FORESIGHT APPLICATIONS FOR FUTURE ORIENTED SUPPLY CHAIN AND LOGISTICS MANAGEMENT

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Abstract

Purpose of the article The research topic undertaken by the author, aimed at answering the question: whether and how the use of foresight studies can help to meet the challenges in the process of improving the supply chains. Identification of the challenges faced by supply chains carried out at the initial stage of the research and directions of evaluation of supply chains presented in the literature constituted for the author the justification for seeking new solutions for supply chain and logistics management. The dynamics of the changes in the logistics companies' business environment forces the decision makers to focus on the future, which, on the one hand, is aimed at capturing the changes, and on the other, on dealing with uncertainty. Foresight is one of such tools. Diversity of the existing applications of the foresight research indicates the increased possibility of its application also to the needs of prospective supply chain management. The article presents the current range of applications of foresight studies in the area of supply chain management (including logistics), and three new categories of foresight research, taking into account the supply chains specificity, were suggested.
Methodology/methods The methodology used for the needs of the research process includes a review of the literature and an analysis of foresight projects in the area of supply chain and logistics management.
Scientific aim Proposing new types of foresight studies focused on supply chain and logistics management was the main purpose of the article. According to the proposed new types of foresight studies, possibilities of its application, reasons for it uses by particular users were identified.
Findings Taking into account the types of foresight projects acknowledged in the literature and used in practice and various application areas of foresight research, the author has attempted to expand the existing classification of the foresight studies with three types taking into account the specificity of determinants of supply chains and logistics processes: chain foresight, the process foresight and strategic project foresight.
Conclusions Since the conducted studies are theoretical, they require orientation of further research on the process of operationalization of the foresight research methodology, aiming at the selection of research methods, selection of experts, identification of the goals and results of research. Limitations of the carried out literature studies stem from heretofore narrow achievements in the application of foresight studies in the area of supply chain and logistics management. Subsequent foresight initiatives in the analysed area should enrich the achievements with solutions of both theoretical-methodological and practical nature (in the form of, for example, good practice).

Keywords:foresight, logistic, strategic management

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Introduction

The supply chain consists of a group of entities implementing joint actions aimed at creating the value of the final consumer, including activities from obtaining raw materials to delivering the final product to the final customer. The scope of actions undertaken under the supply chain concerns the flow of: products, knowledge, information, and financial resources. The most important features of supply chains include: cooperation and partnership; integration of key business processes; implementation of common strategies; resource sharing; common information systems and a focus on values for the end customer (Witkowski, 2003, Szymczak, 2015).

The development of supply chains is determined by a number of global opportunities and challenges. Despite the significant increase in the importance of this sector, it is still more variable and uncertain. The development of supply chains is conditioned by the dynamics of change and the complexity of the factors of socio-economic development. Undoubtedly, the main challenges determining the development of supply chains include:

- globalization of socio-economic processes causing the supply chain to become longer and more complex;
- changing customer expectations towards faster deliveries and more favourable conditions for implementation of agreements; causing the shortening of product life cycles and focusing on creating the value for customers by the supply chain;
- increasing requirements in terms of minimizing the negative impact of supply chains on the environment;
- the technological orientation of logistics services;
- the growing importance of management in uncertain conditions.

Globalization manifesting itself, among others, in removing barriers between countries and continents, creating new socio-economic systems and, generally speaking, the internationalization implemented at the level of state, markets, industries and businesses, is an important source of implications for the supply chain and logistics processes.

The increasing complexity of supply chains is a subject of interest of researchers from the perspective of measuring this complexity (Drzymalski, 2015), processes of learning of chains as a strategy for adaptation and counteraction to the complexity of the environment (Giannoccaro, 2015), and the proactive management of flexibility of the supply chains (Gunasekaran, Subramanian, Rahman, 2015). Research on the complexity of the supply chain is mainly focused on the analysis of ways to prevent or adapt to the existing conditions. Equally important as the existing complexity are the factors determining the complexity of supply chains in the future. The complexity may be related to the interior of supply chains, as well as the complexity of environmental factors affecting supply chains. Next to complexity, the second problem determining the functioning of the supply chains is the progressive process of enlargement of the supply chains' range. The expansion of the range of supply chains (in the spatial, quantitative and generic dimension), on the one hand, results from the growing diversification of the range of products and services offered by the suppliers (being the result of expectations of the customers and growing customization), and on the other, from growing technological capabilities overcoming the previously existing limitations. Globalization has caused the complexity of business processes by long supply chains with a greater number of entities, relationships between them and the density of the network. Moreover, the nature of processes within the supply chain is changing in the context of a growing number of competitors in the market. Consumers use different media for the purpose of comparing the prices of the provided services, thereby pressuring logistics companies to provide better, faster and cheaper service. According to the research of PostNord (2014), for 55% of respondents from Poland, free delivery of goods was considered to be a very important factor when making purchases.

