization methodology was modelled referring to a case of small markets. The supply of food industry is complicated, because of various regulations and a demand for high quality products just on time. Various companies are transporting partial freight; therefore, the visibility, lead-time and cost minimization is essential for them. However, they are unable to use all the gathered information and are not utilizing the potential that is possible. The problem of data analysis is a bigger concern to the smaller markets. Many of the small markets are less developed countries that still are not using Big data in their enterprises. In addition, new technologies are developing in the Big data industry. Therefore, the gap of technology will increase even more between large and small markets. The analysed innovation level and technology usage indicated a need for the food industry to change competitiveness strategies. Therefore, the authors developed a competitiveness strategy that is orientated to the food industry of small markets.

Keywords: Big data, supply chain, logistics, competitiveness, food industry, small market

JEL classification: C80, L66, L91

1. INTRODUCTION

Globalization is affecting even more the enterprise activities and competitiveness. Enterprises are working with a growing number of clients and suppliers. Therefore, companies are receiving information from various areas: freight routs, warehousing frequency, product variety, personal information and other issues. This information can be essential in order to conduct a proper method to increase competitiveness, however not all companies manage to clearly identify the aspects of the supply chain. Because of a limited

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understating of information, they cannot accept optimal solutions for a proper competitiveness method. The different level of data analysis distinguishes even more when a small and a large market are compared.

The authors conducted a review of global competitiveness reports and secondary data analysis together with document-based literature synthesis; a competitiveness maximization methodology was modelled by referring to *a case of small markets*. Larger markets are better prepared to use the possibilities of data analysis. Many of the large companies already use data analysis and part of them developed departments for Big data analysis, whereas small and medium enterprises can also benefit from Big data. "Small retailers and manufacturers are anticipated to take significant advantage of this big data opportunity, generating £14.5 billion of new business over the next five years" (Centre for Economics and Business Research, 2012). Nevertheless, the significant difference of Big data implementation in the enterprises is related to experience and methodology of using analysis for forecasting and problem solving. There are many methods created for analysis, e.g. regression analysis, time series, minimal distance, population algorithm and other methods for problem solving. Additionally, artificial intelligence may be used in the supply chain analysis. Artificial intelligence can be understood by explaining the neuron network concept. Neuron networks is a method that gathers various information from different sections of a database. The collected information is analysed, compared and the computations based on various criteria offer steps for a proper problem solution (Kriesel, 2005). Researchers have applied the swarm intelligence to green logistic in order to minimize Co^2 emission (Zhang *et al.*, 2015). However, their research identified only the operational level of green logistics. In order to properly analyse the possibilities some ceteris paribus needs to be approved, however often these restrictions separate the optimization algorithm from the real world. This situation occurs, because computers have a limited memory and a limited calculation speed. A case study was conducted with a 3PL company that had 1000 customers and a few hundred suppliers in order to evaluate every possibility that is possible in the enterprises situation more than 10^{160} should be made for proper. However, the present computers do not have the possibilities to process this kind of calculation sizes, but the situation can change in the near future. Quantum computers are developed and even a prototype is already created. A 50 quanta-bit (qubit) computer could have a better processing speed than any other super computer combined. "The classic computer cannot simulate quantum effects without slowing down exponentially" (Talele *et al.*, 2012). Therefore, a 50 qubit computer could control the whole world traffic system or it could forecast quite precisely the weather for a longer period than present technologies could. Whereas the technology of computing will shift dramatically. In the near future, the difference between competitiveness will change dramatically between large and small markets. "Business has always wanted to derive insights from information in order to make better, smarter, real time, fact-based decisions. The effective use of data is becoming the basis of competition" (Ernst & Young, 2014). Therefore, small markets that are not using Big data for their enterprise will lose even more profit. This could be explained by a similar situation in the past when the internet appeared. Companies that used standard post and phones could communicate better, nevertheless the internet appeared and the communication cost decreased dramatically. Companies that did not adapt to the situation just disappeared. A similar situation can happen in the near future. Only a few researchers have considered this problem in their studies (Manyika *et al.*, 2011; McKinsey Center for Business Technology, 2012). Therefore, the novelty of the study is a competitiveness

methodology designed for small markets in order to properly implement Big data analysis concept in the activities of their enterprises. The method shows steps that small markets should start using in order to implement Big data in their enterprises and to prepare for the future, when qubit computing will be available for the enterprises. If the enterprises do not understand the benefit of innovation, they could lose profit and even bankrupt.

