University of Economics in Katowice

Journal of Economics and Management

ISSN 1732-1948 Vol. 29 (3) • 2017

Grażyna Wieteska

Department of Logistics
Faculty of Management
University of Lodz, Poland
gwieteska@uni.lodz.pl

Ensuring the flexibility and continuity of supplies in the B2B market

DOI: 10.22367/jem.2017.29.07

Accepted by Editor Ewa Ziemba | Received: January 17, 2017 | Revised: June 20, 2017; June 28, 2017; July 5, 2017 | Accepted: July 17, 2017.

Abstract

Aim/purpose – The purpose of this paper is to recognize and compare the best practices that ensure the flexibility and continuity of supplies. Although the flexibility drivers and continuity risk drivers, according to the literature, are actually the same, there is a lack of research articles on this aspect.

Design/methodology/approach – A two-phase methodology design, based on the literature review and in-depth interviews, was used, and seven in-depth interviews with the representatives of manufacturing companies that operate in different sectors were conducted.

Findings – Supply flexibility and continuity are presented in the literature, mainly as the responses to the business environmental events/changes that have already occurred. Nevertheless, the researched manufacturing companies recognize their use in terms of prevention as well. The researched enterprises use traditional ways of dealing with supply problems (alternative supplier, inventory buffers). They do not really connect ensuring supply continuity with long-term disruptions, but rather understand it as prevention of typical supply delays and quality problems. The respondents regard supplier flexibility not only as a way of responding to the forecasted demand changes but also to unexpected situations. The companies ensure supply continuity and supply flexibility using similar but not exactly the same strategies. For the reactive strategies, sourcing decisions are crucial, whereas for preventive strategies – it is supplier performance management.

Research implications/limitations – The small number of conducted interviews is a limitation of performed research, however, some directions for future research can be noted. Apart from other implications described in the paper, it is deduced that sourcing flexibility positively influences supply continuity. Nevertheless, this hypothesis needs quantitative verification.

Originality/value/contribution – The paper compares the issue of supply flexibility with the issue of supply continuity. For these two areas, it identifies common and individual strategies that are performed by researched companies in terms of prevention and reaction to risk and uncertainty.

Keywords: supply, flexibility, continuity, risk, uncertainty.
JEL Classification: G31, H12, M20, L14.

1. Introduction

In recent years, companies have become ever more interested in Supplier Relationship Management (SRM). In parallel, procurement acquires a strategic importance, and is regarded as a source of competitive advantage. Companies declare that their main SRM objective is "to leverage suppliers' capacities". This is particularly important in the face of increasingly demanding clients, shortening product lifecycles, demand/supplier market globalization and the development of socially and environmentally responsible concepts. Companies observe that to achieve this objective it is crucial to focus on joint value creation rather than solely on reducing costs [PricewaterhouseCoopers 2013, pp. 10-11].

The key issue of Supplier Relationship Management and purchasing processes is supplier selection and evaluation [Monczka et al. 2010, p. 34; Wisner, Tan & Leong 2012, pp. 78-85]. Supplier preliminary and periodical assessment includes various criteria, i.e. costs and quality [Routroy 2008]. However, in the face of the contemporary uncertainty of the business environment, the importance of supply flexibility and supply continuity in supplier performance management grows [Ndubisi et al. 2005, Zsidisin, Melnyk & Ragatz 2005, Gosling, Purvis & Naim 2010]. In the literature, there is no paper that compares or combines these two aspects, although the risk drivers [Braithwaite 2003, pp. 6-7] and flexibility drivers [Fayezi, Zutshi & O'Loughlin 2014] are actually the same. The author recognizes the need to fill this research gap. Both supply flexibility and supply continuity are concerned with responding to the adverse events that can affect suppliers and supplies and thereby disrupt value-adding processes. This is why supply flexibility and supply continuity can be important characteristics of resilient supply chains.

The turbulence of the business environment in the 21st century is a source of increasing supply uncertainty and risk, which is why companies should seek out new ways of dealing with unexpected supply disruptions. Environmental turbulence covers the newness, speed and intensity of environmental changes as well as business environment complexity [Ansoff 1985, p. 58]. The greatest uncertainty relates especially to the novelty of the events which impact on supply

chain value and whose likelihood cannot be influenced by managers. In the face of such events, top management need to have contingency plans.

In recent years, two approaches that are focused on dealing with the increasing uncertainty of the business environment have been developing simultaneously: the supply chain flexibility concept and supply chain business continuity concept. Since they are both extensive, the author decided to research the strategies that are recommended for managing relationships with suppliers. The aim of this study is to identify the best practices that ensure flexibility and continuity of supplies. It is interesting to note how researched companies assess these two aspects. The paper will compare strategies that are taken by the enterprises to ensure the flexibility and continuity of supplies in terms of a prevention of risk and a response to risk. The paper refers to B2B relationships between the manufacturing companies and their first-tier suppliers.

The article will answer the following questions:

1. What strategies do the companies use to ensure supply flexibility and to ensure supply continuity?
2. What strategies are the same for ensuring supply flexibility and for ensuring supply continuity?
3. Which strategies are proactive and which strategies are reactive?

The structure of the paper consists of a literature review, research methodology, discussion and conclusions. The first part is related to the supply flexibility issue and supply continuity issue. It provides definitions of supply chain flexibility, supply flexibility, supply chain business continuity as well as identifies the strategies that are recommended in the literature to deal with external and internal risk for supply chains today. The second part of the paper, which is the research methodology, characterizes the research and the tools used in the research. The next section shows the research results in table form. Finally, a discussion on ensuring supply flexibility and ensuring supply continuity as well as conclusions are presented.

2. Theoretical background

2.1. The supply flexibility issue in the literature

The aim of this part of the paper is to present a definition of supply flexibility and the strategies to increase supply flexibility. Despite being well covered in the literature, some research gaps will be pointed out at the end of this section.

