MISTAKES DURING THE MANAGEMENT OF SUPPLY CHAINS AND METHODS OF ANALYSIS THESE REASONS

Sebastian Wieczerniak
Poznan School of Logistics, Poland
E-mail: sebastian.wieczerniak@wsl.com.pl

Piotr Cyplik
Poznan School of Logistics, Poland
E-mail: piotr.cyplik@wsl.com.pl

Jaroslaw Milczarek
Poznan School of Logistics, Poland
E-mail: jaroslaw.milczarek@wsl.com.pl

Received: June 10, 2018
Received revised: August 18, 2018
Accepted for publishing: August 20, 2018

Abstract

Building and managing supply chains is not a simple task, during which there are many barriers and challenges. The following article shows what mistakes, difficulties and challenges occur during supply chain management. Analysing the available literature, it can be observed that there are a lot of publications supporting their formation and management, and the problem of their difficulty is little explored. The purpose of this article is to present challenges faced by managers, of medium and large enterprises in Poland, during planning, operation, control and improvement of supply chains. In order to achieve the assumed goal, a survey was conducted among middle and senior managers in many Polish enterprises to indicate the most common difficulties. Production companies from various industries as well as logistics operators were selected for the survey. To systematize these problems, the Deming cycle was used and the challenges were assigned to the stages Plan, Do, Check, Act. This allows a schematic approach to problem solving. The advantage of this article is to propose a methodology to analyse the root causes for errors that were considered the most frequent during the study. The first part of the article presents the problems occurring during the supply chain management, the second part contains the results of research and methods of analysis of the root causes of problems adjusted to the particular phases of the Deming cycle.

Key words: Supply chain building, errors in the formation of supply chains, challenges during the creation of effective supply chains, Deming cycle, management of material and information flows, analysis of root causes

1. INTRODUCTION

The Supply Chain means the flows of raw materials, materials, semi-finished products, finished products, information and money. It starts from raw material procurement to production, up to consumption of the final product by the end user, receipt of payment by participants in the chain and ends with feedback from the consumer. Reverse logistics, which means the flow of returnable packaging, complaints and recycling, is also included in the supply chain.

The primary purpose of Supply Chain Management is to coordinate the level of stocks throughout the chain, rather than transferring them between cooperating companies. The role of coordinator in the chain is taken over by a company whose position is dominant due to its economic strength, size and authority. With the support of IT applications it is possible to forecast demand, exchange documents in electronic form, track movements, coordinate financial flows. The ambition of an efficient supply chain is to organize supplies in such a way as to eliminate or reduce intermediate storage.

Regardless of the differences in the definition of supply chain management, there is always a need for all its participants to develop and adopt the basic principles of its functioning and development. In defining these principles, it is particularly important:

- transparency and trust,
- strategic cooperation,
- leadership,
- mutuality.

The acceptance of these supply chain management principles helps to mitigate conflicts between suppliers, customers and service providers. Their implementation can be counterbalanced by sources of conflict such as competitiveness of objectives, imbalance of bargaining power or decisions taken on the basis of different information.

2. HISTORY OF INTEGRATED SUPPLY CHAINS

Different forms of economic cooperation have been known for centuries, but the management of integrated supply chains began to develop dynamically only at the beginning of the 1980s. However, the theoretical and methodological basis of the discussed idea was based on the results of research carried out at least twenty years earlier. Supply chain managers even refer to the late 1950s and early 1960s acquis. This applies in particular to Forrester's publications, which, when examining the flows between suppliers and customers, pointed to problems of excess inventory in suppliers, which are now called the "bullish whip effect" (Forrester, 1961). The results of marketing studies on the allocation of inventories in distribution channels and networks should be considered equally important. In the second half of the fifties of the 20th century, it was the first time that a new system had been created. W. Alderson formulated the principles and explained the benefits of postponing the provision of services and allocating inventories to the next levels in the distribution channels as a

way to reduce the risks associated with changing customer behaviour (Alderson, 1957). At the end of the 1950s, the first analytical model of allocation and control of inventories existing in production and distribution networks was developed. The author of the F. Hanssmann model, examining the possibilities of optimizing the costs of inventories and increasing revenues from sales as a function of delivery time, proposed the use of dynamic programming (Hanssmann, 1959). However, the term "supply chain management" appeared for the first time in the literature only in 1982 and was associated with the reduction of stocks within the company and its cooperating companies (Cooper et al., 1997). The authors of this concept were R. Oliver and M. Webber, who wrote about the supply chain in the context of the role that the top management of multinational companies should play in identifying conflicts between the objectives of different functional areas of the organisation that result in an uncoordinated flow of products, information and financial resources (Christopher, 1992). Currently, mining, processing, trading, logistics and other service companies involved in the movement of products, information and financial resources from the original producer to the final customer and back are considered to be the supply chain. The supply chain is not, therefore, the same as its management. Since the mid-1990s, the prevailing view has been that cooperation in supply chains starts as early as the product development phase. Another basic process that should be managed on a chain scale is demand planning and order processing. An even broader scope for cooperation in supply chain management stems from an analysis of the relationship between product and supply chain relationships. Within both dimensions, R. Cooper and R. Slagmulder distinguished between the development and implementation phases (Cooper & Slagmulder, 1999).

