Strategies, Methods and Tools of Supply Chain Management in Polish Enterprises

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This paper demonstrates the state of supply chains in Polish companies, describes the reasons for their current situation and their future perspectives. Moreover, it presents the results of research into supply chains and their strategies, together with methods and tools applied in researched companies. The topics covered in the paper include: effects of and obstacles for supply chain integration, conceptions of supply chain management, application of computer systems and tools. All collected data are analyzed in the context of company size and capital origin.

1. INTRODUCTION

In the face of the increasing changes caused by the globalization, Polish enterprises have to adjust their actions to the market demands. It is important to ensure high quality of services along with shortening the time of order completion. The flexibility of the logistics system should be the basic characteristic of modern company. In order to increase the competitiveness of Polish firms their managers strive to supply chain management improvements.

The objective of the article is to analyze the actual state of supply chains in Polish enterprises. The authors describe previous situation of logistics in domestic companies and its reasons basing on the literature. The results of research conducted in companies are presented. They concern the conceptions of supply chain management applied in enterprises, the effects of supply chain integration that are observed. Moreover different types of computer systems and tools that are used in companies are described.

A lot should be done in Polish enterprises to catch with the standards of Western Europe. First of all it is necessary to change the attitude of managers who have to look for new sources of profits instead of cutting the costs only. "Everybody wins something" should be their new motto. The level of risk in joint action is usually lower and the competitiveness of the whole chain is usually higher than the competitiveness of each element.

2. SUPPLY CHAIN MANAGEMENT

According to Chopra and Meindl [1], supply chain consists of all elements that are directly or indirectly involved in fulfilling customers' requests. The chain includes of course manufacturer and suppliers, but also transporters, warehouses and retailers. There are four elements that influence supply chain's performance. A change in each element can significantly alter supply chain's efficiency and responsiveness:

- inventory – all raw materials, work in process, and finished goods within a supply chain,
- transportation – all ways of moving inventory from point to point within a supply

chain. It includes different means and routes,

- facilities – places where inventory is stored, assembled or fabricated,
- information – data and their analysis concerning inventory, transportation, customers etc. that are necessary for the correct functioning of supply chain.

The main obstacles that influence supply chain are [1]:

- increasing variety of products – it makes forecasting and meeting customers' demand more difficult,
- decreasing products life cycle – shorter life cycles increase uncertainty thus they hinder the coordination between supply and demand,
- increasing growth of customers' demands – they demand faster fulfillment, better quality, and better product for the same price they paid years ago,
- globalization – apart from benefits that spring from possibility of finding better or cheaper suppliers, it makes coordination of supply chain harder,
- difficulty in executing new strategies – putting new strategy into practice is much more difficult than its creating. Companies often fail even to imitate successful strategies,
- fragmentation of supply chain ownership – more and more popular outsourcing causes the managing of supply chain being more difficult because of possible conflict of interests.

The most common trends concerning supply chain are: globalization, increased cross-border sourcing, collaboration with low-cost providers and shared function of transportation and administration.

The aim of supply chain management is creating the value for customers and entrepreneurs thanks to the integration of key business processes. Activities are coordinated in order to improve the long-term performance not only of the separate elements but also of the whole chain.

According to the Council of Supply Chain Management Professionals [1], supply chain management includes the planning and management of all activities related to sourcing, procurement, conversion, and logistics management. It also involves the most important elements of coordination and collaboration with partners in the chain (suppliers, intermediaries, third-party service providers, and customers).

It's worth mentioning that the results of A.T. Kearney's 2011 Assessment of Excellence in Procurement study shows that all companies that demonstrate high level of procurement performance among other things better managed risk and vastly improved supply chains [2].

3. STRATEGIES AND TOOLS OF SUPPLY CHAIN

Supply chain strategy is often confused with supply chain management. The meaning of supply chain strategy is broader however; because it defines how the supply chain should operate in order to compete. "Supply chain strategy is an interactive process that evaluates the cost benefit trade-offs of operational components. Business strategy involves leveraging the core competencies of the organization. It also includes the analytic and decision-making process surrounding what to offer (e.g. products and services), when to offer (timing, business cycles, etc.), and where to offer (e.g. markets and segments) as a competitive plan." [3]

The literature of the subject mentions many different divisions and types of strategies. Strategies, that according to the result of different surveys, are popular in Polish enterprises are described below:

Agile – developing a flexible and reconfigurable network, sharing competences and market knowledge, responding rapidly and cost-effectively to changes.