Generic changes in consumer expectations are varied according to sectors. In relation to the production of, for example, food products, consumers are demanding safe food (Beska, Land, Seuring, 2014), and for the consumers of textile industry, individualization is more important (Kanat, Atilgan, 2014). Delivery time becomes the primary determinant of the quality of services in the supply chains in such sectors as ICT, medical. Research conducted by PostNord (2014) shows that for more than half of respondents from Poland, the maximum acceptable waiting time for delivery is 3 days. For comparison, the automotive industry in times of economic crisis is struggling with drastically changing demand resulting in significant implications for the transport industry (Xia Tang, 2011). Dynamics of changes in the expectations of increasingly demanding customers is a challenge for the entire supply chain. Their early diagnosis, and even prediction becomes a key success factor. Meeting the needs of the final consumer is ever more often considered in the context of the value supplied to him (Szymczak, 2015). Changes in customer expectations can be continuous and sudden, incidental. The second type of change is difficult to predict and entities must develop mechanisms for gathering information on future

potential customer expectations, which is often associated with engaging clients in the process of creating the value.

The value created in supply chains is one of the elements of the global supply chains performance evaluation (Estampe, 2014). Features determining the created value form the basis for the assessment of the results generated by the supply chains. Currently, it is not sufficient to provide the right products at the right time and at the right price. The more important challenge to logistics is to create value for the customer. Often, the use of ICT supports the process of creation of the value for customers (Wamba et al, 2015).

In the context of minimization of the negative impact of supply chains on the environment, the conducted research regards, among others, the development of technologies that reduce carbon dioxide emissions by the transport systems, storing (Pei, Jia, 2015); development of reverse logistics (Rivers Logistics) (Ravi Shankar, 2005; Vahabzadeh, Asiaei, Zail, 2015; Thode Filho et al, 2015; Agrawal et al, 2015), sustainable urban logistics (Morana, Gonzalez-Feliu, 2015), green supply chains (Rostamzadeh et al, 2015), corporate social responsibility in the supply chains or measurement of the impact of the logistics activities on the environment (Mangiaracina et al, 2015). The problems addressed by researchers reflect concern for the present and future state of the natural environment, in the context of a dynamic supply chains development.

The increasing complexity of logistics processes also results from the dynamic development of technologies (e.g. RFID) (Markmann et al, 2013). The development of ICT is, on the one hand, an opportunity, on the other, a threat to the development of supply chains. In the context of opportunities, for many entities ICTs are an element of creating value for customers, e.g., in terms of the convenience of ordering without leaving home, product delivery to the door or delivery time. Risks arising primarily from the need to keep delivery deadlines and follow the development of technology, often requiring large expenditures.

The abovementioned conditions for the development of supply chains confirm the fact of their functioning in conditions of uncertainty. The complexity and dynamics of change of the processes affecting logistics make it necessary to make decisions under conditions of uncertainty (Von der Gracht and Darkow, 2013). Increase in the uncertainty increases the risk to the business. Logistics companies interact with an increasing number of players on the market, and have to manage a larger number of operations (e.g. of intermodal in nature), at longer distances in the conditions of more complex administrative procedures. Eventually, supply chains are becoming more sensitive (Markmann et al, 2013), and the managers are not satisfied with the existing planning tools for forecasting and are looking for new tools in this area (Von der Gracht and Darkow, 2013). In the case of a large dynamic of changes, determining or even estimating the level of probability of occurrence of adverse events becomes difficult, if not impossible. Management under the conditions of uncertainty means that the previously dependable methods in the field of hazard identification and risk assessment do not fulfil their purpose. Mathematical models for identifying, assessing and managing the risk in the supply chain fail (Supply Chain Risk Management - SCRM) (Szymczak, 2015). There is therefore a need for early warning systems (Supply Chain Early Warning System - SCEWS) using heuristics based on creative thinking and logical relationships (Szymczak, 2015).

