

Schroeder, Meike; Gomes, Renato Barata

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## Supply Chain Risk Management in International Trade Operations Between Germany and Brazil

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# Supply Chain Risk Management in International Trade Operations Between Germany and Brazil

Meike Schroeder and Renato Barata Gomes

## **Abstract**

While different aspects of export barriers and supply chain risks in companies have been discussed in literature intensively, there exist only a small number of current, international studies analyzing supply chain risks that might occur in companies during international trade operations between Germany and Brazil. Thus, the aim of this paper is to identify and classify potential risks that might occur during international trade operations between German and Brazilian companies compromising the supply chain management. Moreover, supply chain risk management measures will be compiled to support entrepreneurs in managing those risks.

In the remainder of the paper, at first the theoretical background is provided for risk and supply chain risk management. Afterwards, a literature review of existing studies related to export problems is given and the research methodology for the empirical part is described. Subsequently, the empirical results of expert interviews, that have been conducted so far, reflect the work in progress. In addition, first developed measures are presented regarding operational risks. Finally, the paper finishes with a conclusion and further research.

**Keywords:** Supply chain risk management, Brazil, Germany, international trade

## 1. Introduction

Brazil as the third largest country in the American continent with 8.5 million km<sup>2</sup>, poses big challenges to the development of infrastructure projects capable of integrating the 26 states, one Federal District and 5.570 cities. Logistics system in Brazil is currently unbalanced and dependent on the road transportation corresponding to 58% of the total transportation modals, followed by the railroad (25%), aquatic (13%), pipeline (3.6%) and air transportation (0.4%) (Coutinho 2013). One of the most important indicators of the road transportation system's quality is the extension of paved roads. In Brazil approximately 13% of the total roads are paved compared to 68% in the United States (9.8 million km<sup>2</sup>).

Railroad transportation is normally indicated as the best transport modal for distances over 800km and larger volumes of goods such as commodities. Therefore, rail transportation should be the most indicated modal for cargo transport in continental countries such as Brazil. However, Brazil has currently little over than 30 thousand km of railways in operation (CFA 2013), mostly concentrated in the regions southeast and south, compared to 224 thousand km in the United States (FRA 2014).

Five ports are responsible for most of cargo transport among all Brazilian ports. Together, Santos (southeast region), Itaguaí (southeast region), Paranaguá (south region), Rio Grande (south region) and Itaqui (northeast region) ports transported 221 million tons in 2012, representing approximately 70% of the total transport among all Brazilian ports (Antaq 2013).

In the last decade Germany has been continuously ranked among the top five exporters to Brazil. From 2000 to 2013 Germany's exports to Brazil increased more than 200% (MDIC 2014). In 2013 Germany exported approximately 1.5 trillion US\$ dollars F.O.B. (Free on Board) to Brazil, from which 95% accounted for manufactured products, 4.6% semi manufactured and 0.4% were commodities (MDIC 2014).

Although international trade has increased considerably over the last decade, cross-border co-operations are associated with numerous challenges and barriers (Bauerschmidt et al. 1985, Christensen et al. 1987).

While different aspects of international export barriers have been discussed in scientific studies, a detailed analysis of risks that might compromise the supply chain during international trade operations between Germany and Brazil is rare. This paper seeks to close this research gap.

## **2. Current State of Research**

### **2.1 Risk and Supply Chain Risk Management**

Supply chain management plays an increasing role in international trade operations, whereby supply chain management can be defined as *“the management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole”* (Christopher 1998, p. 15).

International trade involves important elements related to supply chain management such as international negotiation, purchasing, law, customs management, foreign exchange policies, international tax management, inventory management, etc. There are risks involved on each aspect of international trade mentioned above.

The term risk is widely discussed both in academia and practice. In the context of business economics risk indicates a potential loss or damage and therefore means the opposite of a chance (March et al. 1987). It may influence the flow of products, services, finance and information. Therefore, supply chain risk can be defined as *“the damage – assessed by its probability of occurrence – that is caused by an event within a company, within its supply chain or its environment affecting the business processes of more than one company in the supply chain negatively”* (Kersten et al. 2011, p. 154).