Flexibility influences a company's performance positively [Sánchez & Pérez 2005] and is one of the four performance dimensions of operations and supply chains, the others being: time, costs and quality [Bozarth & Handfield 2008, pp. 29-31]. In the face of supply chain uncertainty, it is recommended to build supply chain flexibility [Tachizawa & Giménez 2007; Fantazy, Kumar & Kumar 2009; Fayezi, Zutshi & O'Loughlin 2014]. Supply chain flexibility is a most complex issue, as it refers to all the value-adding processes that are performed in the supply chain. Supply chain flexibility is "the ability of an organization to manage the internal (e.g. manufacturing) and interfacing (e.g. procurement and distribution) processes, as well as its key suppliers/customers to respond to expected changes in supply, product and demand in an efficient manner enabled by both technological and social platforms" [Fayezi, Zutshi & O'Loughlin 2014, p. 368]. Flexibility allows companies mainly to deal with forecast errors [Tachizawa & Giménez 2009] and it is a characteristic of an agile system [Christopher 2000; Supply Chain Council 2010, p. 12]. It mitigates the supply/demand disturbances that result from macro environmental changes [Mizgier et al. 2015] or the business environment [Correa & Slack 1996; Fayezi, Zutshi & O'Loughlin 2014] and helps to deal with the consequences of any supply chain risks [Jüttner, Peck & Christopher 2003].

The supply chain flexibility concept is a very wide approach. That is why, it is reasonable to build supply chain flexibility by implementing flexibility into each of the supply chain business process. On the base of a literature review, Fantazy, Kumar & Kumar [2009] established that supply chain flexibility has many dimensions. The authors identified twelve supply chain flexibility types. One of them being supply flexibility, which is the subject of this paper.

Supply flexibility can mitigate the supply chain uncertainty coming from a focal company (production schedule uncertainty, low component commonality, JIT purchasing, slack capacity at focal company), upstream (unresponsive suppliers) or downstream (demand volatility, demand seasonality, low forecast accuracy) [Tachizawa & Giménez 2007].

The analysis of the literature highlights that supply flexibility can be achieved in two ways, mainly by [Vickery, Calantone & Droge 1999; Pujawan 2004; Duclos, Vokurka & Lummus 2005; Chu, Chang & Huang 2012]:

1. Flexible sourcing and/or
2. Cooperating with flexible suppliers.

Flexible sourcing enables companies to switch orders between suppliers efficiently [Pujawan 2004]. Low switching costs should encourage companies to increase flexible sourcing, whereas high switching costs should encourage companies to increase supplier flexibility [Tachizawa & Giménez 2007]. Supplier

flexibility means the ability of suppliers to effectively respond to demand changes. Supplier flexibility results from its flexible manufacturing system [Ross 2010, p. 19; Supply Chain Council 2010, p. 12; Chu, Chang & Huang 2012]. Fantazy, Kumar & Kumar [2009] describe four types of supplier flexibility: volume, mix, delivery, and product. The first type indicates the supplier's ability to respond rapidly to volume changes in orders. Mix flexibility means the supplier's ability to produce a wide range of products. Delivery flexibility is described as the supplier's ability to quickly respond to delivery time changes. Finally, product flexibility is recognized as the supplier's ability to implement changes to its offered products. For business practice, it is crucial to know how exactly supply flexibility can be built. Tachizawa & Giménez [2007] suggest the following strategies to deal with internal and external risk for supply chains:

1. Strategies that ensure sourcing flexibility: multiple sourcing, alternative transportation modes, reduction in time needed to replace unresponsive suppliers;
2. Strategies that ensure supplier responsiveness: single sourcing, supplier selection based on flexibility, internal collaboration, integration with logistics provider, close proximity of suppliers;
3. Strategies that ensure sourcing flexibility and supplier responsiveness: joint product development with suppliers, providing delivery forecasts to suppliers, long term relationship with suppliers, inventory buffers at the focal company.

The literature on supply flexibility does not, however, provide information on which strategies are proactive and which are reactive in terms of supply chain risk management. This is crucial, especially for managers that are designing resilient supply chains today [Hohenstein et al. 2015; Abubakar, Amr & Amr 2017]. Moreover, it does not mention which strategies are recommended to ensure supply continuity [Rice & Caniato 2003; Zsidisin & Ellram 2003] and which are used to ensure supply flexibility. These aspects will be researched in this paper.

2.2. The supply continuity issue in the literature

The aim of this part of the paper is to present a definition of supply continuity and business continuity strategies. Although business continuity management is well described in the literature, the supply continuity issue is still a research gap despite the increasing uncertainty of the XXI century.

The Business Continuity Management (BCM) concept refers to disruptions (e.g. natural disasters, epidemics, financial crises, terrorism) that can seriously affect value-adding processes and supply chain performance. BCM is "the development of strategies, plans and actions that provide protection or alternative modes of operation for those activities or business processes which, if they were to be interrupted, might otherwise bring about a seriously damaging or potentially significant loss to the enterprise" [Protiviti Inc. 2013, p. 1]. Contingency planning is directly aimed at reducing supply chain vulnerability, which is defined as "a condition that affects a firm's goal accomplishment upon the occurrence of any negative consequences from the disturbance" [Svensson 2002, p. 112]. In BCM, the key issues are how to maintain the process for critical resources. The type of adverse event has a secondary effect because losses increase with time so the reaction speed is crucial.

Business continuity is "a strategic and tactical capability of the organization to plan for and respond to incidents and business disruptions in order to continue business operations at an acceptable predefined level" [ISO/DIS 22313:2012].

Continuity problems result from the lack of critical resources that are essential to perform value-adding processes. In the case of purchasing, the most common continuity problem appears when the supply of components is interrupted. The reason for this situation can be a serious breakdown of a supplier's manufacturing system or a security problem in logistics processes, such as theft or the loss of a supplier. Bankruptcy, relocation, portfolio changes or communication problems can also cause the removal or change of the supply chain link.