These conditions cause the future-oriented supply chain management (Future oriented supply chain management - FOSCM) to be a challenge for the supply chain. The companies not prepared for the future will be exposed to an unacceptable risk and higher operating costs, in relation to the organizations that systematically ask themselves questions about the future of logistics (Melnyk et al, 2009). Supply chains should respond quickly to market signals, to quickly identify and exploit emerging opportunities. According to the proposal of Szymczak (2015) the future supply chains are:

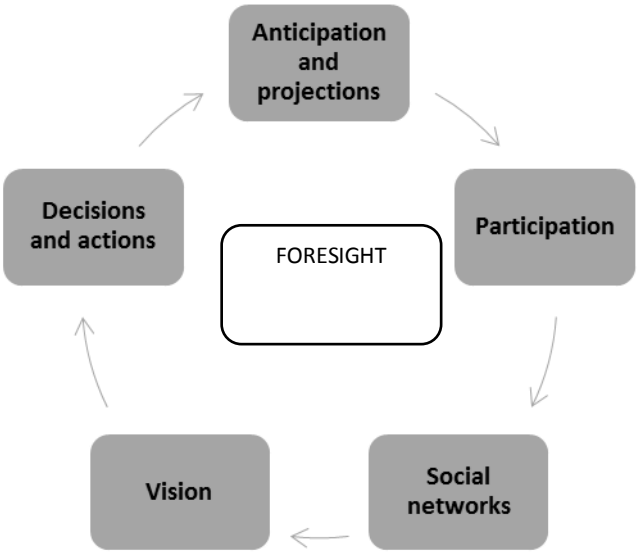
- flexible supply chains - having the ability to adapt to the changing conditions of operation,
- sensitive supply chains - having the ability to respond to customers' needs,
- resilient supply chains - having the ability to cope in the face of the change.

Foresight, successfully used in areas such as research development, regional development, development of technology, may be a tool enabling the prospective management of supply chains.

1 Foresight definition

Among the definitions of foresight as the most famous are considered the one developed in 1995 by B. R. Martin and in 1996 by L. Georghiou. According to B. R. Martin foresight is a process involved in systematic attempts to look at the long-term future of science, technology, economy and society, aimed at identifying strategic areas of science and technology serving to ensure the maximum economic and social benefits (Martin, 1995). Foresight is the approach based on: the future, planning and social networking (Miles, 2002)

Foresight is perceived as a systematic, participatory process of building a medium- and long-term vision, aimed at today's decisions and mobilization of joint actions (Keenan, Miles, 2001; Nazarko, 2011). According to Gavigan et al. (2001) foresight features includes: anticipation and projections, participation, social networks, vision and decision and actions (Figure 1).



Source: based on (Gavigan *et al*, 2001)

Figure 1 Foresight features

Foresight research are based on the following assumptions: 1) multiple futures are possible (i.e. that future developments are uncertain and un-predictable), 2) change (drivers) can be identified and studied, and 3) the future can be influenced (Berger et al, 2008). Foresight enables coping with uncertainty and obtaining the competitive advantage in the turbulent environment (Rohrbeck, 2010). In an ideal world, innovation management and strategic foresight should reinforce each other (Von der Gracht; Vennemann and Darkow, 2010).

Classification of foresight studies can be made taking into account the institutional, territorial and conceptual dimension of foresight. The institutional perspective reflects the type of entities interested in developing and implementing the foresight research results (companies, local authorities). Territorial perspective reflects the spatial object (country, region), which is of interest to the foresight research. The conceptual dimension of foresight studies relates to the subject of the research, i.e. the search for answers to questions about future states of a reality (technology, development of the industry, the transport system, the development of the health system, education) (Ejdys et al, 2015; Halicka et al, 2015; Halicka, 2014).

The experience from the utilisation of foresight studies accumulated up to date indicates a huge potential for its further application. The processes of supply chain management focused on their improvement may be the area of potential application of foresight research.

2 Current foresight applications in supply chain and logistics management field

The literature undertaking the subject of using the foresight methodology for designing and improving the functioning of the supply chain is rather limited. Liebl and Schwarz (2010) demonstrated the underdeveloped linkage with foresight and logistic. Often, however, the term foresight, is not treated as a methodical approach to shaping the future, but as a prospective consideration of particular, changing conditions (Nazarko, 2011).