In order to cope with this large variety of potential supply chain risks, companies should implement a supply chain risk management. This paper is

based on the definition of Norrman et al. (2004, p. 14) by those supply chain risk management is understood as “*to collaboratively with partners in a supply chain apply risk management process tools to deal with risks and uncertainties caused by, or impacting on, logistics related activities or resources*”.

The typical supply chain risk management process encompasses the following steps: risk identification, analysis, handling and control (Terry 1972).

The first step, *risk identification*, is often considered as the most important one since only those risks which have been identified can be managed afterwards. There exist different methods for risk identification, such as interviews, checklists, or failure mode and effects analysis (FMEA). Depending on the applied method to identify risks, a risk classification may support the process step. There are a large variety of potential risks which may occur during company's business and also a large number of approaches for classifying them. Risks can be classified in many different ways and from different perspectives (Christopher et al. 2004).

Tummala et al. (1996), for example, use the severity level to classify risks. Therefore, they differ between catastrophic, critical, marginal and negligible risks. According to Narasimhan et al. (2007) supply chains need to be robust at three levels; strategic, tactical and operational. That's why they only take these three categories into account for classification. Baumann et al. (2006) use the same categories, but still divide the category operational into financial and hazard. Sheffi (2005) differentiates between financial, strategic, hazard and operations vulnerability. Here, operations vulnerabilities include everything related to business disruptions. Hazard vulnerabilities include random disruptions and malicious disruption (Sheffi 2005).

The second step of the supply chain risk management process deals with the risk analysis. In this context, the gathered risks are assessed by indicating the likelihood of occurrence and possible damage. Subsequently, the risks are prioritized in preparation for the risk handling step. *Risk handling* represents the third step of the risk management process. Strategies are selected that target at avoiding, reducing, transferring, sharing or taking the risk (Norrman et al.

2004). In the last step, *risk control*, it is reviewed whether the measures applied have been effective. The risk management process should be run through iteratively because single risks or the whole risk situation may change over time (Eberle 2005, Kersten et al. 2012).

In the next chapter, existing studies about export barriers are described.

## **2.2 Existing studies about export problems**

From a company perspective, exporting is an attractive foreign market entry and expansion alternative (Katsikeas et al. 1994). Therefore, different kinds of barriers to the export activities have already been studied since the 1960s, especially by international marketing scholars (Bilkey 1978, Bauerschmidt et al. 1985).

Within various studies the researchers have identified obstacles to exporting covering different countries. There have been very few studies about export problems focussing Brazil or/and supply chain risk management. In the following, some international studies are described as exemplary. It is not claimed that this list is complete.

Katsikeas et al. (1994) for example, investigated exporting problems encountered by indigenous Greek manufacturing firms from an ethnocentric perspective, in the context of a relatively small European country. Their results show that firm size, and export market experience are crucial in explaining perceptions of exporting problems. Finally, Katsikeas et al. provide guidance to public policy makers, but on a very general level, e.g. to reduce export pricing constraints or to create more customized programmes which help firms to develop export strategies.

O'Rourke (1985) confirmed in his survey of Pacific Northwest agriculture firms that small business differ in exporting practices, attitudes and problems from larger business. While large firms saw transportation costs, trade barriers and foreign competition as the major obstacles to increased exports, small firms pointed out that their major obstacles concern their own resources in terms of limited capital etc.

Sullivan et al. (2007) analysed export incentives by collecting data from managers in the European forest production industry and exposed that European managers perceive an important difference between the strategies versus tactical dimensions of exports. Naidu et al. (1993) also emphasized the effects of incentives and suggested implications for policy makers in export assistance in terms of designing effective export assistance programs, such as to define the objectives clearly.