Achieving full supply chain integration requires the provision of demands, sales forecasts, production schedules, orders and other information related to the physical flow of products to actors in the chain. Joint planning and implementation of a logistics strategy for the chain and definition of the role of its different links are also necessary. Agreeing on the principles of risk-sharing and possible benefits resulting from joint logistics undertakings is another condition for establishing long-term relations with partners. It may also be helpful to establish a central flow coordinator, i.e. a link that is the main initiator of undertaken actions and controls their implementation, in particular to eliminate duplication and uncoordinated actions in transport and storage. The success of creating an integrated supply chain also depends on abandoning the practice of transferring the costs of maintaining inventories to suppliers or recipients in favour of monitoring and optimising inventories along the entire chain (Śliwczyński, 2008).

Integration benefits come from economies of scale, focusing on what a company does best (outsourcing). It also eliminates barriers to the free flow of logistic streams and avoids any duplication between different participants of the logistic channel, e.g. stocks, marketing activities, quality control.

For efficient supply chain management using Industry 4.0 concept, the different elements of the supply chain need to be integrated. The flow of goods, information, money and logistics back to back must work smoothly. However, it is often the case that there are problems with the operation of supply chains (Kocsi & Oláh, 2017; Szozda, 2017).

3. THE PROBLEMS ENCOUNTERED AT THE VARIOUS STAGES OF SUPPLY CHAIN MANAGEMENT

The basic principle of the scientific method and the Deming Cycle is iteration - once the hypothesis has been confirmed, it contributes to the further expansion of knowledge after the cycle has been repeated. Repeating the Deming cycle can bring you closer to your goal, usually improving your performance and result. The PDCA model should be implemented in an iterative way, spirally expanding the knowledge of the system, while approaching the target with each subsequent cycle. This can be imagined as open-ended spiral springs, where each loop is one cycle of the method and each cycle brings an increase in our knowledge of the system under examination. This approach is based on the belief that our knowledge and skills are limited, but there is room for improvement. Especially at the beginning of the project, the key information may not be known; the scientific method, near the Deming, provides feedback to support our assumptions and increases our knowledge. By broadening our knowledge, we can choose between improvement and goal change. The pace of change and adaptation to customer needs is a key factor in competitiveness in supply chain management. PDCA allows you to take big steps in improvement or breakthrough changes, while maintaining your goals. The PDCA approach is typically associated with large, resource-intensive projects, involving both time and people, to cover global supply chains.

The Deming cycle in the PDCA version consists of the following steps:

PLAN - planning, which means determining the activities that are necessary to achieve the goal,

DO – execution according to all points of the intended plan

CHECK – analysing the results, which means checking whether the plan has been effective and what can be done to improve the process

ACT – an action that consists of improving the process and integrating ideas into the next plan.

3.1. Problems at Planning Stage

In the Deming cycle, each process begins at the planning stage. At this stage, the objectives and processes necessary to deliver results in line with the expected end result should be defined. By determining the expected effect, completeness and accuracy of the specification, which is also part of the target improvement. If possible, start on a small scale to test possible impacts. Supply chain planning aims to determine the length of the supply chain, its components, the processes between its components and the point of separation. At this stage, it is very important to establish indicators and their forecast values.

3.1.1. Functional Instead of Process Approach

A chain is commonly understood as an interconnected sequence of organisational units forming a string. The supply chain has traditionally been divided into so-called "silos" for planning, procurement, logistics and services, with

individual managers focusing on extrusion of maximum value within their own "cells". Initially, this approach was impressive in terms of improving overall financial performance, but today, when it is much more difficult to do so, companies should stop treating the supply chain as a simple sequence and begin to see it as a process that encompasses many functions and organisational structures. The difference is seemingly small, but for many companies it means very serious challenges. Supply chain managers now go far beyond their in-house activities and relationships to deal with B2B and even B2C processes and interactions. This, of course, requires the ability to deal with external partners.

The new approach involves listening to customer voices and integrating marketing and consumer research processes into the supply chain. This change in approach not only allows more to be squeezed out of the internal supply chain, but also creates a collaborative structure that generates new value in the systems between the individual "silos", while keeping an eye on the "total cost of ownership structure".