Therefore, the object of the study is Big data concept implementation in the food supply chain aiming to increase competitive advantage.

Moreover, the goal of the study is to conduct a methodology for competitiveness maximization in a small market of food industry using Big data concept.

The objectives of the study are:

1. Analyse the particularities of food supply chain.
2. Evaluate the computerization level of the food supply chain in different markets.
3. Create a competitiveness maximization methodology for small markets by referring to Big data concept.

2. THE FOOD SUPPLY CHAIN PARTICULARITIES

The world's economy is growing rapidly, and new companies are entering the market. The different working style has changed since the previous decades, and now the largest profits are made not from manufacturing, but from distributing products throughout the world. Therefore, a new perspective to the supply chain management is needed. For an enterprise to be competitive it needs to develop strategies based on their activities depending on various factors. This chapter will be orientated to the supply chain. All industries have been affected by the internet, but new trends like internet consumers have appeared. The largest impact on the supply chain is made in the food industry. This is because food products are being ordered online and a proper distribution system is required. There are many regulations that require the food products to be tracked, in high quality and delivered on time (Olsson, 2004). Other industries' is simpler, because they do not have such restrictions for expiration date, as food product does. Therefore, a unique level of optimization is needed to this particular market. This problem is even more concern when companies are working in international markets. This is the effect of the globalization and the internet, that small market has a possibility to distribute their products around the world.

The distribution process may be complicated, especially in the food industry. The main 4 types of information gathering methods in the supply chain are procurement, warehousing, transportation and demand (Figure no. 1). Firstly, it is important to overview the supply chain management from the beginning. The chain begins from the suppliers that distribute raw material. The food industry is a wide topic, so this can be gained from various types of suppliers - raw meat, vegetables, berries, grain etc. These all products are food products, but they have very different requirements. First of all, the suppliers may come from various regions, there may be multiple of them. To service them and to communication proper is a hard challenge. Nevertheless, there are more problems ahead. One of the things is transporting the raw materials to the warehouse. The transportation can require different requirements, because some products need temperature restriction, other may require a different type of truck. For example, grain may require a specific type of truck that does not fit any other product category. The next challenge that may come is the warehousing of raw material. A warehouse will be needed for all products, because just in time production may be possible in the food industry. Nevertheless, it will not be arrange second to second so at

least partial warehousing will be needed. However, the requirements for the products will not change. There will be needed temperature control and humidity. Usually there are few types of temperature inside the warehouse – frozen -18 C^o, chilled about +5 C^o, no temperature requirement (just normal room temperature) and deep frost -24 and below. These requirements depend on the product type and manufacturer. Another important factor is humidity, which is also important for the products to have the right quality level. In addition, the last difficulty is distributing the food products. If comparing the classic economy system with supermarkets, the distribution is not so complicated, because they are distributing large quantities of products. However, this problem may differ in small markets, because there often are distributed partial cargo that requires grouping of different products. In addition, the most difficult distribution is from the internet, because there is a requirement for high quality, low lead-time and very low product quantity.