Da Silva et al. (2001) analysed the perceptions of export barriers to the Mercosur by top executives of Brazilian companies located in the state of Rio de Janeiro. In addition, they made a comprehensive literature review by presenting a compilation of export barriers derived from previous international studies that investigated each barrier. They explored which obstacles ranked as most important were related specifically to Mercosur markets.

Blos et al. (2009) analysed the supply chain risk management in the automotive and electronic industries in Brazil and showed the importance for a good supply chain communication by detecting supply chain vulnerabilities. Finally, they made suggestions but on a very general level, like e.g. to implement supply chain risk management and business continuity management training program, and to create an executive management position of chief risk officer.

In summary, there exist different studies analyzing export barriers, but only a few of them are focused on supply chain risk management and on Brazil and seldom considered both perspectives – Germany and Brazil. They all apply their methods in different regions and branches, which makes it difficult to transfer their results to the supply chain management. Furthermore, most publications provide guidance to public policy makers, recommendations on the company's level are rare.

### **3. Research findings**

#### **3.1 Research Design**

Based on the literature review and the identified research gap this article aims to identify and classify potential risks that might occur during international trade operations between Germany and Brazil and that might compromise the supply chain management. Moreover, supply chain risk management measures will be compiled to support entrepreneurs in managing those risks. For this purpose, the paper is based on the qualitative research style (Blaxter et al. 2006). Interviews have been conducted to get a better understanding of which risks might occur.

The complexity of the research question requires a qualitative approach in form of personal interviews. Furthermore, export-related risks address a sensitive issue. Hence, it was of great importance to build trust with the company representatives. By choosing personal and individual conversations a willingness to answer questions in a greater depth and an open discussion was achieved between the interviewer and the selected interviewees.

The authors conducted first expert interviews in the core time from April until June 2014. Table 1 gives an overview of the experts.

For this, interviewees from German and Brazilian companies were selected. Until now, a total of four firms were studied; two companies based in Germany and two companies based in Brazil. All companies interviewed develop business in both countries. Therefore, the answers express the point of view of both countries regarding supply chain risks of German companies exporting to Brazil.

The interviews were conducted according to a half-standardized interview guideline. Most questions were open questions. The interviewees were asked to name the most important risks that might occur for German companies operating in Brazil. In addition, they were asked to describe their experience handling these risks. At the end, the interviewees were able to express wishes and recommendations.

No.	Company	Interviewee	Company Size
A	Manufacturing Company (Germany)	Supply Chain Coordinator Brazil and Argentina	T/over: 1 billion EUR; Employees: 3,900
B	Shipping Carrier (Germany)	Container Stock Coordinator South America	T/over: 5 billion EUR; Employees: 4,491
C	Trading Company (Brazil)	Co-founder and Managing Director	T/over: 2,2 million EUR; Employees: 5
D	Manufacturing Company (Brazil)	Industrial Automotive Product Business Manager	T/over: 1,9 billion EUR; Employees: 7,910

Tab. 1: Overview of company representatives interviewed

### 3.2 Results of the expert interviews

The risks mentioned in the interviews can be assigned to the four main aspects, related to the classification of Sheffi (2005): Governmental and general risks, financial risks, hazardous risks and operational risks.

Analyzing the aspect *governmental and general risks*, different main critical risks were listed by the experts. The first one is the abrupt Brazilian government changes in import and export rules and legislation. It was unanimous among the interviewees that those changes impact directly import and export operations. Moreover, some changes might even make these operations unfeasible. The second critical risk is the unclear and complex tax system in Brazil. Brazilian and German experts agree that the complexity of the Brazilian tax system has a negative impact in international trade between both countries.

