Business continuity: Securing the supply network using an integrated map-based risk management solution

Tobias Engel (tobias.engel@hs-neu-ulm.de)
Hochschule Neu-Ulm, Department of Information Management, Neu-Ulm, Germany

Thomas Bella (jm.thomas@gmx.net)
Mieschke Hofmann und Partner, Senior Manager, München, Germany

Abstract
The implemented supply chain risk management solution at a Top10 Tier1 supplier in the automotive industry uses a map-based approach to visualize risks throughout the network. The integrated solution allows firms to create and import own risk clusters for proactively managing risks and simulating scenarios in case of risk occurrence.

Keywords: Dynamic Supply Chain Risk Management, Business Continuity, Visualization

INTRODUCTION
Global competition and varying customer demand create a need for responsive and agile supply chains. In consequence, firms need to collaborate and share information (Lee, 2002). Hence, supply chains are critical determinants for efficiency and effectiveness in the face of rapidly changing and competitive business environments (Rai, Patnayakuni, & Seth, 2006). However, product lifecycles are shortened, competition on a price level increases, and inventories are reduced while the delivery performance shall be improved (Hernandez-Espallardo, Rodriguez-Orejuela, & Sanchez-Perez, 2010).

Firms answer that challenge by implementing initiatives such as global sourcing or tracking and tracing in order to ensure competitiveness. In consequence, global supply chains create multiple points of information (events) such as arrival of goods in the harbor or accident on the road causing a delay. Hence, firms have to comprehend the information and make it useable. One option is the visualization of material flows using a map-based approach. The visualization creates transparency and facilitates usability for involved supply chain stakeholders.

While visualization allows supply chain partners to view the physical flows, it is important to enrich the visualization of physical flows with further supply chain specific information such as the calculation of time-to-survive and time-to-respond.

However, to realize an enrichment of the visualization, supply chain partners need to collaborate (Enslow, 2006). For a successful collaboration, it is important that firms share their data along the supply network. Sharing of data includes inventories, buffers, production plans, fore-

casts, stock in transit, and loading times including frequencies (Engel, Bhat, Venkatesh, Goswami, & Krcmar, 2014a). Further information such as "arrival at the port", "parts loaded", or "temperature during transport" enrich the visualization, enhancing supply chain practitioners to react more precise on events. Such kind of data can be collected i.e. via sensors, GPS signals, or RFID tags (Engel, Goswami, Englschalk, & Krcmar, 2014b).

While Toyota provides an example on how to create transparency, collaborate, and increase the overall supply chain performance (Dyer & Nobeoka, 2000), sharing that kind of data allows partners to calculate margins; hence, firms avoid to share that information (Butner et al., 2010). Therefore, firms realize supply chain risk management solutions that are able to combine their own data being enriched by external data.

This case study provides first insights on a supply chain risk management solution being implemented in the automotive industry by a Tier 1 supplier. While the planned full paper aims to report details on the implementation and used data, this research-in-progress paper further reports the general possibilities of the solution (Engel, Bella, & Lutz, 2015a, 2015b).

DYNAMIC SUPPLY CHAIN MANAGEMENT SOLUTION

To guarantee the usability and thereby the supply of goods, the solution consists out of four elements. While it depends on the firms and the aim of the supply chain management solution, firms can either start with the first element or with the second element. However, to implement the third element (and fourth element), it is crucial that at least the second element has been implemented.

The first element allows firms to map their own assets such as production sites and related peripheries. The second element visualizes involved stakeholder within the supply chain. The third element creates relations among supply chain stakeholder in order to visualize the supply network. The fourth element adds dynamic events in order to allow firms to simulate the impact of the event, provide options including an estimation of occurring costs (including a relation to the balance sheet), and an option to activate a collaboration-functionality.

The first element ensures knowledge about own production sites including the exact geographical location (versus mailbox address) and, if needed, the peripheries of the sites. This knowledge allows applications such as re-negotiation of insurance policies for hurricanes or flooding. While the focus of the first element is on own production sites, risk assessment for supplier locations is realized within the second element. As a risk assessment for own production sites mainly focuses on geographical and political risks, supplier locations have also to be assessed for further risks such as insolvency of supplier or capability to ensure promised production capacities.

Within the third element, relations between own production sites and supplier locations have to be set up. This includes all relevant locations such as supplier production sites and also harbors, cross-dock locations, or streets. Using a map-based approach, various options for the visualization of the supply chain are possible such as size of the line which represents the supply chain varies based on the transport volume and/or frequency.