Rezapour et al. (2011) with the team indicate that the process of designing new supply chains must take into account many factors. One of such factors is the presence on the market of competitors providing the same range of services as a designed supply chain. Foresight as defined by the authors is treated as a dynamic approach to the emergence of new competitors on the market. The literal translation means farsightedness, or analysis (in this case) of the possible emergence of new competitors in the long term perspective (Rezapour, Farahani, 2014). Farsighted competition (competition with foresight) allows operators to anticipate their subsequent actions/reactions to the existing or new competitors in order to maintain their market position (Plastria, Vanhaverbeke, 2008).

Research carried out by Förster and the team (2014) was an attempt to connect elements of strategic issue management (SIM) and corporate foresight methodology in the process of support of decisions regarding the future supply chains. As a part of the corporate foresight approach the authors used the Delphi method for the evaluation of 16 projections by 81 experts in the perspective of the year 2030 relating to the strategic supply chain management. The projections were evaluated by experts, taking into account two criteria: the probability of occurrence of a given phenomenon and the importance of the impact of the phenomenon on the functioning of supply chains. The analysed phenomena related to the following areas: technology, product range, consumer demography, e-commerce, sustainability, value-added services, brand loyalty, brand innovation, collaboration, individualization, concept stores, distribution channels, automated ordering, city supply, IT collaboration, legal restrictions. The conducted analyses allowed to select the projections which are most probable and which have the most significant impact on supply chains, and which will arise in the perspective of the year 2030 (Förster et al, 2014). The weakness of the carried out process was treating foresight methods as tool elements, serving as a source of information for the next process, which was the strategic management. Foresight was not treated as a methodical approach to shaping the future, but as an information tool. Such features of the foresight research as participation, commitment, creating a common vision of the future have been insufficiently exposed.

Friesz et al. (2011) points to the need for the application of foresight, understood as a prospective perception in relation to the performance of supply chains, taking into account the emerging unexpected interference of the operational processes.

The aim of the research conducted by Ejdys, Nazarko, Nazarko, Halicka (2015) was to present good practices and potential benefits of using foresight studies in the process of creating the future of the broadly understood transport sector. Issues of mobility, transport and logistics constitute an attractive research area for various kinds of forward-looking activities. The future of moving people and goods from one place to another may be seen as a variable that is heavily dependent on a wide array of heterogeneous factors. This provides a space for an interdisciplinary future-oriented reflection where various economic, social, technological, environmental, political, legal etc. trends and phenomena are taken into consideration (Nazarko, Ejdys, 2011; Ejdys et al, 2015). The authors analysed two types of foresight projects: corporate foresight – realised by the companies from the transport sector and sectoral foresight, referring to the entire logistics and transport sector at various levels, regional, national and global levels. With respect to corporate foresight they pointed out the good practices resulting from the implementation of projects by companies such as Volkswagen and Daimler Chrysler's Society and Technology Research Group. Authors concluded with the indication of the four groups of potential benefits of foresight studies at the sectoral level which include:

- early warning system,
- foresight as a tool of innovation creation,
- creation of current and future image of the organization,
- engagement and participation tool (Ejdys et al, 2015).

At the international level, examples of application of foresight studies relate to attempts of developing scenarios of the development of logistics and transportation in the perspective of the year 2030 in the developing countries: Brazil, Russia, India and China. (Hirschinger et al, 2015). For the purposes of the research process the Delphi method was. The reason for the research undertaken by the authors was recognising the importance of the logistics sector in the development of the analysed developing countries. Directing the foresight research on the logistics sector resulted from the following objective reasons:

- effective and efficient logistics systems should not result only in an increase in the volume of trade but also contribute to the growth of export-oriented foreign direct investment; which will lead to an increase in exports and foreign business,
- limitation of logistics capacity and inefficiency of systems will determine the time and cost of logistics services,
- lack of suitable logistics infrastructure (terminals) and other logistic barriers, such as ineffective procedures will contribute to an increase in uncertainty,
- economies of the developing countries reflect the important connections in the network of global supply chains (Hirschinger et al, 2015).

In the authors' opinion, taking into account the above prerequisites, foresight of the structural and institutional changes and limitations of logistics resources becomes a basic requirement guaranteeing success in international supply chains (Hirschinger et al, 2015).