The independency between federal, state and municipal tax policies makes it difficult for foreign companies to develop export cost analysis, because each selected state and city will have a different tax system. Third critical risk describes the failure of the Brazilian government in completing its acceleration plan for the short-term expansion of railways, ports and roads. Although there are a federal interest to speed up logistics infrastructure in Brazil to sustain Brazilian growth, in reality those projects have not been completed according to plan. This issue relates to the fourth critical risk which describes the lack of developmental support from the Brazilian government as well as difficulty for companies to develop a plan for industrial development due to political and economic unrest. As further risks, corruption and excessive bureaucracy in governmental offices were mentioned, which increase the costs of doing business in Brazil, as well as the slowness of customs clearance processes when compared to other American countries.

Regarding the *financial risks*, the most critical risk listed by all interviewees was the currency fluctuation. Brazilian imports from Germany are affected when Euro gets stronger against the Brazilian currency Real. As mentioned previously, Germany is one of the most important trade partners of Brazil. Many companies in the Brazilian industry rely on German products using its machines, tools and technologies in their production processes. Therefore, currency fluctuation impacts directly Brazilian companies' import processes and budget plan on a daily basis – vice versa in Germany. Fuel prices were also appointed as a major risk, by one interviewee located in Brazil and one in Germany. International Trade has a complex logistics system requiring commonly the integration of multimodal transportation. Ocean freight industry is controlled by a few large corporations with high influence in the freight rates levels. Therefore, worldwide fuel prices have direct impact in international trade costs as well. As another risk, the high interest rate for financing projects was listed. Brazilian banks charge high interest rate for credit lines making it difficult for small and medium-sized enterprises to develop and compete with larger corporation which have more resources to fund their projects or to negotiate

better rates with local and international banks. This issue relates to the next minor risk pointed out which is the high amount of financial resources to develop a successful import program. Companies willing to import products from Germany need to create a purchasing plan at least 3 to 6 months in advance. Due to the logistics complexity, long lead time and all risks involved, companies must plan an inventory buffer in order to avoid shortage. Customs clearance costs are very high due to the high taxes charged in Brazil and are normally paid upfront impacting directly companies' cash flow.

Regarding *hazardous risks* strikes generated by labor unions were pointed out by the experts. In addition, high costs and time expenditure to transport goods from ports to remote areas in the country were distinguished. Lack of multimodal integration and the dependence of road transportation in Brazil combined with the low quality level of infrastructure turn to be a logistics bottleneck in the supply chain. Besides, main ports and roadways are currently functioning at their maximum and there is no space for additional capacity. Therefore, during export season of soy grain, oil and meal, logistics capacity in many Brazilian ports is overloaded. Another critical risk described was related to the floods in the southern industrial regions of Brazil. Floods in the southern part of Brazil due to high rain volume have been occurring, in the past years, at least once a year causing difficulties for accommodating and unloading vessels at the ports. It is common that vessels skip the affected ports and navigate to the nearest sea port increasing total freight costs. This natural disaster overloads port capacity occasioning one week to one month delay in import and/or export processes. One minor risk described by the experts was the intermittently availability of water and other energy supplies impacting the productivity of many Brazilian industries that do not have a backup energy system when the public power grid fails.

Against the background of *operational risks* the damage and theft of products during delivery due to bad road quality and security for road transport was distinguished by the experts. Those issues impact directly in extra delays

during delivery. Due to bad road conditions, trucks often need to stop on the shoulders for maintenance increasing the risk of product theft.

Summarizes the major operational risks mentioned by the interviewees.

Operational Risks		
Security lapse	Theft of products during delivery; products get damaged, because there are no improvements in road quality and security for road transport.	B, C, D
Forecasting errors	Forecasting errors in all parts of the supply chain; difficulty in forecasting price and shipment volume due to unclear tax system; unreliability in forecasting	A, C, D
Availability of reliable and quality suppliers	Loss of reputation and supply chain disruption due to bad service provided by third party service providers; suppliers are unreliable and must be constantly	A, B, C, D
Skills shortage	Shortages of qualified and experienced personnel.	A, D
Lag in lead times	Lag in lead time due to longer lead times between import and completion of finished goods; extra time and money spent on transporting finished goods from remote	A, C, D
IT Infrastructure problems	Poor IT infrastructure and data management systems; internal processes and tools are slow in adapting to the quick changes in IT systems and new	A, D

