

University of Warmia  
and Mazury in Olsztyn

**FINANCE**  
**and MANAGEMENT**

Volume 3 • Number 1  
2018

ISSN 2451-3903 (online)

**Finance and Management** (ISSN 2451-3903) is published two times a year (June, December) by Faculty of Economic Sciences, University of Warmia and Mazury in Olsztyn.

The Journal is available on the websites: <http://www.uwm.edu.pl/wne/fm.php>

Publishing in Finance and Management: please see our website, <http://center.uwm.edu.pl/fmj/> for manuscript preparation and submission guidelines.

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#### 7 Good Practices Implementing in Transport of Goods in the City

*Joanna Nowakowska-Grunt, Mateusz Chłąd*

The city logistics, characterized by interdisciplinary character, has a huge impact on economic, ecological and social factors that improve the city, leading to improvement of the quality of its inhabitants' life. The consequence of such a state is the application of logistics management methods, rules and procedures in the management of the urban system. Among these needs, the requirement of smooth movement and the possibly free access to a wide range of consumer goods, as well as resources, are of particular importance. Hence, the implementation of city transportation functions is currently one of the key challenges for decision-makers. Taking into account all the objectives of stakeholders present in cities and linking them with the tasks that logistics management imposes on them it is a complicated and very complex process. This is mainly due to the fact that problems and time-consuming implementation of appropriate solutions improving the flow of goods are noticed.

#### 18 Development Trends of Electronic Trade at Stock Exchange Market

*Nadiia P. Reznik*

The paper discusses about influence of algorithmic trading on the stock exchanges. Speculates about high-frequency trade as a component of algorithmic trading, chooses its advantages and disadvantages. Competently constructed methodology and technology of the game help to receive a profit without defeats. IT-technologies play one of the leading parts. The speed of any of the trading platforms and the wide spread of the Internet are essential and important factors in modern trade. Every second can become decisive in Internet-trading. Creating new, developing and improving existing Internet-technologies will surely lead to even greater mobilization of investors in the future. Traders should use server-based platforms to minimize technical failures. The biggest advantage of high-frequency trade and algorithmic trading is to cover weak sides of human, but it needs constant monitoring.

#### 29 Management of Defective Products on the Example of the Household Appliances Industry

*Marta Starostka-Patyk, Monika Strzelczyk*

The main purpose of the article was to present issues related to the management of defective products on the example of the household appliances industry. The first part of the work presents issues regarding the reverse logistics concept, with particular emphasis on its implementation in the area of reverse flow management in enterprises. Subsequently, the concept of management of defective products with the indication of examples of products included in this group was discussed. Then, the Polish household appliance industry was characterized. In the further part of the work, the results of own research carried out using the questionnaire method are also presented. They allowed to verify specific research hypotheses. The importance of the management of defective products concept in enterprises is

particularly important in the context of ensuring sustainable development. In spite of this, there are some barriers in the surveyed enterprises of the household appliances industry that limit or prevent the introduction of this idea. These barriers include, first of all, the lack of interest in this type of management activity, as well as the lack of competence of the staff. Correction of these barriers may bring tangible results, as the results of the conducted research indicate that the implication of the management of defective products concept may positively affect the achievement of the organization's goals. After analyzing data from questionnaires, it should also be pointed out that defective products in the surveyed organizations are mainly damaged goods, parts of products, waste and by-products, and packaging. The mentioned products in the majority are recycled, scrapped or recovered from components, and raw materials used for further production.

#### **40 Supply Chain Management – the Case Study of the Company from Dairy Industry**

*Anita Nowakowska*

The purpose of this paper is to clarify the issues related to logistics supply chain management on the example of the chosen cooperative. Activities in the supply chain are complex processes that are necessary to meet customer requirements. At the present time, the key aspect is effective co-operation and continuous improvement throughout the supply chain, starting with the purchase of raw materials through the production and distribution of finished products. Choosing the right suppliers of raw materials, proper transportation, production technology, distribution, quality care of the products gives an important aspect for the company to function properly.

### **PART 2**

#### **58 REVIEW OF THE BOOK “Raw Material Market and Bank Risk (in Terms of Market Risk and Credit Risk)” by Bogdan Włodarczyk**

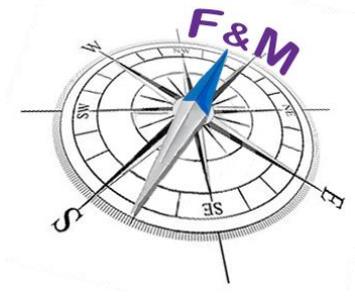
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# **Finance and Management**

Journal of the Faculty of Economic Sciences  
University of Warmia and Mazury in Olsztyn

**2018 Volume 3(1)**

## **PART I**

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**Original**

**Research**

**Papers**



## **GOOD PRACTICES IMPLEMENTING IN TRANSPORT OF GOODS IN THE CITY**

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**Abstract.** The city logistics, characterized by interdisciplinary character, has a huge impact on economic, ecological and social factors that improve the city, leading to improvement of the quality of its inhabitants' life. The consequence of such a state is the application of logistics management methods, rules and procedures in the management of the urban system. Among these needs, the requirement of smooth movement and the possibly free access to a wide range of consumer goods, as well as resources, are of particular importance. Hence, the implementation of city transportation functions is currently one of the key challenges for decision-makers. Taking into account all the objectives of stakeholders present in cities and linking them with the tasks that logistics management imposes on them it is a complicated and very complex process. This is mainly due to the fact that problems and time-consuming implementation of appropriate solutions improving the flow of goods are noticed.

**Keywords:** transport of goods, city logistics, good practices, benchmarking

**JEL Classification:** H76, R42

### **1. Introduction**

Implementation of the objectives of implementing new solutions for goods transportation allows for the introduction of solutions adapted from various European programs, which will reduce pollution, improve transport, increase satisfaction of city residents and what is the most important, that is, delivering goods and services on time at certain costs. One of the leading programs is BESTUFS, implemented in several European cities, where it is possible to present solutions supporting the above-mentioned factors. BESTUFS – The Best Urban Freight Solutions is the thematic network established by DGTREN under the 5th Framework Program. The network coordinator is PTV, and the partners are: ARRC, NEA, Rapp Trans, recently joined by: CDV and Transman. BESTUFS does not focus on research activities, but on the exchange of best practices regarding urban freight transportation within the network, i.e. with practitioners, experts, the academic environment and legislative bodies (Iwan 2014).

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## 2. Examples of good practices

As a part of the mentioned project, workshops are organized on the goods transportation in the city, presentations and manuals of best practices are published, and activities related to compiling EU research reports are carried out, which are then presented at local, national and EU levels. These factors are obviously possible to adapt in Polish cities, where Szczecin is the leading example. Szczecin has introduced the solutions allowing reduction of CO<sub>2</sub> such as introduction of transport alternatives and turn to the resident as a person accepting the development of freight transport in the city in the 21<sup>st</sup> century (Małeckki, Kijewska, Iwan 2014), (table 1).

Table 1. Examples of good practices – BESTUFS

<b>BESTUFS</b>	
<b>Plane: Access, unloading and loading of delivery vans in urbanized areas</b>	
<i>Solutions</i>	<i>Examples</i>
Effective use of infrastructure	Managing the operation of road infrastructure, zones or loading bays for commercial traffic, IT solutions and communication technologies combined with mechanical access gates or variable road signs, optimization of operational efficiency by enterprises servicing the city, reduction of negative environmental impact, interdisciplinary cooperation (planners, urbanists, operators, and road managers), and legal regulations.
Rules for access and loading of delivery vehicles in urban areas	Marking, truck traffic, maps and city information, loading bays, nearby delivery areas (ELP), urban consolidation centers, regulations on weight and size of the vehicle, regulations on entry times, development and enforcement of access and delivery rules, environmental zones / standards emission of harmful substances, night supplies, lanes for heavy vehicles, road toll systems.
Technologies in urban freight transport	Technologies supporting Intelligent Transport Systems (ITS), such as telematics (on-board devices), global positioning system (GPS), smart cards and finally variable message signs. In this case, one should be highlight, both freight transport management systems (computer route planning and delivery scheduling, navigational control systems, time window booking systems) and urban traffic management systems (UTMC, VMS, UTC, sensors of occupied parking spaces, maps and signposts).
Environmentally friendly vehicles	Environment-Friendly Vehicles (EFV) are used in urban transport mainly in Western European countries. The development of such innovative ideas is supported by public institutions. It is a new technology and largely an innovation. Use of alternative fuels, filters, emission standards, electric and hybrid vehicles. Initiatives in this area already implemented in several European cities can serve as a good practice in the field of urban logistics (e.g. Spain, the Netherlands, France, Great Britain, Switzerland, Germany, Sweden, and Denmark).
Legal regulations	Introduced to ensure compliance with regulations and protect cities against unnecessary transport. Transport systems should be designed in such a way that legal interference is minimal, based on cooperation with operators, understandable and monitored.

table 1 – cont.

Public-private partnership (PPP)	Examples and solutions of PPP are based on mutual benefits. Well-prepared can bring synergy effects and increase the effectiveness and efficiency of enterprises. The important role of the administration: coordination, dissemination, control, monitoring.
Deliveries especially for retailers and end consumers	Possible development and necessity of interest in urban logistics solutions due to the development of e-commerce, and the increase in the number of "single" parcels delivered to the city. Solutions: home delivery (home, work place, boxes, parcel lockers, points and collection banks), the need to match the vehicle to non-standard dimensions and different types of goods (change of the supply structure), usually provided by one employee of the company, fragmentation of orders and deliveries, solutions they eliminate intermediaries.
MCK – consolidation centers	Definitional diversity: public distribution, central sorting of goods, a city reloading center. Shared urban handling center, cargo platforms, shared goods distribution systems by various entities, consolidation center (sometimes dedicated to a specific industry branch, e.g. construction), a municipal distribution center, a logistics system municipal, logistics center, delivery / receipt point, suburban logistics support center, logistics village. In general, the logistics base servicing the city, examples of good practice (mostly managed from the operators' funds): Great Britain, France, and Switzerland. They affect better supply chain organization, impact on storage, pre-sales service, qualitative and quantitative verification of products, returns handling, cost reduction.

Source: Own elaboration based on BESTUFS

At this stage of the program analysis, it is possible to think what cities can gain by learning good practices (Iwan 2013). European variants allow to specify the expectations of contemporary recipients of goods and services, including city customers (Jaroszyński 2010). On the extremely specialized market at the moment, the flexibility of supply is important while maintaining the quality of the range and the performance of services at a given time (Strzelczyk 2013). Many customers are able to make additional payments to present a standard that will satisfy them (Grondys, Kott, Sukienik 2017). The availability of supplies in the city in this aspect is possible to implement when planning the appropriate time corridors (Kiba-Janiak 2016). The demand for a high level of supply, considered in accordance with the above aspects, is related to the precise optimization of all necessary operations from loading to unloading (Russoa, Comib 2012), (figure 1).

The concept of sustainable development, which primarily deals with the analysis of the causes of over-exploitation and destruction of the environment, defines a strategy to limit this process in three main areas: environmental, economic and social, for example:

- economic factor related to congestion, low efficiency and waste of resources,
- environmental factor taking into account the emission of pollutants,
- social factor, i.e. the physical flow of gas emissions, public health (Chamier-Gliszczyński, Krzyżyński 2011).

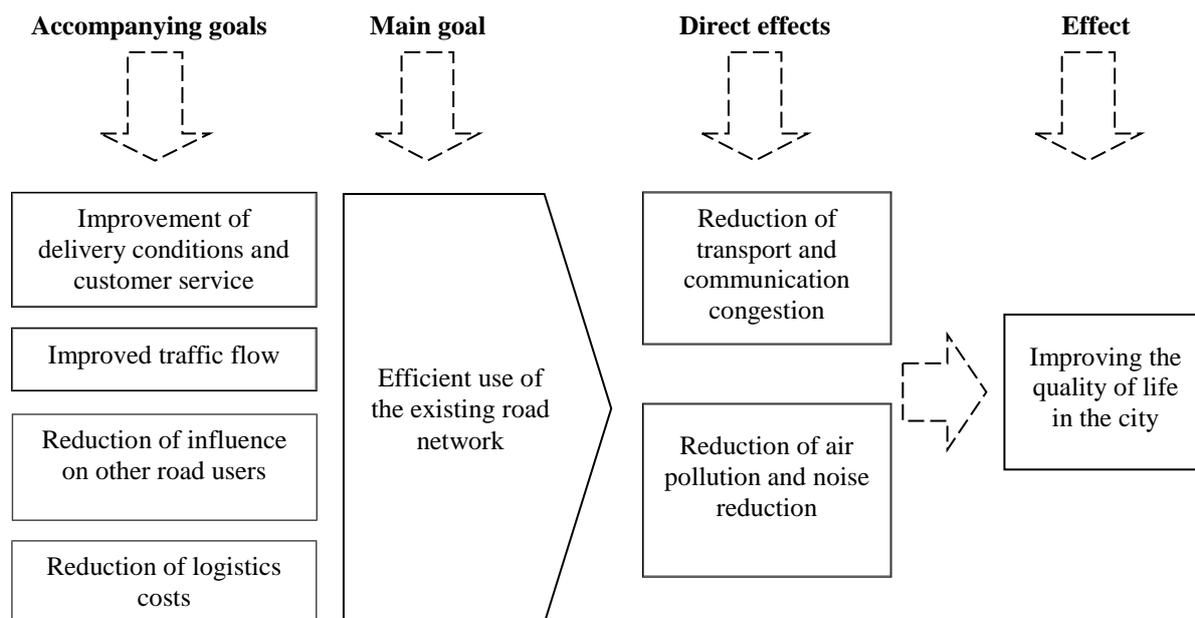


Figure 1. The goals and effects of managing the flows of goods in the city

Source: Own elaboration based on (Wydro 2005).

Effective use of infrastructure in the city area allows to observe the movement of vehicles and findings in the meaning of alternatives to the inability to develop road infrastructure. To manage the operation of infrastructure, the use of commercial bays, which improves the working conditions of transport operators and allows to reduce the negative impact of their operations, may already contribute to the use of the commercial traffic, which has already been applied in some European cities. Recently, simplified information and IT solutions have been introduced allowing for the technological mechanization of connection with signs and cargo gates tailored to cities where there are infrastructural conditions for the transport of goods (Krajewska, Łukasik 2017). Some cities give not only changes within the infrastructure at this stage, but also those that give a specific value, e.g. loading zones on which storage or transshipment is carried out (Dembińska-Cyran 2009). The efficiency and reliability of the supply system should support the city's economic system, and its organization should be taken care of by all who influence the shape of the city and its transport system. The main factors that should pay attention to the above mentioned goals can be (Iwan 2013):

- the least adverse impact on the environment and the surrounding cars performing orders,
- cooperation of authorities, transport organizers and all other entities involved in this process to make an effective and reliable organization,
- the influence of urban planners on the flow of cars,
- optimization of operational efficiency of transport companies for environmental protection,
- implementation of rules and legal steps in the economy, transport environment.

The presented goals of implementation of efficient use of transport infrastructure are presented in table 2.

Table 2. The goals of efficient use of transport infrastructure

The purpose of accessibility	The variant of accessibility
Support from the transport industry in developing strategies and creating transport initiatives	Partnership and cooperation with freight transport.
Improving continuity in the transport journey	Marking and telematics of urban transport. Mapping and aggregate information. Introduction of road tolls. Introduction of night supplies.
Support in the implementation of transport goals for drivers of delivery vehicles	Introduction of belts for delivery vans and lorries on the example of buses. Marking and telematics of urban transport. Mapping and aggregate information. Introduction of belts for delivery vans and lorries on the example of buses. Municipal consolidation cents. Regulations related to the weight of vehicles and sizes.
Supporting transport companies at the place of delivery and loading	Organization of roadside loading bays. Local Unloading Zone. Municipal consolidation centers. Regulations related to the weight of vehicles and sizes.
Reduction of harmful factors affecting the environment and the risk of road collisions resulting from the share of transport vehicles	Regulations regarding the time of entry. Permission for night unloading. Zone protection. Introduction of belts for delivery vans and lorries on the example of buses.
	Encourage the use of ecological vehicles. Introduction of sanctions and penalties.