The executors of research for the needs of the German logistics cluster developed IT tool (IT platform) called foresight support system (FSS) (Keller, Markmann and von der Gracht, 2015). Ultimately, in relation to the logistics sector the FSS system should:

- support the processes of creating, combining and processing the information about the desired future development from the perspective of: government, society and technologies;
- stimulate cooperation among stakeholders, aimed at the development of the innovative and competitive potential;
- motivate and stimulate stakeholders to continuous and systematic use of tools allowing for dealing with the future and the strategic options, and supporting innovative processes;
- integrate various tools and applications;
- serve as an educational instrument about the future and teach the ability of the future management in order to overcome the limitations (Keller, Markmann and von der Gracht, 2015).

In the methodological sphere the authors observed that individual methods of foresight are often used, while combinations thereof are poorly recognised. A combination of methods should be aimed at action-oriented foresight process that is focusing the foresight on activities (Keller, Markmann and von der Gracht, 2015). The classification of foresight methods was suggested by Magruk (2011), taking into account the hybrid approach. The author has allocated foresight methods for 10 classes: normative, creative, consultative, multi-criterial, radar, simulation, diagnostic, analytical, revision, strategic.

3 Foresight classification for supply chain and logistics management purposes

Taking into account the current areas of application of foresight research, research objectives and the results, the author made an attempt at classifying the foresight studies focused on supply chain and logistics management. Classification of foresight studies aimed to identify what kind of foresight can be used by a particular user, in order to meet specific targets.

Foresight research can be implemented taking into account the subjective (who is the executor of foresight studies), and the objective (what processes do the foresight studies relate to) approach. In the first approach, individual entities or entire supply chains, regarded as a network of interconnected and cooperating entities, may be entities implementing the foresight research. In the second approach, foresight may concern the processes implemented within the supply chain such as logistics, including transportation, courier, warehouse services.

Taking into account the current typology of foresight research distinguishing regional, strategic (corporate), sectoral, technology foresight, and business information foresight (Nazarko, 2013; Nazarko et al, 2013; Ejdys, Nazarko, 2014; Ejdys et al, 2015) three additional types of foresight research, relating to the specificity of the area which is the supply chain and logistics management, and going beyond the criteria for classification of foresight study can be distinguished. These types include:

- chain foresight;
- process foresight;
- strategic project foresight.

Foresight focused on supply chain management (*chain foresight*) will be a new type of foresight, not fitting in the current classifications. It is justified with the following reasons:

- supply chains are increasingly global in nature;
- supply chain is created by many entities co-working with each other;
- processes implemented within the supply chains involve many sectors;
- development of supply chains is dependent on the development of different types of technology;
- supply chains are focused on creating value rather than information.

The use of foresight studies for the purposes of the process of improving supply chains will contribute to implementation of the basic functions of supply chains. Features (attributes) of foresight studies are consistent with the supply chains features (Table 1). Common attributes of foresight and supply chains indicate the usefulness of foresight studies applications for the purpose of improving supply chains management processes.

Table 1 Relationships between foresight and supply chain features

Foresight features	Supply chain features
anticipation and projections	customer value (current and expected) creation
participation	cooperation and partnership
social networks	resources sharing, common information systems
vision	common vision, common strategy
decision and actions	integration of key business processes

The *process foresight* proposal results from the fact of implementation of many processes characterized by the specificity (e.g., transport processes, storage, distribution, etc.) under the supply chain. Especially in a very complex situation, complex supply chains, chain foresight may be impossible to carry out. In such a situation, one can concentrate on the processes implemented within the supply chains.

Strategic project foresight refers to the key projects (investment, non-investment) determining the effectiveness and efficiency of new or planned supply chains and logistics processes. An example of this type of projects can be designing of logistic routes (e.g. Silk Road) or designing of new centres and logistics terminals. The aim of this type of research may be searching for business partners, economic integration of the countries participating in the project and obtaining the involvement of all stakeholders convinced of the rightness of the undertaken actions, bringing benefits to all the participants (win-win solution). In particular, with respect to strategic projects characterized by high financial expenditures, long-term perspective taken into account at the stage of planning appears to be necessary.

Table 2 presents an extended classification of foresight studies taking into account the specificity of the area of management of the supply chain and logistics management.