The literature presents different sourcing strategies that enable the maintenance of supply continuity in the case of a serious supply disruption. Zhibin et al. [2012] suggest supplier diversification and double/multi sourcing implementation. However, it has been shown that managing a wide supplier base during disruption leads to a slower recovery [Jain, Girotra & Netessine 2015]. Another strategy is keeping emergency sourcing [Zhibin et al. 2009]. Backup/alternate suppliers should be located near the plant itself. Zhibin & Babich [2014] advise implementing an indirect procurement strategy. They underline the need to create the possibility of cooperation with intermediaries when a crisis situation arises. Supplier assessment criteria are also important. Rice and Caniato [2003] recommend selecting suppliers that have at least two plants, assuring supplier manufacturing process continuity in the case of any problems. There are scientists who recommend an inventory build-up [Rice & Caniato 2003]. Tomlin and Wang [2012] suggest increasing inventory when a supplier goes bankruptcy. The last publications underline the role of building long-term relationships with suppliers to recover from disruptions effectively [Jain, Girotra & Netessine 2015].

It must be acknowledged that supply flexibility allows companies to react to supply chain uncertainties of a high frequency of occurrence and causing short lasting disturbances, whereas BCM is implemented to react to internal and external supply chain risks that occur rarely but may cause long-term breakdowns.

In conclusion, the literature presents the business continuity issue mainly in terms of its reactive approach. This may result from the fact that the BCM concept is focused mainly on emergency and recovery plans. However, it is interesting to note whether companies perceive the supply continuity aspect in terms of proactive activities, as there is a need for the building of anticipatory supply chains today [Closs et al. 1998]. Secondly, the literature does not mention whether the strategies that are recommended to ensure supply flexibility [Tachizawa & Giménez 2007] are used to ensure supply continuity. These aspects will be researched in this paper. It must be highlighted that an interesting observation was presented by Skipper and Hanna [2009], in which they conclude that flexibility can minimize the supply chain risk whereas contingency planning increases flexibility.

3. Research methodology

A two-phase methodology, based on the literature review and in-depth interviews, was used. Owing to the need to obtain in-depth knowledge, a case study methodology was adopted. A multiple case study methodology gives the possibility to present the researched issue in more accuracy and depth in comparison with a quantitative method. It allows for a deeper relationship between the researcher and the respondent and, thereby, more accurate information [Matejun 2012]. This methodology is also considered to be preferred by operations management researchers [Voss, Tsikriktsis & Frohlich 2002]. The seven IDIs were conducted at the beginning of 2016. The interviews were semi-structured and based on three open questions:

1. How do you manage the relationship with suppliers?
2. How do you understand and ensure supply flexibility?
3. How do you understand and ensure supply continuity?

The interview tool was tested on three managers employed in three different manufacturing companies. This ensured that the open questions are well structured and understandable by business practitioners.

The respondents were purchasing managers and CEOs, who were selected on the basis of their in-depth knowledge on SRM. Respondents were employed in medium and large manufacturing companies operating in the B2B market in

Poland (although one researched company may be classified as small). The author decided to research this type of company because these manufacturers cooperate with a number of first tier suppliers and pay close attention to supply quality and timeliness. Moreover, this type of organization was researched in the analyzed literature the most often.

The main criterion for the company selection was whether the enterprise recognizes and performs SRM. This assumption ensured a mature approach of the organizations to the researched issues. Each researched company operates in a different sector: RTV, pharmaceutical, automotive, household goods, clothing, food and electronic (Table 1). Moreover, all companies offer products for both the domestic and foreign markets. Such an approach was chosen to ensure the comprehensiveness of the study. A few days before the interview, each company was provided with the research questions[1].

Table 1. Characteristics of the researched manufacturers

Industry	Position of the respondent(s)	No. of employees	Capital	Spatial range	Markets for products
RTV	Senior Purchasing Buyer	289	foreign	international	domestic and foreign
pharmaceutical	Head of Purchasing and Logistics Department and one employee	111	foreign	national	domestic and foreign
automotive	Supplier Development Manager	520	foreign	international	domestic and foreign
household goods	Head of Logistics	2283	national	international	domestic and foreign
clothing	CEO	501	national	national	domestic and foreign
food	Head of Purchasing Department	125	foreign	national	domestic and foreign
electronic	CEO	10	national	international	domestic and foreign

4. Research findings and discussion

4.1. Research findings

The results of the interviews are presented in Table 2. The first column highlights information on how companies manage their relationships with suppliers, while the second and the third columns present the activities that enterprises carry out to ensure supply flexibility and supply continuity.

[1] Selection and interviewing of companies was supported by ASM Centrum Badań i Analiz in Kutno.

Table 2. The interviews results

Industry	SRM	Ensuring flexibility of supplies	Ensuring continuity of supplies
1	*2*	*3*	*4*
RTV	around 130 suppliers; segmentation using such criteria as type of item, order value, location, supplier selection and regular evaluation; building partnerships (although the company has higher bargaining power), a win--win strategy as a source of additional value	around 130 suppliers; segmentation using such criteria as type of item, order value, location, supplier selection and regular evaluation; building partnership (although the company has higher bargaining power), a win--win strategy as a source of additional value	joint problem solving, partnership; trust (mutual informing about problems); suppliers' need to accept future demand (production plans) provided by buyer officially; when suppliers have production problems of item X; the company shifts orders to different products within the same supplier (supplier mix flexibility) and adjusts the production plans to this change; placing orders in advance (although lead time is short); negotiating feasible agreements (cost, time); inventories (components arrive one week before the production starts); the use of air transportation of supplies during crisis situation; supplier evaluation as a source of information about supplier's problem; sensing the mood of supplier's employees (phone calls)
pharmaceutical	around 65 suppliers from across the world, supplier segmentation based on type of item; each supplier segment is evaluated using different criteria; supplier segmentation based on the results of periodical assessment of suppliers; SRM strategy depends on the stage of cooperation with a particular supplier as well as the type of product	involving flexibility criterion in supplier selection (supplier manufacturing capabilities) and evaluation (responsiveness), audits; partnership (such a cooperation is a source of added value); providing purchasing plans and forecasts to suppliers; seeking suppliers that accept a situation when the company orders more than planned; the expectation that the supplier passes on information about any changes in its portfolio/ production method/ specification; when possible, having an alternative supplier	delivery punctuality criterion and supply quality criterion in supplier evaluation; performing second-party audits; building partnerships; if possible, having an alternative supplier for each item, signing long-term agreements (with large contractors)
automotive	around 150 suppliers from across the whole world; involved in the manufacturing process of 15-16	several suppliers for each item, cooperation with distributors (required components immediately	several suppliers for each item; cooperation with distributors; quality criterion during selection and

Table 2 cont.