Source: Own elaboration based on BESTUFS

When implementing any changes, city authorities should be sure that they are correct and understandable for both transport companies and residents. They also need to be checked and analyzed in terms of compliance with constituted as well as local, national and international law. An example here may be the signage to explain the rules to drivers through clear and legible horizontal signs, as well as vertical signs (Dębowska-Mróz, Kacprzak, Olszowski 2017). Introduction of time signaling and information about orders and prohibitions in force in relevant time zones in the city. The implementation of the labeling system can be met by:

- warning and informing drivers about road regulations, changes resulting from temporary restrictions, not suitable roads for transport vehicles,
- informing drivers about the possibilities and conditions of parking on the streets,
- anticipating and responding to road congestion and attempting to drive vehicles for detours,
- the use of real information by the city authorities regarding the signs and their current status (Białek 2007; Szoltysek, Jaroszyński 2009).

In order to avoid entry of heavy goods vehicles into unsuitable places, it should be then suggested to impose or even impose a change of route or passage. Therefore, the use of more comprehensive tools allowing for quick response and ensuring satisfaction of all parties.

There is a very long time of mapping and municipal information consisting in providing the right amount of valuable information for drivers and transport companies in order to properly organize the transport route (COM 2006). In some cases, also a quick reaction to forced changes of routes, road congestion or collision. This information is real, current and free, it satisfies transport companies and encourages compliance with these rules (Szołtysek 2008).

Because of this, the important element is the designation in the city of loading bays located at the street, in places where there is heavy traffic of trucks and there is no possibility of loading and unloading at the target location. The stopping of vehicles in the loading bay forces transport companies and drivers to respect appropriate time zones allowing them to perform a given activity. All formalities must be carried out quickly and efficiently so as not to delay further deliveries.

The organization of such processes facilitating loading and unloading forces all parties to comply with the rules of delivery time regulations. Here the distinguished is two types of such information (OECD 2004):

- temporary entry restrictions,
- temporary restrictions on loading and unloading.

The time limit for entry of heavy goods vehicles is one of the key most used tools used in supply planning. These regulations are aimed at limiting the traffic of trucks at the right time and in a specific place. Restrictions may apply to all delivery vehicles, taking into account area or road bans "sensitive" to traffic including (Borys 2009):

- shopping areas and pavements,
- residential streets,
- entire housing estates.

All implementation processes can be implemented based on an approach focused on developing the foundations of new solutions, as well as focused on solutions already tested and implemented. In the case of the adaptation process, an important role is played by the adjustment process related to the specificity of the implemented solution in terms of the natural environment (Szołtysek 2007) . Such solutions relate primarily to changes in the scope of tasks and ways to perform them and a structural relationship with the addition, subtraction and exchange of organizational structure elements and modifications at the stage of changes occurring between them (Witkowski 2007). By checking and verifying EU projects, it is possible to see the consequences of the adopted assumptions. Adaptation can be used as a solution to best practices. This approach is noticeable in adjusting urban mobility as an IT and information tool that allows for quick response in appropriate situations for the transport of goods.

### **3. Benchmarking**

Sustainability understood in terms of practice is the way to meet the problems of measurability and the evolution of good practices. The life cycle will cause the universality or sometimes limited character of the system of introducing the practice in specifying barriers. There should be taken into account the solutions and methods obligated in the structure that refer to the social, economic and environmental element in relation to the internal and external

factors affecting the target element (Kaszubowski 2011). This consists in the concept of benchmarking as an exploration process in order to implement the basic assumptions of good practices (table 3).

Table 3. Reference of benchmarking to the plane of transport of people and loads in cities

<b>Benchmarking</b>	
<b>Public transport</b>	<b>Freight transport</b>
implementation of a wide range of communication needs: absolutely obligatory, obligatory, optional and incidental, which determines its role in the functioning of the city's social and economic system	reduction of unnecessary, uncoordinated transport
the statutory obligation to ensure the availability of collective transport services by self-governments at various levels, treatment of public transport - especially quality, accessibility and costs of services as a criterion for assessing the efficiency of self-government institutions	limitation of congestion
the structure of the system is very transparent and concentrated - the coordination of collective transport services by the organizer appointed by the local government unit or through a municipal entity performing organizational and transport tasks	reducing costs, both for individual links in the supply chain, as well as external costs
the deficit of public transport, which is only a partial coverage of operating costs with revenues from the sale of services; this should lead to the optimal use of financial and technical resources	using proven methods of organizing logistic systems adapted to the specificity of the city's functioning as a socio-economic system
in the case of efficient management of the collective transport system - ongoing quality control of services performed by carriers and the study of residents' preferences and transport behavior	creating comprehensive solutions tailored to specific needs and conditions
easy to determine the spatial extent of transport activity, defined by the location of stops, stations, interchange nodes, bus-belts, the location of rail transport infrastructure or the arrangement of bus lines	continuity of service provision, which facilitates collection and comparing data

Source: Own elaboration based on (Iwan, Kijewska 2014).

Within these areas there can be pointed out the criteria for assessing and comparing activities targeting public transport and delivery. Using the indicators presented in the Urban Transport Benchmarking Initiative report<sup>2</sup>, the Common Indicator Report, it can be pointed out that the elements that can be assessed and compared with the best are:

- • general indicators (concerning the city and the region),
- • indicators concerning the transport network,
- • fleet indicators,
- • transport characteristics,
- • economic indicators,
- • security indicators,
- • environmental indicators.

<sup>2</sup> <http://www.transport-research.info/project/urban-transport-benchmarking-initiative>

There is an ability to make assumptions that are binding in relation to the following premises when selecting good practices for urban freight transport:

- paying attention to technology from a wider perspective,
- good urban practices in freight transport, taking into account the whole supply chain, taking into account, of course, limitations in the implementation of assumptions in the areas (Szołtysek 2007),
- focus on the clients while maintaining their high satisfaction,
- focus on environmental protection and protection of natural resources (Schrank, Lomax 2007).

Table 4. Criteria for selecting data in benchmarking

Criterion	Characteristic
collection	not all necessary data is collected
availability	not all data that is collected is available; this applies in particular to data held by private companies
generality	there is often a lack of information about already collected data
utilization	available data is not always used in the right way
interpretation	the data used may be misinterpreted; the most common problems are accuracy and comparability
accuracy	the accuracy of the collected data is of particular importance in the case of small differences in results or when changes in value are analyzed over time; the accuracy of the data must be able to accurately reflect trends
comparability	differences can occur in the way data is defined, grouped and presented
complexity	the data does not necessarily reflect all aspects of the system under analysis; it is necessary to collect the possible wide range of data related strictly to the analyzed part of the system indicated as a key factor for its effectiveness
topicality	data should be the most up-to-date in order to reflect current changes

Source: Own elaboration based on (Kaszubowski, 2011)

Deliveries of the last kilometer are one of the main elements of the increased traffic of delivery vehicles throughout the city. The basic features that reduce the rational functioning of the transport system are the degree of fragmentation and the low level of utilization of the loading area. The importance of such supplies increases with the interest of shopping (Iwan 2015). Electronic commerce is currently the most important factor in the field of shopping. That is why new solutions are being developed to support deliveries. A favorable solution for limiting the transport of consolidation and the use of cargo space in full class are the collection banks (Kaszubowski 2011). This favors the system of delivery and collection by the customer. This premise is possible in the implementation of several key elements, such as time, synchronization, efficiency, quality and availability (Brzozowska-Woś 2014).

Most entrepreneurs operating in the area of urban freight transport consider the maximization of profit as the key activity. The managers do not notice long-term effects of unfavorable impact on the urban environment, which usually results in a negative impact on the economic account of the given enterprise. For this reason, activities aimed at improving

awareness in this area and enabling selection and implementation of solutions allowing implementation of the aforementioned postulates in practice based on cooperation and seeking a consensus (Nowakowska-Grunt, Chład, Sośniak 2017) are of particular importance. One of such solutions is the partnership for the quality of freight transport, which is an agreement aimed at the development of a sustainable and efficient cargo transport system within urban areas. In the 1990s, urban consolidation centers began to function, based on these assumptions, but in many cases these were unsuccessful ventures, ending in partial or total failure (Kaszubowski 2011). It is only in recent years that this type of partnership has started to take on greater significance. This concept has been very well received in the UK, where urban logistics problems have been studied for many years and where many effective implementations of solutions to eliminate the negative impact of freight transport on urban structures have been achieved. Its main tasks include (Łukomska-Szarek 2016):

- increasing the level of knowledge,
- understanding cargo transportation problems,
- promotion of good practices and effective solutions, taking into account the needs of individual stakeholders in terms of the availability of goods and services, as well as environmental and social conditions.

An agreement of this type usually connects many stakeholders interested in improving certain activities in urban freight transport. Most often these are supply companies and distributors, local authorities, local business, local communities, environmental protection organizations and other institutions, such as, for example, institutions and research centers (Kiba-Janiak 2015). The partnership activities usually allow for spreading the costs of implementing the adopted concepts to improve urban freight transport between the interested parties. Sustainable urban freight transport is today a major challenge for European cities (Iwan 2015).

#### **4. Conclusion**

The city authorities should take into account several key observations when preparing possible solutions for the distribution of goods in the city. First of all, the actions envisaged in the projects should be part of the local development strategies. When preparing the project, a "business plan" should be developed, which will cover both the period of financing the venture from EU funds and the subsequent period. When developing such plans, cooperation between individual stakeholders of urban freight transport is necessary, e.g. in the form of public-private partnerships. Business managers are reluctant to refer to changes. The conviction for new pro-ecological behavior should be supported by financial and advisory support as well as a promotional campaign indicating the benefits that the company will receive (Szołtysek 2008). Each enterprise wants to survive on the market and the managers, taking decisions, take into account primarily the economic calculation. In practice, this usually means choosing cheaper solutions even more harmful to society. Managers must therefore be convinced that it may be cost-effective to consider sustainable transport assumptions. Overcoming all resistance with regard to the implementation of new, more

environmentally friendly behaviors should be supported by local solutions based on restrictions.

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# DEVELOPMENT TRENDS OF ELECTRONIC TRADE AT STOCK EXCHANGE MARKET

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**Abstract.** The paper discusses about influence of algorithmic trading on the stock exchanges. Speculates about high-frequency trade as a component of algorithmic trading, chooses its advantages and disadvantages. Competently constructed methodology and technology of the game help to receive a profit without defeats. IT-technologies play one of the leading parts. The speed of any of the trading platforms and the wide spread of the Internet are essential and important factors in modern trade. Every second can become decisive in Internet-trading. Creating new, developing and improving existing Internet-technologies will surely lead to even greater mobilization of investors in the future. Traders should use server-based platforms to minimize technical failures. The biggest advantage of high-frequency trade and algorithmic trading is to cover weak sides of human, but it needs constant monitoring.

**Keywords:** high-frequency trading, algorithmic trade, stock exchange, securities information processor, alternative trading system, market pricing, stock exchange quotation

**JEL classification:** F31, B17

## 1. Introduction

The frontier between algorithmic and high-frequency trade (HFT) is rather blurry, although this is not the same. Algorithmic trading is based on the programming of special systems, which, with the appearance of specific combinations, automatically open and close deals, while high-frequency trade performs these processes at maximum speed.

Algorithmic trade can be considered as a strategy for the rapid acceptance and implementation of investment decisions with the help of algorithms that trade without human intervention, and high-frequency trade – as a part of this strategy.

U.S. Commodity Futures Trading Commission (CFTC) offered a seven part test for what constitutes an HFT (Brush 2011):

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- The use of extraordinarily high-speed order submission/cancellation/modification systems with speeds in excess of five milliseconds or generally very close to minimal latency of a trade;
- The use of computer programs or algorithms for automated decision making where order initiation, generating, routing, and execution are determined by the system without human direction for each individual trade or order;
- The use of co-location services, direct market access, or individual data feeds offered by exchanges and others to minimize network and other types of latencies;
- Very short time-frames for establishing and liquidating positions;
- High daily portfolio turnover and/or a high order-to-trade ratio intraday;
- The submission of numerous orders that are cancelled immediately or within milliseconds after submission;
- Ending the trading day in as close to a flat position as possible (not carrying significant, un-hedged positions overnight).

Companies have the opportunity to attract additional funding to increase the profitability of its activities in the stock market. Stock exchanges should have become a place where the demand and supply of securities are concentrated, agreements are concluded in accordance with the established rules and the exchange rate is formed. However, after the emergence of various intermediaries, the stock market has been broken into a large number of segments, and its structure has become much more complicated.

## **2. Analysis of recent research and publications**

Different aspects of algorithmic trading and peculiarities of high-frequency trade are represented in recent publications by prominent authors. A careful study of the world economists discussing IT technologies on the stock-exchange market shows that there are two main focuses in this field. The first one chooses advantages of high-frequency trade (Rishi K. Narang 2009; Jones C. 2013; Hendershott T., Riordan R. 2012; Boehmer E., Fong K., Wu J. 2018; Gerig A. 2015). Scientists argue that using of IT technologies is a step for future of stock-exchange market because computers help to cover emotions and weakness of humans. Furthermore, scientists have proved that new technologies for transmission of information about stock-exchange market helps appearance new age of trade. The positive influence of algorithmic trading on the market is confirmed in the works of A. Gehrig and K. Jones. High-frequency traders due to the possibility of ultra-fast response to emerging news directly contribute to the growth of information efficiency of markets. As A. Gehrig (2015) has shown, the sequence of pricing of assets also improves, the prices become more synchronized, and that is, the change in the price of one instrument is more quickly reflected in changes of the prices of other assets. The analysis of 42 markets conducted by E. Boehmer, K. Fong and J. Woo (2018), demonstrated that the more casual the price change appear with the more intensive the algorithmic trading operations, which indicates the improvement of the parameters of market efficiency. Confirmations of the positive influence of robot trade on liquidity are noted in the work of T. Hendershott and R. Riordan (2012). "Inside the Black Box" of Rishi K. Narang details the work of hedge funds in the field of quantitative trading.

Initially, the book is aimed at investors who doubt whether to invest their finances in such a "black box" (2009). Despite of the seeming irrelevance for a private algorithmic trader, the paper presents full material on how the "right" trading system should work and how profitably it can be.

The second focus of recent publications is more concerning on disadvantages of algorithmic trading (Chernyak O. 2013, Johnston M. 2015, Picardo E. 2016). Chernyak O. insists that modern trade technologies involve the risks, namely: in stressful conditions, the interaction between automated trading programs (trading robots) and algorithmic trading strategies can quickly undermine liquidity and cause turmoil in the markets (Chernyak 2013). Johnston M. warns aside from being prepared for the emotional ups and downs that you might experience with algorithmic trading, there are a few technical issues that need to be addressed. These issues include selecting an appropriate broker, and implementing mechanisms to manage both market risks and operational risks such as potential hackers and technology downtime (Johnston, access 2017). Picardo E. names HFT like algorithmic trading on steroids. Algorithmic HFT has a number of risks, the biggest of which is its potential to amplify systemic risk. Its propensity to intensify market volatility can ripple across to other markets and stoke investor uncertainty. Repeated bouts of unusual market volatility could wind up eroding many investors' confidence in market integrity (Picardo, access 2017).

The paper lights both sides of algorithmic trading. A significant influence on this process was made by information technology (IT) development. Appearance of new technologies helps to cover disadvantages of present, but this present should be clearly defined that was made next.

### **3. Presentation of the main research material**

At the moment, trades in the United States are held by 11 public stock exchanges, about 50 alternative trading systems (ATS), also called "hidden pools", and about 200 outsiders (as a rule, these are broker dealers who can sell/buy securities, acting from one's or another's name). The New York Stock Exchange (NYSE) and the NASDAQ are considered the largest public stock exchanges. Public stock exchanges are being severely affected by regulators, while ATS systems, which are usually controlled by large banks and financial institutions, are less likely to be influenced by the authorities (Mancino, Sanfelici 2012).

When you place an order on your online brokerage account, this order may be transferred to a specific stock exchange or to the ATS system. After you submit your application, you will almost immediately receive confirmation of the transaction's conclusion, but you will not be able to see through whose hands your order was able to pass in a few milliseconds.

Today, high-frequency trade is actively used with the help of robots at the stock exchanges. The share of such trade on different exchanges is from 30 to 70 percent of transactions (Hong, Wang 2000).