QR (Quick Response) – reducing order-response time, and achieving greater accuracy in shipping the correct goods in correct quantities, by employing computerized equipment (barcodes and EDI) to speed up flow of information. Strategy applied mainly between suppliers and retailers of general merchandise.

ECR (Efficient Customer Response) – attempts to identify and remove inefficiencies that have caused excessive inventory and unnecessary costs at all levels of the supply chain.

TQM (Total Quality Management) – introducing continuous improving of products' and processes' quality. The base of TQM strategy is the belief that everyone who is involved in the creation or the consumption of the products or services offered by an organization is also responsible for their quality.

JIT (Just in Time) – raw materials and components are delivered from the vendor or supplier immediately before they are needed in the manufacturing process. This strategy is striving to improve a business return on investment by reducing inventory and associated costs. JIT focuses on continuous improvement and can improve manufacturing, quality, and efficiency.

VMI (Vendor Managed Inventories) – inventory is replenished by the supplier who either monitors the customer's inventory with own employees or receives stock information from the customer. The vendor then refills the stock without the customer order.

CMI (Customer Managed Inventories) – retailer makes the decision on the inventory replenishment. JIT or QR methods of inventory management are used in dependence of the regularity of demand.

Striving to higher efficiency in supply chain management the majority of companies use IT tools. According to Witkowski [4], the possibility of achieving shorter time of deliveries is highly determined by the popularization of systems of electronic data interchange, global positioning system (GPS) for transporting vehicles and systems for automatic identification of the products using barcodes. Apart from well-known systems like MRP/MRP II/ERP, modern enterprises use also solutions mentioned below [4, 5]:

LIS (Logistics Information Systems) – join elements from MRP and DRP (Distribution Requirements Planning) systems. They gather, collect and process data that are used in decision making process.

SCM (Supply Chain Management) – they enable inspection of products flow. It is possible to analyze the movement of products between the suppliers.

EDI (Electronic Data Interchange) – transferring data in standard format between computer systems. It is commonly used for sending orders to warehouses, tracking shipments, and creating invoices. Data are interpreted by computer systems without human participation.

RFID (Radio Frequency Identification) – a technology that uses radio waves to transfer data from an electronic tag or label attached to an object, through a reader for the purpose of identifying and tracking the object. RFID is coming into increasing use in industry as an alternative to the bar code. The advantage of RFID is that it does not require direct contact or line-of-sight scanning.

Electronic catalogues – list of goods or services on sale with their description and prices published as a printed document, or as an electronic document (e-catalog) on the website or on CD, DVD, etc.

More and more enterprises strive to integrate logistics in supply chains. They undertake these actions in response to market pressure that concerns: the quality, the response time and the costs. Four main aims of supply chain management are listed in the literature: lower costs, higher quality and diversity of products, responsiveness and sensitivity to consumers' expectations, shorter response time. Actions for better integration of purchasing, production and distribution are required to achieve these goals.

One issue distinguishes several phases of this integration. A characteristic feature of higher phases is a partnership in relations among companies in supply chain. According to Christopher [6] the main benefits of partnership are:

- shorter delivery times,
- better rates of JIT deliveries,
- lower inventory levels,
- lower problems with quality,
- stable and competitive prices.

4. SITUATION IN POLAND

In the early nineties many obstacles hindered the development of supply chains in Poland. The most important were: lack of knowledge on the subject of logistics management and of new solutions concerning computer systems and tools.

27

However lack of confidence and the custom of competing in winner-looser way were also the problem.

Over the years the situation in Poland has been getting better and a progress in knowledge of new conceptions of supply chain management has been noticed. Employees from bigger companies and from companies with international relations have usually presented higher level of skills and knowledge [7].

