



Internal Visibility of External Supplier Risks and the Dynamics of Risk Management Silos

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Internal Visibility of External Supplier Risks and the Dynamics of Risk

Management Silos

Abstract

This paper investigates the factors behind silo-based risk management practices in organizations. Based on interviews with different actors working with the supply management processes within and across different organizational levels in a major multinational manufacturing corporation, it reveals how silos of risk management activities are formed. The findings show that there are profound differences in risk visibility between different actors due to differences in their hierarchical levels, organizational positions, and business contexts. Drawing on the theoretical lenses of bounded rationality and contingency theory, the paper reveals how these differences in visibility create silo-based risk management processes and discusses the pros and cons of such configurations. It concludes that silo-based behaviours are inherent features of any complex organization and that the implications of managing risks in silos are strongly influenced by the types of dependencies (positive or negative) among risks. Therefore, it is elemental for organizations to be aware of this phenomenon and configure their risk management processes accordingly based on the dependencies among the various risks to which the organizations are exposed.

Managerial Relevance

This paper discusses the risk visibility of actors in the supply management processes of a large global organization. It reveals a stark difference in visibility of supplier risks within and across different levels of the organization that results in silo-based risk management behaviours in the organization. The paper provides normative support for management decision making to cope with risk management silos in the following ways: first, by

creating awareness that the supplier risk perceptions at different hierarchical levels within an organization may differ substantially; second, by explaining that this difference in visibility is a natural phenomenon and exists because of the differences in roles, responsibilities, and contexts of the organizational members; third, by differentiating between two types of dependencies (negative and positive) among various supplier risks; fourth, by discussing the cause–effect relationships among risks to understand the influences of both positive and negative dependencies; and, finally, by discussing the implications of these dependencies to understand when silo-based risk management is problematic and when it is plausible for organizations to manage risks in silos.

1. Introduction

In today's context of globalization, outsourcing, and contract manufacturing, suppliers play a key role in determining an organization's success [1]. Suppliers' faults or disruptions are critical, because these events can have serious impacts on their clients' business. For example, because of a fire incident in 2000, Philips, a semiconductor supplier of Ericsson, failed to deliver some critical components. The incident not only caused Ericsson a reported loss of \$400 million [2] but also drove it out of the cell phone market [3]. Moreover, the toy manufacturer Mattel was forced to recall \$94 million due to unsafe levels of lead in toys designed for toddlers by a Chinese manufacturer [4]. The incident cost the company \$110 million [5]. Recently, faulty airbag components manufactured by Takata Corporation caused Toyota to recall 2.3 million vehicles. The inadequate quality control by Takata Corporation made it difficult to identify the vehicles with defective airbags, resulting in a fine of more than \$70 million for the corporation [6]. In addition, Honda is reported to have spent \$360 million on recalling airbags also manufactured by Takata Corporation [7].

Theoretically, risk management consists of at least five rational steps. The starting point is to assemble a cross-functional team of risk experts. The second step is to convene a cross-functional team for brainstorming purposes to identify the portfolio of enterprise risks. The third step is to filter, assess, and prioritize risks, and the fourth step involves making a decision regarding the most appropriate treatment strategies for handling each risk item, including possible mitigation measures for the "actionable risks". The final step is to monitor the changes in the network, customer needs, technologies, partner strategies, and competitors to update the assessment of risk. Over the years, the above approach to managing risks has been advocated by a number of researchers [8]–[11].

However, while this mainstream approach is primarily based on theoretical reasoning, empirical studies have shown that in corporate practice risk management is often silo based [12]. This implies that risk management is sub-optimized in the departmental structures; that is, an IT division primarily addresses IT risks while a finance division mostly addresses financial risks and so on. [13]. Thus, in practice organizations seem to be unable to reap the benefits of the prescribed integrated approaches of the literature [14]. Furthermore, there seems to be a misalignment between researchers' theoretical presumption concerning risk management and organizations' management of risks in practice.

To understand this misalignment, this paper focuses its attention on the internal visibility of risks among organizational members. "Internal visibility" in this paper means the internal line of communication and agreements between different actors engaged in the supply chain management process of the purchasing firm [15]. Anchored in an extensive case study of the supply management processes of a major multinational manufacturing corporation, the paper investigates why the silo structures persist in risk management activities. To understand the causes of silo-based risk management practices, the paper poses the following research questions:

- (1) How are different supplier risks visible among the actors within a purchasing firm?
- (2) Why is the visibility of supplier risks different for different actors?

The paper is based on the assumption that risk management strategies and other activities in organizations are situational [16]. Therefore, drawing on Halldorsson et al.'s [17] observation that there is no single "right" theory for explaining an empirical phenomenon in the supply chain, in this paper the empirical findings are analysed through two complementary theoretical lenses: bounded rationality and contingency theory. While bounded rationality reveals that human actions are rational within the limits of the

situational factors of organizations [18], the contingency theory approach [19] directs our attention to how these situational actions are constrained and influenced by technology and organizational contexts [20].

The paper proceeds in the following stages. First, the theoretical background section discusses the concept of supplier risks and their visibility as well as our two theoretical lenses. Second, the empirical setting and the method adopted for collecting and analysing the data are presented. Thereafter, the findings are discussed in accordance with the two theoretical lenses to distil the factors that lead to risk management silos. Finally, the paper concludes with a discussion on the implications of risk management silos in large global organizations.

2. Theoretical background

2.1 Supplier risks

Risk has been discussed to a great extent within the discourse of supply chain management [21]. Different authors use different risk concepts, often with different connotations, such as disruption, vulnerability, uncertainty, disaster, peril, and hazard [22]. However, this paper focuses on supplier risks and uses the definition provided by Jung et al. [23], which is “an unexpected event that occurs from an upstream supplier and spreads to the downstream of the supply chain”. Drawing on this ontological definition of risk, it is possible to identify a wide array of supplier risks that have been discussed in previous research. Table 1 provides some examples.