High-frequency trade provides high liquidity of investors' deposits, the ability to quickly buy/sell a financial asset, and for high-frequency traders – to receive income. However, no matter how profitable the high-frequency trade appears, it also has some negative consequences for the market.

### **The appearance of hidden pools and the growth of trade in it**

As a result of the economic stimulation that arose due to imperfect legislation, hidden pools became even more relevant. More transparent public stock exchanges are usually considered like "legal markets", while less transparent alternative trading systems and hidden pools are commonly referred like "shadow markets."

Today, the part of hidden pools is about 15-18% and continues to grow. Approximately 40% of the total volume of transactions takes place through the Trade Reporting Facility (TRF), which covers the entire «over-the-counter trade», including the activities of alternative trading systems, upstairs trading – when stock exchange traders directly negotiate with each other and conclude a big deals.

The development of shadow trade has a negative influence on the market pricing process. Brokers-dealers and major investment banks, taking into account the consequences of new regulatory rules, hurried up to organize several hidden pools to capture the flow of orders from large organizations. Because large organizations can trade in hidden pools anonymously and can don't report about closing a big position.

Stock exchanges have become the last chance to receive liquidity for some institutions. Despite the fact that 60% of the trades are still held in the "legal markets", the stock exchanges have many problems because of orders which involved in the payment system of commission in the maker-taker model (and in the taker-maker model). Public stock exchanges today are sources of stable liquidity, but really its activity and reliability gradually decrease.

### **Unexpected consequences of securities information processing**

In addition, the regulation of the national market system involves the creation of a securities information processor (SIP), which is the norm of regulation, allowing the implementation of arbitration strategies. These strategies are one of the main topics that concern the opponents of HFT.

SIP is a centralized processor, to which all stock exchanges send its market data in order to create a universal "internal market" for each security which is registered on the stock exchange. In total, there are two SIP processors: one works with registered securities of NASDAQ and takes place on its technology platforms, and the other works with securities of the New York Stock Exchange (NYSE) and other organizations which are trading with the help of NYSE technology platforms. In short, all 11 public stock exchanges are connected via a cable to SIP, which collects the data, analyzes it and issue the NBBO (National Best Bid and Offer), (Wilson access 2017).

The process of transferring market data from the stock exchange to the SIP takes a share of a second. Given the fact that the signal is transmitted at different speeds which is depending on how close to the stock exchange the servers of its clients are placed, there is a small lag compared with the "direct data flow". The closer you are to the server of stock exchange (or use the extremely high frequency (EHF) connection), the faster you receive and transmit this data.

For example, the two largest trading centers of America, New York and Chicago are placed from each other on 720 miles distance that can be reached in 3.9 milliseconds if you

move at a speed of light. However, the differences in modern data transmission technologies and how much time is needed to pass this distance, cost millions of dollars for high-frequency trades. Table 1 shows an example of technologies that are used by different companies.

Table 1. Technologies that are used by different companies

<b>Who use</b>	<b>Standard cable</b>	<b>Company SPREAD NETWORKS</b>	<b>Company MCKAY BROTHERS</b>	<b>Company TRADEWORK</b>
<b>Technology</b>	Fiber optic cable that laid under ground	Fiber optic cable that laid under ground	EHF radiation that spreads by the air	EHF radiation that spreads by the air
<b>Date of implementation</b>	Middle of 1980s	Summer, 2010	Summer, 2012	Winter, 2012
<b>Length of way, miles</b>	approximately 1000	825	744	approximately 731
<b>Duration of data transmission, milliseconds</b>	14.5	13.1	9	8.5

HFT companies are ready to pay a huge sum of money to place its servers near the stock exchange servers. So they can get data faster than a slower SIP. The stock exchange engine, which collects together purchase and sale orders, at one time was situated on the trading floor of the New York Stock Exchange, and a separate specialist worked with it. Today, such engines are placed in large rooms along with exchange servers.

Supporters of HFT argue that anyone can get direct access to the stock exchange and install their servers near it, but really only solid companies have the means to develop and implement HFT-strategies on a large scale. Services of hosting servers near the stock exchange bring a good profit for it, just should remember that the stock exchange is, first of all, a commercial organization. HFT companies pay millions of dollars to install their servers in the stock exchange building: demand for services of location, communication, speed and bandwidth is quite high (Jones 2013).

As a result, HFT-firms are getting data faster with the help of direct access to the stock exchange, while the rest of market follows the quotes transmitted by the slower SIP. Due to this, HFT companies can use arbitration delays with the aim to outpace other orders and, thus, earn on a large number of transactions. Formally, this strategy differs from the "front-running" and is rather a loophole that appeared as a result of a conflict of interest and differences of stimulation mechanisms.

### **Layering and cancellation of orders**

It seems that the current condition of the US stock market is the most liquid financial market in history, but it has a number of serious disadvantages.

Supporters of HFT believe that the stock market is in the most favorable for the ordinary individual investor condition. The volumes of transactions have increased, and it leads to

more favorable execution of orders and low commission fees. At first glance, such situation should be appropriate for small individual investors who do not conclude large transactions on constant base. However, it is false idea.

The interaction between automated trading programs and algorithmic trading strategies can quickly undermine liquidity and cause chaos in markets under stress conditions, and high volumes of trading are not always a reliable indicator of market liquidity. One of the most striking examples of such a state is the famous "flash crash", which took place on May 6, 2010 in the US stock market – a sudden and serious drop in the price level by almost 10% in a matter of minutes (Agapova 2014).

The HFT arbitrage, which is based on delays, has negative effect for organizations, because of taking profits from large deals. Income from high-frequency trading is distributed throughout the market, but much part of it is concentrated in the hands of several HFT-firms.

Aggressive HFT companies use arbitration strategies of delay: thus, they can manipulate with bunch of orders without allowing market participants to execute their bids at a better average price. Although this is just one of the possible scenarios, the market is really packed with orders that nobody and never intended to do: it is more like a lure for attraction of other players in the market and take possession of their money.

When HFT supporters are talking about the advantages of fast auto trading, they do not take into account the fact that most liquidity is just an illusion. Often it happens that we see a minimal spread of any stock, but the size of the order on the domestic market can be so small that traders will not be able to execute it.

### **Maker-taker model**

With the development of shadow trade, commercial stock exchanges have to keep the flow of orders which bring income. Collocation services and additional fees represent a significant portion of its profits, but stock exchanges support a stable flow of orders to remain competitive (Gerig 2015).

To capture the flow of orders that are flowing into hidden pools, which can usually make a better deal, the stock exchanges resort to such controversial practices as payment for the flow of orders. Its essence lies in the fact that stock exchanges and wholesale companies pay each individual broker-dealer for the direction of his order on a particular route. As a compensation for the sent flow of orders, the stock exchange pays the broker-dealer a reward for the limit orders per each share. This reward is usually insignificant, but when it comes to several million shares, the total amount is quite significant.

One variant of such scheme is used when large organizations send flow of orders: this model is called maker-taker. Not so long ago, it caused the true anger of the HFT opponents.

The introduction of payment for orders flows and the very fact of using the maker-taker model are far from the real purpose of the stock exchange, which is appeared like platform for meeting of buyers and sellers and market pricing under the influence of the law of supply and demand. If the situation had not been distorted because of improper stimulation, which contributed to the development of shadow markets, the introduction of rewards would be superfluous.

The high-speed race for profit has led to the over-saturation and consolidation of the HFT-industry. Big fish eat smaller. Today only the fastest HFT companies with the largest volume of resources survive. Any HFT-strategy can be transformed into itself, which means that if a HFT company knows about strategy of other, then it can develop a high-speed algorithm on its basis and take over an advantage.

If the revenue, which consist of potential revenues from arbitrage delays, is still high, then as time goes on, many players of HFT industry will get smaller parts.

### Significant overload on stock infrastructure

The development of high-frequency trade transforms the quality of market transactions into its quantity. This leads to a significant overload of the trading infrastructure, as the representatives of the stock exchanges and experts have repeatedly repeated.

Stock exchanges should use certain mechanism of protection to avoid the negative effects of high-frequency trade on the "transparency" of the stock market, stock exchange quotations of prices on market principles, trading infrastructure, etc. (Andersen at al. 2012). These include: the creation of regulatory norms and restrictions through the taxation of a large number of applications or increasing of tariffs for customers with a large volume of applications; introduction of a minimum time interval for the life cycle of the application; introduction of limit on the number of transactions; introduction of equal conditions for all users of stock information, etc.

In general, the development of the HFT is cyclic and is characterized by the following scheme (fig. 2):

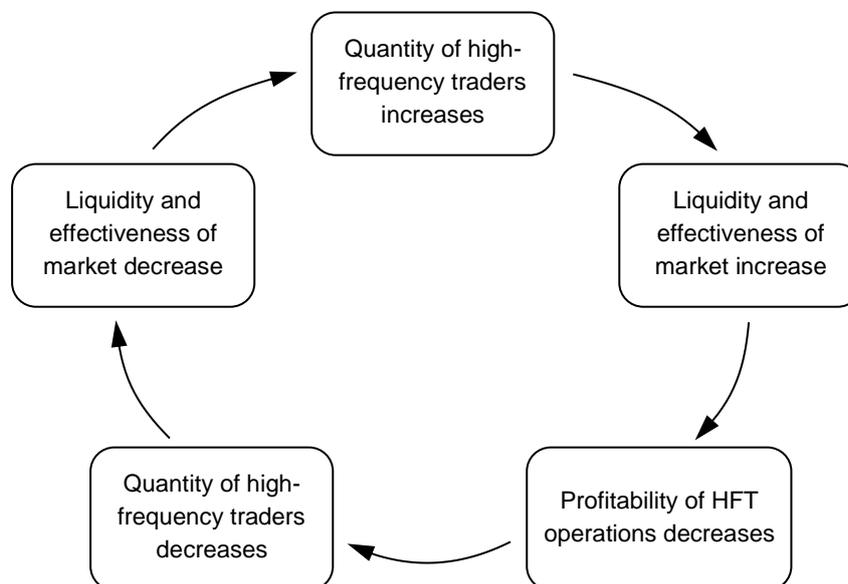


Fig. 2. Cycle of HFT development

Incorrect motivation has led to the emergence of entire groups of different mediators (figure 3), who exist due to transactions that do not correspond to the ultimate goal of stock exchange activities – the execution of transactions in a free market.

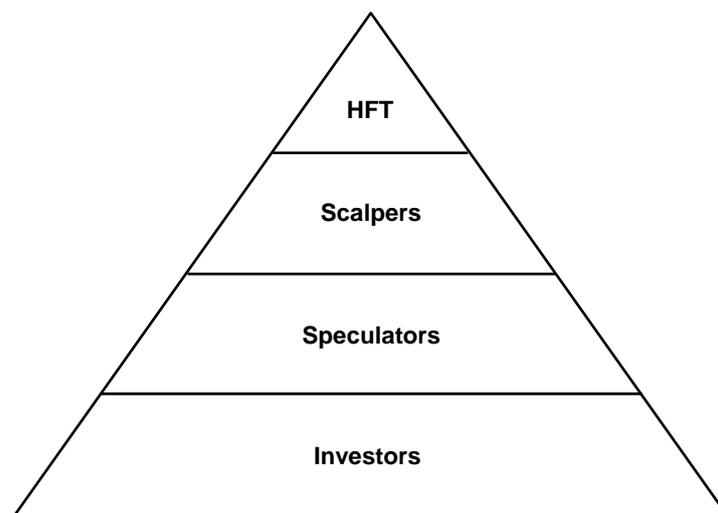


Fig. 3. Types of traders

Some categories of representatives of the stock market, who compete for profit between themselves, fall into the area of algorithmic trading:

- First of all, it is investors who execute long-term operations – they buy shares of certain enterprises, based on a deep analysis of their activities, and whose goal may not be to sell these securities at all.
- Speculators and day-traders who execute securities transactions precisely in order to earn a difference in prices between buying/selling.
- Scalpers are type of merchants who execute a lot of deals in a very short time started from a few seconds. The profit from each such transaction, as a rule, is not very large, and the income consists of a huge quantity of transactions.
- Actually, high-frequency traders, who create trading robots which operate according to certain algorithms.

This pyramid is a "feed chain", that is, long-term investors become a source of profit for short-term investors, and short-term investors – a source of profit for speculators and day-traders, and so on. But this is true in the case if the market is arranged correctly and has correct proportions of all listed groups of traders.

Automated algorithmic trading allows trader to set special rules for trade orders to execute actions that they have been programmed to automatically execution with the help of computer. Entry and exit rules can be based on simple conditions such as moving the middle run or complex strategies that require a complete understanding of the programming language which is specific for the user's trading platform and the experience of a skilled programmer. Automated trading systems usually require the use of software that is associated with mediator of direct access, and any special rules must be written in their own language platforms. For example, the TradeStation platform uses the EasyLanguage programming language; The NinjaTrader platform uses the NinjaScript programming language (Narang 2009).

Many traders, however, decide to program their own indicators and strategies or work closely with a system development programmer. Although it usually requires more effort than using the platform master, it provides much more flexibility and results can be higher. Unfortunately, perfect investment strategy which guarantees success doesn't exist.

The computer can control the markets to find options for buying or selling based on the specification of the trading strategy after setting the rules. Depending on the specific rules, as soon as trade is entered, any orders will be automatically created with the use of protective "footsteps", one of the most important functions which help to save profit. In fast-growing markets, instant enter of order can mean the difference between small losses and catastrophic losses in the case of "the market goes against the trader".

There is a significant list of advantages from using an automated algorithm in the markets, including:

- 1) Reduce emotions. Automated trading systems minimize emotions during the trading process. It is usually easier for traders to follow the plan if emotions are kept under control. Since sales orders are executed automatically after the system conditions are met, traders will no doubt in the trading process.
- 2) Possibility of Back test. Back testing applies trade rules according to historical market data to define the viability of the idea. In designing of system for automated trading, all rules must be absolute, have no place for interpretation (the computer is not able to guess – precisely need to set the exact algorithm). Traders can take these exact sets of rules and check it according to historical data before taking risks with real money.
- 3) Save the discipline. Since the rules of trade are established and trade is executed automatically, the discipline is safe even in unstable markets. Discipline is often lost due to emotional factors such as fear of loss or desire to get a little more profit. Automated trading helps to ensure discipline and strictly follow trade plan.
- 4) Improved entry-to-order speed. Because computers respond immediately to changes in market conditions, automatic systems are able to generate orders as soon as the trading criteria are met. Entering or exit the position for a few seconds earlier can greatly change the result of the trade.
- 5) Diversify trade. Automated trading systems allow the user to trade with a few accounts or different strategies at one time.

Generally, the biggest advantage of high-frequency trade and algorithmic trade is to cover weak sides of human. Despite of it, automated trading system cannot be seemed like substitute of human, because possible mechanic failures and data of system need constant monitoring.

Automated trading systems can have many advantages, but should to know about some problems and disadvantages too:

- 1) Technical errors. The theory of automated trading describes everything simply: install the software, program the algorithm and look after it. Really, however, automated trading is a complicated way of trading, but not without errors. Depending on the trading platform, the order may be on a computer, not on a server. This means that if an internet connection disappears, the order may not be sent to the market. There may

also be a discrepancy between the theoretical requirements generated by the strategy and the component of the platform, which transforms it into a real algorithm (Mikhailov, Noegel 2005).

- 2) Monitoring. Although it would be great to turn on the computer and leave the auto trade for a day, but automated trading systems require monitoring. This is due to the possibility of mechanical failures such as connection problems, power loss or system faults.
- 3) Excessive optimization. Despite the specifics of automated trading systems, traders who use tracking techniques can create systems that look great on paper but work weakly on real markets. Traders sometimes misunderstand that a trading plan should have about 100% profitable trades, or never have to be reduced to be viable. Thus, the parameters can be configured to create an "almost perfect" plan – which is not possible as soon as it is applied to the real market.

Traders have opportunity to run their automated trading systems through a server trading platform such as Strategy Runner. For an additional fee, an automated trading system can scan, execute and control bids – with all orders placed on its server.

#### **4. Conclusions**

Competently constructed methodology and technology of the game help to receive a profit without defeats. IT-technologies play one of the leading parts. The speed of any of the trading platforms and the wide spread of the Internet are essential and important factors in modern trade. Every second can become decisive in Internet-trading. Creating new, developing and improving existing Internet-technologies will surely lead to even greater mobilization of investors in the future. Traders should use server-based platforms to minimize technical failures.