The results of research conducted in 2001 in the Mazovian, Great Poland and Lower Silesian voivodeships showed that the companies took advantage of the knowledge about supply chain management. Enterprises established long-term relationships with their cooperators that have enabled better integration of logistics processes. Cooperation included: joint planning and realization of logistics strategies, sharing transporting functions, making available sales forecasts and production schedules to the suppliers. Many supply chains however, didn't have information and products flow coordinators. [4]

The level of computerization in departments of logistics was low in 2001. Big companies and these carrying out international activity were better equipped and often used integrated computer systems, EDI, GPS and electronic catalogues. The others usually limited themselves to the electronic mails. The most popular effects of supply chain integration were: inventory level reduction, reduction of transport and inventory maintenance costs, better services. The respondents said that the biggest difficulty in establishing partnership were too little knowledge and experience [4]. However lack of confidence towards contractors, poor development of the transport and the warehouse infrastructure, insufficient resources and disproportion in the companies force were also mentioned:

Similar conclusions drawn from the surveys conducted that time were presented by Witkowski [6]. According to the opinion of Polish managers, the impression that cooperation improvement was impossible was important obstacle in creating partnership relations in the supply chain. Moreover the creation of partnership was also hampered by great number of different projects conducted in the same time. It should be however emphasized that situation has been conditioned by circumstances like:

privatization, restructuring of companies and limited development of distribution channels.

During the years 2006-2007 the previous problems were not solved and insufficient resources were still the most important among them. In spite of the hopes put on the EU funds only the indicator of the storage space development has increased significantly [8]. In 2007 a revival of international transport was noticed, and the participation of Poland in the transporting in the EU area grew even to 8%. The integration of enterprises and consolidation of the supply chains influenced the reduction of transport costs. One also observed that the number of intermediaries was getting smaller because of the trend of supply networks shortening. Moreover outsourcing of services became more and more popular.

In 2008 the level of computerization of Polish companies was surveyed. The Internet was used nearly in all companies but ERP systems were applied only in 10% of enterprises (the result was lower than in 2006). Only 14% of companies (most of them were the big ones) used electronic tools for interchanging information necessary in supply chain management. The data concerned inventory or demand forecasts and the capacity of production were transmitted the most often.

5. RESULTS OF RESEARCH

The research [9] was conducted in Polish enterprises in 2011. Most of the companies (45%) belonged to the production sector, 23% were commercial ones, 22% were in the service sector and about 8% were building companies. Domestic capital dominate in 72% of analyzed enterprises. The companies were divided according to size (number of employees) and 40% of them belong to medium enterprises. The range of activity was the last criterion – 41% of enterprises act on the global market and almost the same percentage acted on the domestic market. 20% of analyzed companies carried out activity only on the local market.

The questionnaire was divided into four parts that concern issues like:

- integration within supply chain,
- strategies of supply chain management,
- instruments that support supply network management,

- obstacles of supply chains' integrated management.

Detailed analysis of the results of research was carried out taking into consideration areas mentioned above.
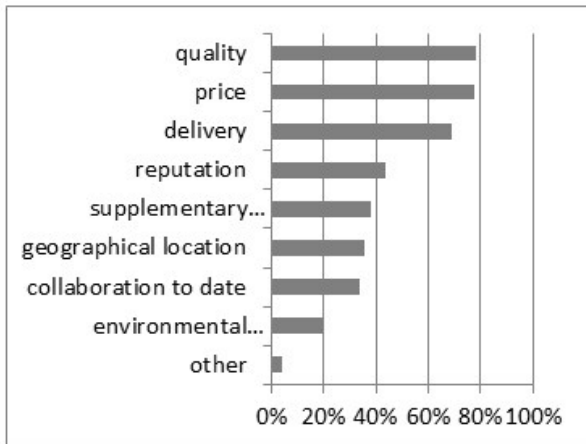

Fig. 1. The importance of the supplier selection criteria

The first question brings up the problem of supplier choice criteria that have been applied in the enterprises. According to the results of survey (see figure 1), the most important criteria are: quality, price and delivery. All these criteria have received at least 70% of the maximum note. In the second group (at least 30% of the maximum note) are: reputation, supplementary services, geographical location and collaboration to date.
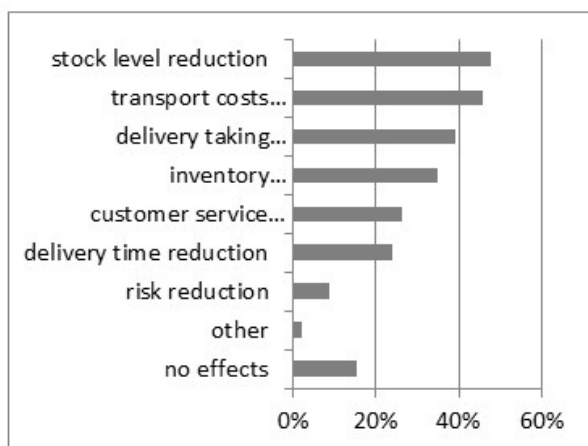