Table 2 Foresight classification for supply chain and logistics management

Foresight performer/user	Technology foresight	Strategic (corporate)	Regional foresight	Sectoral foresight	Business information foresight	Chain foresight	Process foresight	Strategic project foresight
Government (regional)	■		■					
Government (central)	■			■				■
Company	■	■					■	■
Supply Chain (network)						■	■	■
Trade, business, industry associations			■	■	■			■

Source: Authors'.

Conclusion

Taking into account the acknowledged in the literature and used in practice types of foresight projects and various application areas of foresight research, the author has attempted to expand the existing classification of foresight studies with three types taking into account the specificity of determinants of supply chains and logistics processes: chain foresight, the process of foresight and strategic foresight project.

The internal (between participants of supply chains) and external (mainly resulting from globalization processes) conditioning causes the functioning of supply chains to be taking place under the conditions of uncertainty and increased risk. This is caused by the dynamics and complexity of environmental factors. Only early diagnosis of impending changes can prevent the loss of competitiveness at the level of enterprises and supply chains.

Foresight as a tool for early warning, allowing for the identification of weak signals and wild cards while at the same time engaging stakeholders will allow for creating the future image of organization, the supply chain - in the form of alternative scenarios. Shaping of the participatory created future is left to the participants of the foresight process.

Since the conducted studies are theoretical they require direction of further research towards the process of operationalization of the foresight research methodology, aiming at the selection of research methods, selection of experts, identification of the goals and results of the research.

Limitations of the carried out literature studies stem from heretofore narrow achievements in the application of foresight studies in the area of supply chain and logistics management. Subsequent foresight initiatives in the analysed area should enrich the achievements with the solutions of both a theoretical-methodological and practical (in the form for example of good practice) nature.

References

Agrawal, S., Singh, R.K., Murtaza, Q. (2015). A literature review and perspectives in reverse logistics. *Resources, Conservation and Recycling*, 97, 76–92.

Berger, G., Bourbon-Busset, J.d., Massé, P. (2008). *De la prospective: Textes fondamentaux de la prospective fancaise 1955-1966*, Paris: L'Harmattan.

Beske, P., Land, A., Seuring, S. (2014). Sustainable supply chain management practices and dynamic capabilities in the food industry: A critical analysis of the literature. *International Journal of Production Economics*, 152, 131-143.

Drzymalski, J. (2015). A measure of supply chain complexity incorporating virtual arcs. Journal of Systems Science and Systems Engineering, 24(4), 486-499.

Ejdys, J., Nazarko, J., Nazarko, Ł., Halicka, K. (2015). *Foresight application for transport sector*, in: *Clean Mobility and Intelligent Systems*, M. Fiorini, J-C. Lin (eds), London: The Institution of Engineering and Technology, pp. 379-402.

Ejdys, J., Nazarko, L. (2014). Foresight gospodarczy - instrumentem orientacji na przyszłość [Economic foresight as an instrument of a future-oriented strategy]. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu* 340, pp. 651-664.

Estampe, D. (2014). *Supply Chain Performance and Evaluation Models*. London: Tuition House.

Förster, B., Keller, J., von der Gracht, H. A., Darkow, I. L. (2014). Delphi-based strategic issue management: crafting consumer goods supply chain strategy. *International Journal of Physical Distribution & Logistics Management*, 44(5), 373 – 391

Friesz, T. L., Lee, I., Lin, Ch.-Ch. (2011). Competition and disruption in a dynamic urban supply chain. *Transportation Research*, 45, 1212–1231.

Gavigan, J.P., Scapolo, F., Keenan, M., Miles, I., Farhi, F., Lecoq, D., Capriati, M., Di Bartolomeo, T. (2001). *A Practical Guide to Regional Foresight*, Report EUR 20128 EN, Foresight for Regional Development Network (FOREN), European Communities. Retrieved from http://foresight.jrc.ec.europa.eu/documents/eur20128en.pdf.

Giannoccaro, I. (2015). Adaptive supply chains in industrial districts: A complexity science approach focused on learning. *International Journal of Production Economics*, 170, B, 576–589.

Gunasekaran, A., Subramanian, N., Rahman, S. (2015). Supply chain resilience: role of complexities and strategies. *International Journal of Production Research*, 53(22), 6809-6819, doi: 10.1080/00207543.2015.1093667.