Another major shortcoming is the fact that you are following a well-established path that has its advantages: employees are assured of comfort and their leaders do not have to change their market strategies. The problem is that this attitude can block extensive transformation processes that require fundamental changes in the interactions between the supply chain and other business functions of the company, and can also prevent the chain from being adapted to make optimal use of closer interactions with consumers. For example, we would have scored little if we had not succeeded in moving away from a centralized 'push' system based on the concept of supply and towards a decentralized 'pull' system based on point-of-sale signals. Forecasts of processes aimed at minimizing missed deliveries from factories or warehouses are not the same as forecasts of processes determining the supply chain, but using data coming from points of sale. Many companies measure their success not by the number of units of goods they produce but, like our retailers, by the number of units they sell.

3.1.2. Alliances

Supply chain planning has the potential to create alliances. Alliances that bring individuals together in a complete chain of dependencies contribute to effective cooperation. Strategic alliances bring producers together in partnership with suppliers, transporters and logistics service providers. As a result of the development of JIT strategies, companies reduce the number of suppliers but strengthen their cooperation in order to achieve cost and quality objectives. This makes it possible to limit the number of suppliers and carriers (Rudnicka, 2014).

For example, freight forwarders drastically reduce the number of carriers and allocate larger, more regular and sustainable loads to transport. Manufacturers choose several preferred suppliers and place most of their orders with them. As a result, there is much greater interdependence in the supply chain. In the event that several subcontractors enter into an alliance with the aim of achieving high returns in the short term at the expense of the other elements of the chain, this could destabilise the chain and, in the worst case, lead to a break in cooperation.

3.1.3. Determination of the Decoupling Point

Decoupling point - determines the location of storage of the main inventories in the flow of goods flows. This point separates the independent and flow-dependent demand for the product in question. Independent demand arises outside the undertaking concerned and represents the primary demand of the market in question. This demand is determined by forecasting, in contrast to the dependent demand, which can be calculated deterministically. This concept resulted from the desire to reduce the total level of stocks in the supply chain.

Depending on the location of the decoupling point, parameters such as order processing time and the cost of the security stock will change. There are five typical locations for a decoupling point. At the same time, they define the basic variants of shaping the logistics system of the company:

- MTS - Make To Stock - goods are stored in warehouse and delivery is done from distribution warehouse - is usually used by companies with their own distribution network. Stocks are located close to the consumer. This is usually associated with a fast delivery time and a relatively high cost of security inventory.
- MTS - Make To Stock - production in the manufacturer's warehouse, i.e. in the central warehouse or in the production warehouse next to the factory.
- ATO - Assemble To Order - Assembly only after receiving purchase order,
- MTO - Make To Order - parts manufacturing and assembly only after receiving purchase order,
- ETO - Engineer To Order - material purchase, parts manufacturing and custom assembly - inventory costs are transferred to the suppliers of raw materials, the longest lead time of the order (Fechner, 2006).

The main problem in determining the allocation point is determining the relationship between the investment risk (related to the size of inventories in the supply chain) and the risk of losing the order. For example, if the chapter point for the bread product were set at MTO, the customer who comes in the morning for the bread would have to wait for the combination of ingredients and the baking of the bread. However, the number of breads sold to orders would increase significantly. Reducing the risk of losing an order would reduce overproduction. At the same time, the loss of an order in this case leads to much higher investment costs, as every point of sale in the supply chain would have to be equipped with expensive equipment to make bread. In the case of companies manufacturing exclusive yachts, which have an individual design and sometimes also individual materials and manufacturing technology, the chapter point must be placed as close to the raw material as possible, i.e. the ETO point. This location of the separation point reduces the risk of losing the order. A client who is looking for an individual yacht is not able to choose a yacht from the market and takes an active part in its creation. At the same time, contracts for the purchase of this particular yacht are already signed at the design stage. The loss of such an order results in high costs for the supplier, as the personalization of the yacht makes it difficult to sell it on the primary market.

3.2. Problems in the Do Phase

The next step after the planning in the Deming cycle is Do, consisting in the implementation of the plan from the first step. In this step, data is also collected for charts and analyses necessary in the next process i.e. control.

3.2.1. Insufficient Transparency of Data

Each supply chain operates with a certain inertness, not faster than the slowest of its devices or processes. Efficient supply chain management practitioners are constantly looking for a balance between the effort required to gather information and the benefits of being able to respond to it in real time. This approach works well, for example, when we collect store inventory information for our inventory management program from vendors using channel partners. In this type of case, it is worth obtaining information on a daily basis, but it is more practical to update it on a weekly basis, as the response time of transport networks is usually three days (two for transport and one for picking up and packing goods).

It results from the observation that ERP systems used to collect data about an enterprise give a certain picture of the ordering (transactional) side of the company's activity. However, many users of such systems do not take the necessary further action and as a result have a lot of data 'in stock' but little knowledge. All information about transactions with customers as well as production plans and logistical arrangements should be available almost immediately. The data obtained can then be analysed using supply chain planning tools and converted into useful knowledge. Too many companies made the costly mistake of assuming that a suitable ERP package from the right supplier would immediately solve all the problems (Kot et al., 2011).