Insert table 1 about here

According to Hallikas et al. [24], risks appear in clusters and the nature of risks may take a hierarchical form. As a result, some risks can be caused by other risks. For example, quality and delivery risks might result from employee turnover risk [25]. Similarly,

reputational damage can be caused by sustainability issues of the supplier [26]. Moreover, one effect factor can be caused by one or more causal factors. For instance, quality failures may occur because of employee turnover and/or sustainability issues at a supplier's premises [25], [26]. Hallikas et al. [24] further reveal that in reality the nature of risk consists of much more complex relationships. As a result, a host of ways to classify supply chain risks exists [27], [28], [29]. This paper adopts the classification by Hallikas et al. [24].

As the types of supplier risks vary (see table 1), so do the ways in which these risks are managed. The literature is filled with numerous methods and techniques for identifying, evaluating, and mitigating the various kinds of supplier risks [25], [30]. However, as empirical studies have suggested, there is a sharp distinction between what researchers prescribe as the best way to manage risks and how risks are actually managed in practice. Consequently, this paper discusses the visibility of supplier risks among the various managers engaged in managing different kinds of supplier risks in the purchasing firm's supply management process.

2.2. External versus internal visibility of supplier risks

The identification of risks is one of the core aspects of any risk analysis. The ability to understand the dynamics of a supply chain and to foresee any possible deviation or disruption is crucial. Acquiring this ability to see from one end of the supply chain to the other end [15] is important to understand the identity ("what it is"), the location ("where it is"), and the status ("in what condition") of entities transmitting through the supply chain [31]. However, achieving this visibility is challenging due to the interconnected nature of supply networks. This "ability to see from one end of the supply chain to other" is referred to as "supply chain visibility" [15]. The significance of supply chain visibility is demonstrated in a survey of 149 companies, conducted by the Aberdeen Group in 2013,

in which 63% of the respondents claimed that supply chain visibility was their top priority [32]. Improving supply chain visibility helps to reduce uncertainty, because more information is available about the identity, status, and location of the risk among the actors of the supply chain [15]. Hence, it is considered not only as a key risk mitigation strategy [33] but also as a vital capability for any firm [34].

Since a supply chain is an inter-organizational concept [17], mainstream supply chain research emphasizes the coordination between, and collaboration among, various supply chain members. Supply chain visibility research is no different in this regard. So far it has primarily paid attention to the “external visibility”, that is, the identity, status, and location of supplier risks that are exogenous to the focal firm [15], [34]. With a few exceptions, for example Sheffi, Christopher, and Peck [15], supply chain visibility studies have not shed much light on the internal visibility of such risks among the actors within the focal firm.

This paper, therefore, focuses on the internal visibility from two perspectives: as an additional risk factor (i.e. a lack of visibility may cause or amplify risks) and as a capability for mitigating risk. “Internal visibility of risk” in this paper means the visibility of various supplier risks among different actors within an organization. The internal visibility is examined through two theoretical lenses: bounded rationality and contingency theory.

2.3. Bounded rationality

The idea of bounded rationality was originally coined by Simon [35] as an alternative to the rational decision-making model of the economic man. In spite of the societal norms of rationality and rational decision making, all humans are bounded in their decisions and actions by limited information about possible situations, alternatives, consequences, and future preferences [18]. Thus, in organizations, all individuals work under the conditions

of imperfect knowledge and can only act rationally within the limits of the known information at any particular time [36]. Moreover, organizations have hierarchies, structures, roles, norms, and standard operating procedures governing the different individual actions [37].

In spite of its broad impact on organization and management theories, the bounded rationality perspective is sparsely used in the supply chain risk management literature. Highlighting this rarity of articles, Ghadge et al. [22] noted that behavioural dimensions such as bounded rationality could provide important perspectives for risk mitigation strategies. Thus, drawing on the bounded rationality perspective, this paper assumes that the differences in visibility of various supplier risks affect the way in which the different actors within an organization manage or take action on risks.

2.4. Contingency theory

Contingency theory represents a broad approach to organizations that rests on two basic assumptions: first, that there is no one best way to organize; and second, that no single way of organizing is equally effective in all situations [19]. Based on the above assumptions, contingency theory suggests that organizations must adapt their structures to fit the contextual factors to achieve a high level of performance [20].

Grötsch et al. [38] claim that the contingency approach forms a natural theoretical basis for proactive supply chain risk management. There are several examples of researchers using the contingency approach in the supply chain and operations management literature. For example, Danese [39] utilized contingency theory to identify the effects of contingency in collaborative planning; Trkman and McCormack [40] used contingency theory to develop a conceptual model for managing supply chain network risks; and Wagner and Bode [41] used contingency theory to determine the strategic fit between supply chain risks and different management strategies. Furthermore, drawing

from the contingency theory perspective, Talluri et al. [42] posited that the appropriateness and effectiveness of risk mitigation strategies are contingent on the internal and external environments. In line with this approach, Stonebraker and Afifi [43] discussed the importance of variations in supply chain technologies and suggested that a contingency approach is needed to address short-term, mid-term, and long-term strategies across a range of different business conditions. By taking a contingency perspective, Schoenherr et al. [44] theorized that institutional pressure moderates the relationship between the firm's environmental engagement and the strategic sourcing environment.

In spite of the significant contributions from all the previous articles, contingency theory has so far not been applied to understand how the contextual factors affect the internal visibility of supplier risks among different actors within an organization. Hence, this paper is anchored on the contingency theory for two reasons. The first is to identify contextual variables that may affect the internal visibility of diverse supplier risks. The second is to explain how and why the risk management silos are created in organizations.