Fig. 2. Effects of supply chain integration in surveyed enterprises

The results obtained are mostly in accordance with the tendencies that can be observed in developed European countries. While 20-30 years ago, price was considered as the most important criterion, now quality and delivery are equally important. Taking into consideration the quality or to date col-

laboration is a good symptom because it indicates that companies intend to create long-lasting contacts with their suppliers. In comparison with foreign results, importance of environmental protection is the criterion that is underestimated by surveyed companies. Polish enterprises don't give much attention to the fact whether their suppliers comply with the regulations concerning environmental preservation.

Next question concerns the actions undertaken in order to supply chain integration. As it is presented in figure 2, about 60% of surveyed companies confirm these efforts, so they were asked to describe their actions. 61% of these companies are monitoring and optimizing the stock level through the whole supply chain. 57% of enterprises use shared transport and the same percentage joints forces with their supplier to plan and realize logistics strategies. 53.6% of surveyed companies make sales forecasts and production schedules available to the suppliers. Half of companies tries to reduce the number of their suppliers and third of them sets an information and products flow coordinator. Less than 10% of enterprises set the rules of risk sharing or of sharing joint logistics actions potential profits.

It seems that a correlation between some of the actions described above can be observed. Activities like monitoring and optimizing stock levels within the whole supply chain and making sales forecasts and production schedules available to the suppliers are usually taken by the same companies. Similarly: common transportation and reduction of suppliers' number are done together. Information and products flow coordinators are set in the companies where suppliers participate in logistics strategies planning and realization. This situation is in accordance with the results of surveys described by Witkowski and Rodawski [7]. The low number of enterprises with information and products flow coordinator indicates that the full integration of supply chain doesn't occur in surveyed companies. It's also curious that such low significance is attached to the problem of risk management while this problem is so often raised in literature.
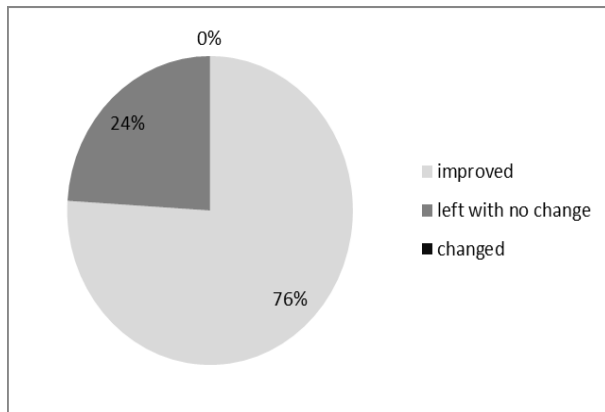
Fig. 3. Opinion about a future of supply management strategy currently used in company

Fig. 4. Conceptions of supply chain management used in analyzed companies

The second part of the questionnaire concerns the strategies of supply chain management. The questions are aimed at identifying the conceptions that are used in surveyed companies. Because of different terminology applied in companies the authors have decided to use two separate classifications of strategies: one according to Coyle, Bardi and Langley [10] and own classification.

In first question the following strategies are listed:

- time-based,
- asset productivity,
- moving from push to pull systems,
- relationship-based
- value added.

Surveyed companies use time-based strategies most frequently (50%). Asset productivity, value added and moving from push to pull systems strategies are considerably less common – they are applied respectively by 17%, 15% and 11% of the enterprises.

The respondents are asked to present their opinion about strategy that is used in their company (the results are shown in figure 3). As much as three-fourths of them claim that this strategy should be improved (not changed). In the opinion of the rest, the logistics strategy should be left without changes. The results show that the respondents understand the necessity of changing the way the company acts as response to the changes in customers' demand. Curiously enough, no company intends to change its strategy. It may be explained by the fact that the hybrids of management conceptions that are used in companies are adjusted to the circumstances in which they work.
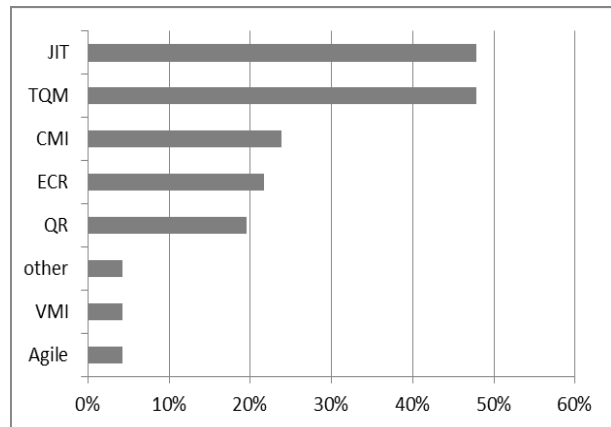
In the next question several conceptions of supply chain management are listed. Respondents are asked to point out the solutions that are widely used in their enterprise. The conceptions that are suggested (each person can point out maximum three of them) are listed below:

Agile,

QR (Quick Response),

ECR (Efficient Customer Response),

TQM (Total Quality Management),

JIT (Just in Time),

VMI (Vendor Managed Inventories),

CMI (Customer Managed Inventories).

The results are presented in figure 4. Two conceptions are distinctly more popular than the others. Both Just in Time and Quick Response strategies are used in almost half of surveyed enterprises (48%). The second group consists of three conceptions that are used in about 20% of companies. There are Customer Managed Inventories (24%), Efficient Customer Response (22%) and Quick Response (19.5%) in this group. The less popular are Vendor Managed Inventories and Agile strategies – only 4% of respondents use them.

It is possible that high results of Just in Time and Quick Response strategies can be caused by respondents' insufficient knowledge of the rest of strategies. Research [7] that were carried out several years ago among Polish managers showed that their knowledge about logistics is often limited to the strategies and conceptions that have been applied since 90s. Modern strategies aren't so well-known.

Relatively small number of companies that are applying CMI and VMI conceptions may indicate that integration of supply chains aren't still popular in Poland. It is probably connected with the lack of the information and products flow coordinators in Polish supply networks. Moreover the managers may feel anxious about assigning the control of the inventory to another enterprise.

There is a strong connection between the strategies that are applied in companies. Some conceptions of supply chain management are used together – the most common is combination of TQM and JIT strategies. The most universal is Total Quality Management that is used together with all conceptions mentioned above.

The respondents that didn't been use the conceptions connected with quick reaction (QR and ECR) had been asked about their plans. 75% of enterprises confirm they want to implement these strategies mostly because of the management improvement and customers' demands meeting.

Next part of the questionnaire concerns the instruments that support supply network management. Nowadays almost all strategies require appropriate computerization of logistics processes. In first question respondents are asked to point out maximum three tools from following list:

email,

electronic catalogues,

EDI (Electronic Data Interchange),

GPS,

RFID (Radio Frequency Identification),

EPOS (Electronic Point of Sales).

In line with expectations, near all (98%) logistics departments (see figure 5) use electronic mailing. The electronic catalogues are also popular – they are applied in near half of analyzed companies (49%). Electronic Data Interchange is used by one fourth of enterprises. Considerably less companies uses the other tools (GPS and RFID) because they require more expensive equipment. It may be also conneceted with a little number of transport companies taken into consideration in this research.

Next question concerns computer systems that are used in departments of logistics. The answers come as surprise because nearly 30% of companies admit they don't use any system. 61% of the investigated enterprises use MRP or MRP II systems. ERP systems are considerably more rare (21%).
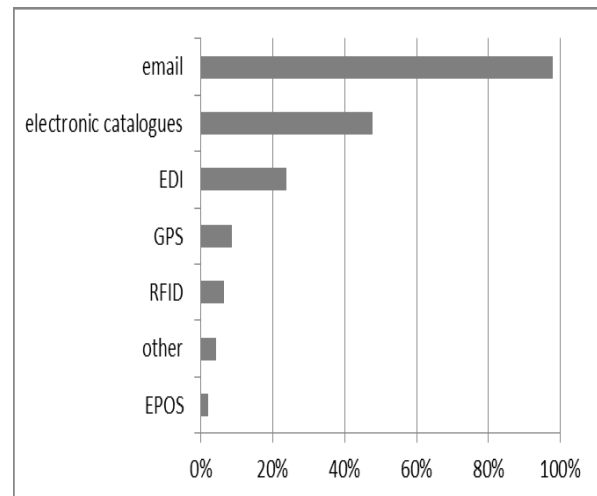