The high-frequency trade has not the best influence on market pricing, since, in pursuit of its own benefit, the interests of investors are offset. In addition, the share of shadow trade increases, stock exchanges suffer because of overload of trading infrastructure. Rich companies became more rich because have the ability to use the latest technological advances to instantly capture stock fluctuations with its large capitals. Thus, ordinary traders who monitor quotes with the help of standard SIP, have just crumbs. Using the maker-taker model destroys the natural purpose of the stock market and negatively effects on the market pricing. Stock exchange activity quietly began its adaptation to the cyclicity of high-frequency trade, which generated segments of traders, each of whom feeds at the expense of long-term investors.

In order to update justice in the financial market, it is necessary to improve its regulation by market methods and maximize the use of free trade opportunities. Changing the landmarks of stock exchanges for investors' interests will improve the situation on the stock market. Increasing of mechanism of protection against negative consequences of high-frequency trade can do it too. Norms of regulation should always be as simple and effective as possible to meet the original purpose of the stock market, namely, to be the place where the pair of buyers and sellers will be organized.

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# MANAGEMENT OF DEFECTIVE PRODUCTS ON THE EXAMPLE OF THE HOUSEHOLD APPLIANCES INDUSTRY

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**Abstract.** The main purpose of the article was to present issues related to the management of defective products on the example of the household appliances industry. The first part of the work presents issues regarding the reverse logistics concept, with particular emphasis on its implementation in the area of reverse flow management in enterprises. Subsequently, the concept of management of defective products with the indication of examples of products included in this group was discussed. Then, the Polish household appliance industry was characterized. In the further part of the work, the results of own research carried out using the questionnaire method are also presented. They allowed to verify specific research hypotheses. The importance of the management of defective products concept in enterprises is particularly important in the context of ensuring sustainable development. In spite of this, there are some barriers in the surveyed enterprises of the household appliances industry that limit or prevent the introduction of this idea. These barriers include the lack of interest in this type of management activity, as well as the lack of competence of the staff. Correction of these barriers may bring tangible results, as the results of the conducted research indicate that the implication of the management of defective products concept may positively affect the achievement of the organization's goals. After analyzing data from questionnaires, it should also be pointed out that defective products in the surveyed organizations are mainly damaged goods, parts of products, waste and by-products, and packaging. The mentioned products in the majority are recycled, scrapped or recovered from components, and raw materials used for further production.

**Keywords:** management, reverse logistics, sustainable development, defective products, household appliances industry

**JEL classification:** M11, Q56, L68

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## **1. Introduction**

In a production enterprise, logistic flows occur in relation to the implementation of supplies of raw materials, auxiliary materials, etc., production, where flows include finished products or semi-finished products, and distribution, where flows relate to commercial products and spare parts. The production enterprise also has flows fed with defective products and waste (Pfohl 1998). The article will focus on the subject of defective products management.

The concept of defective products management has acquired a special meaning in recent years. In the era of globalization and dynamically developing markets, enterprises are looking for new and more efficient opportunities to manage their activities. An additional stimulus is still tightened legal acts aiming at care for the natural environment and its protection (Szkutnik 2010), applicable in the scope of conducting business activity, especially production (Witkowski 2015). That is why it is so important to properly manage defective products that involve enterprises in the implementation of three main priorities (Bajdor 2017; Grondys 2017): economic, social and environmental aspects.

In the light of the presented topic, the main goal of the article is to present issues related to the management of defective products on the example of the household appliances industry. The authors defined four research hypotheses. The first one is as follows: in the household appliances sector the largest group of defective products are damaged products. The second research hypothesis is defined as follows: most of the defective products in the household appliances enterprises are sent for recycling or scrapped. The authors also assumed that the main barriers to managing defective products in the home appliance industry are the lack of interest in this type of management activity as well as the lack of competence of the staff. This assumption is the third research hypothesis. The last, fourth research hypothesis, assumes that in the opinion of respondents, the management of defective products in the surveyed organizations affects the implementation of the company's goals. Verification of research hypotheses was possible because of own research - the survey method was based on the questionnaire method.

## **2. Reverse logistics in the aspect of managing a modern enterprise**

Reverse logistics processes relate to physical, reverse flow of products, from the typical final place to the entry point in the enterprise, with the assumption of value recovery or other kind of proper disposition. In reverse logistics, the occurrence of its processes is very important at the moment of fact appearance, i.e. when the reverse flows are supplied. Then all of its activities concern the management of these flows and related information. On the other hand, reverse logistics processes do not apply when there are no products or materials in the reverse flows, i.e. when products and materials have already reached the final destination, ending the circulation in classical logistics flows, and have not yet been qualified for reverse flows, being outside of the logistic flows.

In the literature thematically related to reverse logistics, it is evident that it brings tangible benefits to diversified profiles and industries as well as entire sectors and branches of the economy. In connection with the ever-increasing importance of reverse logistics processes,

many manufacturing enterprises began to adopt them as a strategic tool for gaining economic benefits and improving the social image of the company (Kannan et al., 2012). Enterprises have also noticed that better understanding and utilization of reverse flows, as well as effective implementation of reverse logistics processes allows to gain a competitive advantage (Stock and Mulki 2009, Kot and Grabara 2009).

Enterprises, conducting specific economic activities, transform products. This transformation consists in the qualitative transformation of products when they are subject to production or consumption processes, and on time-spatial transformations, when production connects with consumption in the distribution process, concerning the movement and storage of products (Nowakowska-Grunt and Kabus 2017). The spatial-temporal transformation of goods in the logistics of the enterprise is based on the management and implementation of the logistics processes taking place in it.

In enterprises whose operations are based on the production of products, and these products supply physical flows, the management of logistics processes is a very important area covering seven key areas (Brzeziński et al. 2014), the last of which is reverse logistics (figure 1).

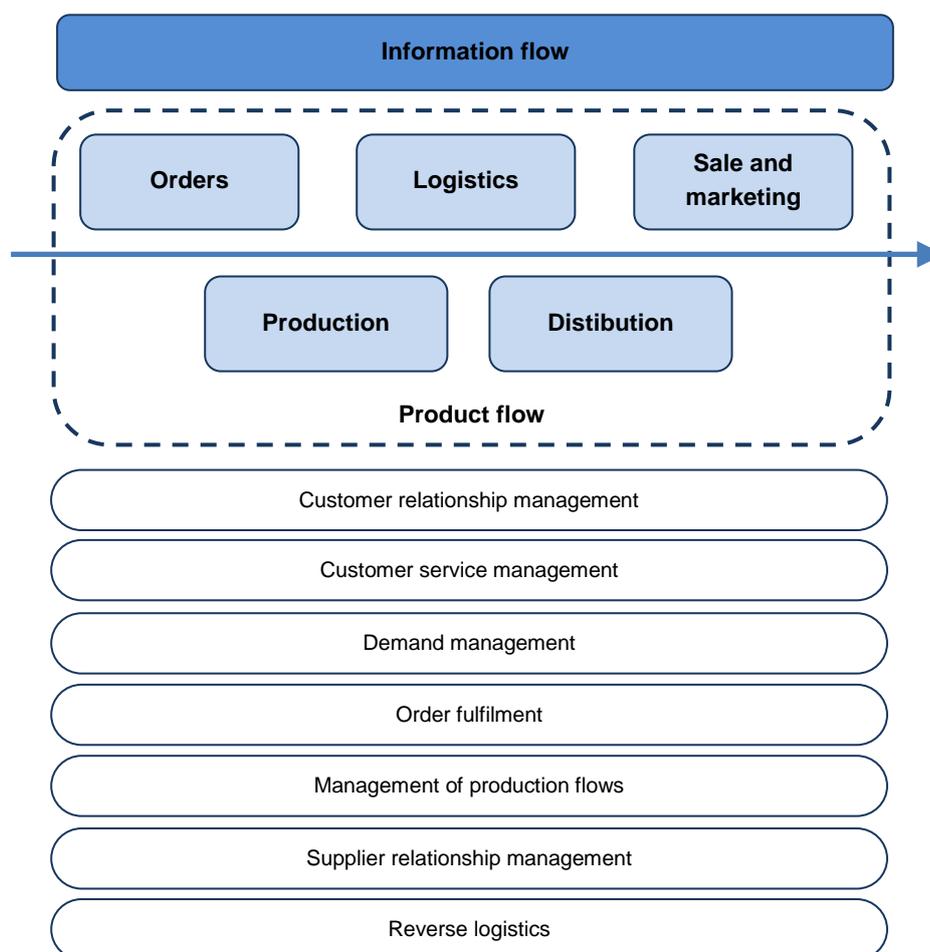


Fig. 1. Areas of logistics processes management in contemporary enterprises

Source: Own elaboration based on: (Lambert et al. 1998).

Reverse logistics in an enterprise is one of the areas of logistics processes management, which are, according to the interpretation of Figure 1, dependent on each other and often condition their correctness of the functioning of other areas. The basic characteristics of these areas are as follows (Croxtton et al. 2001):

- customer relationship management – defines the structure of development and maintaining relationships with clients, including product development;
- customer service management – enables direct contact as well as provides direct information about the requirements of individual clients;
- demand management – creates a balanced structure between customer requirements and the production capacity of a given enterprise;
- order fulfilment – applies to all activities necessary to define customer requirements, design a logistics network and fulfill orders placed by customers;
- management of production flows – it applies to all activities necessary to move products between production units and to obtain, implement and manage production flexibility in an enterprise;
- supplier relationships management – creates a structure for the development and maintenance of relationships with suppliers;
- reverse logistics – applies to all activities related to management of reverse flows occurring in the enterprise.

Although in the context of a certain timeframe all the above-mentioned areas of logistics management in an enterprise evolve, adapting to the ever-changing economic, political and social realities, the most important from the point of view of the concept of sustainable development, which is now a widely promoted approach in management, is reverse logistics area.

It should also be noted that enterprises never function alone, but on the basis of cooperation with the business environment in which they are located. Therefore, reverse flows include not only the structure of a given enterprise, but also involve other participants in its environment. Among the groups of entities participating in the management of reverse flows subject to reverse logistics processes, one can mention (Jeszka 2014):

- basic entities: producer, broker, retailer;
- specialized reversing logistics intermediaries: recycling points, recovery organizations, etc. .;
- public-private organizations, charities.

These entities, participating in the management of reverse flows, deal with many types of subsidies of these flows, towards which reverse logistics processes are implemented.

### **3. The concept of defective products management**

In their operations, companies must take into account not only traditional product flows but also reverse flows containing returns of defective products. These flows consist of products such as (Rogers and Tibben-Lembke 2001): damaged products that have failed in use but can be repaired or reused, products outdated but still of some value, products not sold in the retail trade, products withdrawn from sale, parts of products that still have a certain value, products

that can be used other than their original purpose, waste products that need to be disposed of or can be re-used and packaging.

Returned defective products due to the place of introduction into the flow are divided into three groups: producer returns (e.g. surplus raw materials, quality control returns, production residues), distribution returns (e.g. trade returns, surplus stocks), and market returns (e.g. warranty and post-warranty products, products that have completed the life cycle) (Starostka-Patyk and Nitkiewicz 2014). Taking into account the reason for returning a defective product, it can be divided into five groups (de Brito and Dekker 2002): returns of products with a completed life cycle, trade returns, warranty returns, post-production waste and by-products and packaging.

Regardless of belonging to a given category, returns of products are considered in the category of defective products. And this raises the need to undertake activities aimed at their development through the appropriate organization of management processes in this area, because it leads to either restoring such products to the same or similar value to the first quality products or to regain any value considered in terms of benefits (Popa et 2013).

Returns management of defective products is based on a certain hierarchy of processes that allows the circulation of defective products and other materials in the flow of enterprises (figure 2).

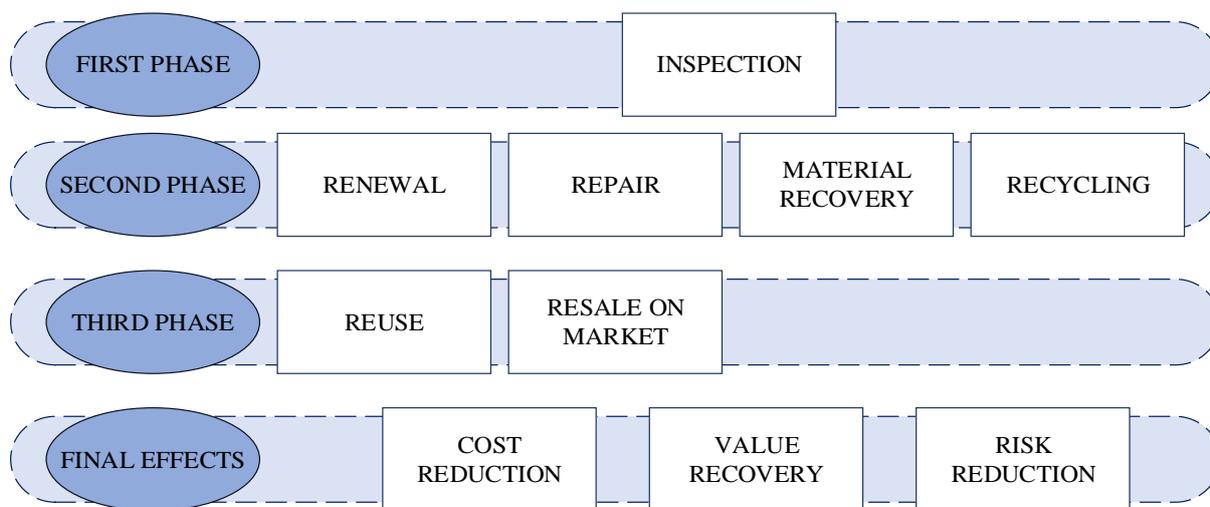


Fig. 2. Hierarchical structure of management processes of defective products in enterprises.

Source: Own study based on: (Rogers et al. 2002).

The management of defective products is based in the first phase on the qualitative inspection of returned products. On this basis, they are directed to the second phase, where they are subject to processes of renewal, repair, and recovery of materials or recycling - depending on the state of quality found. After the positive phase of the second phase in the next phase, the products are reused and placed on the market (usually secondary products). Thanks to the hierarchy of management processes of defective products so composed, enterprises obtain beneficial effects in the form of cost reduction (e.g. limiting the purchase of

raw materials and components for production), recovery of value from returned products and risk reduction.

In addition to the above structure of management processes of defective products, enterprises must also focus their attention on the key elements of these processes, which include activities such as (Rogers and Tibben-Lembke 1999): supervision of return flows, shortening of turnover management, return information systems, centralization of points accepting returned goods, managing returns, which is related to their processing and refurbishing, value recovery, negotiation and financial management.

Typically, defective products in the enterprise system are initially managed as follows (de Brito 2003): return to the seller, sale in a new form, sales through manufacturers' stores and discount stores, sale to the secondary market, charitable use, processing / renewal, regeneration materials / recycling / depositing in landfills.

Depending on the qualitative and quantitative condition of a given product, based on a contractual obligation with sellers, and the demand for products, the company may use one or more of the options mentioned above for its products.

In the past, it was easier for entrepreneurs to get rid of unnecessary products because no benefits emerged from the management of a used or expired commodity. However, due to the increase in landfill disposal costs and the increase in prices of raw materials and production materials, enterprises recognized the need to reorganize their practices and reduce costs by implementing an appropriate management organization of defective products in the form of returns and introducing these products to secondary markets. The effectiveness of time and costs are key success factors here (Starostka-Patyk and Nitkiewicz 2014). That is why it is very important to implement modern solutions for the operations of enterprises, because thanks to this there are immediate or somewhat distant benefits, but always effectively affecting the company's competitive position, its financial situation, increasing its value in the eyes of clients and, finally, significantly facilitating processes production.

#### **4. The household appliances industry in Poland**

The household products production industry is one of the most dynamically developing production sectors in Poland. In fact, it has been characterized by the highest production volume of household appliances for several years. The recipients of these products are not only wholesale and retail points located in Poland, but they are also exported. In 2016, the largest amount of home appliances was exported to Germany, France or the United Kingdom (Rynek AGD w Polsce).