3. Methodology

3.1. Empirical setting – The case

This paper is based on serendipitous findings from an extensive case study of supply chain risk management. Case research, compared with traditional research methods (e.g. surveys, simulations, and quantitative modelling), is deemed appropriate for gaining insights into complex systems such as organizations [45]. Since large organizations are presumed to adopt more sophisticated risk management practices than small organizations, a major multinational manufacturing corporation was chosen for an in-depth study. The case company was a large global group with more than 43,000 employees, a large number of product brands, and operations in 70 countries all around the globe. The group owned over 200 individual companies under its corporate umbrella.

Many of these companies, as well as the group as a whole, held leading positions in various customer segments. Because of its large size and the decentralized nature of its operations, the group applied a divisional management structure consisting of five divisions. Each division was responsible for coordinating the operations of a large number of subsidiary companies so that each company was able to conform to the group's overarching visions, missions, and objectives. The five divisions differed in terms of sales, number of employees, regions, product types, number of suppliers, and number of subsidiary companies (see table 2).

Insert table 2 about here

The overall supply management process of the case organization was chosen to be the unit of analysis for this study. Consequently, five different supply management processes, each representing one division of the multinational corporation, were studied. Though a single case study has limited generalizability, it can provide rich insights that can contribute to the theory-building process [46]. Therefore, a single case is preferred for this study to gather deep insights and understanding of the phenomenon (e.g. risk management silos) under study. In addition, since the case is a world leading multinational corporation in the manufacturing industry, with a global presence and a multitude of successful products, it is an adequate empirical setting for studying risk management silos. The decentralized nature of the case organization along with its diverse product portfolio and global activities within a single organizational set-up provided the required opportunities to collect substantial information on risk management silos. Thus, without claiming generalizability of this study, it seems plausible for the current findings to be valid for other similar settings as well.

3.2. Data sources

The study applied multiple data collection methods to assist in information triangulation [47]. Data were primarily gathered from three sources: (1) semi-structured interviews; (2) archival internal documents (e.g. risk reports and internal presentations), as well as publicly available external documents (e.g. financial and sustainability reports); and (3) direct observations made during internal corporate meetings and a field trip to one of the significant manufacturing units of the corporation.

Overall, 18 informants were interviewed, representing 3 distinct hierarchical levels of the case organization: the corporate group level, the divisional level, and the subsidiary/company level (see table 3).

Insert table 3 about here

The corporate level of the organization was represented by four respondents: the Corporate Chief Technology Officer (CTO), Group Supply Chain Director, Quality and Sustainability Manager, and Risk Insurance Manager. The twelve divisional-level interviews were split equally among sourcing directors and category managers from around the world (except Division A, which did not have any category managers). Finally, two purchasing managers (one each from Division B and Division C) represented the individual company level.

Most of the informants were met at least twice, the first time during a formal interview and the second time (or more) during internal meetings. The interviews were semi-structured and conducted according to a predefined interview guide (see Appendix A). Most interviews were held face to face. Due to the diverse locations of the divisional sourcing directors, they had to be interviewed by telephone. The length of the interviews and meetings averaged approximately 2 hours.

To warrant reliability of the collected information, two measures were taken. First, most of the informants were asked to provide documents and presentations describing their work processes. Second, follow-up issues were raised for clarification purposes when the respondents were met for the second time.

4. Results

The supplier risks are mapped against the interviews with the respondents at various levels of the case organization in the following subsections to answer the first research question: how are different supplier risks visible among the actors within a purchasing firm? Therefore, this section is structured according to the risk visibility observed at the three organizational levels.

4.1. Risk visibility at the group level

The group-level members were located at the relatively small headquarters of the corporation. They belonged to the same organizational context, even though their roles and responsibilities varied significantly. The group-level members were top managers of the organization who rarely dealt with the suppliers directly. Their knowledge of the supply base of the group was shaped by reports generated in the divisions or in the various subsidiary companies as well as through personal interactions with middle managers (e.g. divisional sourcing directors or company plant managers) of the organization. Table 4 presents the key supplier risks reported by the respondents at the group level.

Insert table 4 about here

The chief technology officer highlighted the importance of the innovation capability of the group's suppliers. Innovation was one of the core corporate strategies for growth, and the corporation had just earned a position in the Forbes list of the 100 most innovative companies in the world. The group had its own R&D operations, but, according to the

CTO, it was hard to maintain a technology leadership position in the industry by being solely dependent on the group's own R&D competence. Therefore, if the suppliers of the group were not innovative enough, they might jeopardize the group's leading position with respect to innovation.

All the divisional sourcing directors reported to the Group Supply Chain Director. Hence, he had a high-level overview of all the divisions. He discussed the importance of the nature of the source. Relating this to the classical model presented by Kraljic [48], he highlighted the case of a motor supplier. The Kraljic [48] model is based on the construct of power and dependence [49], which explains how the purchasing power of buyers plays a role in the nature of the dependency in the buyer-supplier relationship. Despite the corporation's leading position in its industry, it was a small player in the electronics component market, meaning that its purchasing power was quite low in this segment. Thus, if anything happened to a major supplier, there was a significant risk of a shortage of critical parts, because the supplier in question might give priority to its largest customer and not the case organization.

The Group Quality and Sustainability Manager emphasized various types of sustainability risks, such as workers' rights, health and safety, the environment, and management systems. He was responsible for ensuring that sustainability audits were conducted at key suppliers' sites on a regular basis. His mandate came from one of the top strategic objectives at the corporate level, which was to build a sustainable supply base. To ensure sustainable sourcing, each year a number of sustainability audits were carried out, especially among the low-cost country suppliers of the corporation.