Fig. 5. Tools applied in departments of logistics in analyzed companies

Last part of the questionnaire takes up the issue of obstacles that stand in the way to supply chain management integration. The main problems that hinder the close cooperation among the enterprises in supply chain network are asked about. Each respondent can point out maximum three of following propositions:

- lack of knowledge and experience,
- insufficient resources,
- lack of confidence towards contractors,
- disproportion in the companies force,
- impression that cooperation improvement is impossible,
- insufficient transport or warehouse infrastructure,
- limited development of distribution channels,
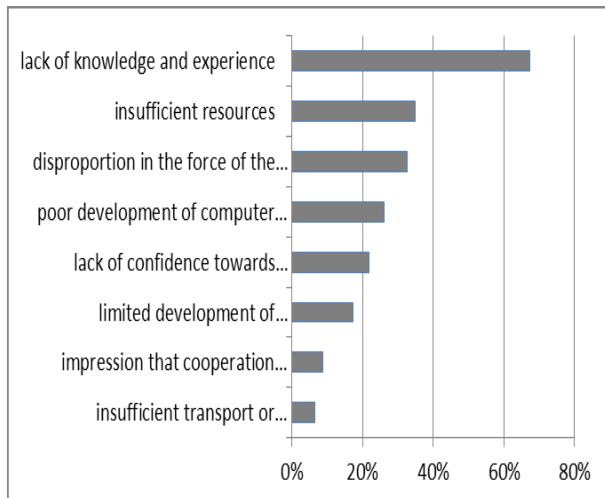- poor development of computer infrastructure.

Fig. 6. Obstacles that stand in the way to supply chain management integration in analyzed companies

As it is presented in figure 6, the greatest problem in supply chain integration is lack of knowledge and experience. It is indicated by 67% of respondents. Insufficient resources are the limitation for nearly one third respondents (35%). Almost the same percentage of companies point out disproportions in force (33%). Poor development of computer infrastructure is an obstacle for 26% of enterprises. Judging from the results of previous question, the lack of integrated computer systems may be here the issue.

6. ANALYSIS OF COLLECTED DATA

Collected data were analyzed according to two criteria: origin of capital and size of the enterprise.

6.1. ANALYSIS ACCORDING TO THE ORIGIN OF THE CAPITAL

The importance of supplier selection criteria in companies with domestic capital is a little bit different than in companies with foreign capital. It come as surprise that quality is the most important criterion for the companies with domestic capital while price is most important for the companies with foreign capital. The differences are also noticeable in the case of supplementary services, geographical location and environmental protection criteria (see figure 7).
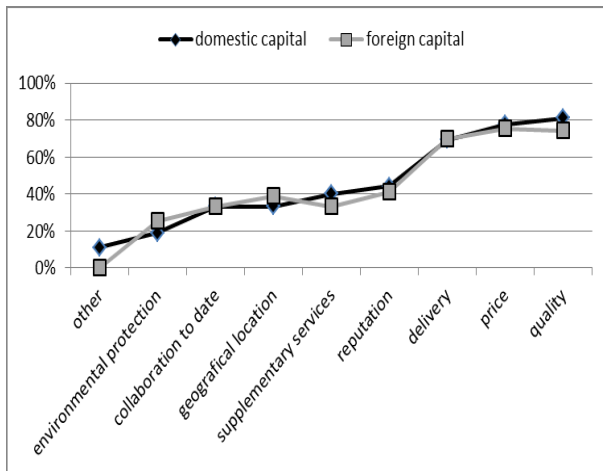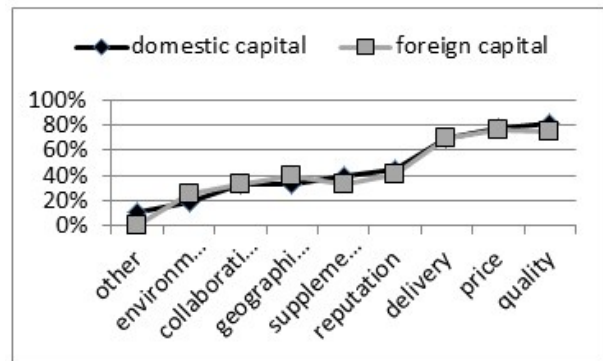

Fig. 7. Differences in the importance of suppliers selection criteria between companies with different origins of capital

The next difference can be seen in the the results of supply chain integration. All companies with foreign capital notice the effect of the integration and in most cases their average results are higher than in the case of enterprises with Polish capital. It is especially visible in the case of effects such as "delivery taking quality improvement" and "transport costs reduction" when the difference is higher than 30%. "Stock level reduction" is the only result that is significantly more frequently observed in enterprises with domestic capital (see figure 8).