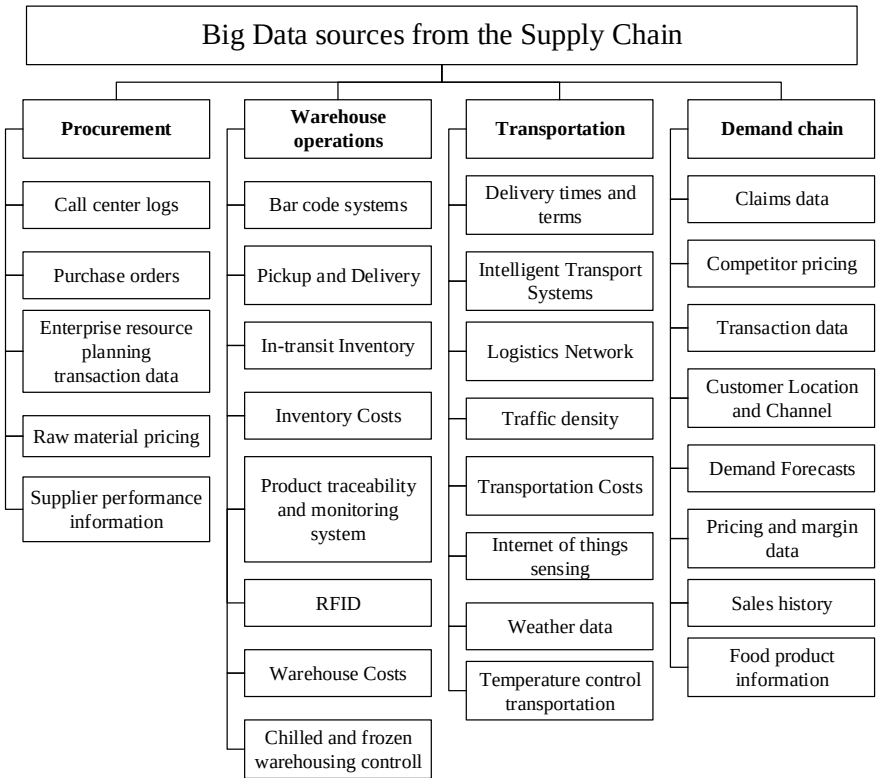

Figure no. 1 – Big data sources from the supply chain

The large flow of freight through the supply chain requires other abilities to properly manage the chain. There may be several problems regarding the situation. The most common ones could be directed to three parts: cost, lead-time and transparency (Accenture, 2014) . Firstly, it is important to mention what is the supply chain. Supply chain is a process that includes distribution of products and services to the right people, at the right time and at the right cost. Therefore, the cost is one of the priorities of the supply chain. Companies that can maintain lower cost can increase their competitiveness. The second aspect is lead-time

that is essential especially for the online food shops, because the products may expire. In addition, the transparency is also important especially with a large quantity of customers and suppliers. The transparency is even more important if the enterprise is working in the international market (Ventana Research, 2007). A situation could happen if the products are transported to different countries or regions – the reverse logistic transportation cost could increase dramatically. Another simple problem could be a misplacement of a few boxes; the manufacturer, supplier or customer could cancel the contract, because of bad services. Therefore, it is essential to control the information flow. These are only the basic aspects of the supply chain. The other aspect is risk evaluation and management. The information that is gathered can help maintain lower cost and develop strategies for "Force majors". When companies are working in the international market and there is a constant flow of cargo every week from a few trucks to 50 trucks, the biggest crisis can appear regarding force majors. What the companies should do if the warehouses were burned down or there were be flood and were block part of the main road. The information flow of cargo and regular evaluation of it can help minimize the loss in these situations (Benyoucef and Jain, 2009). Therefore, it is essential for enterprises to manage the supply chain by using computerization technologies, and this is even more important when working in the international market. Small markets without international markets would not have possibilities to increase profit and maintain a proper competitiveness level.

3. COMPUTERIZATION OF THE SUPPLY CHAIN MANAGEMENT

The previous chapters indicated the importance of understanding the information flow of the supply chain management. This chapter will overview the computerization possibilities of the supply chain in the food industry.

First of all, it is important to review information gathering technologies. The analysis of information can be conducted when we have the information on a database. Therefore, there are many methods to gather information from the environment. The concept of internet of things (IOT) is a developing industry that helps to communicate between machine and physical object, infrastructure, environment or other intelligent systems. There are many different methods for IOT that were used in the past and new concepts are created. These methods will be overviewed by referring to a supply chain case.