The Group Risk and Insurance Manager handled the insurance company, which provided insurance for the manufacturing plants of the corporation. He had no direct contact with suppliers and did not deal directly with anyone involved in the supply

management process. Hence, his visibility of risks from suppliers depended on two sources: first, the group's experiences of insurance claims due to supplier failures; and second, reports generated by the insurance provider that contained information about the various supplier risks to which the different manufacturing units were exposed. He was mainly concerned with the environmental risks that might cause property damage at a supplier's site. This was the only kind of supplier risk that the corporation transferred through insurance. Since one of the manufacturing units had recently encountered supply disruptions due to a fire at a supplier site, fire risk emerged from the interview as the most significant supplier risk.

4.2. Risk visibility at the divisional level

At the divisional level, two types of actors who were responsible for the supply management process of the group were interviewed: sourcing directors and category managers. Table 5 highlights the primary supplier risks indicated by the sourcing directors.

Insert table 5 about here

The sourcing directors were responsible for ensuring that the subsidiary companies within the respective division were able to meet the corporate objectives for the supply management process. The category managers were responsible for coordinating purchases among the subsidiary companies under each division to reap the potential benefits of large-volume purchases from suppliers. While the responsibilities of the sourcing directors were to set directions for strategic sourcing, the responsibilities of the category managers were to ensure that those strategic sourcing directions were met for the categories within each division. Table 6 presents the primary supplier risks mentioned by the category managers.

Insert table 6 about here

Even though the roles and responsibilities of the sourcing directors and the category managers differed within the divisions, their respective roles displayed strong similarities across the divisions. As a result, the effects of the contextual factors on the visibility of risks were prominent in their responses. For instance, Divisions A, B, and C had similar kinds of products but differed in size, customer base, and sourcing environment. Division D, on the contrary, produced advanced technical products, such as electronic ID cards, mobile access systems, and was significantly smaller than the other divisions. As a result, this division was highly dependent on its suppliers in terms of technical capabilities and sometimes even required suppliers to deliver goods directly to the customers. Moreover, because this division had government organizations as customers, it had to be very careful with the product delivered to these critical customers. Errors in delivery from suppliers to such customers might cause reputation problems and easily destroy the business relations with a particular country.

In addition, because of the nature of the products sold by Division D, the category manager of this division had numerous suppliers located in China. Every year during the Chinese New Year, a large share of the Chinese manpower leaves for holidays and never returns. He mentioned that the Chinese suppliers sometimes lose as much as 50% of their current workforce, making them unable to adhere to the promised delivery schedules. Consequently, the primary risk discussed by the category manager of Division D was the employee turnover at the supplier's production site.

Furthermore, the interviews from Division B revealed a variety of risks due to differences in the sourcing environments within this division. The category managers from this division mentioned three different risks as being the most critical: economic

risk, cost risk, and dependence risk (due to the volume of business undertaken). This could be explained by differences in the purchases of raw materials between the categories. For example, steel and brass were the raw materials for stamping. According to the category managers, both of these materials were highly sensitive to price volatility. Consequently, cost was mentioned as the main concern by the category manager of stamping. For the lock case category, on the contrary, the supplier base was highly concentrated; only 2% of the suppliers covered 80% of the spending (see table 6). As a result, the lock case category manager recognized this dependence on suppliers as the primary risk.

Division E revealed a specific situation. This division had grown at a fast pace due to numerous acquisitions in recent years. Consequently, the number of suppliers added to this division was extremely high compared with the other divisions. Consequently, the need to aggregate suppliers among the subsidiaries in this division was also considerable. However, because of the long switching time from one supplier to another, such aggregation was very costly. In addition, many suppliers were required to provide spare parts for after-sales services. According to a category manager of this division, many of these after-sales products were highly profitable but mostly single sourced, which made them very risky for the division.

4.3. Risk visibility at the company level

The corporation had a highly decentralized management structure. Under the umbrellas of the five divisions, each subsidiary company was responsible for its own purchasing and had its own purchasing manager. The role of these purchasing managers at the company level was to ensure that the incoming materials from the contracted suppliers met the production requirements. The purchasing managers reported periodically to the middle managers (e.g. category managers and sourcing directors) on suppliers' performance. Thus, even though the two purchasing managers interviewed belonged to two different divisions, their positions, as well as their visibility of risks, showed a strong resemblance. Their roles did not vary much due to the context in which they operated, most likely because of the generic reporting requirements on suppliers' performance. Consequently, both the purchasing managers mentioned quality failures and delivery failures from suppliers as their primary concerns. The information obtained from the purchasing managers was further substantiated when documents from Division D also revealed these two risks as the key risks from suppliers at the company level.

5. Discussion

The results section reveals how different types of supplier risks were visible to the actors working at different hierarchical levels, and with different responsibilities, within the case organization. Such visibility, or lack of visibility, of supplier risks shaped their perceptions and actions regarding which risks to manage and when. In this section the reasons behind these differences in visibility are discussed by analysing the results through two theoretical lenses to answer the second research question: why is the visibility of supplier risks different for different actors? Next, different supplier risks are clustered according to the various hierarchical levels of the organization. Last, the implications of risk management silos are discussed at length.

5.1. Bounded rationality and differences in internal visibility

The bounded rationality perspective suggests that decisions and actions are based on the amount and type of information that a decision maker has at a particular point in time [35]. In the empirical case, it is observed that the type of information sought by an organizational actor is highly dependent on the roles and responsibilities that s/he has been asked to perform. For example, the Quality and Sustainability Manager at the group level was responsible for carrying out sustainability audits that accumulate suppliers' sustainability-related information. Therefore, he was concerned with sustainability risk because he was mandated by the organization's norm for maintaining a sustainable supply base. Likewise, the CTO was responsible for the innovation function at the group level. Consequently, he wanted to know whether the suppliers were innovative enough and feared an innovation capability risk from the suppliers.

