

Innovative Suppliers as a Source of Risk for Manufacturing Companies

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In dynamic supply networks, based on large degree of outsourcing, risk is increasing. In literature many different sources of risk for supply chain management were discussed. Even though there is a rich stream of literature investigating risk in supply chains, there has been little research applied to the precise risk that exists with inbound supply at manufacturing companies¹. Manufacturers often outsource portions of their operations as a result of “make-or-buy” decisions, having it based on different reasons. In that case research in risk and its management deals with the level of inter-organizational relationships². External suppliers represent diversified levels of innovations concerning their products and/or technologies; they are often classified as “innovative suppliers”³. Certain degree of innovation was clearly identified as a source of risk and uncertainty in supply chains⁴. Also the relationships between manufacturers and their suppliers may be based on partnerships or they may demonstrate more opportunistic behavior of engaged parties. The purpose of the research presented in this paper is to analyze the problem of impact of innovative suppliers on technological and behavioral risk in manufacturers’ supply chains.

Keywords: supply chain, suppliers, innovative suppliers, innovation, risk

INTRODUCTION

Manufacturers often outsource portions of their operations as a result of “make-or-buy” decisions, having it based on different reasons. As a result, supply processes tend to be quite stable or they

may become evolving towards larger uncertainty⁵. “Stable” supply processes can be described by mature manufacturing practices and mature underlying technology. “Evolving” supply process is where the manufacturing processes and connected technology are in its development stage and the supply base may be missing proper experience. In the case of stable manufacturing processes their complexity is managed usually by long-term supply contracts. Evolving manufacturing process requires a lot of “finetuning” and often may be subject to breakdowns and uncertainties. Suppliers themselves undergo the process on innovation and are less reliable than in stable manufacturing. In that sense management deals with the level of

¹ G. A. Zsidisin, A grounded definition of supply risk, *Journal of Purchasing and Supply Management*, No 9, 2003, pp.217-224.

² C. Harland et al, Risk in Supply Networks, *Journal of Purchasing and Supply Management*, No 9, 2003, pp.51-62.

³ H. Schiele, How to distinguish innovative suppliers? Identifying innovative suppliers as new task for purchasing, *Industrial Marketing Management*, vol.35, issue 8, November 2006, pp.925-935.

⁴ J. L. Cavinato, Supply Chain Logistics Risks. From the Back Room to the Board Room, *International Journal of Physical Distribution & Logistics Management*, vol.34, No 5, 2004, pp. 383-387.

⁵ H. L. Lee, Aligning Supply Chain Strategies with Product Uncertainties, *California Management Review*, vol.44, no.3, Spring 2002, pp.105-119.

inter-organizational relationships in order to (cope with those uncertainties⁶.

External suppliers may represent diversified levels of innovations concerning their products and/or technologies; they are often classified as “innovative suppliers⁷. Certain degree of innovation was clearly identified as a source of risk and uncertainty in supply chains⁸. Also the relationships between manufacturers and their suppliers may be based on partnerships or they may demonstrate more opportunistic behavior of engaged parties.

The purpose of the research presented in this paper was to analyze the problem of impact of innovative suppliers on general as well as technological and behavioral risk in manufacturers’ supply chains. The main research questions concerned the following issues:

RQ1: How do manufacturers dealing with innovative suppliers perceive the level of risk connected to the relationships with those suppliers?

RQ2: In what way contracts signed with innovative suppliers help to mitigate the risk:

- a) At the stage of negotiating the contract?
- b) During the process of contract enforcement?

RQ3: What specific attitudes towards technical and behavioral risks resulting from relationships with innovative suppliers are demonstrated by manufacturers?

RQ4: Are the signed contracts between manufacturers and their innovative suppliers an effective tool of risk mitigation in supply networks?

1. CONCEPT OF INNOVATIVE SUPPLIERS

Innovation in the large sense does not necessarily mean a world innovation, but can be anything new to the firm, even if that was already new for other companies.

Innovation in manufacturing process does not depend solely on operations of a single company, isolated from the environment. It usually involves

the whole supply chain and especially, the firm’s suppliers. Literature shows that at towards the end of last century only 20% of the most technology-intensive companies largely relied on external sources of technology, while nowadays that share increased to 85%⁹. Therefore, the process of generation of innovation and processes fostering innovation were also presented in literature¹⁰.