1	*2*	*3*	*4*
	thousand product models (each model consists of 10 parts); the company has three ATO production lines; each line is supervised by a supplier development manager; 10% of suppliers are distributors (offering a lower price in comparison with manufacturers, a distributor buys high volumes and buys more frequently than a company, which is why it gets greater discounts), SRM objectives: savings (in the face of short product lifecycle) and maintaining production capacity; the most difficult aspect to negotiate in Europe is price, whereas in China it is lead time	available), an ERP system, lead time and production capacity are vital criteria during supplier selection; performing supplier audits, joint product development, supplier development activities, signing agreements with appropriate flexibility clauses, supplier holds inventory, flexibility is expensive when lead time is long	evaluation is the most important for supply continuity; suppliers need to perform FMEA; second-party audits (assessing machines, quality control in suppliers' plants); supplier trial period at the start of the cooperation (on average, 3 of the 5 suppliers are eventually accepted); the company keeps a high consignment stock of items/ /safety stocks; agreements with appropriate requirements, during crisis situations the company chooses air transport and switches orders to other suppliers, ensuring shorter lead time; the use of distributors for urgent situations (although sometimes the price can be excessive), if the supplier stops production (e.g. for one month) the company buys the whole inventory buffer from the supplier ASAP (rapid alerting on unexpected situations is expected from the suppliers); the company runs supplier development activities
household goods	three segments of suppliers: 1. direct components (around 200, mainly from Europe), 2. raw materials (several dozen), 3. specific parts made of raw materials (strategic suppliers, over a dozen, located within 100 km of the plant); the other criteria of supplier segmentation: value of supplies, volume of supplies, product type (e.g., glass, steel, electronic, electric) and supplier results in terms of KPIs	local suppliers, SAP, VMI, suppliers with advanced IT systems, clauses in contracts detailing what percentage a company can change in the order, assessing manufacturing capability of suppliers, joint product development, partnership	local suppliers, SAP, VMI, suppliers with advanced IT systems, preliminary audit followed by an integrated (comprehensive) audit before cooperation starts, supporting suppliers in post-audit activities, partnership, joint relationship management
clothing	40-60 suppliers from Asia and Europe, segmented into three groups: suppliers of fabrics, suppliers of packaging, suppliers of accessories, (in the case of suppliers of fabrics, the segmentation is based on	the contracts are short or are not signed at all; there is a huge variety of fabric in this specific market and the fabric lead time is rather long, which is why the company prefers sourcing flexibility and	quality is a critical criterion of supplier selection, the high quality of fabric ensures company manufacturing process continuity; the company has alternative suppliers for each purchased item, however, the fabric

Table 2 cont.

1	*2*	*3*	*4*
	the type of fabric – e.g., plain, striped)	sending orders to different suppliers depending on current needs; orders are placed to a variety of suppliers and at different times	supplier need to be chosen 3-4 months before supply; when a supplier cannot provide the fabric because of a sudden internal problems, the company buys fabric from the stock of European suppliers for a higher price, second-party audits (assessing manufacturing systems, machines, etc.), the company does not keep inventory buffers, the ordered fabric is used to produce specific clothes immediately
food	around 400 suppliers from all continents, the IT system allows segmentation of suppliers using different criteria, e.g. location, type of item, supply punctuality	second-party audits, disintermediation practices, defining clear quality requirements before signing a contract; agreements defining range of possible order changes (+/− volume); preferring suppliers that are responsive to any unplanned changes in delivery time; having local suppliers (able to deliver supply in 24 hours); a short lead time is a crucial selection criteria of suppliers of packaging (suppliers operating in the market have different manufacturing capabilities), joint product development	preparing sales forecasts and production plans; internal integration of sales department and production department; tough negotiations (on quality and punctuality) with suppliers that operate in developing countries; signing long-term contracts; multiple suppliers of raw materials (particular countries that are a source of high natural risk – e.g. risk of droughts – at different periods of time); having alternative suppliers (usually distributors) located in Europe; visiting suppliers located in Africa and Asia to mitigate the risks arising from cultural differences; second-party audits; keeping high inventory stocks for components with a long lead time and a high quality risk; developing suppliers that are a source of a high (quality, legal, punctuality, safety systems) risk
electronic	around 20 suppliers, segmented in terms of the type of component that are needed for ETO or MTS production	having an IT system that integrates sales and procurement; seeking new suppliers to have access to greater supplier production capacity at once, high product flexibility is a key supplier selection criterion; defining strict requirements for partners; performing supplier audits; joint product development, outsourcing	selecting suppliers that are reliable in terms of supply quality and punctuality; preferring a long term and close partnership; defining strict requirements for partners; for some items, a company may need to cooperate with suppliers that have quality problems (there is a lack of an alternative in the market); second-party audits; keeping inventory stocks

The researched companies notice many different aspects in the area of ensuring supply flexibility and continuity. The research results (Table 2) are discussed below.

4.2. Discussion on ensuring supply flexibility

Respondents noticed the great importance of information systems in building supply flexibility. IT tools integrate both the internal and external supply chain. The SAP system integrates the departments of manufacturing company, especially in terms of sales, production and material planning processes. Supply chain integration can be supported by ERP system and other applications [Siau & Tian 2004].

Manufacturing companies (especially in the MTO/ATO production environment) stress the need to share sales forecasts and production plans with suppliers as well as the need to update shared plans on a regular basis. This allows suppliers to prepare their manufacturing systems for the upcoming demand. Companies also identify the role of the VMI system, which speeds up supplier reaction to demand changes. VMI prevents supply chains from stockouts [Seifbarghy & Pourebrahim 2012].