Bar codes. The main area of the supply chain is the raw material order and the distribution of products. Because of large flow of products and raw materials, it is hard to maintain the process and not to mix the orders. This problem appeared often in the old times, but people developed ways to identify the products using numerical systems. Nowadays the technologies have changed and other possibilities have developed. One of them is bar codes. A barcode is an optical machine-readable representation of data relating to the object to which it is attached. The common barcode consists of numbers that indicate the product type, supplier, warehousing place or other important information. When scanned the system inputs the code in to the database and it helps maintain precise information for the enterprise.

Radio frequency identification. Similar methods were later developed, but they are used in a more advanced level, also their usage has expended widely. Radio frequency identification (RFID) uses electromagnetic fields to transfer data wirelessly. The tags usually contain information that is processed via internet or satellite. These technologies have changed dramatically the process of ordering and manufacturing. While barcodes need to be scanned by a short distance. The RFID only needs a transmission station and an

antenna. In addition, this can be done by satellites. Because of this, the lead-time of information processing has changed dramatically. RFID can be used while transporting goods or ordering. The packages must be marked with RFID chips that hold more information than the barcode. This helps to maintain the flow of goods even more, because they can be used worldwide and when a truck enters a port, they can identify that the process will be handled soon. More usage of RFID consists of safety issues, companies can prevent thefts even easier, because it will be hard to take away a good through the front doors and on the other doors a transmission antenna can be mounted that would indicate if the goods a transported not by schedule or the wrong way. In addition, other authors analysed how the RFID technology can help optimize and help to make decisions in the supply chain. Their research concluded that RFID network system can detect condition of perishable products as they are moved downstream the supply chain before undesired totally loss of products occurs (Mejjaouli and Babiceanu, 2015).

Fleet management. RFID technology usage can be combined with GPS signal and other receivers to transform to a fleet management system. Fleet management can be used for: vehicle cost tracking, vehicle maintenance, driver management, speed management, fuel management. "Fleet management is a function which allows companies relying on transportation in business to remove or minimize the risks associated with vehicle investment, improving efficiency, productivity and reducing their overall transportation and staff costs, providing 100% compliance with government legislation (duty of care) and many more. These functions can be dealt with by either an in-house fleet management department or an outsourced fleet management provider" (Bielli *et al.*, 2011). These technologies are essential for Big data concept, because mathematical optimization methods can better solve the fleet management problems. This is related with various aspects of the chain – product quality, lead-time, cost.

Warehouse management system. The first computerized method was developed to ensure the control of material flow during distribution and. In this process there are many singularities that depend on the industries' type, time of storage, the quantity of products. The food industry may require temperature control. The chemic industry requires different regulations, because those materials could be toxic. In addition, if a company works with a large variety of products, they cannot be stored together, e.g. if food, cosmetics and perfume is stored together, it is likely that these products will be damaged and unsuitable for distribution. Because of this information it is important to attend the warehouse with computerization, otherwise it can be difficult to maintain a large flow of cargo. Some companies may have 100 trucks per day that is approximately 3300 thousand pallets per day. Moreover, that could lead to more than 53000 thousand boxes movement per day. With this much flow of products a computerization system is top priority. A research highlighted the performance levels and enhanced productivity of the manual warehouses by developing a warehouse management system framework and cost benefit analysis strategy. The study proved that with the WMS implementation the cycle time of cargo movement inside the warehouse reduced from 773 minutes to 236 minutes (Ramaa *et al.*, 2012).