Despite such a large extent of innovation in supply process research and practice were not quite successful in full identification of innovative suppliers¹¹. Some indirect input has been made by research on purchasing involved in new product development, early supplier involvement and literature on supplier selection. Literature survey prepared by Schiele indicates that innovative suppliers can be described by the following characteristics:

- Specialized firms (“technology specialists”) seem to be the more innovative ones rather than general contractors supplying several industries,
- Suppliers from oligopolistic supply markets, where competition is based more on quality than prices, seem to be more innovative than suppliers from polypolistic structures,
- Suppliers with a strong export orientation are more innovative than those from a purely domestic industry,
- Relationship between buyer and innovative supplier is based on mutual obligations, where success in new product development correlates with the quality of relationship¹²,

⁹ E. B. Roberts, Benchmarking Global Strategic Management of Technology. Survey of the World’s Largest R&D Performance Reveals, Among Other Trends, a Greater Reliance Upon External Sources of Technology, *Research Technology Management*, 44 (March-April 2001), pp. 25-36.

¹⁰ I. J. Chen, A. Paulraj, A. A. Lado, Strategic Purchasing, Supply Management, and Firms Performance, *Journal of Operations Management*, vol.22, no. 5, 2004, pp.505-523.

¹¹ H. Schiele (2006): op. cit.

¹² M. Hoegl, S. M. Wagner, Buyer-Supplier Collaboration in Product Development Projects, *Journal of Management*, vol.31, 2005, no.4.

⁶ C. Harland et al: op. cit.

⁷ H. Schiele: op. cit.

⁸ J. L. Cavinato: op. cit.

- Innovative suppliers and buyers are important for each other, which has been indicated also long time ago by the popular Kralijic Matrix¹³,
- The innovative suppliers cooperate with the buyer on a long-term basis extending often to more than 10 years period (e.g. Ahman¹⁴; Liker et al.¹⁵),
- Innovative suppliers undertake many improvement efforts within the frameworks of suppliers development programs increasing process and product innovations (e.g. Krause et al.¹⁶; Monczka et al.¹⁷,
- Suppliers' design capabilities, their process and product know-how and proofs confirming that (such as e.g. obtained certificates) constitute an important basis for the buyer's trust in the supplier's competence and it is an important element influencing the innovative outcome (e.g. Roy et al.¹⁸,
- Innovative suppliers often may be engaged in several collaborative ventures at the same time, thus demonstrating that collaboration is their company strategy and culture (Green, Keogh¹⁹).

¹³ P. Kralijic, Purchasing Must Become Supply Management, *Harvard Business Review*, vol.61, no.5, 1983, pp.109-117.

¹⁴ S. Ahman, Towards Strategic Purchasing in a Supply Network, in "Sourcing Decision Management", A. Ancarani and M.Raffa (ed.), Napoli, Roma 2005, pp.101-113.

¹⁵ J. K. Liker, R. R. Kamath, S. N. Wasti, M. Nagamachi, Supplier Involvement in Automotive Component Design: Are There Really Large US Japan Differences?, *Research Policy*, no.25, 1996, pp. 59-89.

¹⁶ D. R. Krause, T. V. Scannel, R. J. Calantone, A Structural Analysis of the Effectiveness of Buying Firms' Strategies to Improve Supplier Performance, *Decision Sciences*, vol.31, no.1, 2002, pp.33-55.

¹⁷ R. Monczka, R. Trent, R. Handfield, *Purchasing and Supply Chain Management*, 2nd edition, Mason 2002 (Ohio).

¹⁸ S. Roy, K. Sivakumar, I. Wilkinson, Innovation Generation in Supply Chain Relationships: A Conceptual Model and Research Propositions, *Journal of the Academy of Marketing Science*, vo. 20, no.10, 2003, pp.1-19.

¹⁹ R. Green, W. Keogh, Collaboration in the UK Upstream Oil and Gas Industry. Five Years On, 5th *International Conference on Multi-Organizational Partnerships and Co-operative Strategy*, Oxford 1998.

Innovative suppliers often become relatively important ones because buyer's prior commitment to new technology and joint product development would involve high switching costs if the supplier needs to be changed and new relationship with a new supplier should be established.