Furthermore, the managers at the divisional levels were responsible for strategic sourcing. Hence, their main concern was sourcing risks, and they were constantly seeking information on how to mitigate these risks from the suppliers. Finally, since the purchasing managers primarily interacted with their suppliers to ensure material deliveries, they assembled information on quality risks and delivery risks, which made these risks more visible and prominent to them.

Thus, the current findings revealed that the internal visibility of the external supplier risks was dependent on differences in the roles, responsibilities, and hierarchical levels of the respondents. This suggests that, depending on the differences in roles and responsibilities, actors in a complex organization form individual sets of conceptualizations of risk, which, in the long run, may create role-specific overconfidence in the specific set of risk mitigation strategies related to each type of role. Consequently, risk management silos are created.

5.2. Contingency theory and differences in risk visibility

Differences in risk awareness were apparent among the respondents, for which the bounded rationality due to the organizational position of the respondents had little explanatory power. For instance, in spite of the generic roles, such as the sourcing directors and the category managers, which were standardized across the divisions, their interviews displayed significantly different perceptions of supplier risks. Instead of role specificity, these differences reflected differences in the immediate contexts in which each sourcing director and category manager operated. Two contingency variables were important specifically in this respect: the technology [43] and the strategic sourcing environment [44].

For instance, the effect of technology as the contingency factor was visible in the risks mentioned by the Division D respondents. Since the products of Division D had a higher degree of technical sophistication than those of the other divisions, the sourcing directors of Division D emphasized technology and reputational issues as key risks from their suppliers (see table 5). While some of the responses from the other divisions were common (e.g. both Division C's and Division E's sourcing directors mentioned switching time as the key risk), none of the respondents from the other divisions mentioned risks similar to those of Division D.

Likewise, the effect of the strategic sourcing environment as a contingency factor was visible in the responses of category managers from different divisions. For instance, for the category managers of Division B, different concentrations of the supply base resulted in risks such as economic risk, cost risk, and volume dependence risk from suppliers. On the contrary, for the category manager of Division D, the context of having the key supply base in China translated into risk such as employee turnover. In addition, the responses of the category managers of Division B revealed that the differences in the strategic

sourcing environments may also vary within a division. Even though they belong to the same division, their operational context varied considerably. When the supply base concentration was moderately high (e.g. for the category manager of lockset and stamping), the primary concerns were cost and economic risk from suppliers. On the contrary, when the supply base concentration was extremely high (e.g. for the category manager of lock cases), the principal risk perceived was the volume of purchases from each supplier, since this easily creates high dependence on single suppliers.

In brief, the above findings suggest that risk mitigation strategies need to be contextualized, not only on the organizational level but also due to various operational contexts within an organization. Consequently, one risk mitigation strategy may not fit all types of organizations and not even all organizational units under the same corporate umbrella.

5.3. Different silos at different levels of hierarchy

As highlighted in the theoretical background section, risks in organizations appear in clusters and the nature of the dependency among risks may take a hierarchical form. Moreover, the nature of relationships (e.g. cause and effect) among risks in reality is particularly complex [24]. By analysing the risks mentioned in the interviews using the conceptualization of risk by Hallikas et al. [24], it was possible to identify a pattern in silo-based risk management in relation to the respondents' hierarchical positions.

Various clusters of risks seem to appear at different hierarchical levels (see table 7), and these risk clusters appear to be closely related to the organizational functions performed at each hierarchical level. For example, the risks of quality and delivery failures primarily appeared in interviews with respondents at lower hierarchical levels. The nature of this type of risks is operational. Consequently, these risks were identified,

assessed, and mitigated where the operations of supply management were carried out on an everyday basis, that is, primarily in various subsidiary companies.

Insert table 7 about here

Contrarily, strategic risks, for example issues concerning innovation, the environment, and sustainability, appeared in the interviews with the respondents at the group level (table 7). These risks also reflected the organizational positions, responsibilities, and functions performed at the corporate headquarters. Furthermore, at the intermediate level, that is, the divisional level, the main responsibility of the divisional management was to handle issues related to various sourcing decisions. Consequently, sourcing-related risks, such as risks related to the nature of the source, the switching time, and employee turnover, primarily appeared in the interviews with the respondents at the divisional level.

Consequently, the current findings suggest that there are different kinds of risk management silos at different levels of the organizational hierarchy. In large and complex organizations, all the actors may work with limited visibility of the supplier risks. As a result, the division of labour that is created to handle the supply management process may direct the actors involved to specialize and focus on their specific cluster of risks. Thus, in large organizations, risk management silos occur as a side effect of the division of labour and the functional differentiation.

To summarize, this research indicates that silo-based risk management may be a consequence of complex structures in large global organizations. Because of the differences in the organizational roles and responsibilities and the operational contexts, the internal visibility of supplier risks among the various actors involved in the supply management process changes and, consequently, the measures to tackle those risks are performed in silos. However, in theory, effective risk management is claimed to be a

holistic, enterprise-wide process involving all the key stakeholders in, for example, finance, senior management, internal auditing, and risk management [50]. Therefore, it is crucial for large global organizations to understand the implications of silo-based risk management to deal with various risks effectively and efficiently.

5.4. Implications of silo-based risk management

Hallikas et al. [24] argued that the cause and effect relationships among numerous risks are complex in practice. The results of this study extend this argument further by revealing the differences in visibilities of various supplier risks across different hierarchical levels. This difference in visibility adds to the complexity and can be comprehended by understanding the types of dependencies among various risks. Observably, there are two types of dependencies among risks: a positive dependency and a negative dependency. A positive dependency means that removing a risk will help to eliminate one or several risks. A negative dependency, on the contrary, means that removing one risk may cause (create) one or several other risks. Figure 1 depicts these two types of dependencies across various hierarchical levels in the case organization.