Ordering processing. The next important chapter that needs to be overviewed is ordering process. This includes raw material ordering, goods distribution and reverse logistics. As if it was mentioned before, the quantity of goods can be thousands of boxes per day. The Amazon company during Christmas may distribute 426 items per second. Because of large flow of orders, it is essential to computerize the ordering process. In addition, the history of the orders is important, because of the reverse logistics concept. Reverse logistics

is a process when the products are returned back to the supplier, e.g. the shipping can be late; the products can be damaged, mixed and so on. Because of this, it is important to hold the information about the products for 6 – 12 months or even more depending on the industry and the warrant time. If the money was returned, the enterprise must know how much and where it needs to be sent.

These information gathering technologies are essential for the internet of things concept. IoT in the future will help provide a possibility to transport goods without human intervention from producer to consumer and the manufacturers will have a direct feedback on the market's needs (European Commission, 2008). This will dramatically change the competitiveness of enterprises, because companies will have even more precise information for their usage. Nevertheless, gathering information is not enough: it is important to evaluate it and to achieve optimal solutions for the problems.

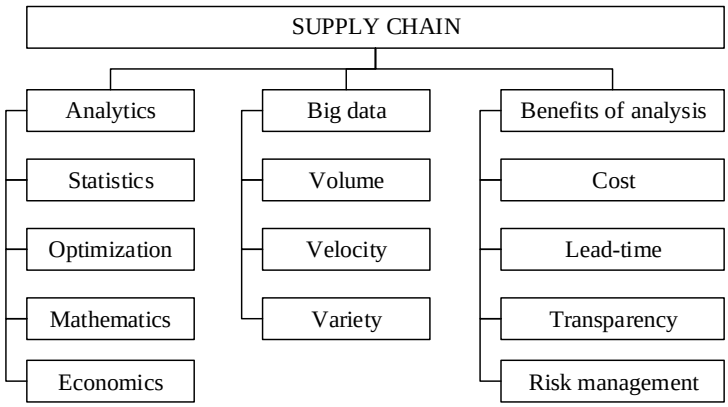

Figure no. 2 – Big Data concept in the supply chain

It is important to understand the importance of analysis possibilities in the supply chain (Figure no. 2). Big data concept has risen only recently in this time, but many companies started implementing the concept in to their business. Big data can be explained by three terms (Cecere, 2013). The first one and most common was is data quantity, like mentioned in the previous chapter the supply chain gathers information from various aspects of the business; additionally, if the enterprises are working in the international market, the volume may increase even more. This can be a problem for some companies because larger storage of data can increase the cost of data servers. However, there are new technologies that decrease the cost - cloud servers. The cloud servers store information online and do not require such high cost equipment like older servers do. Research indicates the importance of cloud servers, However, the usage of them is quite low in small markets, because of difficulty to adapt to technologies and higher capital investment requirements (Truong, 2014). The other aspect of Big data is variety. This is particularly true in the food industry, because the supply chain consists of the many elements: suppliers, warehouses, distributors, manufacturers, customers, government institutes, R&D centres etc. Therefore, the variety needs to be optimized properly. For this purpose enterprises are using data warehouses. Data warehouses can be combined to use analytic services for proper optimization of the supply chain (White, 2013). Moreover, the last part of Big data is the acceleration of the information. The information size and variety has dramatically increased; the speed of the

information flow has also dramatically increased. However, this may not be particularly true with some companies that work only with a few clients; nevertheless, many companies are trying to specialize in a larger variety of activities – from manufacturing till selling. In addition, there is a trend to form clusters and produce large networks for competitive advantage maximization. For this purpose, combined information can be analysed and proper strategies may be created (Bosona and Gebresenbet, 2011).

Big data concept consists of data size from one point of view, but the other is more essential and that is analysis, evaluation, and decision-making. The process of data analysis can require specific knowledge of mathematics, economics, statistics or programming. Therefore, this is the area where small markets has lower knowledge in. However, there are researchers that indicate the importance of Big data concept in the small and medium enterprise. Small and medium sized businesses are realizing that the amount of data they handle could be very large and important in their decision-making and planning process. This paper explored the options for handling large amount of data in small and medium enterprises and offered cloud computing as a possible solution (Schaeffer and Olson, 2014).