Halicka, K., Lombardi, P. A., Styczynski, Z. (2015). Future-oriented analysis of battery technologies, *Proceedings of the IEEE International Conference on Industrial Technology (ICIT*), 16, 1019-1024, doi: 10.1109/ICIT.2015.7125231

Halicka, K. (2014). Designing routes of development of renewable energy technologies, *Procedia - Social and Behavioral Sciences*, 156, 58-62, doi: 10.1016/j.sbspro.2014.11.119 10

Hirschinger, M., Spickermann, A., Hartmann, E., Von Der Gracht, H., Darkow, I.-L. (2015). The future of logistics in emerging markets—Fuzzy clustering scenarios grounded in Institutional and Factor-Market Rivalry Theory, *Journal of Supply Chain Management*, 51(4), 73-94, doi: 10.1111/jscm.12074.

Kanat, S., Atilgan, T. (2014). Effects of Knowledge Management on Supply Chain Management in the Clothing Sector: Turkish Case. *Fibres & Textiles in Eastern Europe*, 22(1), 9-13.

Keenan, M., Miles, I. (2001). *A Practical Guide to Regional Foressight*. Seville: Institute for Prospective Technological Studies, FOREN Network.

Keller, J., Markmann, Ch., von der Gracht, H. A. (2015). Foresight support systems to facilitate regional innovations: A conceptualization case for a German logistics cluster. *Technological Forecasting & Social Change*, 97, 15–28.

Liebl, F., Schwarz, J. O. (2010). Normality of the future: trend diagnosis for strategic foresight. *Futures*, 42(4), 313-327.
Magruk, A. (2011). Innovative classification of technology foresight methods. *Technological and Economic Development of Economy*, 17, 700-715.
Mangiaracina, R., Marchet, G., Perotti, S., Tumino, A. (2015). A review of the environmental implications of B2C e-commerce: a logistics perspective. *International Journal of Physical Distribution & Logistics Management*, 45(6), 565 – 591.
Markmann, Ch., Keller, J., von der Gracht, H., Kroehl, R., Mauksch, S., Spickermann, A., de Lorenzis, G., Kaffe, V., Münnich, M., Stillings, Ch., Foltin, E. & Baciu-Gotter M. (2013). The Competitiveness Monitor as an Innovative Foresight Support System for Mobility, Logistics and Beyond. *Efficiency and Logistic*, U. Clausen, M. ten Hompel, and M. Klumpp (Eds.), Berlin Heidelberg: Springer-Verlag.
Martin B. R. (1995). Foresight in science and technology. *Technology Analysis & Strategic Management*, 7(2), 139–168.
Melnyk, S. A., Lummus, R. R., Vokurka, R. J., Burns, L. J. and Sandor, J. (2009). Mapping the future of supply chain management: a Delphi study. *International Journal of Production Research*, 47(6), 4629-4653.
Miles, I. (2002). *Appraisal of Alternative Methods and Procedures for Producing Regional Foresight, Contribution to: Mobilising the Regional Foresight Potential.* 5. Retrieved from http://pl.scribd.com/doc/36405036/Appraisal-of-Alternative-Methods-for-Foresight#scribd.
Morana, J., Gonzalez-Feliu, J. (2015). A sustainable urban logistics dashboard from the perspective of a group of operational managers. *Management Research Review*, 38(10), 1068-1085.
Nazarko, J. (2011). Kształtowanie polityki proinnowacyjnej regionu np. foresightu technologicznego «NT FOR Podlaskie 2020» [Shaping pro- innovative policy of the region, case study of technology foresight «NT FOR Podlaskie 2020»]. *Optimum – Studia Ekonomiczne*, 2, 241- 251.
Nazarko, J. (2013). *Regionalny foresight gospodarczy. Metodologia i instrumentarium badawcze*, Warszawa: ZPWiM, 122.
Nazarko, J., Brzostowski, N., Ejdys, J., Glińska, E., Gudanowska, A., Halicka, K., Kononiuk, A., Kowalewska, A., Krawczyk-Dembicka, E., Łojkowski, W., Nazarko, Ł., Urban, W., Paszkowski, J., Pawluczuk, A., Skorek, A., Wasiluk, A. (2013b). *Podlaska strategia rozwoju nanotechnologii do 2020 roku. Przełomowa wizja regionu [2020 Strategy of Nanotechnology Development in Podlaskie]*. Rozprawy Naukowe Nr 246, Biblioteka Nauk o Zarządzaniu, Białystok: Oficyna Wydawnicza Politechniki Białostockiej, p.133.
Nazarko, J., Ejdys, J. (Eds.). (2011). *Metodologia i procedury badawcze w projekcie Foresight Technologiczny NT for Podlaskie2020: Regionalna strategia rozwoju nanotechnologii [Methodology and Research Procedures in Technology foresight "NT FOR Podlaskie 2020". Regional strategy of nanotechnology development]*. Bialystok: Bialystok: Oficyna Wydawnicza Politechniki Białostockiej
Nazarko, J., Glinska, U., Kononiuk, A., Nazarko, L. (2013a). *Sectoral foresight in Poland: thematic and methodological analysis. International Journal of Foresight and Innovation Policy*, 9(1), 19-38.
Pei, XB., Jia, DF. (2015). *Study on the way of Low Carbon of the Manufacturing Logistics System*, Proceedings of the 2015 International Conference on Education, Management and Computing Technology. Advances in Social Science Education and Humanities Research, 30, 1698-1702.
Plastria, F, Vanhaverbeke, L. (2008). Discrete models for competitive location with foresight. *Computers & Operations Research*, 35, 683 – 700.
Postnord. (2014). E-commerce in Europe 2014, Postnord. Retrieved from http://www.postnord.com/globalassets/global/english/document/publications/2014/e-commerce-in-europe-2014.pdf.
Ravi, V., Shankar, R. (2005). Analysis of interactions among the barriers of reverse logistics. *Technological Forecasting & Social Change*, 72, 1011–1029.
Rezapour, S., Farahani, R. Z. (2014). Supply chain network design under oligopolistic price and service level competition with foresight. *Computers & Industrial Engineering*, 72, 129–142.
Rezapour, S., Farahani, R. Z., Ghodsipour, S. H., Abdollahzadeh, S. (2011). Strategic design of competing supply chain networks with foresight. *Advances in Engineering Software*, 42, 130–141.
Rohrbeck, R. (2010). *Corporate Foresight: Towards a Maturity Model for the Future Orientation of a Firm*. Heidelberg: Springer.
Rohrbeck, R., Battistella, C., Huizingh, E. (2015). Corporate foresight: An emerging field with a rich tradition. *Technological Forecasting & Social Change*, 101, 1–9.
Rostamzadeh, R., Govindan, K., Esmaeili, A., Sabaghi, M. (2015). Application of fuzzy VIKOR for evaluation of green supply chain management practices. *Ecological Indicators*, 49, 188-203.
Sodhi, M. S. (2003). How to do strategic supply-chain planning. *MIT Sloan Management Review*, 45, 69–75.