Insert figure 1 about here

As depicted in figure 1, risks such as quality failures and delivery failures at the subsidiary company level may be caused by one or several other risks, such as sustainability risk, employee turnover risk, or environmental risk, that are visible at the group or at the divisional level. Hence, it may not be problematic to manage such risks in silos, because it can eventually assist organizations in avoiding quality and delivery failures while carrying out operations. Similarly, reputational damage may occur due to the lack of sustainable practices at suppliers' sites. Therefore, managing sustainability

risk by performing regular sustainability audits in isolation at the corporate level may not be problematic.

On the contrary, the innovation capability (see figure 1) of suppliers (the prime risk visible to the CTO at the corporate level) may potentially conflict with switching risk and cost risk (the prime risk visible to the sourcing directors and category managers at the division level). Therefore, if the sourcing directors and category managers who are positioned in the diverse divisions around the world are not aware of such a risk that is visible to the CTO at the corporate level, they may end up selecting a non-innovative supplier and as a result unintentionally jeopardizing the corporate vision of the group to be the innovation leader in the industry. Similarly, a supplier may have high technological capability but may fail to deliver the required quality and delivery specifications. Thus, removing such a supplier because of a quality failure or a delivery failure at the company level may potentially create a technology risk at the corporate/group level. Therefore, in cases in which there are negative dependencies among risks at different hierarchical levels, managing risks in silos can be problematic.

Consequently, it is elemental for organizations to comprehend the nature of the dependencies (e.g. positive or negative) among different types of risks to tackle the risk management silos that may exist at various hierarchical levels within an organization. Understanding the positive dependencies among risks will assist organizations in carrying out risk management activities in silos without much need for integration. Identifying the negative dependencies among risks will support organizations in recognizing cases in which managing risks in silos is counterproductive. Negative dependencies are critical, because the adverse impact of silo-based risk management is the largest for such cases. As revealed in the previous section, risk management silos are formed according to the function performed at different hierarchical levels. Managing risks in one such functional

silos can potentially affect risks in another silo. Since this hierarchical nature of organizations is ubiquitous, organizations need to have some responsible levels with awareness of internal visibility and risk dependencies, especially for tackling the negative dependencies among risks.

6. Conclusion

This paper aimed to answer two research questions. First, how are different supplier risks visible among the actors within a purchasing firm? Second, why is the visibility of supplier risks different for different actors? The findings suggest that different actors working at the different hierarchical levels of the organization do indeed see different risks from suppliers, firstly because the organizational actors are bounded by their roles, their responsibilities, and the rules of the organization and secondly due to the contingencies, such as technology and the strategic sourcing environment, that make certain types of risks critical for specific individuals. In other words, organizational hierarchies are encapsulated in different roles and responsibilities, which may lead to visibility imbalances. Therefore, it might be difficult to avoid risk management silos; hence, they must be managed. To set up the most effective risk management approach (e.g. silos vs integrated systems), it is critical for organizations to understand the types of dependencies among risks. In the case of a positive dependency among risks, whereby removing one risk from one silo may help the removal of risks from other silos, managing risks in silos can be quite efficient and effective. In cases of a negative dependency, whereby removing one risk from one silo may create new risks in other silos at different hierarchical levels, managing risks in silos can be counterproductive. Hence, organizations have to take measures such as cross-functional integration and communication among different hierarchical levels that may potentially increase the

internal visibility of risks among the stakeholders involved in the supply chain management process.

It is not possible to claim generalizability based on a single case study. However, given that the case is a representative sample of a large, global corporation in the manufacturing industry, it is plausible to assume that the phenomenon (e.g. risk management silos) and the explanations (e.g. why the silos of risk management persist) are also valid in many other complex organizations. Admittedly, though, silos of risk management may come in diverse shapes and forms in different industrial set-ups because of the variations in roles, responsibilities, and context; thus, studying silos in other organizations can be an avenue for future research.

Furthermore, the multi-faceted empirical picture of supplier risk management that is provided in this paper implies that there is a latent need for in-depth case studies to gain rich insights into the realities of organizations operating in the supply chain context. The findings suggest that these realities vary considerably among the actors working at different hierarchical levels of the organization. Quite surprisingly, the current supply chain research portrays a single, homogeneous, and monolithic view of organizations. However, from an in-depth understanding of supplier risk management in practice, this study reveals that future research needs to take account of the heterogeneity of perspectives that exist even in a single organization (e.g. a focal firm). This means acknowledging the presence of an internal variety of perspectives (from the CTO to the sourcing manager, to the category manager, and to the purchasing manager) in present-day purchasing organizations and configuring risk management processes accordingly.

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Table 1: Examples of Supplier Risks in the Literature

Supplier Risk	Definition	Prior Research
Economic	Risk related to economic issues of supplier, insolvency, bankruptcy, lack of financial stability	[21], [23]
Environment	Risk due to uncertainty in the supply chain environment, accidents such as fires, social political actions, natural disasters	[21], [22]
Technology	Risk of technology issues, e.g. suppliers are not technologically competitive	[21]
Sustainability	Violation of socially and ecologically sound production at a supplier's site, e.g. child labour, workers' health	[26]
Innovation capability	Suppliers are not innovative enough	[1]
Employee turnover	Incapability of keeping employees, resulting in a massive loss of employees	[25]
Cost	Change in the price of purchase goods due to scarcity, unavailability in the market, or a wilful increase of the supplier	[51]
Switching time	Amount of time taken to replace an existing supplier	[23]
Volume of business given	Dependence on suppliers in terms of high spend	[40]
Nature of sources	Number of supplier sources available in the market: sole, single, dual, multiple	[52]
Quality failures	Purchase goods do not meet the quality specifications	[51]
Delivery failures	Delivery failures of purchased goods, such as missing on-time delivery, missing full-quantity delivery	[51]
Reputation damage	Risk of the corporate reputation being damaged by the supplier due to sustainability issues, quality of products, etc.	[53]