The methods used in the analysis stage can vary from simple calculations like finding the mean, dispersion or other characteristics to solve complex optimization problems. The methods that may be used depends on the task. There are many mathematical methods that can be used for optimization problems – clustering, regression, time series etc. Even machine learning can be used in the process for optimization of supply chain management. These are general methods that can help solve many supply chain problems. The other technologies that need to be mentioned are appearing and developing rapidly in recent years. One of them is artificial intelligence. Artificial intelligence is not necessarily a robot, but it can be a complex program combined with machine learning. The best case with artificial intelligence usage would be a regular software for a freight loading system. There may be many suppliers and customers in an enterprise, and employees could have difficulties optimize the process, a computerized software can help do the job. The other new technologies that have prototypes are quantum computers. These are computers with large calculation possibilities. The main idea is that a bit in the old computers can have two symbols 1 or 0. Moreover, the quantum computer can have 1 and 0 at the same time, because the atoms are moving very fast. However, the technology is still being developed, on the account of the fact that it requires a lower temperature to work. Nevertheless, in the future the quantum bit computers will change the industry dramatically (Schuld *et al.*, 2015).

The whole idea is that Big data concept is essential for every company in order to maximize competitiveness. However, these possibilities are more used in large industries' and because of complex technology usage, enterprises that work with Big data will prevail even more and companies that are still not using Big data may not feel much different today. However, when in the future quantum computing, machine learning and artificial intelligence will change the industry, the differences between large multinational companies and small businesses will expand even more.

4. METHOD OF COMPETITIVENESS STRATEGY

Enterprises need to understand the Big data concept, but also they need to implement it into their activities. This is essential in order to obtain proper competitiveness, because Big data analysis can help increase profit. Before determining a methodology for small markets competitiveness, it is essential to overview the Big data usage level in different markets. For

this purpose, several countries have been chosen for analysis. One of the less developed country is Lithuania that is part of the European Union, established near the Baltic Sea in the East Europe. It is a small country with high internet development that is one of the top best in the world and high IT professionals. However, the manufacturing level is lower than in other countries. Because many of the producers do not produce final products, they simply lack technology and experience. However, this country has potential to specialize in other fields like services, distribution, warehousing. Lithuania is in a logistic collider that has possibilities to distribute products around Europe, Asia, United States and Australia (Baskutis, Navickas, Gruzauskas, Olenceviciute, 2015). Nevertheless, Big data services in this country are still being implemented that may lead to high potential in the future. The statistics department of Lithuania indicates that the manufacturing, transportation, wholesalers and retailers are rapidly growing in the last 3 years; the quantity of enterprises has increased by 10% (Statistics Lithuania, 2015a). In addition, about 40% of these companies are implementing innovation. This means that in spite of being a small country, Lithuania has potential for proper development and positioning in the world market.

Table no. 1 – Enterprises using IT systems

	Supply chain management	Enterprise resource planning	Customer service (CRM)	Information gathering (CRM)	Marketing analysis (CRM)
2009	26.70 %	5.80 %	12.60 %	11.20 %	8.90 %
2010	33.30 %	11.50 %	15.30 %	14.00 %	12.60 %
2011	27.80 %	12.60 %	16.80 %	14.90 %	13.20 %
2012	37.30 %	23.10 %	17.70 %	15.80 %	13.80 %
2013	36.00 %	39.60 %	20.10 %	18.40 %	11.60 %
2014	25.30 %	29.80 %	27.20 %	25.10 %	18.70 %

Source: Statistics Lithuania, 2015b

The level of systems usage differs in different industries, however all of them are growing. (Table no. 1). This information can identify just partial information of the potential possibilities, this is because the IT usage systems are displayed by all sectors and not only manufacturing, distribution and sales. However, the gathering and systemizing of information is growing, therefore Lithuania has possibilities to use this information for proper competitiveness.