The researched companies take into account the flexibility aspect during supplier selection. This approach is presented in the literature [Ndubisi et al. 2005; Gosling, Purvis & Naim 2010]. Manufacturing flexibility determines flexible supplies [Chu, Chang & Huang 2012]. Buyers assess the manufacturing capabilities of potential partners, especially in terms of production capacity. Another crucial supplier assessment criterion that increases flexibility in the relationship with suppliers is lead time (LT). A short LT means a quick response to changing demand. For items with a long lead time, the respondents advise holding inventory in own or supplier's warehouses. Finally, a very important criterion used for supplier pre-evaluation and selection (stressed by the respondent employed in the clothing industry) is having an advanced IT system. IT solutions are important for building supply flexibility and continuity, however, it must be noted that technology dependency can be a source of risk for supply chains as well. Companies attribute great importance to agreements when building supply flexibility. Nevertheless, it is sometimes better not to sign a contract, making it easier to change a supplier. Clauses are placed in the agreements which define to what degree the buyer can change an order, mainly in terms of a volume. Flexibility is not particularly perceived by the researched companies as a modification of an order that has been already placed. Still, when the prod-

uct lifecycle is very short and the demand highly unpredictable, the expectations can differ. "Solectron may order 10,000 units of Product A on Friday for delivery on Monday and then call back on Monday and ask the supplier to take back the 10,000 units and deliver 8,000 units of Product B instead" [Bozarth & Handfield 2008, p. 31].

The interviewed manufacturers also take into account the supplier flexibility aspect during periodical assessment. Yet, the researched companies do not use any particularly specified KPIs to evaluate supplier flexibility. The respondent employed in the food company holds that supplier flexibility is probably immeasurable.

The companies also define supplier flexibility as involvement in solving sudden demand problems. However, this kind of a responsiveness is not included in the agreements. The companies subjectively assess whether the supplier agrees to change the delivery date (mostly into an earlier one) or volume (mostly into a larger one) when there is an unpredicted need. Manufactures assume that suppliers should deal not only with a statistical forecast variation but with forecast errors, too.

Furthermore, the companies recognize the vital role of partnership, which is crucial in building supply chain flexibility [Tachizawa & Giménez 2007]. The basis of partnership is trust. Companies expect that suppliers will inform them about all upcoming changes in portfolio, technology or specification.

All companies assess suppliers using audits. The household goods company recognizes the huge value of supporting suppliers in post audit activities, whereas the auto motive company develops suppliers. The SD concept impacts the purchasing process and, at the same time, the supply chain performance positively [Sánchez-Rodríguez, Hemsworth & Martínez-Lorente 2005]. The electronic manufacturer underlines that strict requirements and audits have improved suppliers, especially those located in emerging countries, also in terms of flexibility. Finally, the companies underline the role of joint product development for supplier flexibility. Early supplier involvement influences the launch of a new product positively [Handfield & Lawson 2007], e.g. in terms of time and costs.

All respondents build sourcing flexibility. They commonly decide to have alternative suppliers. Double/multi sourcing is important to ensure supply flexibility [Tachizawa & Giménez 2007]. In the research, this is very popular especially when components are easily available on the market. When the company decides to single source, an emergency supplier must be accessible, one who is usually located close to the buyer's plant. In general, manufacturers avoid intermediation. However, for easily available goods, very often a distributor from a European country becomes a supply backup. Such a partner is a guarantee of

quality and fast delivery. Nevertheless, a higher price must sometimes be calculated for. The electronic company considers production outsourcing to be a source of flexibility. In addition, using competitors' resources may also be a response to a long-term breakdown in a plant, ensuring manufacturing process continuity.

4.3. Discussion on ensuring supply continuity

Building a reliable supplier base requires Supplier Performance Management. SPM consists of not only supplier selection and evaluation but also supplier improvement [Monczka et al. 2010, p. 34; Handfield et al. 2011, p. 314]. Supplier selection and supplier evaluation are processes that researched companies implement to ensure supply continuity. Respondents also perform preliminary and periodical audits in suppliers' plants, assessing the technical infrastructure and quality control systems. Such an evaluation is a source of information about the current supply risk. Respondents also underline the role of joint problem solving. The household goods company supports suppliers in post-audit activities.

Supply quality and punctuality are crucial criteria for supplier assessment [Routroy 2008], especially for the sectors that need to deal with very strict legal requirements towards product safety. In this case, the companies need to be sure that a supplier's manufacturing process is a reliable one.

The selection of resilient suppliers should also take into account whether a potential business partner performs risk management and develops business continuity plans [Torabi, Baghersad & Mansouri 2015]. Suppliers operating in the automotive sector need to perform FMEA.

Automotive and food manufacturers carry out supplier development programs. These programs are aimed at improving the supplier's manufacturing system in terms of quality, safety, time and costs [Krause 1997; Wagner 2006]. Reducing the number of machine breakdowns and quality problems ensures supply reliability. Strengthening the supply chain is one of the operational strategies to manage disruption risk [Tomlin & Wang 2012].

Supplies are the input to the manufacturing process. That is why the respondents link supply continuity with manufacturing continuity. Respondents regard supply continuity as supply regularity that can be ensured by using IT tools which allow cooperators to share information on sales and production plans thereby supporting the suppliers when preparing for future demand. Manufacturers want to be sure that suppliers will meet future requirements. Sometimes, they expect from the business partner an official confirmation of the provided production plans (the RTV company).

The researched companies experienced that supplier involvement in cooperation guarantees supply quality and punctuality. That is why managers attempt to sign long-term agreements. On the other hand, when a supplier is less reliable, the agreements are signed in order to force a business partner to meet the client's requirements. Nevertheless, manufacturers know that they must negotiate over expectations (cost, time) that are able to be met by their suppliers, otherwise supply risk can be higher and production continuity threatened.