Table 2: Differences among the Divisions in the Case Organization

Attributes	Regional Division A	Regional Division B	Regional Division C	Global Product Division D	Global Product Division E
Sales	21%	28%	14%	24%	13%
Number of employees	6,620	10,260	15,284	3,029	7,429
Regions	North and South America	Europe, Middle East, Africa	Asia, Australia, New Zealand	Global	Global
Products	Mechanical and electromechanical locks, cylinders, and security doors			Secure issuance of cards, RFID identification technology	Automatic doors and after-sales services
Number of subsidiary companies	40	42	30	17	62
Number of suppliers	2500	3400	1200	500	3000

Table 3: Positional Level of the Informants of the Case Organization

Levels	Number of interviews at each level	Informants
1. Group level	4	Chief Technology Officer, Group Supply Chain Director, Group Sustainability and Quality Manager, Group Risk Insurance Manager
2. Divisional level		
a. Sourcing directors	6	1 sourcing directors – Division A, B, C, E 2 sourcing directors – Division D
b. Category managers	6	3 category managers – Division B 1 category manager – Division C, D, E
3. Company level	2	2 purchasing managers of subsidiary companies – Divisions B and C
Total	18	

Table 4: Risk Visibility at the Corporate Group Level

Informants	Roles	Primary supplier risks	Examples of quotes from interviews
Chief Technology Officer	Executive board member. In charge of sustainability, innovation, and supply management processes	Innovation capability	“Product innovation is one of our key strategies. For example, some of our sensors are developed by mobile phone manufacturers. We have to ask our suppliers to develop those sensors”
Group Supply Chain Director	To design and develop supply management of the group	Nature of the market	“We are a very small player in motors. We need to compete against big companies”
Group Quality and Sustainability Manager	To carry out sustainability audits among suppliers of the group	Sustainability	“Whether suppliers are doing any unethical practices such as having child labour, not meeting working hour regulations, etc.”
Group Risk and Insurance Manager	To procure insurance for the group	Environmental	“We had a fire incident due to one of the suppliers who was located within our plant premises”

Table 5: Risk Visibility of the Divisional Sourcing Directors

Informants	Context	Primary supplier risks	Examples of quotes from interviews
Supply Chain Director, Division A	Large, decentralized division with a manual and semi-automatic product range	Economic	“The factor I find most critical is financial stability of the supplier”
Vice President, Supply Management Division B	Large, centralized division with a manual and semi-automatic product range	Nature of source	“Some categories are more difficult to source than another. For example, because we are located in Europe, it is easier for us to source for the machining category. However, for the lock case, we need to go to low-cost countries like China and sourcing becomes difficult”
Director, Global	Large, decentralized	Switching time	“There are some suppliers that are very difficult to switch because they

Informants	Context	Primary supplier risks	Examples of quotes from interviews
Supply Chain Division C	division with a manual and semi-automatic product range		are developing products with us and it would take a long time to develop another supplier like that”
Supply Management Director, Division D	Small division with a highly technical product range	Technology	“We need to select and partner with suppliers which have high technical capabilities but it is also risky. We have some suppliers in Japan and we are trying to develop alternatives in Korea”
Director Strategic Sourcing, Division D	Government as a customer base	Reputation damage	“If we have any issues such as delivering wrong labels when selling to the government we will have a bigger loss”
Procurement Director, Division E	Division is growing very fast with a high acquisition rate	Switching time	“Risk of switching is unfortunately high”

Table 6: Risk Visibilities of the Divisional Category Managers

Informants	Context	Primary supplier risks	Examples of quotes from interviews
Category Manager Lock Set, Division B	Large supply base, but concentrated (15% of the suppliers cover 80% of the volume purchased)	Economic	“We are responsible for keeping the supplier alive”
Category Manager Stamping, Division B	Large supply base, but concentrated (13% of the suppliers cover 80% of the volume purchased)	Cost	“We had to let one supplier go due to price increase issues. However, we needed some time to switch to other suppliers”
Category Manager Lock Case, Division B	Large supply base, but extremely concentrated (2% of the suppliers cover 80% of the volume purchased)	Volume of business given	“Finding alternative sources of supply is difficult for some categories. To identify and qualify second sources are difficult”
Category Manager, Division C	Most of the supply base is in low-cost countries	Nature of source	“Some categories, like screws, are easy to source. Some categories, like trading products, are difficult to source”

Informants	Context	Primary supplier risks	Examples of quotes from interviews
Category Manager, Division D	Key suppliers are in China	Employee turnover	“During the Chinese New Year, 50% of the manpower leaves and never comes back. This loss of manpower affects quality and delivery”
Category Manager, Division E	After-sales services generate high revenues	Nature of source	“We need to have dual sources for our high-profit products; otherwise, it is risky for us”

Table 7: Risks Identified at Different Levels of the Case Organization

Supplier Risks	Group	Division	Company
Innovation capability	*		
Nature of sources	*	***	
Environment	*		
Sustainability	*		
Economic		**	
Employee turnover		*	
Cost		*	
Technology		*	
Switching time		**	
Volume of business given		*	
Reputation damage		*	
Delivery failures			*
Quality failures			*

* denotes at which level a particular risk is mentioned and the number of stars denotes how many time it is mentioned at a particular level

