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SUPPLY CHAIN RISK MANAGEMENT

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ABSTRACT. Background: Supply chain risk management increasingly gains prominence in many international industries. In order to strengthen supply chain structures, processes, and networks, adequate potentials for risk management need to be built (focus on effective logistics) and to be utilized (focus on efficient logistics). Natural-based disasters, such as the case of Fukushima, illustrate how crucial risk management is.
Method: By aligning a theoretical-conceptual framework with empirical-inductive findings, it may be hypothesized that logistical systems do have a positive effect on supply chain risk management activities.
Result/conclusion: Flexibility and capacity, as well as redundancy and standardization, are often viewed as being conflictionary. It shows, however, that in the light of supply chain risk management, those factors may yield a common benefit if proper logistics systems are applied.

Key words: Risk management, flexibility, capacity, redundancy, standardization.

The complexity of international value chains and supply chain logistics requires process transparency and intensified cooperation with partners and a holistic engagement with risks of logistic processes and sound evaluation of their impact on supply chains. This holds particularly true if value chain collaboration is focused on selective sourcing strategies and/or if redundancy in the allocation of activities between partners is low. In these contexts, the role of logistics may differ from classical attributions for that adequate logistics may serve as an enabler for supply chain risk management initiatives.

CONCEPTUAL CONTEXT

Risks in supply chains differ from those in individual companies. Differences especially arise in the intensity of cooperation-related risks, due to reciprocal dependencies, lower inventories and buffers, or cross-company risk interlinking and resulting effects on supply chain partners in the entire value chain. Therefore, the scope of supply chain risk is manifested in the reduction of risks for individual entities of the supply chain and the supply chain as a network entity that is related to multiple supply chain risk sources [Reh 2009]. These characteristics foster a less transparent complexity due to heterogeneous risk situations, viability and management systems of individual supply chain partners and their overall impact on the network [Kajüter 2007]. If companies act under uncertainty, flexibility and adaptability are essential. Important is that adjustments should not only be considered in the context of sales, but also in the light of logistics. Adaptive strategies especially prove to be useful for disruptions evolving over time, which enables companies to better assess changes in the long term [Tomlin, Wang 2012].

Strategies focusing on stockpile inventories can be regarded as useful and practicable to minimize risk as long as disruptions do not

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affect stocks. In this context it is important to protect stocks from internal and external disruptions e.g. by decoupling or storing them outside of the danger area or in proximity to costumers [Tomlin, Wang 2012]. Building stockpile inventory especially in post-eruptive phases may be difficult because companies are even more vulnerable to disruptions shortly after a disastrous event rather than before. Building a diversified supplier network in the context of a risk diversification strategy is a challenge that should be weighed in the light of several factors including costs, configurations, interdependencies and resilience. Significant costs due to heterogeneous supply chains often accrue for investments in plants, IT-systems, suppliers and infrastructure. Similarly, a distribution of production to multiple locations leads to shrinking economies of scale [Norman 1979]. As differentiation may also contribute to greater competition and lower unit costs, pros and cons of the different cost drivers should be weighed accordingly.

The configuration of the supply chain and the associated coordination capability of producers and suppliers probably bear the single-biggest influences on risk management. Individually tailored sourcing strategies adapted to goods and their production processes in conjunction with a sophisticated purchasing portfolio analysis and a continuous supplier monitoring form the basis for a workable and flexible network configuration in a supply chain, which additionally meets the requirements for an integrative risk management [Böger 2010]. Diversification, from the perspective of risk management, often is a balancing act between costs and risks under the compliance with technical, organizational and legal constraints.

A risk diversification is (causally considered) given if all objects are not simultaneously involved in disruptions. Serious effects mainly result from risk interdependence. If objects (e.g. plants) are in interaction with each other due to internal or external circumstances, these incidents affect all objects and can also propagate themselves in the full supply chain. In this context an exclusively object-related differentiation is insufficient as in a functional supply chain risk management there should be taken many more factors into account to successfully control dependencies in a supply chain. In this sense diversification of risk often is subdivided into temporal (temporal shifting of processes), causal (expanding the product portfolio) personnel (spreading sales volumes over multiple clients) and local (spatial separation of production) dimensions [Tomlin, Wang 2012].