2. RISK CONNECTED TO INNOVATIVE SUPPLIERS

Risk is a part of each business environment. In many types of risk discussed by various authors the following risk profiles can be identified: strategic, operational, supply, customer, asset impairment, competitive, reputation, financial, fiscal, regulatory or legal²⁰.

In dynamic supply networks, based on large degree of outsourcing, risk is increasing. In literature many different sources of risk for supply chain management were discussed. Even though there is a rich stream of literature investigating risk in supply chains, there has been little research applied to the precise risk that exists with inbound supply at manufacturing companies²¹. Zsidisin proposed that supply risk should be defined as "the probability of an incident associated with inbound supply from individual supplier failures or the supply market occurring, in which its outcomes result in the inability of the purchasing firm to meet customer demand or cause threats to customer life and safety".

In literature many different sources of supply risks have been mentioned and it is perceived as a multi-dimensional construct. Changes in technology were one of the early identified risk creators²². If a supplier is not able to implement technological changes in the long term, it has no chance to become a strategic and/or the most important manufacturer's source of materials and components. Technical complexity, specialized installations, etc. could affect the level of

²⁰ C. Harland et al, Risk in Supply Networks, *Journal of Purchasing and Supply Management*, No 9, 2003, pp.51-62.

²¹ G. A. Zsidisin: op. cit.

²² G. R. Iyer, Strategic Decision Making in Industrial Procurement: Implications for Buying Decision Approaches and Buyer-Seller Relationships, *The Journal of Business & Industrial Marketing*, vol.11, no.3/3, 1996, p.80.

commercial uncertainty²³. Rapid pace of technology makes it difficult for the buyers to evaluate properly innovative suppliers and identify the likelihood of future problems that may occur in the production and delivery of the product. Frequent major technological changes often destroy existing competencies and require development of new capabilities suiting the new technological requirements²⁴. Therefore more extensive risk management would be necessary at high-tech markets with quick pace of technological change.

Traditionally, manufacturing companies buffered supply risks by using multiple sources for strategic materials and components and holding safety stocks. Those traditional approaches are no longer sufficient in order to deal with actual supply chain environment. New approach to risk examines different possibilities of risk management, which involves understanding the probability and significance of uncertain events, as well as seeking the ways to reduce the risk.

Main strategies applied in order to reduce supply uncertainties include such efforts as²⁵:

- free exchange of information as a result of extensive collaboration with suppliers,
- sharing production plans and product transition programmes to support strategic and operational changes,
- early design collaboration to reduce uncertainties downstream.

The higher the technical and technological sophistication of supplied products; the greater the need for security at the buying company. Risk and benefit sharing is extremely relevant to joint product/ service and process design and supply chain innovations. These activities, uncertain in their nature, require an open dialogue to assess potential benefits and risks in order to renegotiate their allocation. Joint efforts of buyers and

suppliers may significantly reduce risk in the supply process. Collaborative supply management increases the reliability of the final manufacturer's product and reduce quality failures.

Thus, many aspects of future operations are very likely to be determined in signed contracts in order to avoid unforeseen events bringing some detrimental effects that can be quite costly for the manufacturing company. Despite the fact that it has been recognized as increasingly important, relatively little empirical knowledge exists on how it is done and what would be the guidelines for managers in that respect.

3. RESEARCH FRAMEWORK AND METHODOLOGY

Data collection and sample

The main research instrument used for this study was a questionnaire developed by the Global Manufacturing Research Group (GMRG)²⁶. Data collected within the fourth release of a survey was collected between 2006 and 2008 by researchers from several countries in Europe, North America, Asia and Africa. A team of researchers (also the authors of this paper) from the Department of Business Logistics at the University of Economics in Katowice have been participating in the GMRG research since 1994 and actively surveyed Polish companies, providing information for the main GMRG data base. As the reciprocity the Polish research team has the privilege to use the original data gathered globally. This is still an ongoing project coordinated in Poland by Danuta Kisperska-Moroń.

The survey was a random sample of manufacturing firms in a given geographical area. The questionnaire consists of several sections examining such aspects as: general demographics of surveyed companies competitive goal measurement, internal manufacturing practices, manufacturing planning and control information systems, outsourcing and supplier relations, sales forecasting and purchasing practices. The whole complete questionnaire contains several hundreds of questions and variables and led to the creation of a database extremely rich with information. There is no single meta-theory for guiding a development of the GMRG survey. The main idea

²³ L. Laios, S. Moschuris, *An Empirical Investigation of Outsourcing Decisions*, *The Journal of Supply Chain Management*, vol.34, Winter 1999.