Tab. 2: Major operational risks mentioned by the interviewees

Moreover, forecasting errors in all supply chain levels were mentioned as a critical risk by all experts. Forecasting errors in production time, logistics transit time, customs clearance time and cost planning are common issues Brazilian importers have to go through during daily activities. Those errors lead to bad planning and uncertainty during international trade operations. At the same time, such lack of planning affects directly the exporters who cannot plan their production to serve an inconsistent market demand.

Another risk refers to the high costs of operating in Brazil. Considering developed regions in Brazil, their costs can reach the level of the main global metropolis. Besides, Brazilian low tax zones are situated in remote areas which, most of the time, turn to be unattractive for foreign companies to invest.

All interviewees agree in the critical risk which is the lower level and lack of commitment of service providers. Companies normally have to hire internal resources to monitor and manage their suppliers increasing operational costs. Probably one of the main causes for this issue is the low availability of skilled personnel. Although education investments in Brazil have been increasing significantly over the past decade, there is still a shortage in skilled human resources in the country.

Another risk identified is that, due to the longer lead times between import and completion of finished goods, companies operating internationally have to plan and develop long-term sourcing programs requiring more investment capacity and skilled personnel which previously had been analyzed already as an existing issue in Brazil. Poor IT infrastructure and data management systems were listed as further operational risks. This issue leads to poor forecasting and planning for companies due to lack of records and information that can be used to manage business processes.

## 4. Compilation of measures

Chapter four focuses on risk mitigation and hence on measures especially to manage the above identified operational risks. Table 3 illustrates possible measures for the operational risks which were mentioned by the experts during the interviews. They were combined with measures named in Kersten et al. (2009, 2012).

Use of special bins designed for transport security to improve safety measures for goods, parking on guarded parking areas or establishing long-term insurance contracts improving maintenance/servicing of the logistical equipment are e.g. measures to close the security lapse.

Forecasting errors can be reduced by compiling aggregated forecasts together with supply chain partners. Investing in IT tools to track international shipment can be an additional measure.

The availability of reliable and quality suppliers can e.g. be ensured by claiming supplier's audit, by establishing customer relationship management for building trust or by choosing Brazilian international supply chain partners that have international experience.

Investing in scholarship for employees or stimulating internships to promote international experience for the employees are e.g. measures allocated to counter skills shortage.

A proactive reporting of delayed transports or the involvement of logistics suppliers during purchasing plan can reduce loading time after production delivery. Furthermore, integrating international trade software into the existing Enterprise Resource Planning (ERP) or investing in ERP software with incorporated international trade module are measures that help overcoming IT infrastructure problems.

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Operational risks	Measures
Security lapse	Choosing route of transport/transport time with regard to safety issues; parking on guarded parking areas; preventing and improving maintenance/servicing of the logistical equipment of the mode of transport; use of special bins designed for transport security to improve safety measures for goods; establishing long-term insurance contracts.
Forecasting errors	Improving forecast together with SC partners; compiling aggregated forecasts together with supply chain partners, invest in IT tools to track international shipments.
Availability of reliable and quality suppliers	Claim supplier's audit; customer relationship management for building trust; including incentives into the contract; choosing Brazilian international supply chain partners that have international experience.
Skills shortage	Investing in scholarship for employees to improve skills; stimulating internships to promote employees' international experience; exploring existing governmental educational programs and possible incentives to increase level of skilled resources.
Lag in lead times	Holding available logistical buffer capacity; proactive reporting of delayed transports; involving logistics suppliers during purchasing plan in order to reduce loading time after production delivery.

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Operational risks	Measures
IT Infrastructure problems	Investing in international trade specialized software to manage import and export processes; integrating international trade software into the existing ERP; investing in ERP software with incorporated international trade module; defining performance indicators to monitor and control main risks and communicating them to the supply chain in order to create action plans to overcome issues.

