RESEARCH
IN LOGISTICS
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LOGISTICS MANAGEMENT BASED ON DEMAND FORECASTING

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Abstract   The companies of any industry are strongly affected with current globalization trend, which makes supply chain flows more and more bulky and complex. To be competitive in cost and eco-friend way under contemporary business market conditions, the companies should apply system approach of logistics management to plan, manage and control of their logistics processes. Each company's system can be analysed and divided into essential logistics sub-systems: purchasing, production, packaging, warehousing, distribution and reverse material flow management. Thus, the system and process approach are crucial for up-to-date logistics systems or subsystems management in context of long-term sustainable growth. Any effective logistics management system should be based on sub-system of demand forecasting. Demand forecasting is increasingly getting important to make right managerial decisions. Well developed demand forecasting sub-sytem in a company is a ground for effective planning, management and control of all company's processes then also for effective logistics or supply chain management.

Paper type: Research paper

1. INTRODUCTION

Logistics management approaches in conjunction with process management principles constitute the right way of enterprise management in contemporary fully globalized business market environment when it's placed emphasis on competitiveness increase, long – term sustainable growth and living environment protection. As a result of globalization trend of business, huge flows streaming across supply chains regardless of industry nature. It affects companies supply chains and their inner logistics chains hence the companies should apply logistics and process management principles for their planning, management and control business activities. If the companies want to be competitive, they should have well-developed logistics management system across their whole supply chains and also within the scope of their inner logistics chains. The main logistics sub-systems of general logistics system of an industrial company are purchasing, production, warehousing, packaging, distribution and reverse material flow management, thus the basic functional company's parts. Nowadays it's turning out that the right managerial decisions, at any functional part of a company, should be based on accurate demand forecast. Demand pattern drives all logistics activities in a supply chain and it's therefore crucial for effective process management of company's logistics system. To set required logistics or supply chain indicators of integrated logistics system of a company and subsequent processes of logistics planning and management should be based on accurate demand forecasts without questions. Therefore demand forecasting sub-system can be taken as further and essential element of complex company's logistics management system.

Effective planning, management and control of huge material flows and related logistics activities within the frame of logistics process management of a company is very up-to-date topic. For right setting of logistics measures or in wider context supply chain metrics it's necessary to have high accurate demand forecast of a final product, semi-finished product or raw material. Thus a demand forecasting system is fundamental tool to get initial data to make logistics managerial decisions in a right way (Hart, Lukoszová & Kubíková, 2012).

2. LOGISTICS IMPORTANCE FOR ECONOMY

The driving forces of advanced economies are particular industries which are more or less typical for individual countries. Each industry has got its own and

characterized supply chain in which the huge material, financial and information flows originate. As a result of contemporary global trend of business, the material flows are getting more and more complex and bulky. Those huge material flows it's necessary to plan, manage and control, that's the core of supply chain management using logistics science methods and approaches. At the present time, all elements of any supply chain, see Figure 1, are affected by growing importance of international business and growing volume of material flows (Hart, Lukoszová & Kubíková, 2012), (Hart, Rašner & Lukoszová, 2012).
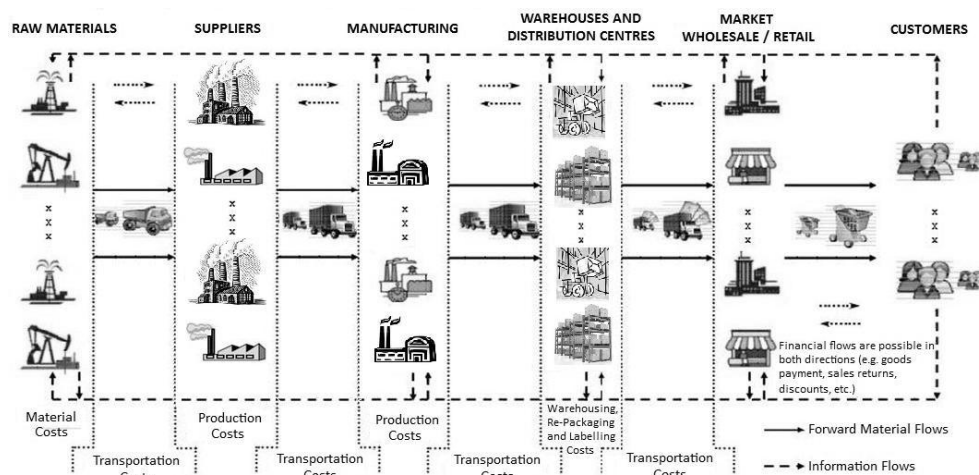

Fig. 1 General Supply Chain (Hart, Lukoszová & Bartošíková, 2011)

For illustration, the evolution of world's economy indicators along first decade of the 21st Century had positive growing trend, see Figure 2. In the Figure 2, it can be seen the global economic crisis of 2008 and 2009 which caused the total merchandise trade decline thereby also the world's GDP decline but positive growing trend of world's economy indicators, in the first decade of the 21st Century, is evident.