²⁴ L. C. Giunipiero and R. A. Eltantawy, *Securing the Upstream Supply Chain: a Risk Management Approach*, *International Journal of Physical Distribution & Logistics Management*, vol.34, No 9, 2004, pp. 698-711.

²⁵ H. L. Lee (2002): op. cit.

²⁶ www.gmr.org

of the survey was to collect information about many aspects of general manufacturing practices worldwide²⁷.

The total research sample used for the initial selection consisted of respondents from such countries as Australia (30 companies), Austria (17), China (57), Ghana (63), Hungary (53), Italy (54), South Korea (99), Poland (57) and Taiwan (50). Out of the large sample only those manufactures were selected who declared co-operation with “innovative” suppliers. After careful examination of the quality of data provided by the respondents, 124 companies were included in a final sample with the following country structure: Australia (7 companies), China (11), Ghana (37), Hungary (2), Italy (8), South Korea (15), Poland (14) and Taiwan (30).

The majority of surveyed companies were small and medium companies operating in electronic and electrical equipment industry, industrial and commercial machinery equipment, food industry and chemicals.

Research methodology

For the purpose of this research only one part of the GMRG survey has been used: “Outsourcing and Supplier Relations”. That section included 12 questions in total providing information on more than 100 variables. Out of the total number of variables only 19 have been selected for the analysis.

The main criterion of selection (i.e. “innovative suppliers”) of companies for the sample has been based on a variable describing the reason why the respondents chose a particular the most important supplier. Only those companies were included in the sample that indicated that the main reason why they consider their suppliers being the most important ones, was the latest new product technology and/or manufacturing technology provided by suppliers.

However, it has to be emphasized that the percentage of the supplier’s products which involve advanced product technology developed recently wasn’t significant. It has been examined what percentage of the supplier’s products involve advanced technology developed recently (i.e. 0-

24%, 25-49%, 50-74% or 75-100%). As Figure 1 illustrates, only 25% (11% plus 14%) of these products involved more than 50% of such technology. Still it has to be noticed that this percentage represents state-of-art technology and from that perspective it can be perceived as quite significant share.

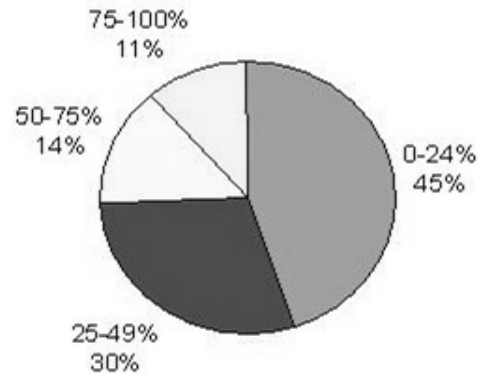


Figure 1: Percentage of the manufacturers’ supplier’s products involving advanced product technology developed recently

In order to determine the potential impact of selected manufacturers on their suppliers, size of both suppliers and manufacturers was compared. What appeared to be important is that 57% of manufacturers organizations were much smaller or just smaller than their innovative suppliers. Only 29% of interrogated firms were larger or much larger than their suppliers, so probably most of respondents can have relatively weak impact on their suppliers (see Figure 2).

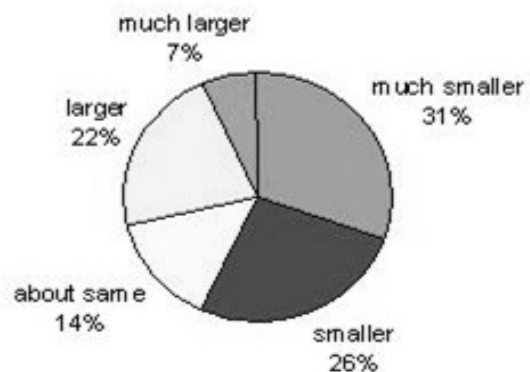


Figure. 2: Size of analyzed manufacturers’ organizations in comparison to their supplier’s organization

²⁷ G. Vastag, D. C. Whybark, Inventory Management: Is There a Knock-on Effect? *International Journal of Production Economics*, vol. 93-94, 2005, pp.129-138.