At present, there are approximately 25,000 employees in the sector of production of household appliances. They work in 30 factories. The regionally main part of production is concentrated in three voivodships: Dolnośląskie, Łódzkie and Wielkopolskie. The following companies are leading producers of household appliances in Poland: Amica Wronki S.A., Ariston Thermo Polska Sp. z o.o.; BSH Sprzęt Gospodarstwa Domowego Sp. z o.o., Beko S.A., Candy Polska Sp. z o.o., Ciarko Sp. z o.o., Daikin Airconditioning Poland Sp. z o.o.; De'Longhi Polska Sp. z o.o. Electrolux Poland Sp. z o.o., FagorMastercook S.A., Gorenje Polska Sp. z o.o., Groupe SEB Polska Sp. z o.o., Indesit Company Polska Sp. z o.o., Miele Sp. z o.o.,

Philips Polska Sp. z o.o. Samsung Electronics Polska Sp. z o.o., Whirlpool Polska S.A., Vorwerk Polska Sp. z o.o. (Branża AGD w PL).

Analyzing CECED data (Produkcja AGD w Polsce I-V 2015; Produkcja AGD w Polsce 2017), which allow to compare the production of home appliances in the period from January to May in 2014 and 2015 (figure 3), there is quite dynamic growth, especially in the case of manufacturing dryers among the group of large household appliances (41%) and mixers, food processors and kitchen robots among the group of small household appliances (35%). Among all groups of household appliances products, the decline in production is recorded only for the production of vacuum cleaners (-41%). The production of other product groups at the beginning of 2015 also increased compared to the initial months of 2014 - for refrigerators and freezers by 1%, dishwashers by 18%, washing machines and washer-dryers by 8%, electric cookers by 12% and electric ovens by 14%. Comparing data on the volume of household appliances production in the period from January to May in 2015 and 2017, it can be concluded that there was a 19% increase in the production volume of electric ovens (large household appliances) and a 100% increase in the production of vacuum cleaners (small household appliances). At that time, the production volume of mixers, blenders and robots decreased (-63%) and electric cookers (-5%). The production of other product groups at the beginning of 2017 increased compared to the initial months of 2015 - for dryers by 5%, washing machines and washer-dryers by 1%, dishwashers by 9% and refrigerators and freezers by 3%.

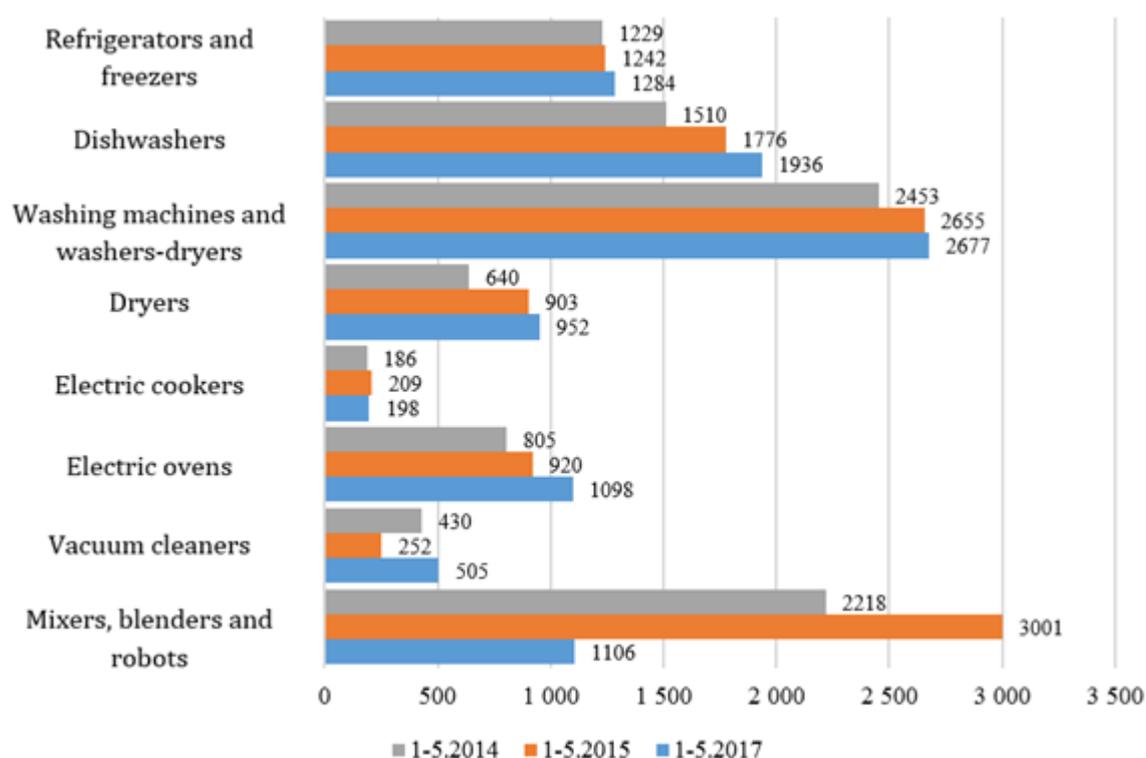


Fig. 3. Production of household appliances in Poland in January – May 2014, 2015 and 2017.

Source: Own study based on: (Produkcja AGD w Polsce I-V 2015; Produkcja AGD w Polsce 2017).

At the same time, in previous years, i.e. 2010 - 2013, there was also a growing tendency in the case of the production of household appliances in Poland. First of all, the production of large appliances was significant, where in 2010-2013 it was 2.2%, 13.6% and 10.7% respectively. The production of small home appliances increased by 3.2% in 2011, however, in the following two years it decreased by 9.1% and 8.3% respectively in 2013 (Gorące roszady na polskim rynku AGD).

## **5. Research methodology**

As part of the project implementation (details in acknowledgement), in the first quarter of 2014, a survey was conducted for Polish manufacturing companies from sectors with high potential for defective products, mainly from the automotive sector, household appliances, electronic and computer equipment, toys and clothing production, etc.

The questionnaire contained 20 questions, and the research sample covered 302 production companies located in Poland. It was designated on the basis of statistical calculations and is a representative sample, thanks to which the survey results reflect the situation of all Polish manufacturing enterprises.

The study included issues related to defective products and the way they were used in the surveyed enterprises, it was quantitative and was conducted in the form of a telephone interview (CATI) by a rented external company specializing in this type of research.

The respondents of the survey were representatives of enterprises holding managerial positions at the level of the entire company and persons designated by them as responsible for accepting returns and developing the company's strategy and policy in this regard.

In order to characterize the Polish household appliance industry in the context of management of defective products, it is necessary to present only a selected part of the survey results.

## **6. Management of defective products in the household appliance industry – research results**

For the purposes of this article, the results of the study identified a group of enterprises that are producers of household appliances that is 27.5 and 27.9 according to the Polish Classification of Activities. Based on the respondents' answers from this group, it is possible to generalize inferences about the management of defective products in the entire industry.

Polish producers of household appliances categorizing defective products indicate the occurrence of: damaged products (40% of respondents), parts of products (40% of respondents), waste and by-products (40% of respondents) and packaging (40% of respondents). The remaining categories of defective products, i.e. outdated, seasonal products, unsold in retail, withdrawn from sale and erroneously considered defective, appear in the household appliances industry at a marginal rate.

Defective products from the household appliances category are returned to the producer most often within a period from one week to one month from the moment of their distribution for distribution (80% of respondents) or from one month to three months (20% of respondents), and when defective products are already in the possession of the producer.

Their qualitative status in relation to the primary condition by respondents is defined as satisfactory (20%), good (20%) and very good (60%). The processing cycle of acquired defective products usually lasts from 1 to 2 days (40% of respondents) or from 2 days to a week (20% of respondents), from one week to two weeks (20% of respondents) and from 2 weeks to a month (20% of respondents).

Polish producers of household appliances recognize their policy of accepting returned defective products as very liberal (60% of respondents) and only a small percentage believe that it is restrictive (20%). As part of managing defective products, enterprises accept their returns themselves (60%) or outsource to third parties (20%), independently renew them through cleaning, repair, etc. (20%), use recovered components or raw materials for production (40%), they organize the sale (20%) and carry out recycling and scrapping (40%), with recycling also outsourced to third parties (20%). They do not completely carry out activities such as: donation, repacking and re-sale, sales in the accepted state and recovery of components.

Eighty percent of the surveyed manufacturers of household appliances admitted that returned defective products reduce the profitability of their business – 20%, that they significantly reduce it – 20% and 60% that they lower it slightly. At the same time, these enterprises decide to accept refunded defective products because they perceive this action as important in building a competitive position through: product quality (100%), price and speed of delivery (80% each), cost reduction, return policy and product differentiation (after 60%). According to the majority of respondents (80%), the management of defective products positively affects the implementation of the company's goals.

As the most important barriers to effective management of defective products, Polish home appliances manufacturers point to company policy (40%) and financial resources (40%), followed by competitiveness (20%), legal conditions (20%), lack of management's attention (20%) and lack of competence of the staff (20%). Organizational solutions and the importance of this issue are not perceived as barriers.

## **7. Conclusions**

The concept of management of defective products has become particularly important in recent years. In the era of globalization and dynamically developing markets, enterprises are looking for new and more efficient opportunities to manage their activities. An additional stimulus is the increasingly stringent legal provisions aiming at caring for the natural environment and its protection, which are obligatory in the scope of conducting business activity, especially production. That is why it is so important to properly manage defective products that involve enterprises in the implementation of its three main priorities: economic, social and environmental.

One of the sectors with a high potential for the formation of defective products is the household appliances industry. For this reason, enterprises located in Poland, which deal with the production of this type of finished products, were examined. After analyzing data from questionnaires, it should be pointed out that defective products in enterprises producing household appliances are mainly damaged goods, parts of products, waste and by-products,

and packaging. Thus, there is no reason to reject the first research hypothesis. However, it should be highlighted that apart from defective products, there were also other products in this group, whose share in the total number of such products is the same as the damaged ones.

There is also no basis for negating the second research hypothesis: the majority of defective products in companies producing household appliances are being recycled or scrapped. However, it should be noticed that in addition to these activities, enterprises decide to use recovered components or raw materials from defective products for further production.

The results of our own research also refer to two further hypotheses. It turned out that in the surveyed enterprises, the most important barriers to the implementation of the idea of managing defective products include, first of all, the implemented company policy and the lack of sufficient financial resources. Thus, the third defined research hypothesis, formulated as follows, and has not been confirmed: the main barriers to managing defective products in the home appliance industry include the lack of interest in this type of management activity and the lack of competence of the staff. Nevertheless, one should strive to overcome the above-mentioned barriers, because appropriate management of defective products can bring tangible results for the organization. In the respondents' opinion, it has a positive impact on the company's goals. Thus, the fourth research hypothesis defined by the Authors was confirmed.

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## **SUPPLY CHAIN MANAGEMENT - THE CASE STUDY OF THE COMPANY FROM DAIRY INDUSTRY**

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**Abstract.** The purpose of this paper is to clarify the issues related to logistics supply chain management on the example of the chosen cooperative. Activities in the supply chain are complex processes that are necessary to meet customer requirements. At the present time, the key aspect is effective co-operation and continuous improvement throughout the supply chain, starting with the purchase of raw materials through the production and distribution of finished products. Choosing the right suppliers of raw materials, proper transportation, production technology, distribution, quality care of the products gives an important aspect for the company to function properly.

**Keywords:** supply chain management, dairy industry

**JEL classification:** L10, L20, M11

### **1. Introduction**

Logistics management is one of the important elements of the modern economy. It allows the free flow of materials, raw materials in the course of production, various types of cargo, freight, and passenger and tourist traffic. Logistic management provides the opportunity to properly evolve the economy of enterprises, while increasing their efficiency, functionality and competitiveness.

At the present time it is easy to see the large impact of logistics as a key function in an enterprise, due to the required efficiency and cost-effective sales of goods. Efficient organization of goods supply, at the same time with the smallest cost and fast transport, determine the competitiveness of logistics.

### **2. The essence of supply chain**

The main objective of supply chain management is to make decisions and actions aimed at the integration and coordination of the process flow of products, information, and funds from the sources of raw materials to the places of their consumption. Figure 1 shows the integrated supply chain.

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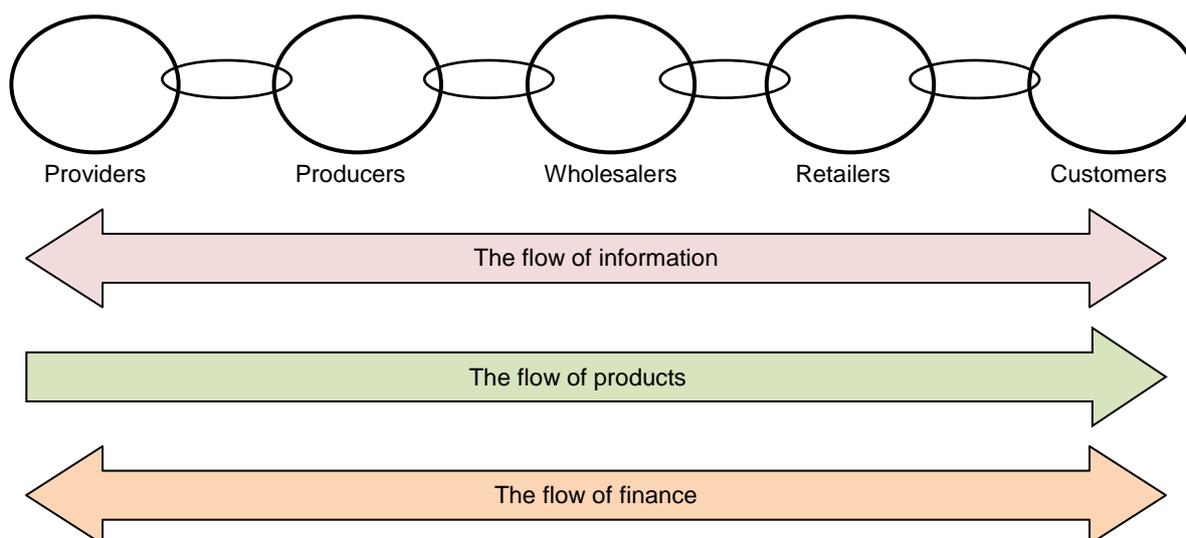


Fig. 1. The integrated supply chain.

Source: (Coyle, Bardi and Langley 2002).

The supply chain is made up of companies and enterprises, which constitute the cells of supply chain. These include entities of supply, production and circulation goods, so: warehouses, wholesalers, shops, carriers and suppliers. Generally it can be said that each cell of supply chain is both a customer and a supplier, because each customer becomes a supplier in the next cell in the chain.

The supply chain, according to the definition in the dictionary of logistics terminology, it is the organizational structure of the group of companies implementing joint actions, which are necessary to meet the demand for certain products (Fertsch 2006). This type of activity includes:

- production,
- sale,
- service,
- supplies,
- inventory management,
- distribution.

The supply chain includes typical logistics operation, merging the supply of materials, organization of production, as well as activities associated with demand and product development, including the area of marketing and production management.

S. Kot, M. Starostka-Patyk, D. Krzywda define the supply chain as a network of organizations involved, through linkages with suppliers and customers in a variety processes and activities that create value in the form of products and services supplied to final consumers (Kot, Starostka-Patyk and Krzywda 2009).

B. Skowron-Grabowska interprets the supply chain as a "network of organizations involved through linkages with suppliers and customers in different processes and actions that create value as products and services supplied to the ultimate consumer" (Skowron-Grabowska 2010). The supply chain is presented as the flow of raw materials, components

and finished products since their initial acquisition until the consumption of the final product by the final consumer. The basic processes that allow for the execution of the supply in that system is transport and storage. The supply chain is a combination of the different companies involved in the delivery of products on the market.

The supply chain is also perceived in two ways (Skowron-Grabowska 2010):

- objective, which consists of raw materials, auxiliary materials purchased in the market sourcing and transformation in the production process to finished goods,
- subjective, which contains all interacting companies forming links of the same chain.

The process of globalization, the dynamic development of information technology, with increasing competition had a significant impact on the fundamental changes in the activity of economic entities. The idea of changes is determined primarily striving to maximize the added value for a group of community enterprise. One of the fundamental factors to achieve this goal is the speed, effectiveness and efficiency of market processes. The basis for creating supply chain is then successful co-operation between its cells. This concept of the supply chain leading to the creation of "extended enterprise" which runs tight integration between the individual cells (Skowron-Grabowska 2010).