In order to increase resilience of a supply chain, it is essential that all supply chain partners have access to relevant information, e.g. performance data. Furthermore they should have the necessary know-how to effectively intervene if a disruption occurs and also participate on the results so that they are motivated and willing to push improvement continuously. In addition, stress-tests are carried out to get a better and more precise understanding of the influence of different disruptive events (domestic and also externally caused) or market distortions in the supply chain performance [Chandrashekar, Narahari 2011]. The higher the data for dynamics, complexity, supply power and distance the greater the stress. If data fits in terms of resilience and stress supply chain partners should focus on keeping up the status quo or a continuously improvement process via active monitoring. If the stress is greater than the resilience the management should replace the affected chain link or the supply chain must be strengthened at this point explicitly [Pfohl 2002]. In the opposite case - if the resilience is higher than the stress - searching for saving potentials, using synergies more efficiently and rationalization efforts should be pursued since potentials and capacities will remain unused otherwise.

EMPIRICAL CONTEXT

Strategies and concepts for evaluating supply chain networks had typically not been based on geographical location of the respective suppliers. Moreover, logistical strategies and concepts had been put in place in order to support supply strategies. While proper logistics functionality typically "relaxes" the constraints put on supply chain contexts, one recent empirical example shows that even proper logistics functionality and

solid single sourcing strategic thinking may not fully substitute for adequate redundancy in a supply chain. Geographical information such as seismological, lithosperic, and geodetic data had not been fully integrated into the strategic sourcing allocation mode of a leading German car manufacturer. In 2009, employees of a leading German car manufacturer managed to apply a powerful new color (so-called "oryx white") onto its cars in the full-blown serial mode. While many customers embraced "oryx white" on their cars, only one factory of one supplier was able to produce certain color pigments needed to uphold a sparkling white effect (so-called "xirallic" - based on aluminum oxide that is surfaced with special metal oxide). Only one plant in the world produced "xirallic" - a plant located near the facility of Fukushima in Japan. When the tsunami in the Pacific and the subsequent catastrophe of Fukushima gained momentum, this plant had to be shut down. "Xirallic" could not be produced for several months, leaving customers of the German car maker without the special "oryx white". Customers of leading American and Japanese car manufacturers were affected as well. As a recommendation, companies should (in the course of a supplier evaluation or assessment) introduce "geophysical risks" as a criterion with specific relevance and incorporate it in their strategic allocation schemes to learn how to correctly interpret the results and proactively address possible (and even unlikely) disruptions. Single sourcing, combined with proper logistics, may thus be replaced by dual sourcing with evenly proper logistics functionality.

While a change of supplier providing standardized, non-critical materials can be considered as unproblematic, a change of a supplier providing complex and strategically important products is not that easy especially in long-time cooperation and interdependence by taking into account high switching costs - supplier development should be preferred over switching suppliers. In this context supplier development can also be understood as an elevation of performance and focusation of core competences to secure short and long term requirements of the sourcing enterprise. This example also showed that a tightening-up of supplier competition and the implementation of incentive contribution structures may have had a cost-cutting effect. However, these are less effective than an increase in reliability and trust - resulting from direct supplier integration in a dual sourcing context. Therefore, companies are advised to stand in direct contact with their suppliers to avoid disruptive effects in terms of quality, delivery and the security of supply. For this reason it is advisable if manufacturers limit themselves not only on the development of one single supplier, but rather to promote and develop several measures aiming at a parallel or multiple supplier development concepts. A (future) in-depth cooperation, e.g. at the level of joint R&D activities can again strengthen the interdependence by leading to a greater incentive contribution efficiency. Special incentive contribution agreements within the framework of in-house contract management should be designed to exclude any free-rider attitude of competitors with access to suppliers and their intangible assets [Meierback 2010].

It shows that standardization largely influences flexibility. While both options seem to be opposing each other, there are examples when both indicators attribute to a more resilient supply chain: A major distribution hub of a leading US-courier service in North America was exposed to heavy weather, leading to hub operations being diminished temporarily. For that the company does uphold corporate wide standards on logistical processes in any of its hubs, employees of another hub could easily replace the capacity lost due to bad weather. By means of rerouting the air-based channels, transportation and distribution flexibility could be upheld. By putting proper logistics in place, supply chain risks can be minimized. This holds true even when indicators are affected that may seem to be conflictionary at first sight.