The main part of the research was divided into two problem areas: identification of sources of risk associated with innovative suppliers 1) during contract development and 2) during contract realization.

In the next step of the research the sample was structured according to the risks associated with these innovative suppliers as perceived by manufacturers. In particular, manufacturers were asked to evaluate strength of technology and behavioral risk connected with their innovative suppliers. An expression “technology risk” was used in this research in the sense of the likelihood that the technology associated with this product may not work, because it is “new”, or because it can easily be replaced by newer / better technology. On the other hand, “behavioral risk” was understood as the likelihood that the chosen supplier may act opportunistically and take advantage of the manufacturer, under difficult exchange circumstances, impossibility of contract enforcement or complex unforeseen circumstances. Because interrogated companies could evaluate two kinds of risk and asses them as low and/or high the matrix of clusters was developed to present the results (see Figure 3).

	Low behav- ioral risk	High behav- ioral risk
Low tech- nology risk	Cluster A: 71 companies	Cluster C: 15 companies
High tech- nology risk	Cluster B: 11 companies	Cluster D: 27 companies

Figure 3. Technology and behavioral risk associated with innovative suppliers as perceived by surveyed manufacturers

As one can see, most of surveyed manufacturers (about 57% in Cluster A) assessed their perceived risk associated with their innovative supplier, both technological and behavioral, as low. Still, many of

them perceives at least one kind of these risks as relatively high (Clusters B and C). Only 22% of surveyed manufacturers consider both types of risk connected to their innovative suppliers as high.

Further on, we tried to provide detailed comparative analysis of characteristics of four clusters and particularly – potentially different ways of risk handling in those four groups of manufacturers (i.e. low technology/low behavioral; low technology/high behavioral; high technology/low behavioral and high technology/high behavioral).

4. INNOVATIVE SUPPLIERS AS A SOURCE OF TECHNICAL AND BEHAVIOURAL RISK

Practices for contract development

Initial insight into the practices of preparing terms and details of contract by manufacturer and supplier indicated that for the majority of surveyed companies it takes not more than 25% of their facility hours to clarify contract/product specification with all manufacturers’ suppliers as a whole and also with their particular innovative supplier. However, it is worth emphasizing that this percentage represents part of the total number of working hours fund, so probably the absolute number of hours they spend on clarifying vital details of contract could be quite impressive (see Figure 4).

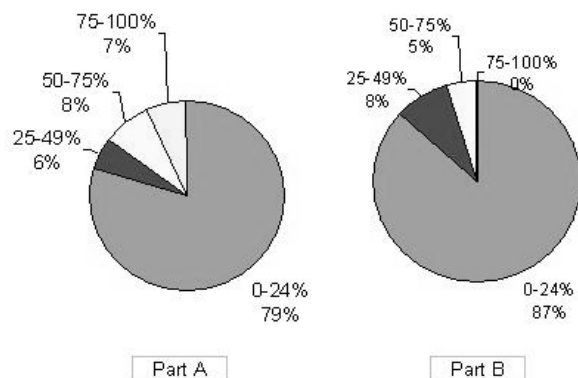


Figure 4. Percentage of the factory hours spent on clarifying contract/product specifications for all manufacturers’ suppliers (part A) and for just this one most important innovative supplier (part A)

However, Part B of Figure 4 suggests that as concerns the most important innovative suppliers, manufacturers time involvement seems to be

smaller than in case of contracts with other suppliers.

The next insight into contract development practices indicated that more than 50% of surveyed manufacturers agreed (more or less strongly) that amount of their negotiation sessions with an innovative supplier is excessive (i.e. beyond what would be considered to be 'normal'). The atmosphere of negotiations was described by excessive haggling in the case of almost 57% of responding manufacturers although agitation during negotiation was declared only by around 45% of respondents. Still it seems that the level of excitement and nervousness connected to contract negotiations with innovative suppliers seems to be quite high. According to these results one may notice that parties concluding a contract are significantly involved in the process of its development and clarifying, devoting vital portion of time and energy to build stable framework for later cooperation (see Figure 5).