Inspired by Engel et al. (2014a), the fourth element extends the visualization by adding dynamic aspects such as inclusion of real-time information, simulation, modelling, or further collaboration tools. Therefore, the fourth step differs from previous steps by allowing firms and supply chain partners to react in real-time on occurring events using a scenario approach. The approach provides firms with information for various scenarios and thereby allows firms to solve the conflict between best price and customer satisfaction by ensuring the supply of goods. In

addition, a relation to the balance sheet can be implemented or further requirements can be realized.

In consequence, firms can gain insights for production sites, increase transparency for the supply chain, and visualize the supply of goods. Especially, the visualization enables firms to get back the control of their supply chains by transferring big data into useable information. Further, the collaboration functionality provides an option to realize mutual gains; and thereby a higher supply chain performance.

FUTURE RESEARCH

The planned full paper will report on the challenges being faced by the firms during the implementation. For example, the first challenge is to align the supply chain management solution with the existing supply chain strategy. Firms need to implement supply chain governance and to define requirements for the supply chain management solution. Requirements reflect topics such as ownership of the tool, compliance requirements, existence of risk assessment processes, communication needs within the organization, or the integration with IT systems. Especially the integration with IT systems is of importance as it allows firms to use master data from ERP systems, create specific reports, or link the system with the balance sheet. Another important challenge is the existence of data. The existence of data includes aspects such as availability of the exact production address or relations within the supply chain reflecting the flow of goods.

By overcoming the challenges and implementing the supply chain management solution, firms and supply chain partners gain in multiple ways. For example, assets can be visualized and risks quantified, risk alerts can be automated, or the impact of risks can be mapped to the supply chain from a qualitative perspective (disruptions of supply) and from a quantitative perspective (effect on the balance sheet). Furthermore, simulations improve the supply chain performance by calculating the best total cost of ownership (TCO) scenario, real-time data can be used to enrich decisions, and routing of goods can be visualized in real-time.

Additional benefits are the implementation of a governance structures and processes for supply chain risks, the alignment with the corporate strategy, better TCO prices, and visualization of inter-dependencies in the supply network, increased agility, and responsiveness of supply chains, and the establishment of collaboration features such as a common supply chain knowledge base.

The supply chain management solution is intended for OEM´s, industrial co-operations with a global footprint, and firms with critical lead times and/or short product lifecycles. Typical functions using the solution are corporate strategy, strategic procurement, supply chain management, supplier quality management, corporate insurance, corporate security, key account management, development and design, finance and controlling, audit and revision, and site management.

CONCLUSION

The planned full paper will report how the Tier 1 supplier integrated the risk management solution into existing business processes and how those processes had to be adapted. Further, the benefits of the supply chain (risk) management solution are presented. Moreover, the importance of IT-systems for supply chain management is reported. In specific, the integration and the relation with other databases/systems within the existing IT-landscape to ensure actual data and create the ability to visualize physical flows. Thereby, we discuss the importance to start the imple-

mentation process from a strategic perspective. In addition, we discuss further opportunities of that solution for supply chain management in case firms collaborate and share information. In consequence, the planned full paper reports a strategic project being used within the field of supply chain management and challenges for project managers leading a transitional project.

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BIOGRAPHICAL DETAILS

Tobias Engel is a Professor of Supply Chain Management at the University of Applied Science in Neu-Ulm (HNU). He holds a PhD in Information Systems from the Technische Universität München. His research interest lies in the area of information visibility and its contribution towards value creation in supply chains. In addition, he has over seven years of industry experience with a focus in supply chain management. During his time in the industry, he gained an Executive MBA degree from the Technische Universität München.

Thomas Bella holds a diploma in mechanical engineering of the Munich University of Applied Sciences and an MBA from the Technical University Munich. He gained over 14 years of professional experience at OEM level in Aerospace Industry in numerous national and international assignments, i.e. being in charge of International Business Development and Sales, Solution Architect for Supply Management and improvement of Category Management and Lead Buyer Organizations. Thomas is a Management Consultant at Mieschke, Hofmann und Partner (MHP), a Porsche Company, since Mai 2014.

Authors: Tobias Engel (tobias.engel@hs-neu-ulm.de), Thomas Bella (thomas.bella@mhp.com)

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