Real-time data masses do not necessarily have to be useful immediately. It is important to identify where in our vast supply chain such a data resource would really be useful for business.

3.2.2. The Bullwhip Effect

The dispersed distribution structure of several warehouses means that there are many links between the market and the manufacturer which mediate in the exchange of information. This fact, combined with the variability in demand, reduces the efficiency of information flow in the supply chain and leads to the so-called bullwhip effect, whiplash effect or whipsaw effect. It was Jay Forrester who discovered in his 1958 research that the build-up of surplus stocks in the early stages of the supply chain was the result of the gradual distortion and strengthening of information about small changes in demand. The relatively small variation in demand reported by final customers increases significantly as demand is reported up the supply chain, i.e. to the manufacturer and further to the suppliers. Demand information is overvalued (distorted) at each successive level of the distribution channel. This leads to excessive investment in stocks in order to meet uncertain and diversified demand. As a result,

the stocks at the upstream end of the supply chain are in fact greater than the variability in demand at the downstream end of the chain requires (Vokhmyanina et al., 2018).

Similarly, the procurement policy depends on companies' internal procedures. Usually, large batches of goods are ordered periodically, which is due to, among other things, the following reasons:

- high cost and high labour intensity of frequent order processing,
- a desire to save on transport costs (full vehicle transport),
- the willingness to take advantage of discounts granted when ordering large quantities,
- the size of the set logistical minima dictated by the suppliers,
- activation of sales related to the willingness to implement the assumed sales plans (increased order placement at the end of the settlement period).

3.2.3. Technology Is Not the Key to Everything

In the most complex supply chain operations there is a need to implement IT solutions. Someone once noticed that every business event involves an IT event. This cannot be denied, but it is important to realise that although a robust IT platform is undoubtedly necessary, it is not the only condition for the success of a given project.

We succumb too easily to the charm of IT solutions and forget that the real key to the success of the transformation process is the remodelling of business processes to be supported by the implemented technology. It is also easy for us to forget that the transformation into small quantities will not happen without the interconnections between the various 'silos' in the supply chain. The best recipe for success is to create a solid technology platform and make it available to the right people, who will be able to implement and properly modify business processes conducive to the implementation of the corporate strategy. The worst solution, however, is to remember to chisel at the technology platform itself.

3.3. Problems Encountered During the Check Phase

The next step in the PDCA scheme is to analyse the actual results measured and collected in the previous phase and compare them with the expected results from the planning step. Searching for deviations and any differences in the implementation from the plan, as well as the compatibility of the plan to enable you to perform the planned task. Data diagrams can help you see trends over several PDCA cycles and convert collected data into information. Information is what is needed in the next step. The most frequently used control is the verification of the results of the KPI (Key Performance Indicator).

3.3.1. Choosing Appropriate Indicators

Key performance indicators are financial and non-financial indicators used as measures in the process of measuring the achievement of an organisation's objectives. They support the achievement of the company's operational and strategic

objectives. They are important for building a result-oriented organisational culture, as they provide employees with objective feedback on their work, costs and quality (Vokhmyanina, 2017).

KPIs are also a tool of managerial control, they enable quick decision making, prioritise activities, react early to problems, and support processes of continuous improvement and effective use of resources possessed by the organisation.

An effective KPI program in a company should meet the following conditions:

- The starting point for the selection of indicators should be the organisation's strategy: indicators should address issues that are important for the company, respond to its needs and problems, and be adapted to its situation and the specificity of the sector in which it operates.
- The number of indicators should not exceed 20 (the aim of the KPI programme is not to measure everything but to create an effective tool for monitoring and managing results).
- The KPIs selected for the programme should take into account the most important process/functional areas of the company; financial indicators should be a minority.
- Each indicator must have a numerical target for the year. The starting point should be the results achieved by the organisation in previous periods and benchmarking of the best similar organisations in the sector.
- Objectives should be raised in subsequent periods, which stimulate actions of continuous improvement.
- Indicators that may "compete" with each other (e.g. the value of stocks of finished goods and the timeliness/fullness of deliveries to the customer in the production company) should be excluded.
- Only those indicators should be selected which are actually influenced by the employees' performance.
- As many KPIs as possible should directly translate into satisfying needs, expectations and customer satisfaction levels; indicators that relate only to the internal processes and needs of an organisation should be a minority.
- KPIs should be used to calculate the results which exist or which can easily be collected with the necessary data (the costs of data collection must not be higher than the benefits of using the index).
- KPIs should be simple, accessible and precisely defined (they must be understood by all employees, the results must not be manipulated).
- The KPI definitions should not be changed without good reason, as this makes it difficult to compare results between periods.
- Staff must be familiar with the KPI definitions; they must understand the indicators and how they are calculated.
- The use of KPIs must be a responsibility - each indicator should have its own owner.
- Employees must receive feedback regularly and as quickly as possible on the results measured by the KPI for the next period (too long waiting period for the results demotivates team and delays the implementation of improvement measures, making the KPI programme ineffective).