In consequence of globalization trend and increasing level of competitiveness, the companies across particular supply chains apply in their management systems process approaches. Enterprise management systems are increasingly using logistics management principles and techniques. The result is that the logistics as a science is getting more and more important and it can be classified in industrial sphere as:
- purchasing logistics or purchasing management system,
- production logistics or production management system,
- packaging logistics or packaging process management system,
- warehousing logistics or warehousing management system,
- distribution logistics or distribution management system,
- reverse logistics or reverse material flow management system (Hart, Rašner & Lukoszová, 2012).
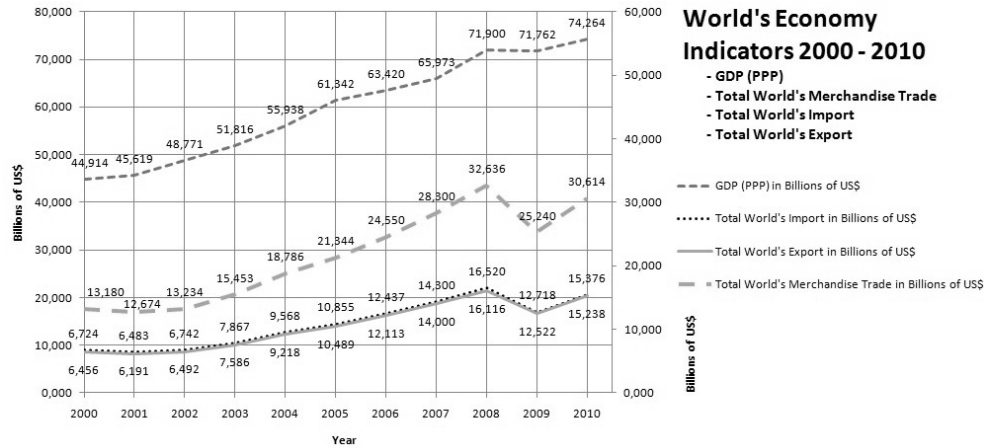
Fig. 2 World's Economy Indicators 2000 - 2010 (Hart, 2011)

By the globalization trend is just not affected industrial sphere but also tertiary sphere, where can be recognized very important and perspective logistics science discipline, city logistics. In context of mineral resources decrease and increasing importance of environment protection is further defined logistics science discipline, green logistics.

Therefore, the logistics science approaches to plan, manage and control, are crucial as for organizations of industrial sphere so for the organizations of tertiary sphere to make effective decisions in cost and eco-friend way under long-term sustainable growth conception.

The increasing signification of logistics science for economy is also emphasized in scenario study "Delivering Tomorrow: Logistics 2050" by Deutsche Post DHL published in February 2012. In that study are defined 5 scenarios of life in the year 2050, taking into account essential factors such as globalization trend, economic and social development, state of the art and environment conditions. In all 5 built-up scenarios:
- scenario 1 – Untamed Economy, Impending Collapse
- scenario 2 – Mega-Efficiency in Megacities
- scenario 3 – Customized Lifestyles
- scenario 4 – Paralyzing Protectionism
- scenario 5 – Global Resilience, Local Adaptation

the logistics science plays significant role for the economy. All scenarios have got common feature, considerably transformed role of logistics. The total demand of logistics services is growing in most of 5 scenarios but special requirements asked the logistics companies to perform are largely different (Hart, Rašner & Lukoszová, 2012), (Deutsche Post AG, 2012), (Logistics, 2012).

Logistics is about creating value – value for customers and suppliers of the firm, and value for the firm's stakeholders (Central Intelligence Agency, p. 13).

3. DEMAND FORECASTING

Forecasting is a process by which it's possible to get presumption of analyse magnitude values evolution in the future. The process helps a company to be better prepared for future conditions of market environment. The outputs of forecasting process are utilizing to answer the questions such are for example:

- What will be the profit in the following period?
- What will be the demand level of given product or service in a business territory?
- How high will be the costs of final product assortment production or offered service in a business territory?
- How much financial resources a company shall have to loan in the next year?
- In which time period and in which way the loan financial resources will be paid back?