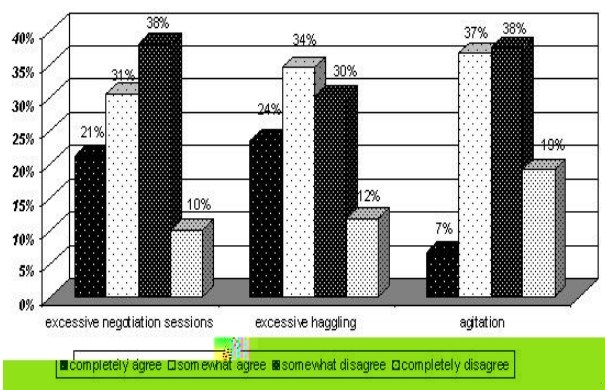


Figure 5. Manufacturers declaring they had excessive negotiation sessions and haggling and that they get agitated with their innovative supplier's representatives

Despite the efforts mentioned above, the effectiveness of the whole process might be questionable. Surveyed manufacturers mostly indicated (81%) that they carefully detail product specifications with their supplier before contract signing (see Figure 6.). On the other hand, in the majority of cases (72%) the manufacturers declared also that they and their innovative suppliers are committed to working out details even after a contract is signed. These results confirm and emphasizes that innovative suppliers and buying manufacturers put much effort in mutual collaboration and problems solving activities.

However, in the context of above observations, it would be worthwhile to say that only small percentage of the details of these contracts was finalized after their were signed. Probably, both contract formulating parties were significantly engaged in clarifying its clauses, and after signing the contract emerging changes probably were small and connected with most specific aspects of the product or cooperation.

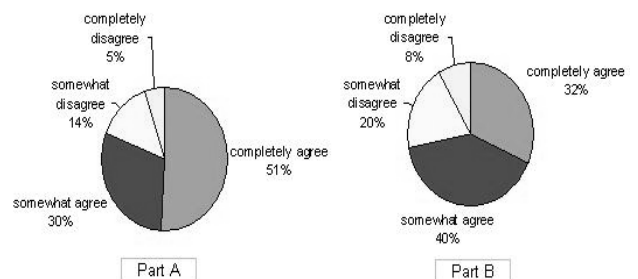


Figure 6. Manufacturers declaring they carefully detail product specifications before contract signing (part A) and are committed with their innovative supplier to working out details after a contract is signed (part B)

Contract realization as a source of risk

Information gathering and its management is considered to be one of the most important process during contract realization. It is much more important when it comes to cooperation with vital supplier, because its product and processes influence significantly products and processes of a given manufacturer. Thus the communication between those parties is of extreme importance.

Further research results show that when comparing innovative suppliers with other suppliers of surveyed manufacturers, the innovative ones are better or even much better in mutual exchange of information in regards to production forecasts, plans, schedules and supply requirements (see Figure 7, part A). Moreover, innovative suppliers are also more careful about manufacturers processes by avoiding requests for schedule changes, especially those requests that could disrupt the normal lead time period in manufacturers plants (see Figure 7, part B). Thus, care for enough information and dedication to communication with manufacturers was evidently better for innovative supplier than for other suppliers of those analyzed companies.

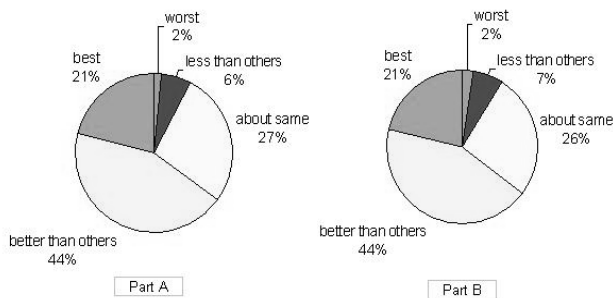


Figure 7. Innovative supplier’s communication (exchange of information) performance in comparison to other suppliers

Efficient manufacturing operations depend greatly on the degree of stability of their production plans. Our research indicates that more than 55% of innovative suppliers are not so eager to cooperate with manufacturers to stabilize production schedules when compared to other suppliers (Figure 8). However, the rest of suppliers were evaluated much better in this respect. Perhaps innovative suppliers are quite willing to exchange information but they are less committed when it comes to support their partners in solving real operational problems.