Respondents appreciate and desire to build a partnership with suppliers that is based on mutual trust. They expect suppliers to inform them about any internal problems that may delay the supplies. Cooperation supported by joint efforts is essential for supply chain risk mitigation [Jüttner, Peck & Christopher 2003].The company producing household goods underlines that joint relationship management is crucial for supply continuity. The food company visits suppliers located in Africa and Asia to mitigate any risks arising from cultural differences (developing countries have difficulties with the implementation of the strict European standards). The RTV company calls suppliers regularly to monitor order fulfillment effectively. A direct conversation can be a source of credible information on the supplier's production stage.

The researched enterprises react to supply disruptions differently. For example, when the RTV supplier has a problem with the production of item X, the company sends an order for item Y to this supplier and at the same time adjusts the own production plans to the other product type. This is possible when a supplier provides a range of components. This situation relates to product mix flexibility [Fantazy, Kumar & Kumar 2009].

Safety stocks protect against quantity uncertainty. However, there is also a practice when the company places an order in advance, although LT is short. This is the, so called, safety lead time and it protects against timing uncertainty [Arnold, Chapman & Clive 2008, p. 307]. It is especially common in cooperation with unreliable suppliers, and also when there are signs that the supplier has some difficulties. Immediately after the automotive company has been informed about a long production breakdown, it decides to buy all the supplier's inventories. This is recommended when the business partner has financial problems and there is a risk of its bankruptcy [Zsidisin & Ellram 2003; Tomlin & Wang 2012].

Safety stocks are established especially for components with a long LT and components that are related with a high quality risk. It is advised to keep safety stocks when the purchase risk is high and the component price is low [Caniëls & Gelderman 2007]. It is also recommended by the automotive company to build consignment stocks when suppliers have problems with punctuality.

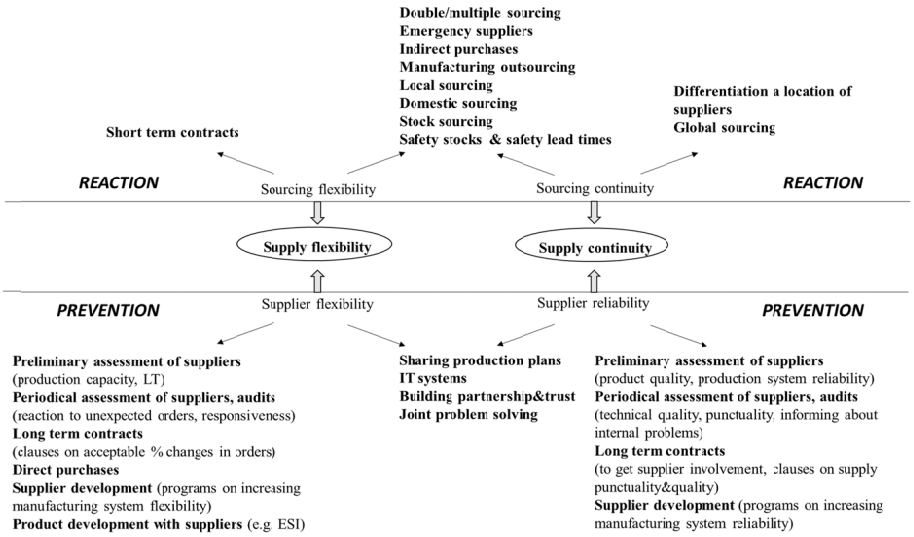
The enterprise uses air transportation during crisis situations (e.g. delayed supply). An alternative transportation mode supports supply chain flexibility [Pujawan 2004]. The researched companies also try to have an alternative supplier for (each) item. Double/multi sourcing enhances manufacturing process continuity [Zsidisin & Ellram 2003; Zhibin et al. 2009]. Companies build in the ability to switch their order to the emergency supplier, ensuring a shorter LT. This is an element of sourcing flexibility [Tachizawa & Giménez 2007]. The emergency suppliers are mainly local ones, and very often distributors [Jüttner, Peck & Christopher 2003]. However, the food company has global sourcing and cooperates with suppliers from different countries. This is necessary to deal with the risk (e.g. drought occurrence) using the risk diversification method.

5. Conclusions

The supply flexibility and continuity issues are presented in the literature mainly in terms of a response to the events/changes that have already occurred. However, the researched manufacturing companies recognize these issues in terms of prevention too.

The interviewed companies ensure supply continuity and supply flexibility using similar but not exactly the same strategies. Figure 1 presents a comprehensive comparison of these two discussed areas. It is based both on a literature review and qualitative research, however, it requires further examination.

Figure 1. Supply flexibility and supply continuity – reaction and prevention against business risk and uncertainty



According to the research, the interviewed enterprises prefer to use traditional ways of dealing with supply disruptions, e.g. keeping safety stocks, having an alternative supplier. Companies understand ensuring supply continuity mainly as the prevention of supply delays and quality problems, not dealing with long-term disruptions. This is interesting in terms of the BCM literature that concentrates on reactive strategies rather than preventive ones. In the face of adverse events coming from the macro environment (e.g. natural disasters), prevention is not enough and sometimes even impossible to implement. That is why supply chain managers should put more emphasis on identifying supply risks that have a low probability of occurrence but potentially huge negative consequences (e.g. bankruptcy of the supplier) as well as on preparing continuity plans for crisis situations in purchasing.

The respondents regard cooperation with flexible suppliers as a chance for effective responses to forecasted demand changes as well as responding to unplanned situations. Companies also perceive supplier flexibility as a supplier's readiness to adjust its resources to new requirements, especially quality. This highlights the presence of the adaptability approach in SRM. Engelhardt-Nowitzki [2012] underlines that supply chain adaptability helps when dealing with external uncertainty.

The small number of conducted interviews is a limitation of the performed research, however, some directions for future research can be noted. Although the manufacturers understand the research area in a similar way, some differences can be identified. These differences may result from the complexity and size of the supplier base, component availability (number of suppliers, bargaining power, production environment type, industry line regulations, demand predictability and the length of product lifecycle). Therefore, this area requires further investigation.