- The KPI programme should be linked to the remuneration/bonus system in the company, and the numerical targets assigned to the KPI should be included in the individual targets of middle and senior managers and should be verified

It is very important to skilfully select the indicators that will illustrate the operation of the supply chain. Too many indicators may lead to individual targets for the indicators excluding the achievement of the other targets. Too few indicators will distort the perception of supply chain efficiency (Milczarek, et al., 2017). In this case, the Balanced Score Card (BSC) methodology can be used.

3.3.2. Trade Off In Supply Chain

Interlinks between logistics and production systems very often give birth to 'cost conflicts', meaning that improvements in one part of the system can lead to deterioration in another. However, if this increases the benefits of the system as a whole, it is beneficial. In terms of costs, this means that a reduction in the operating costs of one element of a system may result in an increase in the costs of another.

These relations are often connected with various types of inventories, which results from the fact that inventories are located at the meeting point of different elements of the systems, and cost conflicts arise precisely at the meeting points of different spheres of business activity, although not only.

Of course, the overall costs, related to quality, are somewhat different. It should be remembered that in addition to the costs of ensuring an appropriate level of quality (e.g. prevention and control costs), there are also the costs of lack of quality (internal - necessity of corrections, waste of materials, time, etc., and external - related to complaints, loss of customers, etc.).

Similarly, the costs related to logistic customer service - the total costs of logistic customer service are, on the one hand, the costs of ensuring an appropriate level of logistic service (costs of transport, maintenance of stocks of finished products, etc.), and, on the other hand, the costs of lack of an appropriate level of service. For the supplier it will be e.g. the loss of a customer, for the customer it will be e.g. the costs of maintaining security stocks in case of delays in deliveries. The costs associated with a lack of quality increase as the number of defects increases. The relationship between the costs of quality assurance and lack of quality is often as shown in Figure 5, and therefore also on a trade-off basis. Therefore, in the past, it was considered uneconomical to strive for 100% quality (quality of implementation), as the costs involved (e.g. control costs) would at some point outweigh the benefits. Nowadays, however, the idea of zero defects is increasingly being pursued, believing that it is a lack of quality that costs too much. These costs may decrease despite the increase in quality. It will be a trade-up relationship. The same can be done with logistic customer service - there can be situations when the level of customer service increases and the costs decrease at the same time. Both quality costs and logistic customer service costs can therefore be determined not only by the trade-off but also by the trade-up principle.

3.3.3 Risk Sharing

A key factor for the success of the supply chain is the sharing of information between the different parts of the chain. Sharing information on market needs provides an opportunity to respond to the changing needs of the market. The fact that customers are confronted with the manufacturer's competitors can be exploited, giving them the opportunity to use this knowledge to change their supply chains.

At the same time, participation in the supply chain requires risk sharing. Such risk sharing diversifies the cost of implementing new solutions and allows for shared responsibility but also common benefits from the measures taken (Klimczak et al., 2017).

However, inadequate risk-sharing, or placing the risk in the wrong place, can destabilise the chain. Cells that will feel that the risk is greater on them than on the rest of the chain may form sub-alliances.

3.4. Problems in the Act Phase

If there are significant differences between actual and planned results, corrective actions should be implemented. Initially, differences should be analysed to identify their causes and to determine where to apply changes that take into account improvements in the process or product. If going through these four steps does not result in the need for improvement, the scope of PDCA can be modified to increase the detail of planning and streamlining in the next iteration of the cycle, or to change the stage of the process that has been attempted. Then, after determining what needs to be improved, we return to the first step, which is to plan the improvement.

3.4.1. Implementation of Changes

Change processes are a daily reality in every organization. However, effective management of change is no longer so widespread. Change processes often lead to unintended results: inertia instead of forward movement. Without the ability to anticipate and prepare, organisations fall into traps that are usually predictable and avoidable. Organisations may be confronted with the following most common traps:

- Insufficient preparation time
- Incorrect communication lines
- Insufficient support from change agents
- Wrong style of crisis management
- Warnings without further delay
- Profits matters, not people.

3.4.2. Disregard for the Human Factor

Many times workers cannot adapt to a new business model or use new tools and processes in the old way. The attitude 'well, because that is how we have always done it' is the main reason why many of the changes in the supply chain have failed.