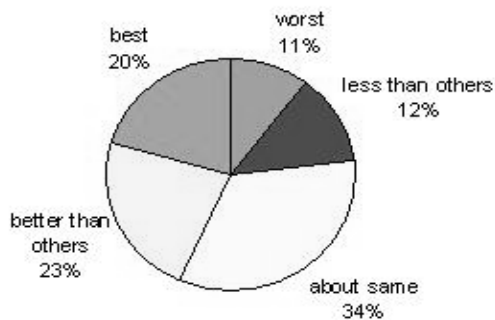


Figure 8. Innovative supplier’s performance in comparison to other suppliers in joint efforts to stabilize production schedules

Innovative supplier tends to be evidently better or best of all suppliers when it comes to exchange of mutual feedback on how well the outsourced part work, endure and fit the specifications of the final product. At that point innovative suppliers prove to be the ‘best-in-class’ in communication with their supply chain partners (see Figure 9).

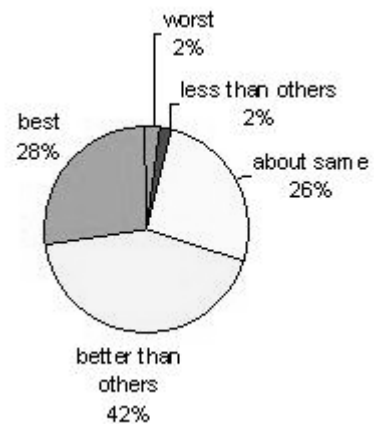


Figure 9. Innovative supplier’s performance in comparison to other suppliers - providing mutual feedback on how well the outsourced part work, endure and fit the specifications of the final product

The above mentioned commitment of innovative suppliers to resolve product performance problems was really impressive – about 80% of manufacturers perceived that quite explicitly (see Figure 10).

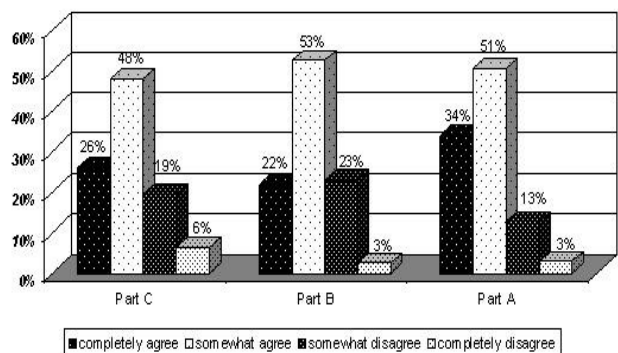


Figure 10. Perception of surveyed manufacturers about their relationship with their most important innovative supplier concerning issues as: 1) mutual commitment to resolving product performance problems (part A), 2) mutual reliance on ‘implicit agreements’ for dealing with contingencies not covered by ‘formal written agreements’ (part B), 3) mutual commitment of not to alter facts (or how facts appear) so as to take advantage of one another (part C)

Again, the realization of contracts depends not only on formal clauses of these agreements. Almost 75% of manufacturers indicated that they rely on ‘implicit agreements’ for dealing with

contingencies not covered by ‘formal written agreements’ – so they don’t need any ‘paper threats’ to cooperate in a right way with manufacturer in such problematic situations. Finally, almost 2/3 of surveyed manufacturers perceived their innovative suppliers as not opportunistic ones, since they are committed not to alter facts (or how facts appear) so as to take advantage of the other party (see Figure 10).

The last examined variable was connected to the likelihood (based on manufacturers’ perceptions) of risk that some vital contractual clauses be legally enforced in the form of specific penalties. These clauses were connected with the following situations resulting from the performance of innovative suppliers:

- breach of contract termination date,
- breach of “exclusivity clause” (i.e. the supplier is not allowed to sell to other organizations),
- poor technical performance,
- late delivery.

The above mentioned situations represent some events potentially most dangerous for surveyed manufacturers in terms of their severity for plant operations. The highest probability of risk was connected to poor technical performance of innovative suppliers (33% of surveyed manufacturers) or their late deliveries declared by 30% of respondents (see Figure 11). After huge effort of manufacturers and their innovative suppliers while developing contracts, detailing product specifications and cooperating for better communication, the possibility of breach of contract termination date as a source of risk was mentioned in 26% of cases as ‘likely or very likely to appear’. In case of 25% of surveyed manufacturers it was likely or very likely that breach of “exclusivity clause” will appear; but that probably could be explained to be a result of the small size of responding manufacturers in comparison with their innovative suppliers).