Time-based strategies are more popular in companies with Polish capital Moreover the majority of enterprises with domestic origin capital want to improve applied strategy.

The most popular conception of supply chain management in the companies with domestic capital is Just in Time while in the others Total Quality Management is used the most often. As it can be seen in figure 9, all conceptions except JIT and TQM are more frequently applied in the companies with foreign capital. The biggest difference in us-

age is for Efficient Consumer Response conception. In enterprises with Polish capital one can observe two regularities. First of all it is a strong attachment to on-time processes what confirms the results of previous question. The second issue is an increasing importance of quality. Total Quality Management concerns many aspects of company's activity and is easier to be identified than other conceptions.
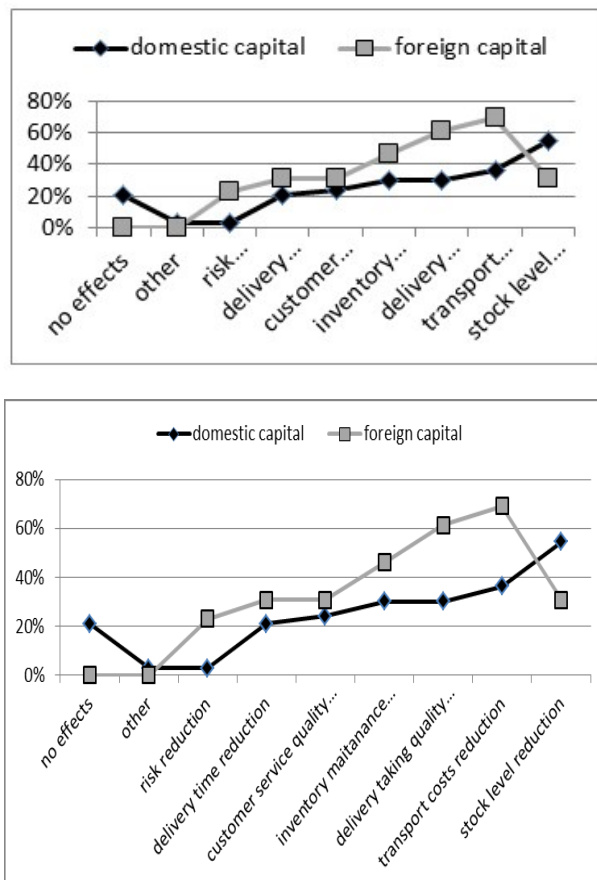

Fig. 8. Differences in the results of supply chain integration between companies with different origins of capital

The differences were also found in the utilization of IT tools in departments of logistics. In the companies with foreign capital the level of usage of instruments like Electronic Data Interchange and GPS is higher. The differences amount to 31% and 24% respectively. It can be explained by the higher technological awareness of these companies and willingness or necessity of foreign standards equaling. Electronic catalogues are the only solution that is more popular in enterprises with domestic capital.

Taking into consideration computer systems in departments of logistics one can find that they are significantly more popular in companies with for-

eign capital (only one of them doesn't use any system). The others use MRP/MRPII or ERP systems what is in accordance with present European trends. As far as the obstacles that hinder supply chain integration are concerned, all types of companies point the lack of knowledge and experience as the most important problem. The main differences could be seen in the case of three obstacles: "disproportion in the companies force", "insufficient resources", "lack of knowledge and experience".
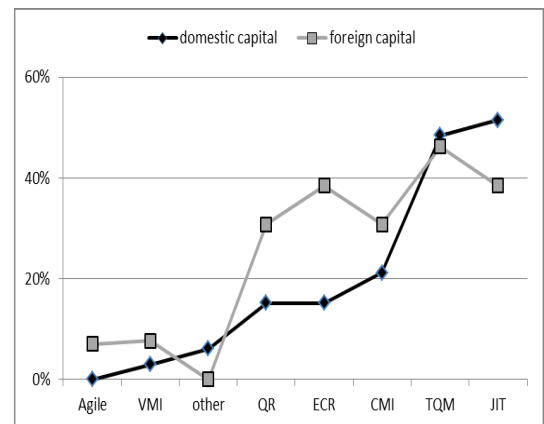