To answer the mentioned questions or for decision making process it's needed to keep at one's disposal forecasts of future demand or forecasts of consumption evolution. As soon as they are available, it's possible to start the planning processes, processes to make decision or it's possible to start management and control processes in a company.

At the present time, when the market environment trends to continual changes, forecasting process is getting more and more significant. It's necessary to ensure that the forecasting process will be constantly updated and conformed to actual market conditions to give accurate forecasts of analyse magnitude values (Hart, 2011), (Hart, Rašner & Lukoszová, 2012), (Krueger, 2008).

3.1. Theory of demand

Demand pattern plays significant role during selection of forecasting methods. Various demand patterns are illustrated in the Figure 3.
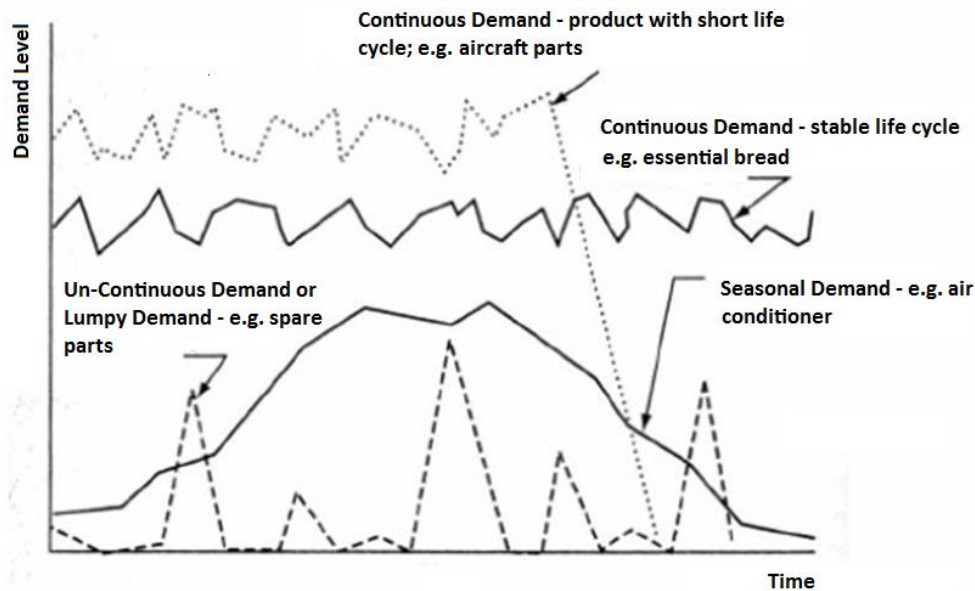
Fig. 3 Essential Demand Pattern (Ballou, 2003), (Hart, 2010), (Hart, Rašner & Lukoszová, 2012)

Planning system or management and control system (e.g. inventory management system) are defined by demand character. According to demand origin, the demand can be classify as independent demand and dependent demand. Further important feature of demand is its time behavior. According to this feature, the demand can be distinguished as continuous demand and un-continuous demand.

3.2. Forecasting methods

It's not realistic to expect that each product in line of products will be forecasted by the same forecasting method as others. For each product or production line is often necessary to select different methods for forecast creation.

The forecasting methods can be classified in several ways. An example of classification can be stated as follows:

- quantitative methods
- qualitative methods
- intrinsic methods
- extrinsic methods
- causal methods.

Quantitative methods of time series forecasting utilize historical data to form a forecast. As an example can be stated simple average method, exponential

smoothing method, regression analysis, Box – Jenkins methodology, etc. Qualitative methods of time series forecasting utilize experience, knowledge and judgement of experts to develop a forecast of analyse magnitude. An example can be panel consensus method, Delphi method, sales force estimate, etc. Intrinsic methods are based on data and information from an organization sources. Extrinsic methods develop the forecasts from data which are from external environment of organization, e.g. business statistics. Causal methods represent forecasting methods when the final forecast is driven by independent variables group so by factors affecting dependent variable which is demand level.