Lithuania has potential to grow and implement innovations, however a comparison to another market needs to be done in order to determine a proper strategy for competitiveness advantage maximization. The global competitiveness index indicates that United States has dropped from 3th place to 5th place. Netherlands has the 8th place in the world competitiveness report. Other similar country, like Finland has also increased their position by one level and Sweden has increased from 10th place to 6th (Schwab, 2014). The results show that small markets have achieved efficiency in their activities and are growing rapidly, while larger nations are not optimizing their possibilities properly. This fact can be viewed two ways as a competitiveness for different markets.

Some markets are focusing on manufacturing, and others are focusing on service providing like IT, distribution and other similar support industries. This can be indicated by

investigating other reports. The analysis indicated that the top manufacturing countries are China, Germany, India, and United States, while Netherlands and Belgium have only below 20th place in the report (Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013). However, the report of logistic performance indicates a different level of competition. Top countries ranked are Germany, Netherlands, Belgium, and United Kingdom. While China is only in the 28th place (The World Bank, 2014). In addition, Lithuania is in the 46th in spite of being in a tactical place for distribution infrastructure development. These reports indicate different level of manufacturing and distribution. Large nations are strong in manufacturing because of high technology level and experience. The problem is that it is hard to achieve experience for small markets, therefore competing in the manufacturing area with Germany, China or United States could be difficult. However, the technology level has led to different efficiency levels, and distribution of products and information can be viewed as a new competitiveness strategy.

This statement can be validated by the logistic competitiveness index that shows Netherlands and Belgium are in the top places. Therefore, these are small markets that have achieved their competitiveness in the information and product distribution area. This field is closely related to Big data analytics implementation possibilities. Not only that, but Netherlands is strong in the Big data analysis field. "The Netherlands ranks among the best in the world in terms of scientific quality and productivity" (Ministry of Education Culture and Science of the Government of the Netherlands, 2014). In addition, the networked readiness index shows that Netherlands is in the 4th place (Bilbao-Osorio *et al.*, 2014). This information is essential for Big data analysis services, this shows that Netherlands is strong in implementing the analysis services in its market. Not only that, but the statistical analysis helped them achieve competitiveness and lower cost. „A Big data project called Digital Delta aims to investigate how to transform flood control and the management of the entire Dutch water system and save up to 15 percent of the annual Dutch water management budget." (Essers, 2015). Regarding these facts, it can be concluded that Big data is in a high level in the Netherlands market and small markets can compete with large nations by achieved efficiency with help of new developing technologies. Moreover, a study concluded that Big data can acquire economic potential for efficiency improvements about $750 billion (Manyika *et al.*, 2011). Small markets may have difficulty in achieving competitiveness through the manufacturing area, because they lack experience and technology. However, the appearing technologies are started being used by all the markets; the ones that will understand the opportunities and seize them will achieve competitiveness advantage in the global market. The different technology level in small and large markets has not been a big concern in various studies. Therefore, a proper methodology needs to be determined for proper Big data implementation inside the small market.

The enterprises of small markets usually transport partial cargo, however there may be differences of the sizes of companies. Even in small markets, there are large multinational companies that have their own logistic department. However, an interview was conducted in Lithuania's food industry that proved that many companies distribute partial cargo. The interview also showed that partial cargo transportation requires 4 times more cost. This is related to the economy of scale, because lower quantities increase costs (Baskutis, Navickas, Gruzauskas, Olenceviciute, 2015). However, the marginal cost can go up when the quantity increases, therefore, there are middle size enterprises that can compete with large multinational enterprises. Another research related to this problem suggested a clustering algorithm for enterprises supply chain cost optimization (Beckeman and Skjöldebrand,

2007). However, this particular research suggested to cluster small and medium size enterprises for cost optimization. This method can be expended and adapted to cluster all the enterprises of a small markets food industries.