Traditional approaches to change management place emphasis on a wide range of training and provide individual employees with the new skills they need to fulfil their new responsibilities. These measures, although necessary, are not sufficient. The traditional approach should also take into account the fact that not every employee can be properly trained and not everyone can learn the skills that his superiors have just wanted. There are people who are unable to think analytically or who lack the technical knowledge to such an extent that they are in no way able to master new ways of acting. Such employees often feel very uncomfortable at work and their incompetence irritates their superiors. If such tensions are not relieved quickly, the resulting situation could seriously harm the transition process.

Workers can be grouped into four categories: first, "pistols" who love change, who catch it in flight and want it to happen a lot, then "opportunists" who accept change if it gives them something, "marauders" who wait until it reaches a very advanced stage and only then do they start to work in it, and "others" who either do not understand it or do not want to understand it and will fight it off until the end. It is extremely important to know who will contribute to our transformation of the supply chain and who will be affected. This will help us to properly divide roles and create effective teams, thereby increasing our chances of success.

3.4.3. Incorrect Perception of Concern for One's Own Interests

In the era of mass production, many companies were involved in the production themselves, believing that in this way they would be better able to control their own destiny. In some places, there is still a prevailing belief that virtual companies or those that have decided to outsource activities that are not part of their core business, thereby renouncing part of their power over themselves. Meanwhile, the whole modern network-based economy has the results it needs, because it is about maximising the basic competences of our business partners and focusing primarily on what is best for us.

Not all companies will be able to turn into virtual companies and not all should try. Even an extensive supply chain management star such as Cisco Systems does not want to give up strategic control and planning of its operations or tactical management of key elements of the supply chain. In the future, however, it is to be expected that the effectiveness of the supply chain will depend primarily on the degree of cooperation between businesses that form large value chains.

4. RESULTS OF THE RESEARCH ON MISTAKES DURING THE MANAGEMENT OF SUPPLY CHAINS IN POLISH ENTERPRISES

One performed survey research among higher- and medium-level managers in Polish enterprises in order to investigate the application of the mistakes faced during the management of Supply Chains (SC). The research embraced large and medium-sized production or logistic service enterprises that function all across Poland. The table including the guideline was sent to responders. 95 surveyed

managers participated in the research that lasted 6 months at the turning of 2017 and 2018. A model of presenting the major survey problems is shown in Table 1.

Table 14. „Mistakes in SC management" survey model

No.	Mistakes in SC management	Deming cycle phase: P/ D/ C/ A	Risk analyse				
			Occurrence	Impact on the customer	Impact on the environment	Impact on the company	Risk
1	Functional instead of process approach						
2	Alliances						
3	Determination of the decoupling point						
4	Insufficient transparency of data						
5	The bullwhip effect						
6	Technology is not the key to everything						
7	Choosing appropriate indicators						
8	Trade off in supply chain						
9	Risk sharing						
10	Implementation of changes						
11	Disregard for the human factor						
12	Incorrect perception of concern for one's own interests						

Source: authors

Explanation for the completion of the survey:
1 – In the column Deming cycle phase put the phase problem occurs in:
- P – Plan
- D – Do
- C – Check
- A - Act

2 – In the occurrence column, enter the frequency of occurrence:
- 3 – Unlikely
- 9 – Likely
- 21 – Likely and already occurred
- 30 – nearly certain

3 – The impact columns assess the severity to the customer, the company's environment and the company:

- 1 – Minor
- 3 – Medium
- 7 – Major
- 10 – Critical

4 – In the risk column, the risk factor is calculated as follows: (impact on customer + impact on environment + impact on company) * occurrence

Source: The authors' own elaboration.

Thanks to the answers of 95 middle and senior managers, data was collected and the answers were analysed. The level of risk was calculated as a median of the risk levels of all corresponding. The results of the survey are presented in Table 2 and the respondents also pointed out problems other than those mentioned in the survey. The most common ones are added to the results table.

Table 15. Results of the survey "Mistakes in SC management"

No.	Mistakes in SC management	P	D	C	A	Risk
1	Functional instead of process approach	54%	15%	15%	12%	153
2	Alliances	58%	23%	12%	4%	294
3	Determination of the decoupling point	85%	12%	0%	0%	81
4	Insufficient transparency of data	12%	35%	35%	15%	420
5	The bullwhip effect	15%	38%	8%	35%	243
6	Technology is not the key to everything	8%	50%	12%	27%	171
7	Choosing appropriate indicators	27%	23%	31%	15%	330
8	Trade off in supply chain	23%	27%	31%	15%	189
9	Risk sharing	19%	12%	58%	8%	180
10	Implementation of changes	19%	23%	15%	38%	460
11	Disregard for the human factor	23%	23%	8%	42%	315
12	Incorrect perception of concern for one's own interests	27%	4%	8%	58%	153
Other: Which?						
13	High employee fluctuation		X			720
14	No response to changes in the environment				X	357

Source: the authors' own elaboration based on the results of the survey research conducted at the turning of 2017 and 2018.