In the supply chain, we can extract the following links (Strykowski 2005):

- contractors of raw materials,
- contractors of components,
- final manufacturer,
- wholesalers (distributors),
- retailers,
- final customers.

It should be noted that the supply chains and characteristics of related concepts are a special variety of network organizations. Their objectives, structure, governance and a range of activities allow for the classification of chains and supply network including chains and logistics networks, to a group of strategy networks, as shown in figure 2.

Networks and supply chains, in contrast to other networks strategy, are developed in order to mitigate conflicts in inventory management through optimization, the size and the reciprocal rules of control, keep the control along the entire value chain.

Criterion for the distribution supply chain from the point of view of organizational configurations can be considered hierarchical structures occurring between the participants. They allow to distinguish the network polycentric and hierarchical network. A further scheme of the supply chain should include the dominant type of organizational ties existing between their participants. In this case, polycentric supply chain can be divided into (Witkowski 2010):

- local area networks based on personal contacts,
- supply network based on technical ties,
- supply network based on equity,
- virtual networks based on ties information.

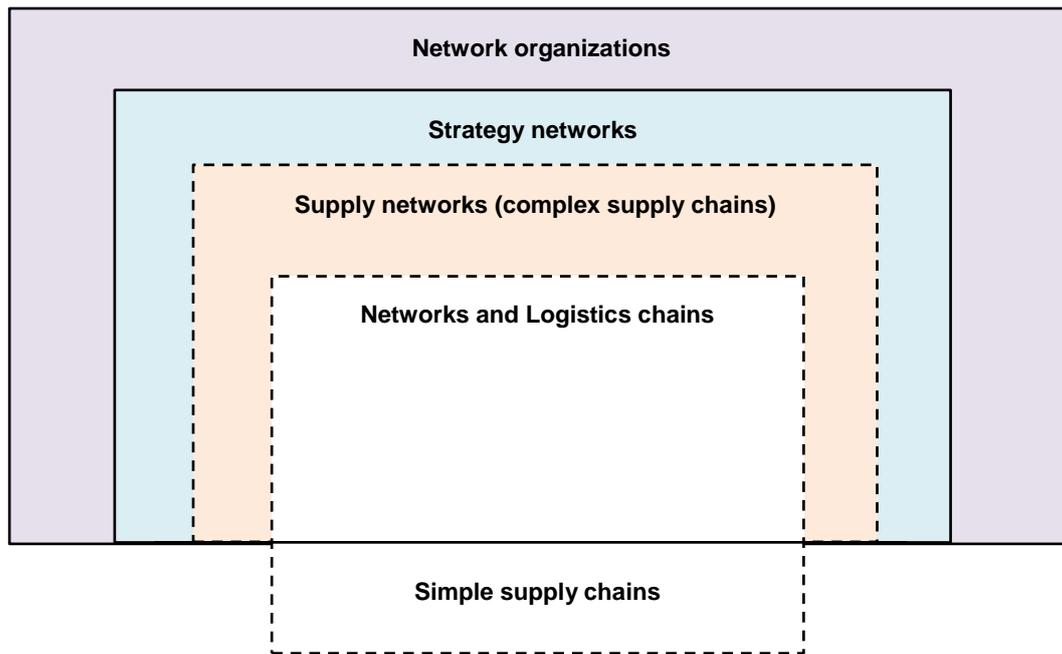


Fig. 2. Networks and complex supply chains as network organizations.

Source: (Witkowski 2010).

To be functionally, supply chain should be characterized by such features as (Krynicka 2005):

- sensitivity to market – this is the correct analyzing and responding to actual demand,
- virtuality – is creating through use of information technology, sharing information between customers and suppliers; this chain is based on information, not on the level of inventories,
- integration processes – this is the close cooperation between customers and suppliers, mutual product planning, common systems and sharing of information,
- webbyness – this is analyze the supply chain as a confederation of partners joined together as a network; it is based on designing, coordinating and managing the relationship with their partners network as well as on the effective building relationships with their final customers.

The form and the type of relationship between the chain links depend on many factors, e.g.: location of suppliers and customers, warehouse locations and also the chosen strategy of cooperation between individual cells. The figure, which may take the supply chain, thereby affecting the efficiency and effectiveness of its operations.

### 3. Aims and objectives of supply chain

The concept of the supply chain in recent years has developed very dynamically. This development was motivated by changes taking place in the business environment. The transition from traditional logistics to supply chain had an evolutionary character. Enterprises in the beginning mainly focused on the problems of physical distribution and therefore their activities related to transport, distribution, packaging, storage, and other activities related to

the delivery of finished products to consumers. The fundamental cause of the concept of the supply chain is considered the pursuit of efficient and effective inventory control to optimize the way from raw material extraction to a market sales (Skowron-Grabowska 2010). In the area of inventory management changes occur in distribution channels, stimulated by large retail chains, which play a leadership role in the emerging supply chains.

The development of supply chains has been achieved through such factors as (Kucęba and Nazarko 2009):

- changes in the forms market, increasing consumer expectations in terms of quality production and prices, as well as the time of the contract and the flexibility of supply;
- changes in distribution channels - retail networks being a leader in the supply chain;
- globalization of the economy worldwide, which is a result of the progressive alleviation of world trade, to meet the requirements of customers from various parts of the world, the development of modernized marketing, search for innovative markets for products located in the saturation phase in the domestic markets, search advantages in scale business, improve the information technology and telecommunications, logistics innovation and improvement of transport systems and infrastructure;
- the costs of investment and scientific and technological research and development by a significant level beyond the financial capacity of individual companies;
- deregulation of services markets, especially transport, leading to a more diversified offer.

Depending on customer needs, the supply chain in the enterprise should provide the right balance of reaction speed with efficiency. If the supply chain provides opportunities efficiently meet the needs of consumers, the company gains a higher market share, and its business becomes more profitable.

For the most common goals formulated in terms of supply chain logistics is considered (Kot, Starostka-Patyk and Krzywda 2009):

- minimizing the cost of the flow of products and information while maintaining the desired level of service by the consumer;
- maintaining the shortest lead time, high reliability, frequency and flexibility of supply;
- optimizing inventory levels throughout the supply chain and adapting with the preferences of individual market segments.

There are other theories that relate to the more general objectives of supply chain management, such as achieving a sustainable competitive advantage and profit from the sale. According to the ideology of creating supply chains, namely the expectations of companies involved in their functioning, in particular the integrator of all logistics processes, we can replace the three types of objectives:

- immediate objectives (detailed)
- intermediate objectives,
- ultimate objectives.

Figure 3 shows the scheme of the objectives of the supply chain.

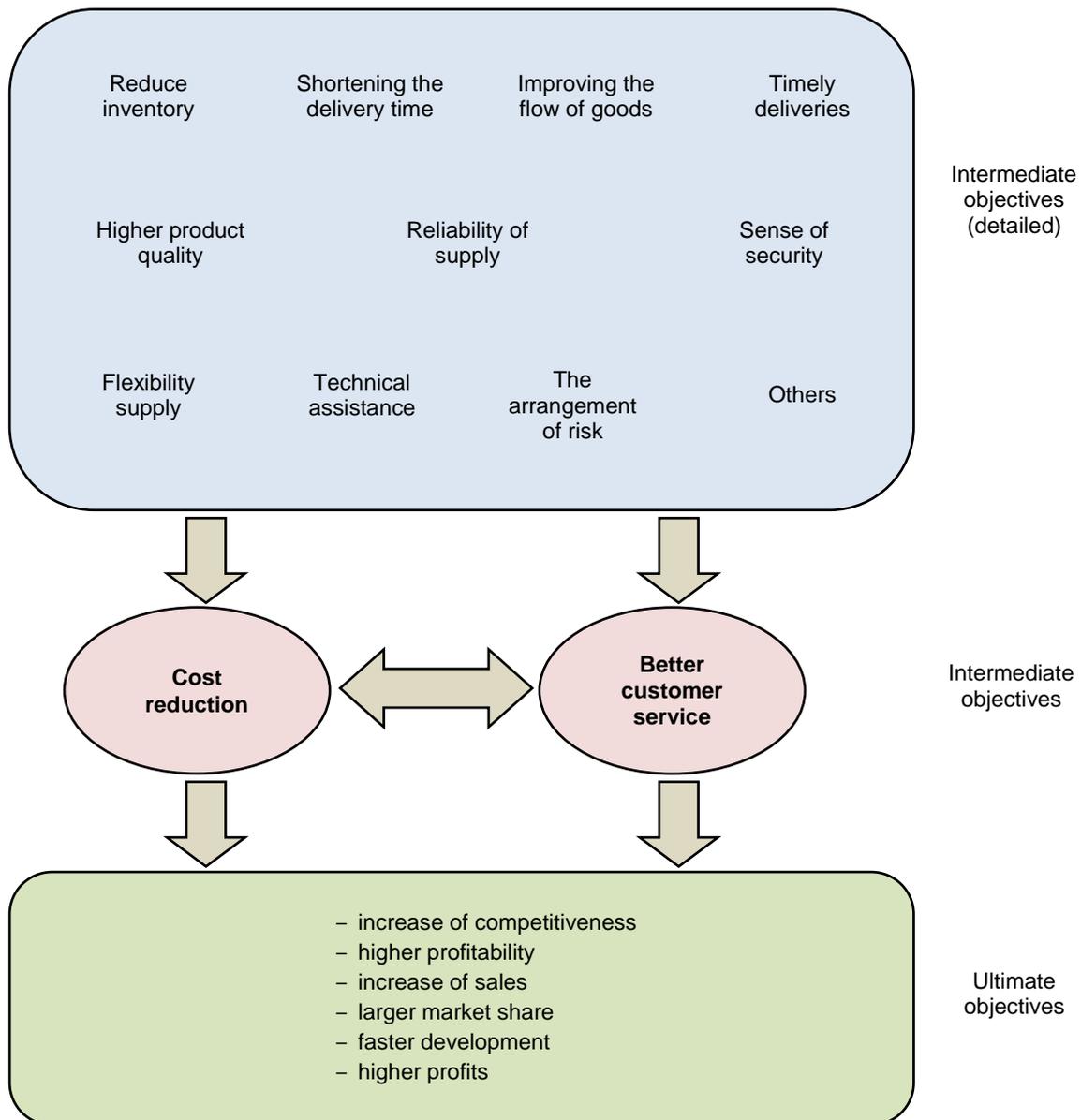


Fig. 3. Systematics purposes of the supply chain.

Source: (Ciesielski 2011).

Immediate objectives (detailed) are those that can be achieved directly. They are homogeneous and more operational than strategic, they can be easily measured. It can be argued that these objectives are immanent in the supply chain, so internal. Immediate objectives are necessary and imposed by the very structure of the supply chain and through measures taken in it (Ciesielski 2011).

Intermediate objectives on the one hand are the result of the implementation of detailed objectives, but on the other they cannot yet be considered as ultimate goals.

Here it is important the reduction of costs and better customer service (Ciesielski 2011). An example can be the implementation of the detailed objective in the form of a reduction of inventory which will reduce and shorter delivery time will increase the level of logistics

customer service. While at the same time lower costs and better customer service can increase the competitiveness of the supply chain, which is the objective of the final.

Ultimate objectives are the general benefits that may become through the supply chain. In addition to competitiveness may be mentioned: increased sales, faster growth, higher profitability, greater participation on market and an increase in profit. Obviously, it would be good to achieve all the objectives simultaneously, but unfortunately this is not always feasible. Therefore, companies and supply chains distinguish between objectives tying them with the adopted strategies of action for selected periods.

One of the essential elements of supply chain management is analyzing the relationships between producing and designing products, and the operation and design of the supply network.

We can specify four areas of supply chain management, which include (Witkowski 2010):

- shaping the product and the network, whose task is to take the necessary decisions on the proposed products and services in the construction of subjective;
- use of the potential of knowledge providers in the planning of products;
- creation of a network of production, leading to the selection and definition of tasks, places of manufacture and storage location of inventories;
- optimization of waveforms occurring within the supply chain, associated with the physical flow of goods, information and funds.

There are three levels of adjustment of the supply chain to the company policy action (Kot, Starostka-Patyk and Krzywda 2009):

1. The first level is the recognition of the market in which the company operates.
2. The second level is an indication of strengths and core competences of the company and the role that the company can fulfill on the market.
3. The third level is the development of relevant skills that will support company in the realization of its function.

Supply chain in the enterprise is an integral part of the approach to the market in which it operates. It must respond to the demands of the market in a manner consistent with the strategy adopted by the company. The supply chain in the enterprise must allow the right compromise between speed reaction and efficiency.

#### **4. Design of supply chain**

Contemporary logistics literature attaches great importance to the correct designing of the supply chain. The supply chain should be designed in a way that complies with prevailing rules, allowing for proper receipt of stocks and then processing them into logistic products or services in such a way that the expectations of the consumer are met.

It is worthwhile to present the Cavinato model, which determines the degree of supply chain integration. According to this model, there is no universal pattern of supply chain. Cavinato draws attention to the fact that there are many types of supply chain and they must be carefully matched to the company's goals. In his theory, he mentions 16 types of supply chains (Kot, Starostka-Patyk and Krzywda 2009). Table 1 presents the supply chain types in terms of management processes.

Table 1. Types of supply chains in terms of management processes.

N	Type of chain	Description / characteristics	Degree of complexity
1	No chain	Features implemented in a free, no strategic advantage of the supply chain.	Low
2	Unknown	Supply chain operations mainly outsourced, such as logistic operators.	Low
3	The chain binding the company	Focused internally. "In the background" behind the competition, trying to catch up (so-called catch-up mode). Competition on logistics and costs of storage and transport.	High
4	Nano-chain	Focused externally. Focused on efficiency of production in plants that require intensive use. Incoming and outgoing processes are secondary. Examples are the production of cars and planes	Low
5	Micro-chain	Logistic model with integrated flow of material goods and information. It balances coming and outgoing distribution with production.	Low
6	Logistics chain of operations	Effective in organizing and executing projects. Includes many suppliers under the venture. Similar to the nano-chain, except for the fact of remaining in the sphere of undertakings.	Average
7	Cash-to-cash cycle	Focused on cash flow, mainly to the disadvantage of the supplier. The starting point is a focus on cash flow with appropriately tailored activities.	High
8	Synergic chain	Elimination of duplication. No competitive advantage. Striving to strengthen purchasing power. Typical for large companies with multiple independent divisions. Concentration on typical merchandise purchases.	High
9	Demand chain	Increased cooperation often dictated by dominant clients such as Wal-Mart. Interdisciplinary in sales and activities. Customized activities. Company with high flexibility. Use of new technologies.	Average
10	Extended supply chain	It has the characteristics of the supply chain. Managers educated in the area of supply chain management. Efficient processes for new products and existing ones.	Average
11	Dominance and market blocking	Preferred monopoly and price level market control. In developed countries it is often considered as illegal.	Low
12	Supply integration	Highly interdisciplinary, resulting from cost reduction activities. Full supply chain approach, platform for competitive initiatives.	Average
13	Speer-to-market	Emphasis on the development of new products. Flexibility. Time is a key factor. Strive to use all the supply chain opportunities to quickly bring products to market.	Average
14	Innovation	Network of manufacturers and logistics providers to provide flexibility. Focus on product development, releasing it, and development phases throughout the product lifecycle. Examples are advanced electronic products or seasonal toys.	Average
15	Value chain	Competition in the supply chain, seeking innovation within the whole chain. Supply coordination. Participants invest in the development of the potential needed to make use of their parts in the chain.	High
16	Information networks	Flexible networks that cover not a lot of material assets for the processing of information flows. Supply chain managers are usually creators and network leaders. Access to data enables them to be processed into information and knowledge.	High

Source: (Skowron-Grabowska 2010).

The above presented models show the individual supply chains and their characteristics. Supply chain creation can be defined as process engineering, based on the choice of the most optimal decision, which will relate to the rules of co-operation between participants in the sender-receiver relationship. Such cooperation can be seen from the perspective of the size of relationships between partners and the need for intense contact.

Supply chain design is closely related to the decision that applies to the two systems (Strykowski 2005):

1. Vertical arrangement - linked to the number and type of intermediary links between the manufacturing company and the final customer; In this arrangement are short chains (with a small number of links) and long (with lots of links);
2. Horizontal arrangement - linked to the number of links, at the individual levels of the chain; in this arrangement we can distinguish narrow chains (for example, one retailer with exclusive sales of specific products) and wide (for example with a large number of separate retailers).

