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# Exploring impact factors of shippers' risk prevention activities: A European survey in transportation

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## ABSTRACT

This paper reports results of a survey examining the impact factors for shippers to implement risk prevention activities. A regression analysis illustrates the relations between risk and quality related impact factors and the shippers' ability to implement risk prevention activities. The study identifies the corporate risk culture and product vulnerability as main impact factors for the implementation of prevention activities in transportation. This paper will be beneficial for transportation managers considering the implementation of risk prevention activities in the transportation field, and will support further empirical research in the transportation management and supply chain risk management research area.

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## 1. Introduction

Transport operations link production and retail networks. During transportation, goods are exposed to many risk factors. This exposure may impair the goods' quality, may destroy the goods, may delay the transport or may even lead to supply chain (SC) disruptions. Transport damage and its consequences entail additional costs and communication efforts for all involved SC members. A resulting SC disruption may have major financial implications, often exceeding the transport claim many times over. Financial and organisational decisions in a disruptive event must be taken as fast as possible to stabilize the value adding processes. However, with a growing number of SC actors (e.g., by outsourcing activities of logistics services), transparency and attributing responsibility for a transport damage become more and more difficult. Among others, insurance companies urge to make use of so-called risk prevention and risk mitigation measures to facilitate the understanding of root causes of transport damage. Insurers aim at reducing their claims-driven costs and in parallel share their risk knowledge with clients to improve transportation. However, although technology-based services like tracking and tracing have proven their value, many companies still do not make use of prevention and risk mitigation measures in the field of transport.

Little research has been carried out on the operational aspects of SC risk management (SCRM). SCRM comprises all relevant strategies, measures, processes and technologies aiming at the reduction of SC related risks (Christopher and Peck, 2004; Closs and McGarrell, 2004; Jüttner, 2005). Wilson (2007) shows that risks referring to transportation are less investigated on the operational layer of SCs than on the strategic level. Transportation-related processes are comparably poorly integrated in current SCRM frameworks (Stank and Goldsby, 2000; Sodhi et al., 2012). Giunipero and Eltantawy (2004) as

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well as [Sodhi et al. \(2012\)](#) understand transportation itself as a risk which has the potential to disrupt a SC with low inventories.

Past research on prevention applications reflects the missing linking between rather strategic SCRM and rather operational transport risk management research activities. Two main aspects have been addressed in the field of risk prevention: (1) strategic aspects of prevention use and (2) operative technological and organisational aspects of prevention use. This research aims to close the gap between the research on rather strategic aspects of prevention use in the field of SCRM and the research on rather operational-technical aspects of prevention by analysing the impact factors for the implementation of prevention activities in the field of transportation. This contributes to shedding light on why many companies do not apply prevention although it appears to be promising from a strategic and an operative-technical perspective.

Against this background, the purpose of this research is to explore the impact factors of prevention application and the roles of risk exposure, corporate risk aspects, and the firm's quality orientation. More specifically, this research focuses on the following research question: *“What are the main impact factors for the implementation of prevention activities in transportation?”*

To investigate this question, collected survey data among European retail and industrial companies was used to carry out an ordinary least square (OLS) regression analyses. The object of evaluation and the unit of analysis is a company.

The present article is structured as follows: First, it reviews the extant literature relevant to prevention use in transport. Then the research methodology is presented and data analysis techniques are elucidated. Next, the findings are derived from analysis and summarised. The paper concludes with a discussion of theoretical and managerial implications along with recommendations for further research.

## 2. State of the art

In 2007 the German Insurance Association proposed that 70% of all transport damage could be avoided by sufficient application of prevention measures, especially by the improvement of packaging ([GDV, 2007](#)). This begs the question why not all companies apply prevention measures and benefit from lower damage costs, from fewer SC disturbances and less communication effort. To approach this question Normal Accident Theory and High Reliability Theory are introduced serving as the theoretical basis for further investigation. Moreover, the concept of prevention is approached in the context of SCRM and in the context of transport risk management.

### 2.1. Normal Accident Theory shows that transport damage depends on the complexity of transport processes

Production and retail networks depend on transport and logistics processes connecting the different sites within a SC network. The transported goods are exposed to a quantity of risk factors, which may reduce the goods' quality, delay transportation or even destroy the goods and lead to SC disruptions.

According to the Normal Accident Theory, damage occurs in systems of high complexity and tight coupling of processes. As for instance ([Bode et al., 2011](#)) show that SCs can be characterised as both complex and coupled processes. Complexity and close coupling cause invariable processes, in which also small delays can cause significant disturbances of operations and thus can impact the functionality of the entire system. [Wolf and Sampson \(2007\)](#) have provided evidence for this core hypothesis. [Wagner and Bode \(2006\)](#) as well as [Wagner and Neshat \(2012\)](#) have accomplished the transfer to the field of SC management. Hence, the appearance of transport damage is the result of a multi-causal chain of events. The identification of the root causes is correspondingly difficult to ascertain. [Perrow \(1999\)](#) suggests that companies learn from occurred claims and recommends planning redundancies and buffers in the new systems and processes. [Bode et al. \(2011\)](#) analysed this in the context of SCM and show that companies primarily build up safety stocks to overcome disruptions in transport processes. Following the argumentation of the Normal Accident Theory, [Jermier \(2004\)](#) shows that complexity is one main driver of damage in the transportation environment. [Cohen and Stewart \(1994\)](#) define complexity more generally as the sum of information required to entirely describe the SC system. Among others [Bozarth et al. \(2009\)](#) and [Pathak et al. \(2007\)](#) analyse the complexity of transport networks. They argue that a higher level of SC complexity may negatively affect the performance of an involved production company. [Vachon and Klassen \(2002\)](#) recommend improving information flows on the transported goods and the application of latest information and communication technologies to handle uncertainties in complex transport networks. According to [Perona and Miragliotta \(2004\)](#) the corporate ability to control the complexity of production and logistics processes is a core competency to optimise efficiency and effectiveness of the entire SC.

### 2.2. High reliability theory – an approach to overcome transport risks by prevention?

According to the High Reliability Theory there are certain framework conditions and characteristics of companies which operate nearly without failures and with a high level of reliability ([La Porte, 1996](#); [La Porte and Rochlin, 1994](#); [Roberts, 1990](#)). The central aspect for reliability is the distinct awareness of employees. [Weick and Roberts \(1993\)](#) present five principles as the basis for this awareness: (1) active dealing with potential failures and tolerance of the existence of failures in general, (2) aversion against premature decisions and simplified interpretations, (3) sensibility for operations and processes, (5) commitment of employees to increase the robustness and flexibility of a company and (5) respect for professional competence.

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