The results of our research suggest that, in spite of all efforts in the process of contract development and later intensity of communication activities between manufacturers and their innovative suppliers, there is still significant possibility of risk connected with operational (technical performance, deliveries) as well as

strategic (contract termination, exclusivity causes acceptance) issues.

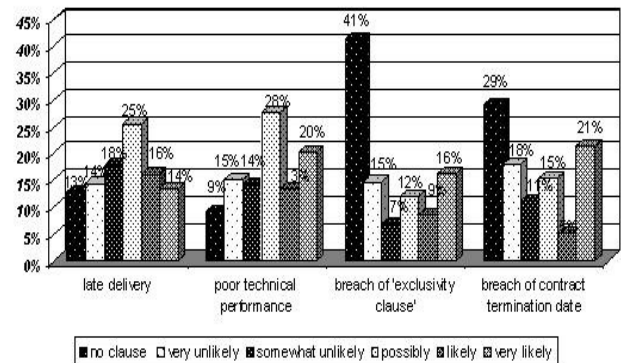


Figure 11. The likelihood that some vital following contractual clauses be legally enforced

5. CONCLUSIONS

The completed research provided a slightly new insight into mutual relationships between manufacturing companies and their innovative suppliers. Generally, many common concepts presented in literature have been confirmed, such as innovation and technology being a source of risk in supply networks and common closer cooperative relationships with innovative suppliers. However, the answers provided to the research questions put some new light on the process of collaboration between manufacturers and innovative suppliers.

RQ1: *How do the manufacturers dealing with innovative suppliers perceive the level of risk connected to the relationships with those suppliers?*

Manufacturers mostly perceive behavioral and technology risk connected with innovative suppliers as low, which seems to be too optimistic in the light of further problems that appear in their cooperation processes. The high probability of penalties for those suppliers applied in different situations of contract breach indicate that the risks can be much higher than generally perceived.

RQ2: *In what way contracts signed with innovative suppliers help to mitigate the risk:*

a) *At the stage of negotiating the contract?*

During contract formulation process manufacturers spend with innovative suppliers more time (in relation to other suppliers) to specify as many terms and details as possible, however,

from the perspective of risk probabilities, the results of that are still problematic. A lot of concern at this stage is put towards product performance and technological details. Also manufacturers tend to protect themselves by many contract clauses and introduction of penalties enforcing suppliers' effectiveness.

b) During the process of contract enforcement?

In order to protect themselves against existing (although not always perceived) risks manufacturers tend to cooperate closely with innovative suppliers in the form of communication exchange and information sharing dealing with production forecasts, plans and schedules or supply requirements. However, joint efforts in operations management concerning common stabilization of production plans and probably other procedures are not so popular. Despite all efforts the most common risk sources result from poor technical performance and logistics problems of late deliveries. These are the types of risk which can easily widespread and be transferred to other parts of supply chain.

RQ3: *What specific attitudes towards technical and behavioral risks resulting from relationships with innovative suppliers are demonstrated by manufacturers?*

Unfortunately it was difficult to identify the difference in practices applied by manufacturers in the four clusters representing various levels of technical and behavioral risks. Manufacturing companies classified in those four groups did not demonstrate any specific different characteristics concerning contract development and/or contract realization.

RQ4: *Are the signed contracts between manufacturers and their innovative suppliers an effective tool of risk mitigation in supply networks?*

On the basis of conclusions concerning three previous research questions, legal contract do not seem to be a proper tool for risk mitigation. Significant effort in terms of time, attention and agitation spent on contract preparation by manufacturers and their innovative suppliers (sometimes perceived even as 'excessive') does not result in proper elimination of risks. Also operational practices require many additional communication and agreements extending beyond formal contract clauses. Probably effective and

efficient cooperation with innovative suppliers, due to the extreme complex nature of such relationships, cannot be easily subject just to legal regulations. Innovative environment requires also many less formal regulations and commitments in the area of behavioral field and organizational culture of involved parties.

This research could be an outgoing point for further investigation cooperation with innovative suppliers and provide some practical advice for managers who deal with those issues on strategic and operational basis in industry with evolving manufacturing processes.

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