The next question is, what strategies are the priority for manufacturing and distributing companies today? The interactions between the supply chain participants may have an impact on decisions in this regard. It is also interesting how particular strategies influence suppliers in terms of their financial and non-financial aspects. This would require adopting multiple organizations as a unit of analysis. It is also interesting when companies should sign short or long term contracts. Both strategies are used to improve supply flexibility.

The literature on resilient supply chain [Hohenstein et al. 2015, Abubakar, Amr & Amr 2017] can benefit from the study too. Mainly, it can be deduced that sourcing flexibility positively influences supply continuity. Nevertheless, this hypothesis needs quantitative verification.

References

Abubakar A., Amr M., Amr A. (2017): *Analysing supply chain resilience: Integrating the constructs in a concept mapping framework via a systematic literature review*. "Supply Chain Management: An International Journal", Vol. 22(1), pp. 16-39, https://doi.org/10.1108/SCM-06-2016-0197.

Ansoff H.I. (1985): *Zarządzanie strategiczne*. PWE, Warszawa.

Arnold J.R.T., Chapman S.N., Clive L.M. (2008): *Introduction to materials management*. Six edition, Pearson, Prentice Hall.

Bozarth C.C., Handfield R.B. (2008): *Introduction to operations and supply chain management*. Second edition, Pearson Prentice Hall, New York.

Braithwaite A. (2003): *The supply chain risks of global sourcing*. Supply Chain Strategy and Trends – Globalization, LCP Consulting, London.

Caniëls M.C.J., Gelderman C.J. (2007): *Power and interdependence in buyer supplier relationships: A purchasing portfolio approach*. "Industrial Marketing Management", Vol. 36(2), pp. 219-229.

Christopher M. (2000): *The agile supply chain: Competing in volatile markets*. "Industrial Marketing Management, Vol. 29(1), pp. 37-44, https://doi.org/10.1016/S0019-8501(99)00110-8.

Chu P.-Y., Chang K.-H., Huang H.-F. (2012): *How to increase supplier flexibility through social mechanisms and influence strategies?* "Journal of Business & Industrial Marketing", Vol. 27(2), pp. 115-131, https://doi.org/10.1108/08858621211196985.

Closs D.J., Roath A.S., Goldsby T.J., Eckert J.A., Swartz S.M. (1998): *An empirical comparison of anticipatory and response-based supply chain strategies*. "International Journal of Logistics Management", Vol. 9(2), pp. 21-34.

Correa H., Slack N. (1996): *Framework to analyse flexibility and unplanned change in manufacturing systems*. "Computer Integrated Manufacturing Systems", Vol. 9(1), pp. 57-64.

Duclos L.K., Vokurka R.J., Lummus R.R. (2005): *Delphi study on supply chain flexibility*. "International Journal of Production Research", Vol. 43(13), pp. 2687-2708.

Engelhardt-Nowitzki C. (2012): *Improving value chain flexibility and adaptability in build-to-order environments*. "International Journal of Physical Distribution & Logistics Management", Vol. 42(4), pp. 318-337, https://doi.org/10.1108/09600031211231317.

Fantazy K.A., Kumar V., Kumar U. (2009): *An empirical study of the relationships among strategy, flexibility, and performance in the supply chain context*. "Supply Chain Management: An International Journal", Vol. 14(3), pp. 177-188.

Fayezi S., Zutshi A., O'Loughlin A. (2014): *Developing an analytical framework to assess the uncertainty and flexibility mismatches across the supply chain*. "Business Process Management Journal", Vol. 20(3), pp. 362-391.

Gosling J., Purvis L., Naim M.M. (2010): *Supply chain flexibility as a determinant of supplier selection*. "International Journal of Production Economics", Vol. 128(1), pp.11-21, http://dx.doi.org.ebscohostresearchdatabasestest0.han3.lib.uni.lodz.pl/10.1016/j.ijpe.2009.08.029.

Handfield R.B., Lawson B. (2007): *Integrating suppliers into new product development*. "Research-Technology Management", Vol. 50(5), pp. 44-51.

Handfield R.B., Monczka R.M., Giunipero L.C., Patterson J.L. (2011): *Sourcing and Supply Chain Management*. 5th ed., South-Western Cengage Learning, Boston, MA.

Hohenstein N.-O., Feisel E., Hartmann E., Giunipero L. (2015): *Research on the phenomenon of supply chain resilience: A systematic review and paths for further investigation*. "International Journal of Physical Distribution & Logistics Management", Vol. 45 (1/2), pp. 90-117, https://doi.org/10.1108/IJPDLM-05-2013-0128.

ISO/DIS 22313:2012. *Societal security – Business continuity management systems – Guidance*.

Jain N., Girotra K., Netessine S. (2015): *Recovering from disruptions: The role of sourcing strategy*. INSEAD, Working Paper Series 2015/85/TOM, Fontainebleau, pp. 1-35.

Jüttner U., Peck H., Christopher M. (2003): *Supply Chain Risk Management: Outlining an agenda for future research*. "International Journal of Logistics: Research & Applications", Vol. 6(4), pp. 197-210.

Krause D.R. (1997): *Critical elements of supplier development. The buying-firm perspective*. "European Journal of Purchasing & Supply Management", Vol. 3(1), pp. 21-31.

Matejun M. (2012): *Metoda studium przypadku w pracach badawczych młodych naukowców z zakresu nauk o zarządzaniu*. „Problemy Zarządzania, Finansów i Marketingu", No. 666(19), pp. 203-214.

Mizgier K.J., Hora M., Wagner J.W., Jüttner M.P. (2015): *Managing operational disruptions through capital adequacy and process improvement*. "European Journal of Operational Research", Vol. 245(1), pp. 320-332, http://dx.doi.org/10.1016/j.ejor.2015.02.029.

Monczka R.M., Handfield R.B., Guinipero L.C., Patterson J.L. (2010): *Purchasing and Supply Chain Management*. South-Western Cengage Learning, Andover.