Szymczak, M. (2015). *Ewolucja łańcuchów dostaw*, Poznań: Uniwersytet Ekonomiczny w Poznaniu.
Thode Filho, S., Saldanha Machado, C.-J., Vilani, R.-M. Laudelina Paiva, J., da Costa Marques, M.-R. (2015). The Reverse Logistics and National Policy of Solid Waste: a challenges to the brazilian reality. *Revista Eletronica em Gestao Educacao e Tecnologia Ambiental*, 19(3), 529-538.
Vahabzadeh, A. H., Asiaei, A., Zailani, S. (2015). Green decision-making model in reverse logistics using FUZZY-VIKOR method. *Resources, Conservation and Recycling*, 103, 125-138.
von der Gracht, H. A., Darkow, I.-L. (2013). The future role of logistics for global wealth – scenarios and discontinuities until 2025. *Foresight*, 15(5), 405 – 419. http://dx.doi.org/10.1108/FS-05-2012-0031
von der Gracht, H. A., Vennemann, R., Darkow, I.-L. (2010). Corporate Foresight and Innovation Management: A Portfolio-Approach in Evaluating Organizational Development. Futures. *The Journal of Policy, Planning and Futures Studies*, 42(4), 380–393.
Wamba, S. F., Akter, S., Tim, C., Engai, E. W. T. (2015). Guest editorial: information technology- enabled supply chain management. *Production Planning & Control*, 26(12), 933-944.
Witkowski, J. (2003). *Zarządzanie łańcuchem dostaw. Koncepcje, procedury, doświadczenia*, Warszawa: PWE.
Xia, Y., Tang, T. (2011). Sustainability in supply chain management: suggestions for the auto industry. *Management Decision*, 49(3-4), 495-512.