With this set of information, we can optimize and improve operational efficiency as well as improve customer service.

The effective functioning of the supply chain needs to integrate its processes, taking into account the interests of all network participants. The company is not able to cope with the current market competition. The need for co-operation of supply chain enterprises flows out of (Strykowski 2005):

- rapid response to changes in demand and customer requirements,
- comprehensive customer service, which contributes to the co-operation of many different types of businesses.

The dynamic supply chain concept is designed to create dynamically reconfigurable supply chains (instantaneous/virtual supply chains) that arise from individual consumer transactions.

Dynamic supply chain stands out (Strykowski 2005):

- network organizational structure,
- temporary existence,
- focusing on the customer,
- using the key competences of the participants,
- intensive use of information technology.

In order to harmonize supply chain operations, the Voluntary Interindustry Commerce Standards (VICS) has set up a committee for Collaborative Planning, Forecasting and Replenishment (CPFR). Supply chains that have state-of-the-art technologies and are supported by the CPFR process are among the most productive. The CPFR process is divided into three different activities: planning, forecasting and replenishing. Within each of these areas you can distinguish several stages, as shown in the figure 4.

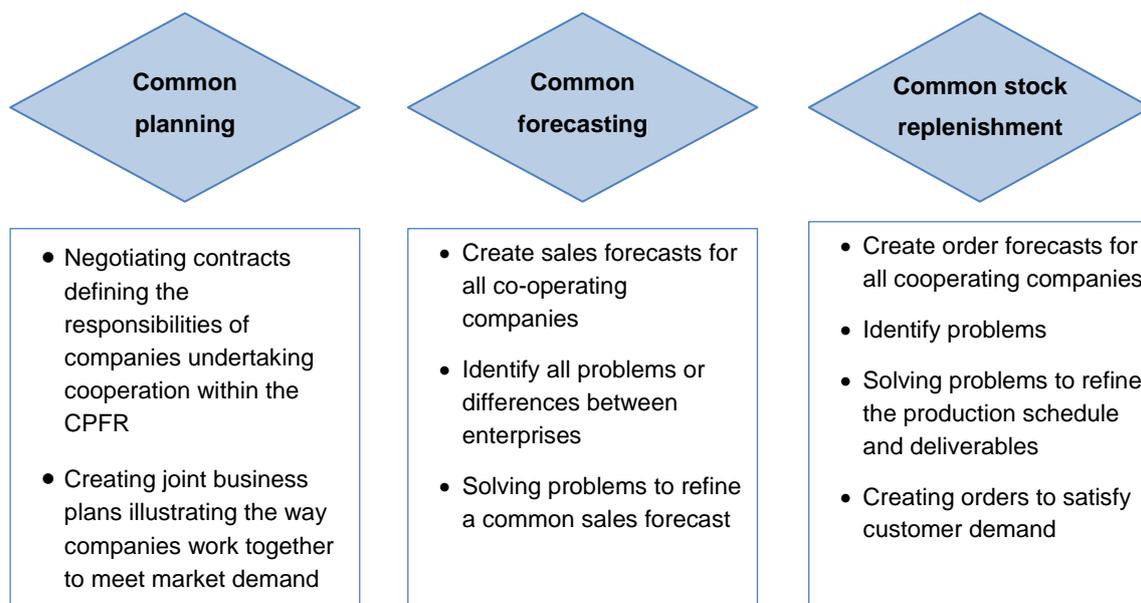


Fig. 4. CPFR process steps.

Source: Own study based on: [http://www.structum.pl/czytelnia-pdf-op/Zarzadzanie\\_lancuchem\\_dostaw\\_Podstawy\\_Wydanie\\_II\\_zalap2.pdf](http://www.structum.pl/czytelnia-pdf-op/Zarzadzanie_lancuchem_dostaw_Podstawy_Wydanie_II_zalap2.pdf) (online access -31.03.2018r.)

Correct design and implementation of the supply chain affects the quality of the product offered and impacts the coordination and synchronization of material, financial and information flows throughout the supply chain. The quality and availability of information is a major factor affecting the functioning of the supply chain and is used in the integration of the cooperating companies. In order for the supply chain to respond effectively to demand and maintain high customer service, at the lowest cost, multidirectional information exchange between all participants must be applied.

## 5. Characteristics of the supply chain of the surveyed enterprise

Dairying as a logistics supply chain is a flow of manufactured goods from milk, understood as a network of interrelated organizations that direct, control and streamline the flow of material and information. Between existing links, there are integration links, as well as formal and informal cooperation, aimed at creating the conditions for the harmonious flow of goods, information and cash through the separated links and the flow of final goods to the final customer (Kapusta 2009). The logistic supply chain for milk and its products is shown in Figure 5.

As can be seen from the figure above, many suppliers are operating on the supply chain, from milk-producing businesses, agricultural holdings and dairy processing plants to milk purchase, storage and processing, to dairy distribution channels and to shops offering various types of dairy products. An important position in this supply chain is occupied by farms which, through the milk production, form the raw material base for dairies and production companies. Before a farmer is qualified as a supplier, he must provide the company with documents that certify: that the herd is free from infectious diseases, feed hygiene is

appropriate (approved by the County Veterinary Officer) and that the milk marketed for processing meets the veterinary requirements.

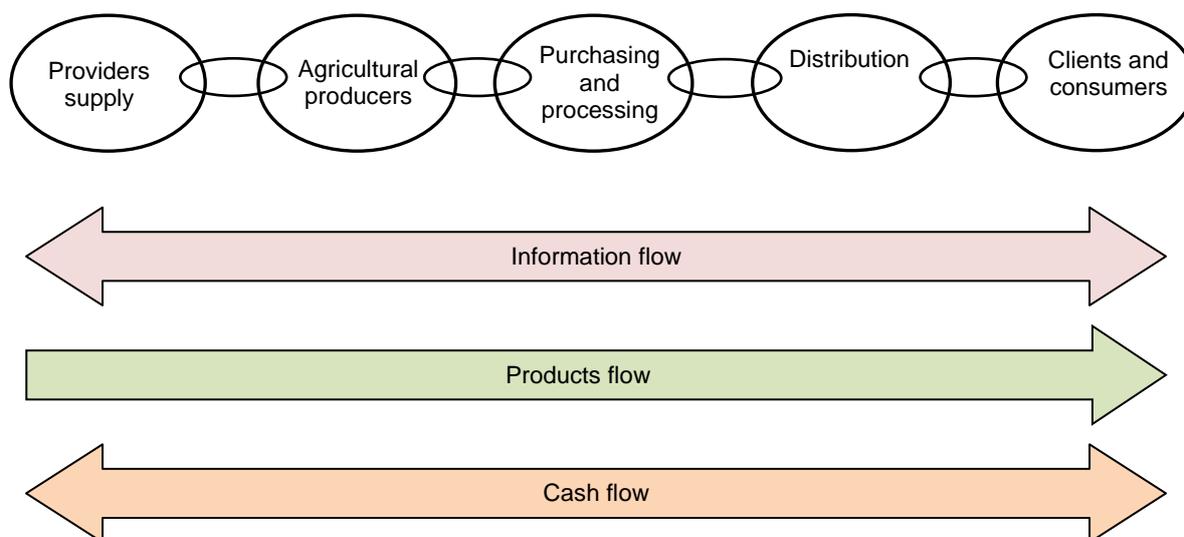


Fig. 5. Logistic supply chain in dairy industry.

Source: (Kapusta 2009).

As a further step of approval, a supplier's audit is carried out taking into account the evaluation criteria:

- appropriate storage room for milk collection and storage.
- having a milk cooler,
- possession of current sanitary-epidemiological booklet by persons performing the udder,
- water consumption for consumption confirmed by research in accordance with applicable law,
- the technical feasibility of the milking machine,
- use of means to clean and disinfect dairy equipment.

To get a positive result you need to get 100% of the rated criteria. After a positive result of the audit, the supplier receives the statute of the approved supplier, receives the number assigned by the Company "X" and is registered in the "prolan" computerized purchasing program, which is the electronic register acts as a list of approved suppliers. In 2017, the Cooperative had 142 registered suppliers.

In the Dairy Cooperative an important logistic process, due to the frequent supply of raw materials, is the transport process. In transport of milk and its products practically uses only one branch of transport, car transport. The dairy has its own transport fleet and are equipped with three milk tankers in a two-day cycle.

Transporting milk from a farmer to a dairy enterprise requires a specific approach. Due to the short shelf life of the milk, the milk should be chilled as soon as possible and delivered to the processing plant so that it is processed into milk products within 24 hours of receipt. The milk collection in the researched company has been modernized, the dairies have changed the milk collection points to the tankers. Each time the cistern driver checks his appearance and

smell and collects raw milk samples from each supplier for testing on fat, water, antibiotics and inhibitory substances. Twice a month, the driver collects raw milk samples from each supplier for microbiological testing and controls the temperature of milk, which should not exceed 6°C (if the temperature exceeds 6°C he does not receive milk). The driver also tests the acidity of the milk using a thermo pH meter. If the acidity does not fall within the pH range of 6.6 to 6.8, the milk is not picked up. If the parameters of raw milk fall within the normal limits, the milk is pumped into a specific tank chamber by electronically measuring the volume of the raw material.

Table 2 shows the compilation of liters and miles of milk tanker trucks in 2017.

Table 2. List of liters and kilometers of milk tanker trucks in 2017 (in thousands).

Month	MERCEDES			SCANIA DKA-S482			SCANIA WGM-VK15		
	liters	km	km increases	liters	km	km increases	liters	km	km increases
January	160.4	3.1	-	118.1	2.1	-	544.4	6.4	-
February	10.3	1.1	4.2	243.1	4.3	6.5	488.2	5.7	12.2
March	94.0	2.8	7.0	31.7	5.2	11.6	491.2	5.5	17.7
April	12.0	1.0	7.9	355.0	5.5	17.2	574.9	5.6	23.3
May	218.9	2.6	10.5	277.0	3.3	20.5	625.7	5.9	29.3
June	532.5	5.9	16.5	203.3	2.3	22.8	417.1	3.7	32.9
July	108.0	2.2	18.7	464.9	4.4	27.1	585.1	4.8	37.7
August	48.9	2.0	20.7	457.7	5.7	32.8	568.3	6.0	43.7
September	66.5	2.8	23.5	318.4	4.7	37.5	559.3	6.0	49.7
October	86.9	1.9	25.4	305.1	5.6	43.0	484.6	5.8	55.6
November	49.7	1.9	27.3	284.5	5.5	48.5	446.0	5.4	61.0
December	48.8	5.4	32.7	279.3	1.7	50.3	489.6	5.9	66.9
<b>Total</b>	<b>1,436.7</b>		<b>32.7</b>	<b>3,338.1</b>		<b>50.3</b>	<b>6,274.4</b>		<b>430.0</b>

Source: Data from Company „X”.

As shown in the table in 2017, the cooperative bought 11 049 182 liters of milk. The net milk was paid PLN 12,193,483, i.e. PLN 1.07 net per liter on average. At the same time, in order to reduce transport costs, a total of 149,887 km was used during the two-day cycle of the tanker.

Milk delivered to the Cooperative, is subjected to preliminary tests to evaluate the raw material. From the mixed milk, a sample is taken and indicates the temperature, acidity, fat and protein content and the presence of antibiotics. Milk pumping is combined with its recording using flow meters. The main department of the plant is the plant, i.e. the place where the equipment and equipment forming the production line for mechanical and thermal milk processing are located. From the dairy apparatus, it is directed to the individual

production lines and technological lines depending on the demand. The production manager receives the order-related data from the customer service department and allocates the amount of milk required for each department on that basis. Due to its short shelf life, products such as milk and cottage cheese are produced under order, while other products are made for stock.

Production includes such divisions as:

- Apparatus department
- Cheese department
- Cottage cheese department
- Department of fermented beverages
- The fresh products department

The Dairy Cooperative specializes in the production of curd cheese and blue cheese, produced from the highest quality milk. The tradition of blue cheese production dates back to 1956. Its production is a combination of traditional recipes with new production technologies.

The cooperative also has such products as milk, cream, buttermilk and kefir in its assortment. Table 3 shows the production in assortment groups in 2017.

Table 3. Own production – 2016/2017 in assortment groups.

Name	2017		2016	
	Production [kg]	Net value	Production [kg]	Net value
Milk	785,712.0	1,144,460.4	1,201,461.1	1,823,785.6
Cream	413,353.6	5,827,642.1	1,305,070.6	5,665,638.9
Cottage cheese	769,148.9	6,622,509.9	789,508.4	6,951,819.9
Blue cheese	149,447.9	2,956,895.6	132,752.2	2,672,387.8
Buttermilk	53,654.8	89,139.1	75,993.7	138,092.7
Kefir	181,351.2	375,638.3	206,362.3	471,740.1
Delicacy in a sprinkle	4,052.5	62,805.6	4,408.7	69,023.0
<b>Total</b>	<b>3,356,720.8</b>	<b>17,079,091.1</b>	<b>3,715,557.0</b>	<b>17,792,487.9</b>

Source: Data from Company „X”.

As is clear from the table above for most assortment groups, sales in 2017 are less than in 2016. The biggest drop was recorded on food milk. The interest of customers of this type of product is decreasing. Undoubtedly, the solution to this topic would be to put into circulation instead of milk in foil, milk in bottles or cartons. Currently Cooperative "X" is not prepared for this technically. The next assortment group where the sale was negative was kefir. It is also probably related to the less functional packaging (buttermilk wrapped in foil – the preferred cardboard or bottle), kefir packed in a cup (the preferred packaging – bottle). Delicacies in a sprinkle also recorded a negative growth in the year 2017 compared to 2016. The reason is unattractive packaging and variable product weight. Introducing a fixed weight of the product would certainly help to increase sales, because the article on the store shelf would not "deter" of its price (price per kg over 20 PLN and the price of one piece – 5 PLN).

The negative increase in cottage cheese production was caused by the drastic decrease in the price of competition in this assortment. High success is a significant increase in production in the group of blue cheeses. The sales increase is 16.7 T, and the revenue growth was over 284 thousand PLN.

The dairy industry's products are stored in warehouses with adequate temperature and humidity. The cooperative has such a designed warehouse that it is possible to mechanically transport the products produced during the production and mechanically load the goods into the means of transport.

The company keeps stocks of materials (e.g. packaging), spare parts and auxiliary materials, dangerous goods and chemicals (e.g. hydrochloric acid), stocks of work in progress (e.g. blue cheese) and finished goods (e.g. cream, kefir). The following storage devices are used in the warehouse: shelving racks, three-level pallet racks (ground floor and two floors) where 3 pallets of 1000 kg can be set, and auxiliary equipment: pallets and containers.

Orders are made by stock employees from the stock of finished goods. The method of permanent storage is used in the warehouse, that is, each unit of stock has a strictly assigned storage location. Order execution takes place individually, i.e., the employee completes one order, sequentially picking all assortment items according to the order. Warehouse staff in the dispensing process use the FIFO system, which tells that the product which goes first to the warehouse, also the first goes out, and the FEFO method, which means that when the product loses its validity date is the first product which goes out of the warehouse. Pallets after delivery to the customer are received back by return transport.

## **6. Examine of selected elements of the supply chain**

Modern supply chain management theories emphasize the huge importance of customer satisfaction. In classical push systems, the customer was the last link in the chain, while in modern pull systems it is the initiator of the chain flow. So, by analyzing the supply chain according to the pull strategy, the customer is the most important part of the flow process and its satisfaction is a priority for the efficiency of the entire chain. Customer satisfaction analysis - links in the flow, is therefore the most important task and the first step in the implementation and configuration of the supply chain.

In the presented article customer satisfaction survey was based on a questionnaire. The survey questionnaire was filled by 50 clients selected at random. The first question was how long ago the customers of the cooperatives purchased their products (fig. 6).

A decisive majority of clients (50%) are clients who cooperate with the cooperative for more than 7 years. These are big steel buyers, who already have a good reputation and appreciate the Spit-roading brand. The second group (22%) are clients working with the company in the range of 5 to 7 years. They can also be included in the group of regular customers, satisfied with the products offered to them by the cooperative.