Tab. 3: Operational risks measures

The results of this chapter show that there is a miscellaneous number of identified measures, which companies can use in order to manage their Brazil-related operational risks. The compilation of measures may be used by the companies to intensify their supply chain risk management. However, it should be taken into account that there will be a need for company-specific adaptation when implementing the identified mitigation measures. Selected measures must tightly focus on the company's financial and human resources. In addition, the type of industry as well as the export destination should be thoroughly considered, because they might require differently weighted measures.

## 5. Conclusions and further research

In this paper the results of conducted expert interviews are presented related to potential risks that might occur during international trade operations between Germany and Brazil and that might compromise the supply chain management. The identified risks were assigned to the four risk classifications: governmental and general risks, financial risks, hazardous risks as well as operational risks. Moreover, a miscellaneous number of measures have been compiled which

can be used by companies in order to manage their Brazil-related operational risks.

Further research is needed in order to strengthen the evidence of this work. Additional expert interviews will be conducted with German and Brazilian companies during the next months. Subsequently, the results of the different industries should be compared by prioritizing industry-related risks.

In conclusion, it should be observed that supply chain risk management is an important approach to operate successfully in Brazil in the long term, but due to the large number of identified governmental, general and financial risks, the supply chain risk management should be embedded in a holistic enterprise risk management approach.

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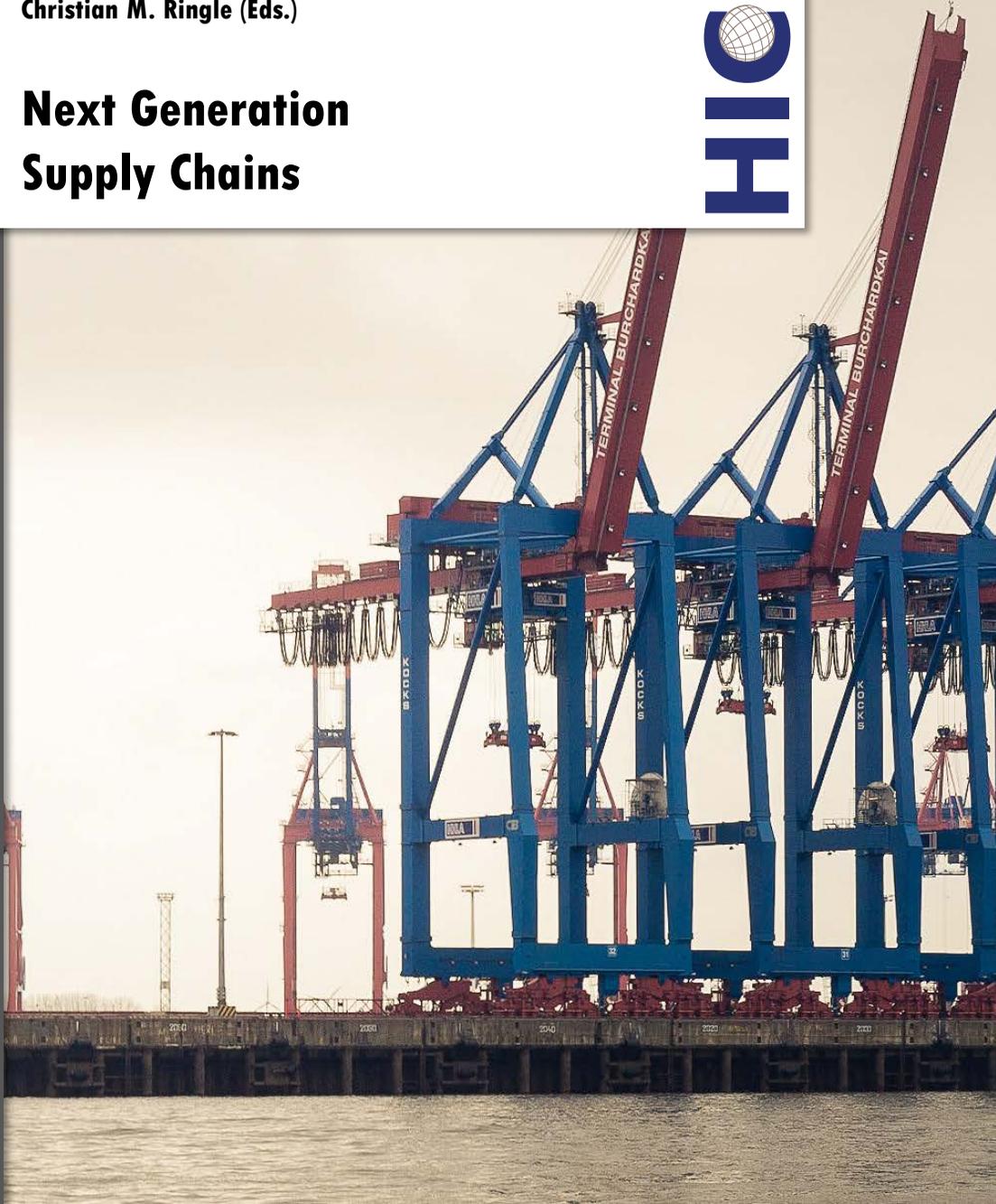
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**Wolfgang Kersten, Thorsten Blecker and  
Christian M. Ringle (Eds.)**