The result of the survey, which problems occur most often in particular phases of management by the Deming wheel method were determined. The added value of this survey was that the respondents determined horizontally the risk of this problem occurring and its impact on customers, external companies and the internal organisation of the surveyed companies.

In the Planning phase, the most common problem according to the respondents is the designated point of chapter, at the same time this problem shows the lowest level of risk. Another problem which, according to the respondents, occurs during planning is Functional, not process approach. The level of risk is almost twice as high as the first problem. The biggest challenge in the planning of supply chains, with the highest risk level at this stage, is the alliances, both internal and between the different actors in the supply chain.

In the second phase of the Deming wheel the most answer was given by the technology is not the key to everything, which at the same time has the lowest level of risk in this group of problems. The bullish effect, whose level of risk is significant, was ranked second and the insufficient transparency of data, which is the second most risky problem according to the respondents, was classified both in the Do and Check stages.

For the third phase, i.e. Check, the managers surveyed were also in favour of three problems. The most common response is risk sharing in the supply chain. The level of risk for this problem is the lowest in this group. The other two problems, i.e. the choice of appropriate indicators and the trade off in the supply chain, reached the same level of prevalence. On the other hand, from the point of view of the level of risk of occurrence and impact on the supply chain, the selection of appropriate KPIs in the supply chain is almost twice as risky.

The last phase, i.e. the act, has the highest total risk level and the most frequent challenge is to properly understand the concern for one's own interests and the interests of all participants of the supply chain.

Among the additional responses most frequently mentioned are: High employee turnover in the Do phase. A few years ago, this problem was not important for managers of companies operating in Poland. At present, the risk of a problem occurring and its impact on the supply chain is significant. The level of risk is highest among the problems identified in the survey. The second most frequent response is the lack of response to changes in the environment. The other responses of the respondents were very low risk and were therefore omitted from the results.

5. SELECTION OF METHODS FOR ANALYSING ROOT CAUSES

Experienced practitioners who are aware of the rich variety of tools and the need to choose and use one proper theorem that there is no tool that is best for your application. (Starzyńska et al., 2009) proposed a method for selecting and using quality management instruments to improve production processes in the form of a matrix of criteria that supports the selection of the most useful quality tool. Each quality tool can be described by its selection criteria as well as the states of these characteristics (Wieczerniak et al., 2017).

An example of the application of criteria and their states in the selection of a particular tool in a given situation is presented in Table 3.

Table 16. Characteristics of quality tools using attributes and their states

Tool	Input data	Phase	Purpose	Visualisation	Perform by
Ishikawa diagram	Non-numeric	P/C	Clustering	Diagram	Team
Pareto diagram	Numeric	C	Rating	Diagram	User
Block diagram	Non-numeric	DC	Visualization; Dependency indication	Diagram	User/ team
Matrix diagram	Non-numeric	C	Indication of the relationship	Matrix	Team
Relationship diagram	Non-numeric	C	Indication of the relationship	Matrix	Team
Systematics diagram	Non-numeric	P	Indication of the relationship	Matrix	Team
Control card	Numeric	D	Monitoring Capacity assessment	Card	User
Diagram of dispersion	Numeric	A	Indication of the dependencies	Diagram	User
Histogram	Numeric	DC	Monitoring Capacity assessment	Graph	User
5 Why?	Non-numeric	D	Indication of the dependencies	Diagram	Team

Source: Starzynska, B., Hamrol, A. & Najlepszy, Z. (2009). *Nowa metoda doboru narzędzi jakości na potrzeby doskonalenia procesów wytwarzania*, Zarzadzanie przedsiębiorstwem, 2, p. 69-74.

On the basis of the above table it is possible to select an appropriate tool for analysing the causes of problems for the PDCA phase in which the problem was diagnosed. Further problems with the planning phase are most effective tools such as the Ishikawa diagram and the systematics diagram. In the Do phase it will be a block diagram, control card, histogram and 5 Why analysis? Most tools can be used in the Check phase, such as Ishikawa Diagrams, Pareto Diagram, Block Diagram, Matrix Diagram, Relations Diagram, and Histogram. The phase for which there is the least number of tools according to The Old Town Act is old. The tool for analysing the source causes for this phase is the Distribution Diagram.

6. CONCLUSION

The advantage of this article is its innovative approach to problem systematization. Based on the principle of continuous improvement of management

processes using the Deming Cycle, the problems have been sorted and make it possible to select appropriate methods and tools for particular stages of management. It also allows you to identify where the root of the problem is in the management phase. Locating the source of the problem allows you to eliminate it at the point of its creation and focus on the causes rather than consequences.

After analysing the information available in the literature and systematising the problems encountered, it appears that serious problems are emerging at every stage of the supply chain management. But by using the Deming wheel you can systematize these problems and adapt the solutions and tools to the different stages of management. Additionally, knowing what problems can wait at each stage you can prepare for and minimize the costs of eliminating them.