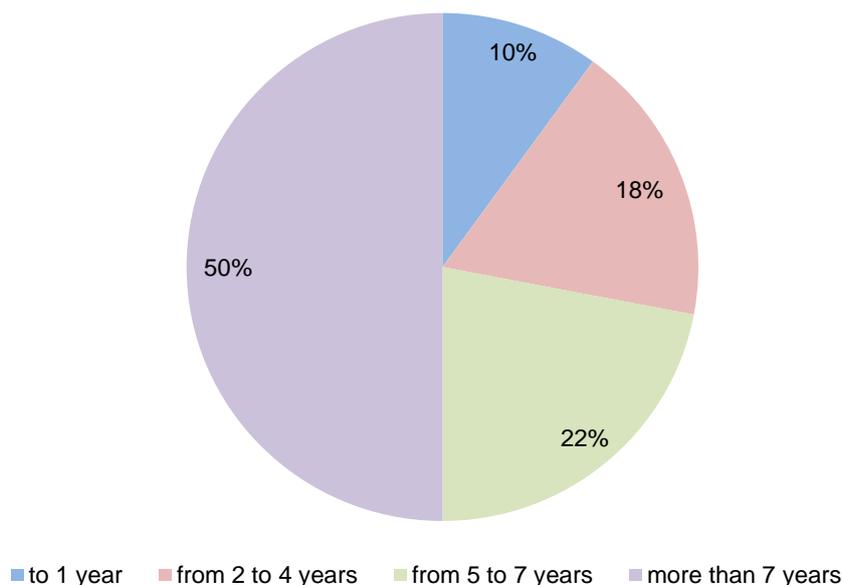


Fig. 6. How long ago the customers of the cooperative purchased their products.

Source: Own study based on survey data.

The smallest group are clients cooperating with cooperative for less than 1 year. This proves that the attachment of the customer to the company and to the products plays a very important role. It is therefore pleasing that for 1 year the cooperative has acquired new customers. The task of increasing the number of new customers through effective management has been fulfilled.

The next question asked was about the frequency of weekly orders (fig. 7).

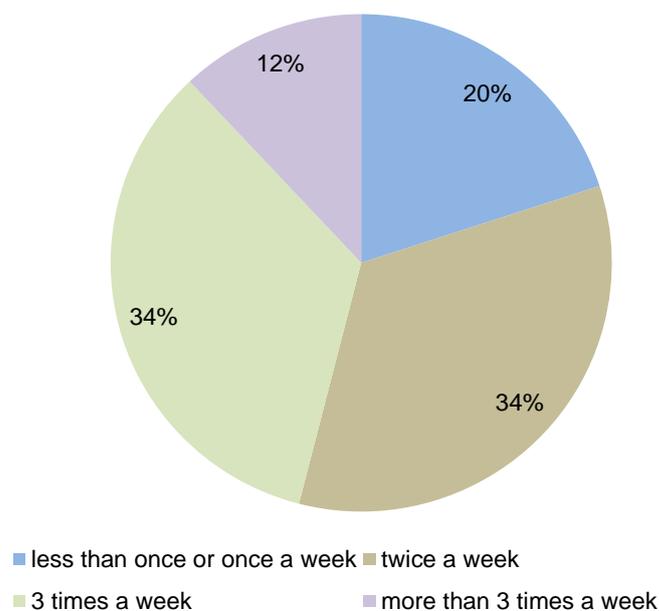


Fig. 7. What is the weekly frequency of your orders?

Source: Own study based on survey data.

Most often (68%), the delivery of Cooperative products takes place 2-3 times a week. Customers who buy fresh dairy products (milk and cottage cheese in the parchment - where the time of consumption is less than five days) expect delivery 2-3 times a week. Least of customers buy products more than three times a week, which is economic for cooperatives because it minimizes transportation costs.

The next question of the questionnaire was designed to select the most frequently purchased products (fig. 8).

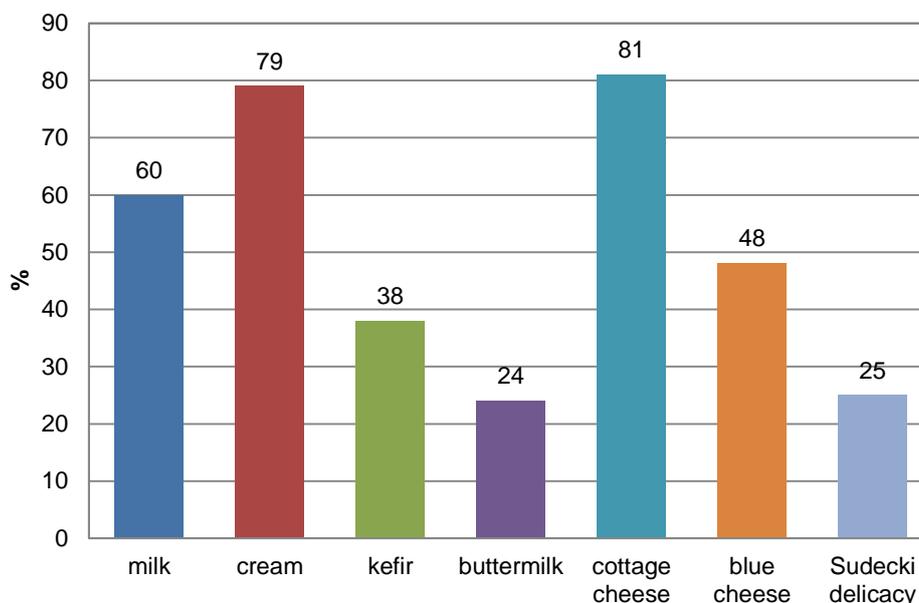


Fig. 8. What products of the cooperative (assortment groups) do you buy?

Source: Own study based on survey data.

From the chart above, the most popular products are curd and cream. Milk is bought in third place, kefir, buttermilk are in the last places.

In the last question, the respondents were asked to evaluate the cooperation with the company, 1-unsatisfactory, 5-fulfilling expectations. Average scores from 50 questionnaires are shown in the table below.

Table 4. Evaluation of cooperation with the cooperative.

Question	Average grade	Question	Average grade
Advertising in mass media	3.38	Possessing a quality management certificate	4.26
Introducing new products	3.80	Brand knowledge in the region	4.30
Price promotions	3.80	Regional product	4.38
Wide assortment offer	3.82	Quality of customer service	4.44
Length of validity	4.00	Product quality	4.60
Attachment to people	4.12	Order execution speed	4.62
Low price	4.18	Timely deliveries	4.64
Processing of complaints	4.18	Completeness of orders placed	4.72
Attachment to brand	4.22		

Source: Own study based on survey data.

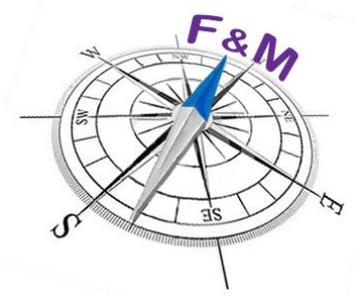
As shown in the table above, the customers the best rated the completeness of the orders placed, the timeliness of deliveries, the speed of delivery and the quality of the products. The cooperative should be satisfied with this assessment, as it means that the management in these areas is properly carried out. On the other hand, the worst was rated: the advertisement in the mass media, introducing new products and price promotions. The reason for this is the lack of company financial resources for introducing novelty and advertising.

## 7. Conclusions

The purpose of the article was to discuss supply chain management on the basis of the chosen company. The surveyed company was the dairy cooperative. The dairy plant puts increasing demands on the quality of raw materials produced by milk producers. Dairy products are delivered to the surrounding markets. Comprehensive service to a large number of wholesalers and retailers enables strong logistic backgrounds as well as own dairy wholesalers. For distribution the plant uses external carriers. The use of outsourcing has reduced costs while increasing the level of delivery. Examine of elements of supply chain shows that the biggest strengths of cooperative are: completeness of orders placed, the timeliness of deliveries, the speed of delivery and the quality of the products.

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# **Finance and Management**

Journal of the Faculty of Economic Sciences  
University of Warmia and Mazury in Olsztyn

**2018 Volume 3(1)**

## **PART II**

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**Miscellanea**

**Essays**

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**Reviews**

**REVIEW OF THE BOOK**

“Raw Material Market and Bank Risk (in Terms of Market Risk and Credit Risk)” by Bogdan Włodarczyk,  
Publisher: University of Warmia and Mazury in Olsztyn

**Marek Szturo**\*

The practical study of bank risk on the raw material market is one of the most difficult areas in terms of methodology. It mainly concerns the area of measurement and quantifiable issues as well as the theoretical approach to the issue of bank risk on the raw material market. More of taking up of this topic should be welcomed. The work is interdisciplinary, requiring proper scientific preparation from the author. Without any doubt, Bogdan Włodarczyk moves freely in the subject matter. The book is characterized by the scale and reliability of the author, and above all, thorough knowledge of the subject of bank risk issues and processes occurring on the raw material market.

The author, taking into account the complexity of economic phenomena and structures, points to the need to create risk decomposition mechanisms and, as a consequence, to distinguish the impact of the various types of risk. The research covered the impact of raw material market on bank risk. The author has examined the comprehensive impact of the raw material market risk on the bank risk.

The book starts from discuss the origins and concepts of risk as well as the definitions and sources of bank risk. Different risk classification criteria and contemporary concepts of risk measures are presented.

The next part presents the concept of the raw material market and their importance in the modern economy. The author referred to the importance of raw materials on the Polish capital market, and also presented the phenomenon of financialization of these markets.

The next part of the book presents an overview of issues related to market and credit risk management. The author focused on the problem of management of equities risk and raw materials risk. He presented short and long-term determinants of stock market indices in the context of prices on raw material market. The Granger causality was used to study the relationship between money supply and raw material market indices. Sensitivity of the return on sectoral investments against the background of the volatility of raw materials prices and the risk implied by the probability of bankruptcy of companies were examined.

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The final part of the book presents the concept of a model for assessing the impact of raw material market on the bank situation. Discussed are the conditions for the implementation of the integrated model and its theoretical assumptions.

It should be emphasized that the issues raised in the book are very important and interesting from the theoretical and practical point of view. The object of the author's interest is current and refers directly to economic reality.

The key advantages of the compact issue in the book were the integrated approach to market risk with other bank risks under the new supervisory regulations and the identification of specific attributes and areas of risk management in the raw material markets. In addition, the original concept of reducing the risk of raw materials in the activities of banks was proposed.



**THE REPORT of the II<sup>nd</sup> Scientific Conference  
“Alternative models of urban development – challenges and problems  
of small towns and their environment”**

**Agnieszka Stanowicka\***

The Faculty of Economics of the University of Warmia and Mazury in Olsztyn has established cooperation with the Spatial Economy College and the Faculty of Civil Engineering, Architecture and Environmental Engineering of the Lodz University of Technology. The cooperation resulted in a scientific conference titled “Alternative models of urban development - challenges and problems of small towns and their environment”, which took place on 11-12 May 2018 in Lidzbark Warmiński.



The organizers were also Marshal's Office of the Warminsko-Mazurskie Voivodeship, Polish National Cittaslow Network, „Polish Cittaslow Cities” Association, Municipal Office in Lidzbark Warmiński. The honorary patronage over the conference was taken by the Marshal of the Warminsko-Mazurskie Voivodeship and Society of Polish Town Planners.

One of the goals of the conference was the integration of representatives of various environments (practitioners, representatives of the local government and the academic community) around the issues of small towns development, including the development perspectives of the cittaslow city network.

1. On the first day of the conference, workshops on modern instruments of city development took place. The subjects of workshops were following issues:
2. CPTED method as a simple and effective tool for creating safe spaces in revitalization projects, renovation of cities and their districts;
3. The city's identity as a promotion tool based on the example of the cittaslow city network;
4. Small City Development Card (using the Design Thinking method);

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5. Cultural heritage in the revitalization and development of small towns and their environment;
6. Improvement of social competences in city planning and revitalization processes.

Workshops were a great opportunity to exchange opinions and practical experience of representatives of local government units (mayors and cities offices employees), leaders, activists and representatives of the world of science.



On the second day of the conference over 60 lectures were delivered, which inspired over 200 participants (including 26 universities and other scientific institutions)

to interesting discussions regarding models, conditions and directions of small towns development. The participants presented their research results and shared opinions in the following thematic panels:

- models of urban and rural development,
- Cittaslow - experiences of the region of Warmia and Mazury,
- spatial planning and revitalization of cities and rural areas,
- conditions for urban development,
- technical infrastructure of the city,
- potential and barriers to the development of Cittaslow cities,
- cultural heritage of cities,
- development potential of cities,
- management of the city and its relations with the environment.

The special guest of the conference was the President of the International Scientific Committee of Cittaslow Cities - prof. Giuseppe Roma, who gave a lecture titled "Cittaslow patterns to improve economy and social life in the small cities of the World".

The conference was complemented by a poster session, on which numerous problems of small town development were presented in an interesting form.



The Faculty of Economics of the University of Warmia and Mazury in Olsztyn and the Lodz University of Technology intend to continue this kind of cooperation.



### **The Center of Innovation and Technology Transfer as an institution connecting science with economy**

**Konrad Szydłowski\***

The development of a knowledge-based economy is currently an important element of socio-economic changes taking place in Poland since the beginning of the transformation period. The free movement of products, services, technologies, human and financial capital as well as the development of innovation, is a key factor in improving Poland's international competitiveness.

The level of innovation in each countries largely depends on the creativity and entrepreneurship of the scientific community. Universities, research institutes and laboratories are the places where scientific research is carried out, transfer to business and support social and economic development. A key role in this proces play internal organizational units of the university, such as technology transfer centers, technology parks, business incubators. An example of this type of units is the Center of Innovation and Technology Transfer at the University of Warmia and Mazury in Olsztyn.

The Center is an university-wide unit whose main goal is to commercialize knowledge and transfer technology to the economy. This goal is implemented in many different areas combining science and economy, and one of the main is the commercialization of results of research and development. To this end, a special commercialization procedure was developed and implemented. It regulates the process of reporting by employees the results of scientific research, development works and know-how. The tasks of the Center include support for the research process, analysis of the possibilities of covering inventions with the protection of property rights, assistance in choosing the commercialization path, analysis of market potential, as well as developing a business model. Brokers of innovation play a fundamental role in this process. Their task is to identify the results of R&D work with high potential for commercialization, assess of market potential, as well as build interdisciplinary research teams on the science-business line. The Center also offers support in searching for sources of financing and introducing innovations to the market.

Another area of activity is the implementation of research services commissioned by enterprises. The Center initiates cooperation of research teams and experts from the University with companies interested in obtaining a specific knowledge, training or consulting research service. Cooperation in this area is established not only with enterprises operating in Warmia and Mazury, but also with nationwide and international entities.

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Cooperation with the economic sector is also supporting companies in applying for funds from the European Union aimed at building a competitiveness through the development of innovative products, services or technological processes. The center's employees help entrepreneurs choose the optimal form and structure of financing, as well as participate in the preparation of documentation necessary to apply for funds.

Moreover the Center actively cooperates with other academic centers in Poland. A perfect example of such cooperation is the "Inkubator Innowacyjności+" – project financed from the European Union. The University of Warmia and Mazury in Olsztyn is a partner of the consortium of the Medical University of Lodz, the University of Lodz and the The Strzemiński Academy of Art Łódź. The main objective of the project is to develop innovation and strengthen cooperation between the scientific environment and the economic environment. It is also supporting the process of managing the results of scientific research, in particular in the field of commercialization. One of the main tasks carried out under the project is to conduct research and development work, which will result in a product, service or manufacturing technology ready to implement to the economic sector. 9 teams conducting research in such fields as biology, biotechnology, energy, special-purpose food, cultivation of plants, achieved financial support.

Activity of the Center also includes numerous types of educational initiatives. The offer is addressed both – to students, as well as the University's teaching and didactic staff. The Center conducts trainings in the field of academic entrepreneurship, creating innovation, technology transfer and commercialization of research and development. Training and consulting in the field of intellectual property protection are also organized.

The experience of Western countries indicates a number of benefits resulting from cooperation between science and the economy. These include the inflow of innovative solutions, creation of new activities, improvement of manufacturing processes, creation of new jobs for people with higher education. The example of the Center of Innovation and Technology Transfer at the University of Warmia and Mazury in Olsztyn shows how important and complex is this cooperation and how important role it plays in cooperation between science and economy.