Ndubisi N.O., Jantan M., Hing L.Ch., Ayub M.S. (2005): *Supplier selection and management strategies and manufacturing flexibility*. "Journal of Enterprise Information Management", Vol. 18(3), pp. 330-349.

PricewaterhouseCoopers (2013): *Supplier relationship management. How key suppliers drive your company's competitive advantage*. London.

Protiviti (2013): *Guide to business continuity management*. Third edition, Menlo Park, CA.

Rice J.B., Caniato J.F. (2003): *Building a secure and resilient supply network*. "Supply Chain Management Review", Vol. 7(5), pp. 22-30.

Pujawan I.N. (2004): *Assessing supply chain flexibility: A conceptual framework and case study*. "International Journal of Integrated Supply Management", Vol. 1(1), pp. 79-97, https://doi.org/10.1504/IJISM.2004.004599.

Ross D.F. (2010): *Supply chain performance measurement*. APICS Profession Development, www.apics-chicago.org/downloads/perform_measure_nov_2010.pdf (access: 20.08.2015).

Routroy S. (2008): *Decision framework for supplier evaluation and selection in supply chain*. "Journal of Supply Chain Management", Vol. 5(3), pp. 19-32.

Sánchez A.M., Pérez M.P. (2005): *Supply chain flexibility and firm performance*. "International Journal of Operations & Production Management", Vol. 25(7), pp. 681-700, https://doi.org/10.1108/01443570510605090.

Sánchez-Rodríguez C., Hemsworth D., Martínez-Lorente A.R. (2005): *The effect of supplier development initiatives on purchasing performance: A structural model*. "Supply Chain Management", Vol. 10(4), pp. 289-301, https://doi.org/10.1108/13598540510612767.

Seifbarghy M., Pourebrahim G.A. (2012): *Supply chain integration under vendor managed inventory mode of operation considering stockout*. "Economic Computation & Economic Cybernetics Studies & Research", Vol. 46(1), pp. 197-218.

Siau K., Tian Y. (2004): *Supply chains integration: Architecture and enabling technologies*. "Journal of Computer Information Systems", Vol. 44(3), pp. 67-72.

Skipper J.B., Hanna J.B. (2009): *Minimizing supply chain disruption risk through enhanced flexibility*. "International Journal of Physical Distribution & Logistics Management", Vol. 39(5), pp. 404-427, https://doi.org/10.1108/09600030910973742.

Supply Chain Council (2010): *Supply Chain Operations Reference (SCOR®) model overview – version 10.0 supply*. www.supply-chain.org (access: 20.08.2015).

Svensson G. (2002): *A conceptual framework of vulnerability in firms' inbound and outbound logistics flows*. "International Journal of Physical Distribution & Logistics Management", Vol. 32(2), pp. 110-134, https://doi.org/10.1108/09600030210421723.

Tachizawa E.M., Gimenez T.C. (2007): *Drivers and sources of supply flexibility: An exploratory study*. "International Journal of Operations & Production Management", Vol. 27(10), pp. 1115-1136, https://doi.org/10.1108/01443570710820657.

Tachizawa E.M., Giménez C. (2009): *Assessing the effectiveness of supply flexibility sources: An empirical research*. "International Journal of Production Research", Vol. 47(20), pp. 5791-5809, https://doi.org/10.1080/00207540802146122.

Tomlin B., Wang Y. (2012): *Operational strategies for managing supply chain disruption risk*. In: *Handbook of integrated risk management in global supply chains*. Eds. P. Kouvelis, O. Boyabatli, L. Dong, R. Li. John Wiley & Sons, New York, pp. 79-101, https://doi.org/10.1002/9781118115800.ch4.

Torabi S.A., Baghersad M., Mansouri S.A. (2015): *Resilient supplier selection and order allocation under operational and disruption risks*. "Transportation Research: Part E", Vol. 79, pp. 22-48, http://dx.doi.org/10.1016/j.tre.2015.03.005.

Vickery S., Calantone R., Droge C. (1999): *Supply chain flexibility: An empirical study*. "The Journal of Supply Chain Management", pp. 16-24, https://doi.org/10.1111/j.1745-493X.1999.tb00058.x.

Voss C., Tsikriktsis N., Frohlich M. (2002): *Case research in operations management*. "International Journal of Operations & Production Management", Vol. 22(2), pp. 195-219, https://doi.org/10.1108/01443570210414329.

Wagner S. (2006): *Supplier development practices: An exploratory study*. "European Journal of Marketing", Vol. 40(5/6), pp. 554-571, https://doi.org/10.1108/03090560610657831.

Wisner J.D., Tan K.-Ch., Leong G.K. (2012): *Supply chain management: A balanced approach*. 3rd ed., South-Western Cengage Learning, Boston, MA.

Zhibin Y., Aydin G., Babich V., Beil D.R. (2009): *Supply disruptions, asymmetric information, and a backup production option*. "Management Science", Vol. 55(2), pp. 192-209, https://doi.org/10.1287/mnsc.1080.0943.

Zhibin Y., Aydin G., Babich V., Beil D.R. (2012): *Using a dual-sourcing option in the presence of asymmetric information about supplier reliability: Competition vs. diversification*. "Manufacturing & Service Operations Management", Vol. 14(2), pp. 202-217, https://doi.org/10.1287/msom.1110.0358.

Zhibin Y., Babich V. (2014): *Does a procurement service provider generate value for the buyer through information about supply risks?* "Management Science, Vol. 61(5), pp. 979-998, http://dx.doi.org/10.1287/mnsc.2014.1963.

Zsidisin G.A., Ellram L.M. (2003): *An agency theory investigation of supply risk management*. "Journal of Supply Chain Management", Vol. 39(3), pp. 15-27, https://doi.org/10.1111/j.1745-493X.2003.tb00156.x.

Zsidisin G.A., Melnyk S.A., Ragatz G.L. (2005): *An institutional theory perspective of business continuity planning for purchasing and supply management*. "International Journal of Production Research" Vol. 43(16), pp. 3401-3420, http://dx.doi.org/10.1080/00207540500095613.