CONCLUSIONS

Supply chain risk management is increasingly gaining significance. Its interdisciplinary character is marked by tensions and interdependencies between quantitative and qualitative factors at the company level as well as at the supply chain network level. Frequencies and effects of

disruptive events have partly developed disproportionately to the intensified networking and interaction with supply chain partners. Risk causes and their impacts often differ on a multi-dimensional level, which additionally complicates the design of new, dynamic standard strategies in complex systems, such as collaborative networks. Intensifying shortages of raw materials and problematic global allocation of resources lead to process structures on the procurement as well as the sales side that are hard to predict. The pivotal point lies in the flexibility of processes. This simple projection of the current state requires even a stronger focus on cooperative activities under the provision of a better networking and monitoring through communications and IT infrastructures in the future. There, redundancy of structures and processes come into play, too. Hence, in terms of improved supply chain risk management, standardization, flexibility, and redundancy typically have to be balanced. While those three alternatives commonly may be viewed as being opposites, it is deductible from the theoretical and empirical contexts that they actually tend to go along with each other if proper logistics is in place.

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ZARZĄDZANIE RYZYKIEM ŁAŃCUCHA DOSTAW

STRESZCZENIE. **Wstęp:** Zarządzania ryzykiem łańcucha dostaw zyskuje coraz większe znaczenie w wielu międzynarodowych branżach. W celu wzmocnienia struktur łańcucha dostaw, procesów i sieci, należy stworzyć odpowiednie potencjały dla zarządzania ryzykiem (skoncentrowane na efektywnej logistyce) a następnie je stosować (koncentrując się na wydajnej logistyce). Katastrofy naturalne, takie jak na przykład ostatnio Fukushima, pokazują jak istotne jest odpowiednie zarządzanie ryzykiem.

Metody: Zestawiając teoretyczno-koncepcyjne założenia z rezultatami emipryczno-indukcyjnymi, można postawić hipotezę, że systemy logistyczne posiadają pozytywny efekt na zarządzanie ryzykiem łańcucha dostaw.
Wyniki i wnioski: Elastyczność i wydajność, jak również redukcja i standaryzacja, są często postrzegane jako elementy konfliktowe. Aczkolwiek, rozważając zagadnienia związane z zarządzaniem ryzykiem łańcucha dostaw, czynniki te mogą przyczynić się do wspólnie osiągniętych korzyści, pod warunkiem prawidłowo skonstruowanych systemów logistycznych.

Słowa kluczowe: zarządzanie ryzykiem, elastyczność, zdolność, redukcja, standaryzacja.

SUPPLY CHAIN RISK MANAGEMENT

ZUSAMMENFASSUNG. Hintergrund: Supply Chain Risk Management gewinnt zunehmend an Bedeutung. Nicht zuletzt hervorgerufen durch Naturkatastrophen (wie z.B. die Katastrophe von Fukushima), erlangen Überlegungen zur Festigung und Stärkung von Wertschöpfungsstrukturen und -prozessen strategische Signifikanz in vielen Industrien weltweit. Damit die Potentiale des Supply Chain Risk Management adäquat aufgebaut (Fokus auf Effektivität) und genutzt (Fokus auf Effizienz) werden können, sind adäquate logistische Systeme erforderlich.
Methode: Durch einen Abgleich eines theoretisch-konzeptionellen Bezugsrahmens mit empirisch-induktiven Befunden zeigt sich, dass logistische Systeme die Leistungsfähigkeit von Supply Chains gerade auch im Kontext von Supply Chain Risk Management positiv beeinflussen können.
Ergebnis/Fazit: Flexibilität und Kapazität werden aus produktionswirtschaftlicher Sicht oftmals als dichotome Indikatoren leistungswirtschaftlicher Potentialgestaltung angesehen. Redundanz und Standardisierung sind dabei aber keineswegs konfliktionäre Zielparameter, sondern können vor dem Hintergrund adäquater logistischer Systeme einen geeigneten Beitrag zur Aufrechterhaltung produktionswirtschaftlicher Performanz in Supply Chain-Kontexten darstellen.

Codewörter: Risikomanagement, Flexibilität, Kapazität, Redundanz, Standardisierung.

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