# **Next Generation Supply Chains**



Prof. Dr. Dr. h. c. Wolfgang Kersten  
Prof. Dr. Thorsten Blecker  
Prof. Dr. Christian M. Ringle  
*(Editors)*

# **Next Generation Supply Chains**

Trends and Opportunities

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## Preface

Today's business environment is undergoing significant changes. Demand patterns constantly claim for greener products from more sustainable supply chains. Handling these customer needs, embedded in a sophisticated and complex supply chain environment, are putting the players under a constant pressure: Ecological and social issues arise additionally to challenges like technology management and efficiency enhancement. Concurrently each of these holds incredible opportunities to separate from competitors, yet also increases chain complexity and risks.

This book addresses the hot spots of discussion for future supply chain solutions. It contains manuscripts by international authors providing comprehensive insights into topics like sustainability, supply chain risk management and provides future outlooks to the field of supply chain management. All manuscripts contribute to theory development and verification in their respective area of research.

We would like to thank the authors for their excellent contributions, which advance the logistics research progress. Without their support and hard work, the creation of this volume would not have been possible. We would also like to thank Sara Kheiravar, Tabea Tressin, Matthias Ehni and Niels Hackius for their efforts to prepare, structure and finalize this book.

Hamburg, August 2014

Prof. Dr. Dr. h. c. Wolfgang Kersten  
Prof. Dr. Thorsten Blecker  
Prof. Dr. Christian Ringle

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## **About HICL**

Since 2006 the annual conference Hamburg International Conference of Logistics (HICL) at Hamburg University of Technology (TUHH) is dedicated to facilitate the exchange of ideas and contribute to the improved understanding and practice of Logistics and SCM. HICL creates a creative environment which attracts researchers, practitioners, and industry thinkers from all around the world.



Innovation is increasingly considered as an enabler of business competitive advantage. More and more organizations focus on satisfying their consumer's demand of innovative and qualitative products and services by applying both technology-supported and non technology-supported innovative methods in their supply chain practices. Due to its very characteristic i.e. novelty, innovation is double-edged sword; capturing value from innovative methods in supply chain practices has been one of the important topics among practitioners as well as researchers of the field.

This volume, edited by Thorsten Blecker, Wolfgang Kersten and Christian Ringle, provides valuable insights into:

- Innovative and technology-based solutions
- Supply chain security management
- Cooperation and performance practices in supply chain management

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