An empirical analysis of risk management strategies for in-house logistics processes in digitalized distribution systems

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***Abstract*—**The importance of logistics and the field's significant growth in recent years is to a large extent a result of globalization, reduced production depth and increasing demands on supply chains in terms of precision and flexibility. Within the scope of logistics, a differentiation is made between in-house and transport logistics. The former term refers to logistics processes which take place on a company's premises while the latter term pertains to the movement of goods over greater distances by land, sea or air.

Aside from wide-reaching developments in B2B production-focused logistics activities, B2C distribution logistics activities have gained significantly in relevance in recent years. This is primarily a result of end users' increasingly pronounced preference for online shopping, under the assumption that certain criteria are met, for example quick delivery, free shipping and simple returns.

Risk management denotes the identification and analysis of, as well as the reaction to, risks. Responses to past events do not fall under the scope of risk management. Risks can be identified through the utilization of market analyses, expert interviews or targeted risk identification processes, for example. The significance of risks is analyzed based on the probability that a risk scenario will occur as well as the severity of that scenario. Risk response can be undertaken in the form of four strategic categories: risk avoidance, risk transfer, risk mitigation and risk acceptance. Risk avoidance generally refers to the elimination of highly probable and severe risks, for example through the refusal to use exposed carcinogenic materials in manual assembly processes. Risks perceived as relatively improbably but at least mildly severe are often transferred, for example in the form of a fire insurance policy. Risk mitigation denotes the diminishment of risks, for example through the utilization of temporary workers in order to avoid excessive labor capacity. Lesser risks are often simply accepted and no response is undertaken.

Due to the described fundamental changes taking place in distribution logistics, it is hypothesized that the corresponding risk environment will also change. Such changes may include the obsolescence of previously relevant risks, the emergence of new risks as well as significant dynamics pertaining to the probability and severity of existing risks which will remain relevant in the mid- to long-term. This paper describes the utilization of empirical methods in order to gain insight into the dynamic field of risk management in in-house logistics processes. Specifically, expert interviews provide insight into the mindsets and relevant activities of leading logistics theorists and practitioners. All interviewees were queried on two topic areas: current and expected developments in distribution logistics and their influence on future risk structures. The semi-structured interview guide is split into two sections with primary and follow-up questions, the latter of which were asked only if applicable.

In order to gain all required information out of the conducted interviews, audio recordings were transcribed in accordance with Mayring's Summarizing Qualitative Content Analysis (QCA). This method allows for evaluation criteria to be systematically developed out of the interview guide through the use of inductive category formation. Initially, a criterion for the selection process in the category formation is defined. This criterion is treated as a deductive element and is established within theoretical considerations pertaining to the subject matter and the aims of the analysis. A two-tailed interview structure defines the two master categories required for further category formation:

Master category 1 is concerned with the description of central elements, aspects and approaches of current and expected developments in distribution logistics.

Master category 2 contains the descriptions of central elements, aspects and approaches of various developments' impacts on distribution logistics risk structures and possible risk responses.

The master categories` corresponding levels of abstraction are determined by formulating inductive categories for every statement with regard to specific recommendations, actions, and viewpoints (coding). Coding, context and recording units are defined. The whole of all conducted expert interviews constitutes the recording unit. Under consideration of all relevant definitions, numerous inductive categories are identified within the first round. Each elaborated category system is reviewed and summarized twice. Subsequently, the final category system is applied to all interviews again in order to merge all inductive categories with both master categories into one holistic system. This restructured category system in turn contains the essence of all experts' knowledge.

The results of the expert interviews are supplemented with the results of subject testing in a laboratory at the Institute of Materials Handling and Logistics (IFT) of the University of Stuttgart as well as with analysis of real data provided by industrial partners active in distribution logistics. This supplementation is intended to provide examples of the observed risks and the risk management activities described within the scope of the expert interview analyses. By deriving a risk checklist and strategy portfolio, specific assistance for risk process improvement for digitalized distribution systems is provided. The topic's relevance is emphasized by the fact that, even today, many logistics organizations lack genuine risk management processes that exceed beyond simple risk transferring to insurance providers.

***Keywords*—**distribution logistics, risk management, strategies

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