Thanks to the synthesis of the problems and the risk analysis, the study of the impact on the company, the customer and the environment can be classified in the different phases of the Deming cycle. Using the available literature, appropriate tools were selected to analyse their source causes. This gives supply chain managers a simple tool to respond to problems and summonses that occur during supply chain management.

7. ACKNOWLEDGEMENT

This paper has been the result of the study conducted within the grant by the Ministry of Science and Higher Education entitled „Development of production and logistics systems" (project No. KSL 2/17) pursued at the Poznan School of Logistics in Poznan.

8. REFERENCES

Alderson, W. (1957). *Market Behavior and Executive Action*, Homewood, Ill., 1957, p. 424.

Cooper, M.C., Lambert, D.M. & Pagh, J.D. (1997). Supply Chain Management: *More than a New Name of Logistics*, „International Journal of Logistics Management", 8(1), p. 32.

Cooper, R., & Slagmulder, R. (1999). *Supply Chain Development for the Lean Enterprise – Interorganizational Cost Management*, Productivity Press, Portland, p. 10.

Christopher, M. (1992). Logistics. *The Strategic Issues*, Chapman and Hall, London 1992, p. 63.

Cudziło, M., Voronina, R., Dujak, D. & Koliński, A. (2018). Analysing the efficiency of logistic actions in complex supply chains 0 conceptual and methodological assumptions of research, *LogForum,* 14 (2), p. 171-184, DOI: 10.17270/J.LOG.255.

Fechner, I. (2006). Service level modeling in supply chain with usage of solutions based on decoupling point concept, *LogForum* 2 (3), p. 1-10.

Forrester, J. (1961). Industrial Dynamics. *A Major Breakthrough For Decision Makers*, MIT Press, Cambrige, p. 12-13.

Hanssmann, F. (1959). Optimal Inventory Location and Control in Production and Distribution Networks, *Operations Research*, 7(4), p. 33.

Klimczak, K. M., Machowiak, W., Staniec, I. & Shachmurove, Y. (2017). Collaboration and collaboration risk in small and middle-size technological enterprises*, LogForum,* 13(3), p. 221-235, DOI: 10.17270/J.LOG.2017.2.9.

Kocsi, B., Oláh J., (2017). Potential connections of unique manufacturing and industry 4.0. *Logforum,* 13(4), p. 389-400.

Kot S., Grondys K. & Szopa R. (2011). *Theory of inventory management based on demand Forecasting.* Polish Journal of Management Studies, 3, p. 148-156.

Milczarek, J., Cyplik, P. & Wieczerniak, S. (2017). 7-steps of changing a purchasing strategy exemplified by a selected enterprise. *17th international scientific conference Business Logistics in Modern Management*, Segetlija, Z., Mesarić, J., Karić, M., Vojvodović, K., Potočan, V., Rosi, B., Jereb, B., Trauzettel, V., Cyplik, P., Hubner, A., Dujak, D. (ed.) Faculty of Economics in Osijek, Osijek, 12-13 October 2017, p. 159-176.

Rudnicka, A. (2014). How to manage sustainable supply chain? The issue of maturnity. *LogForum,* 12(4), p. 203-211, DOI: 10.17270/J.LOG.2016.4.2.

Starzynska, B., Hamrol, A. & Najlepszy, Z. (2009). *Nowa metoda doboru narzędzi jakości na potrzeby doskonalenia procesów wytwarzania*, Zarzadzanie przedsiębiorstwem, 2, p. 69-74.

Szozda N. (2017). Industry 4.0 and its impact on the functioning of supply chains . *Logforum,* 13(4), p. 401-414, DOI: 10.17270/J.LOG.2017.4.2.

Śliwczyński B. (2008). Controlling in supply chain - tool for process integration. *Logforum,* 4(2), 3.

Vokhmyanina, A., Zhuravskaya, M. & Osmólski, W. (2018). The issue of bullwhip-effect evaluating in supply chain management*, Logforum,* 14(2), p. 163-170, DOI: 10.17270/J.LOG.280.

Vokhmyanina, A. (2017). *Forecasting logistic indicators in conditions of annual irregularity*, Transport: Science, Technology, Management, 5, p. 13-20.

Wieczerniak, S. Cyplik, P. & Milczarek, J. (2017). Root cause analysis methods as a tool of effective change. *17th international scientific conference Business Logistics in Modern Management*, Segetlija, Z., Mesarić, J., Karić, M., Vojvodović, K., Potočan, V., Rosi, B., Jereb, B., Trauzettel, V., Cyplik, P., Hubner, A., Dujak, D. (ed.) Faculty of Economics in Osijek, Osijek, 12-13 October 2017, p. 611-627.