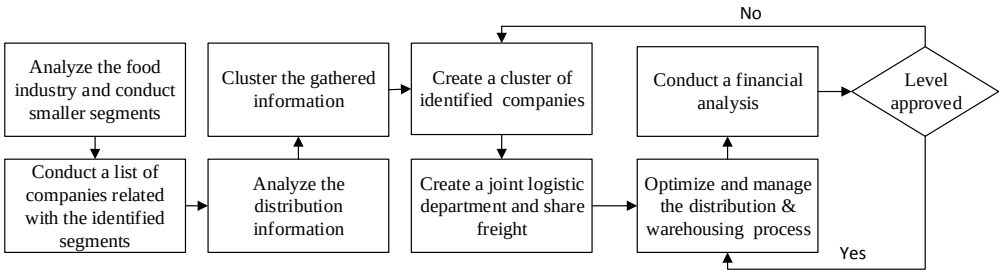

Figure no. 3 – Method for competitiveness advantage maximization

The developed clustering method is orientated to the small markets (Figure no. 3). For proper understanding of the method, a case study needs to be conducted. The initiator who is interested in the development of the market firstly needs to analyse the food industry in the particular market. For example, the market is suitable for online food distribution; therefore, the segments of the industry may consist of various manufacturers producing products that end users need. The segments may consist of various producers like milk, cheese, bread, vegetables and so on. Then related enterprises to these activities needs to be assigned. Then the enterprises should be contacted and interviewed whether they would like to participate in a clustering opportunity for logistic cost and profit optimization. Then, these enterprises should provide information related with the freight distribution – frequency, quantity, requirements, loading, unloading addresses and other important information. Then, the information needs to be clustered in a deeper level by loading, unloading addresses, frequency and quantities. The correct enterprises should form an official cluster. The contract would commit them to provide the freight as planned by the previous gathered information. However, some exceptions should be made, because the market changes frequency. Subsequently a joint logistic department should be formed for freight distribution. The department should have a few employees, a warehouse, and transport. The cluster should have much partial cargo transportation, therefore now they can combine it and distribute together. The information of the cargo can be entered to a database that an artificial intelligence algorithm would decide the best distribution possibilities. This method would optimize the distribution cost, because they would not need to contact 3PL providers which requires more expenses. In addition, the innovation applied in the cluster, would optimize the transportation cost. This particular method could not be applied before, however computerized information gathering methods are being used. Moreover, the Big data concept would dramatically help optimize the process and reduce cost.

5. CONCLUSION

The globalization is changing the enterprises competitiveness strategy, because less developed markets must compete with highly advanced markets. Small and medium enterprises that will not adapt to the changing technologies may lose profit and bankrupt in near future. This fact is related to the upcoming technologies of Big data analytics. The

analysed literature indicated that the Big data analysis services could be used for competitiveness advantage maximization for the supply chain. The lead-time, transparency and cost optimization are the most important areas that can be improved by implementing the Big data analysis. In order to implement analysis services in their enterprise, small marketsneed to start learning particular methods that are required for the analysis. Firstly, the education should consist of mathematical algorithms that are used for data forecasting and interpretation. Secondly, it is important to understand not only the process of the algorithms, but also the results. The understanding of the processed and visualized data can help optimize the lead-time and cost of the distribution. Lastly, in order to achieve better results, a wider view of beliefs needs to be learned. Usually small markets are not so keen to communicate together and share information. This situation can be a huge problem especially in the occupied markets that only in recent years received independence. In addition, the Big data analysis level in the market may differ depending on the technology usage level in the industry. Not all small markets may have implemented computerized information gathering methods in their enterprise. On the other side, not all of the markets need to use clustering processes to achieve competitiveness. Holdings or large enterprises can use Big data inside their activities without a cluster.

In conclusion, the created methodology for competitiveness maximization can lower cost and optimize the distribution process. However, a deeper analysis needs to be conducted. Therefore, this clustering method will be applied to optimize the distribution process of Western and Eastern Europe. This paper indicates a potential for transportation optimization in the food industry, however a deeper analysis will indicate the possible optimization level in financial terms. Consequently, if small markets do not take any actions towards implementing Big data inside their enterprises in the future, they will not have a chance to compete with large markets.

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