Table 1 Classification of Forecasting Methods According to Time Period (Hart, 2010), (Lewis, 1997)

Forecast Type	Time Horizon	Application Example	Example of Forecasting Method
very short-term forecast (prompt forecast)	1 hour to 1 day	demand forecasting of electrical energy consumption	various methods
short-term forecast	1 week to 1 month	demand forecasting in industry and business	exponential smoothing methods
medium forecast	1 month to 1 year	demand forecasting in business and finance	analysis methods of time series and regression models
long-term forecast	1 year to 1 decade	forecasts of technology development	DELPHI, and other

Other way to classify forecasting methods is time period determination for that the forecast is to be developed. From that point of view there are recognized 4 types of forecasts which brief description is stated in the Table 1.
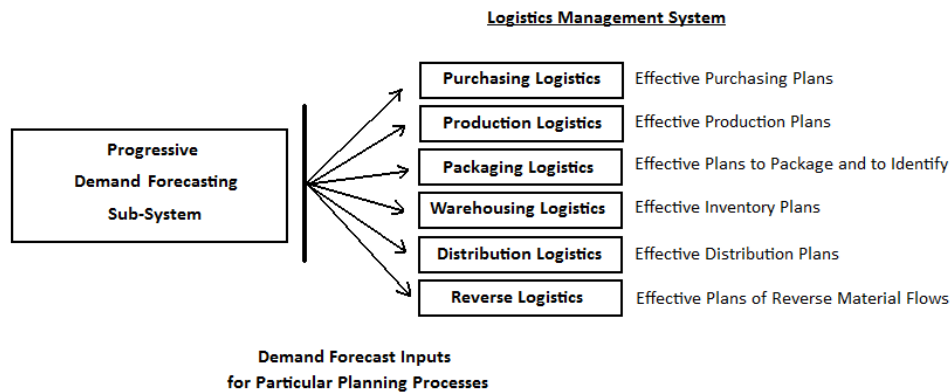
4. CONCLUSION

As a result of still rising material, financial and information flows across supply chains of particular industries, the companies are increasingly realized to apply progressive logistics management methods to manage. The bulky material flows represent considerable financial resources which it's necessary effectively plan, manage and control under current competitive business environment to be successful.

In consequence of contemporary strong globalization trend of industrial and ultimate markets thereby also globalization trend of their supply chains, the companies are applying systems of process management across particular functional levels and simultaneously more and more they implement logistics principles of material

flow management as a result of increasing material flows volume and complexity. As a result of rising volume of international business is an increase of flows intensity across particular logistics infrastructures – cities. That in a final effect increases the significance of logistics management principles also in tertiary sphere. Thus, the principles or approaches of logistics management under current globalized market environment are crucial to enhance a competitiveness of industrial companies in context of long-term sustainable growth and living environment protection.

Basic Concept of Logistics Management System in a Company Using Progressive Demand Forecasting Sub-System

Logistics Management System

Progressive Demand Forecasting Sub-System		
	Purchasing Logistics	Effective Purchasing Plans
	Production Logistics	Effective Production Plans
	Packaging Logistics	Effective Plans to Package and to Identify
	Warehousing Logistics	Effective Inventory Plans
	Distribution Logistics	Effective Distribution Plans
	Reverse Logistics	Effective Plans of Reverse Material Flows

Demand Forecast Inputs for Particular Planning Processes

Fig. 4 Basic Concept of Logistics Management Utilizing Progressive Demand Forecasting System (Hart, Tomaštík & Taraba, 2012, p. 331)

The foundation of any logistics management system which is composed in common industrial company of purchasing, production, packaging and identification, warehousing, distribution and reverse material flow management subsystems, it's progressive independent demand forecasting system gives inputs data for subsequent planning, management and control processes. An essential concept of logistics management system of an industrial company, which is based on progressive demand forecasting sub-system (methodology to create independent demand forecasting system in an industrial company under current global business market conditions, see dissertation thesis by Hart), is illustrated in the Figure 4 (Hart, Rašner & Lukoszová, 2012).

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BIOGRAPHICAL NOTES

Martin Hart is an assistant professor at the Faculty of Logistics and Crisis Management, Tomas Bata University in Zlín. During his doctoral study he has

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Xenie Lukoszová is an associate professor at the Institute of Logistics at Tomas Bata University in Zlin and at the Department of Business Logistics of the Silesian University in Opava. Long-term deals with logistics, marketing logistics, purchasing management, distribution policy, marketing research and logistics audit. She is an author of hundreds international and Czech publications. Since 2000, she relatively intensively cooperates with the business community within the frame of project implementation. From 2000 to 2004, she worked as a consultant at the Department of Development Services in the company Severomoravská Energetika, Inc., Ostrava. In 1998, she received Ph.D. and in 2004, she has become an associated professor in the field of Economics and Management.

Jana Kubíková is an assistant professor at Silesian University in Opava, Faculty of Business Administration in Karviná, Logistics Department. Among her interests of research fields belong logistics, marketing and supply chain management. She is young perspective researcher of cross-disciplinary logistics studies.