Fig. 9. Differences in the adopted conceptions of supply chain management between companies with different origins of capital

All the above mentioned problems are significantly less important for enterprises with foreign capital (see figure 10). Moreover in these enterprises disproportion in the companies force and insufficient resources are less important than problems like "lack of confidence towards contractors" and "poor development of computer infrastructure". It is worth to mention that "poor development of computer infrastructure" is the only obstacle that is more crucial for enterprises with foreign capital.
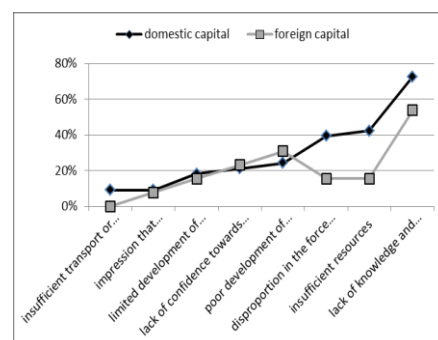

Fig. 10. Differences in the obstacles of supply chain integration between companies with different origin of capital

33

Companies with Polish capital underline the significance of disproportion in the force of companies in supply chain. After the accession of Poland to the European Union our enterprises have started to participate in the international supply chains and had to accommodate themselves to the requirements of the most important participants. Problems that are often mentioned in the nineties like "limited development of distribution channels" or "lack of confidence towards contractors" aren't so important today.

6.2. ANALYSIS ACCORDING TO THE SIZE OF THE COMPANY

In literature one describes the results of research that show a close relationship between the size of company and the strategies, conceptions and computer systems applied. The authors of this paper have also observed analogous relationships in collected data.

Medium and big companies take actions in order to integrate supply chain more willingly. They use shared transportation and make sales forecasts and production schedules available to their suppliers. The lack of an information and products flow coordinator is significantly more frequent in smaller companies.

All sized enterprises use time-based strategies of supply chain management. Relation-based strategies are more popular in medium-sized companies, while bigger enterprises have probably, their own transport base.

The utilization of computer systems in departments of logistics is increasing with the size of company. The most popular solution in the enterprises of all size are MRP/MRP II systems. It comes as surprise that ERP systems aren't more popular in bigger companies.

Knowledge of supply chain management in analyzed enterprises can be judged as high. Respondents from bigger companies and these with foreign capital come out better. However all these polled admit that the main problem is their lack of knowledge and experience.

7. CONCLUSION

Logistics infrastructure in Polish enterprises differs from West European standards. A delay in computerization, supply chain integration and popularization of management strategies is still visible. However during last years this situation has been gradually improved. It is a good indication because according to the results of Cap Gemini survey the concept of supply chain will change in the near future. The information system containing computer systems of individual companies and procedures of data flow that apply common language (standards) will be the necessary condition of the value chain elements' coordination. They will improve company efficiency and will have essential importance for its development [11].

The main aim of this paper is to present the trends of supply chains management strategies' development in Polish companies and the results of their application. The number of enterprises that have agreed to fill in the questionnaire (46) is too small to generalize the opinions, however they are mainly in accordance with the results of literature survey. One can see high level of consciousness that changes in supply chain management are necessary. However lack of knowledge and experience along with low level of computerization hinder the success. Most of the respondents realize the profits of chosen strategy of supply chain management. The most often observed results are: stock level reduction, reduction of transport and inventory maintenance costs, better quality of delivered products. The managers especially pay attention to economic aspects, while quality of service improvement is on subsequent position.

Enterprises that participated in the survey underestimate the importance of risk management and ecological problems. Three most important criteria of supplier selection: quality, price and delivery time are the same in West European and in Polish companies [6].

A lot should be done in Polish companies to achieve the level of supply chain operating that is standard for foreign countries. New trends are implemented with a delay and in many enterprises the integration within the supply chain isn't advanced. It seems that educational undertakings should be carried out to promote new solutions in supply chain management. Especially small and medium enterprises, that aren't in the strong position in confrontation with big corporations, should be supported.

The change of the managers' attitude towards other enterprises in supply chain is necessary. They still don't realize that the goals of the whole supply chain, not only of the single element are important. It should be remembered that the losses of one company are the losses for the whole chain but the profits of one element aren't tantamount to the profits of whole chain.

8. LITERATURE

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