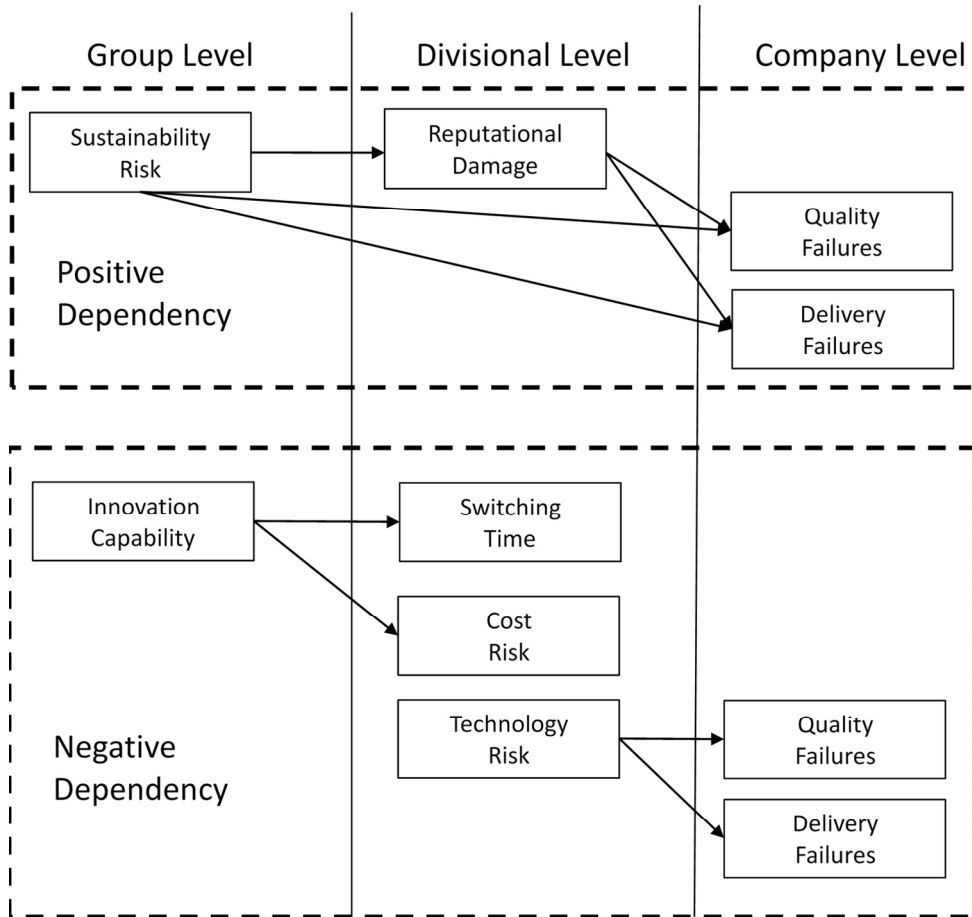


Figure 1: Types of dependencies among risks across different hierarchical levels

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Appendix A: Interview Protocol

1. Define your roles and responsibilities within the group.
2. Describe the decisions need to be taken based on the roles and responsibilities.
3. Describe the strategies you need to define.
4. Describe your position in the organogram of the group.
 - 4 a. Who reports to you?
 - 4 b. Who you report to?
5. Describe the processes you are in charge of.
6. What are the critical risks from suppliers?
7. Why is a particular risk critical for you?
8. How are these risks identified, assessed and mitigated?

Revision 2 List

This document contains a table which lists responses to the reviewer's comments and changes made in accordance with the reviewer's comment.

Table 1: The list of revisions in the manuscript according to the reviewer's comment

Sl.	Reviewer's Comments	Our Responses to the Comments	Changes made in the manuscript
1	Numberings since the Methodology section need to be corrected. On page 9, the Methodology section should be in section 3. You should adjust the following sections and sub-sections accordingly.	Thank you for noticing this error. We have changed the section numberings accordingly.	Numbering of the methodology section is corrected to 3.0. the numbering of subsequent sections are also corrected.
2.	There are some grammatical issues. On page 23, in the first two lines of the Conclusion section, remove "is" twice in the two research questions. You should proof-read the whole paper again.	Thank you for your comment. We have proof read the paper with a professional proof reader to remove all the grammatical errors.	The document is now proof read by a professional proof reader. So all the grammatical errors are removed from the document.
3.	You must shorten the paper to the limit of 33 pages. You are suggested to consider removing some of the contents in the sections of Methodology, Results, and Discussion without affecting the quality of the paper.	Thank you for your comment. However, we have noticed that there is a recent change in page limit of the journal. The current page limits are 42 for review articles and 38 for all other submissions (including research articles). Hence, we did not change anything because the current paper is 37 pages including everything.	Did not made any changes in the document.

Internal Visibility of External Supplier Risks and the Dynamics of Risk Management Silos

Abstract

This paper investigates the factors behind silo-based risk management practices in organizations. Based on interviews with different actors working with the supply management processes within and across different organizational levels in a major multinational manufacturing corporation, it reveals how silos of risk management activities are formed. The findings show that there are profound differences in risk visibility between different actors due to differences in their hierarchical levels, organizational positions, and business contexts. Drawing on the theoretical lenses of bounded rationality and contingency theory, the paper reveals how these differences in visibility create silo-based risk management processes and discusses the pros and cons of such

configurations. It concludes that silo-based behaviours are inherent features of any complex organization and that the implications of managing risks in silos are strongly influenced by the types of dependencies (positive or negative) among risks. Therefore, it is elemental for organizations to be aware of this phenomenon and configure their risk management processes accordingly based on the dependencies among the various risks to which the organizations are exposed.

Managerial Relevance

This paper discusses the risk visibility of actors in the supply management processes of a large global organization. It reveals a stark difference in visibility of supplier risks within and across different levels of the organization that results in silo-based risk management behaviours in the organization. The paper provides normative support for management decision making to cope

with risk management silos in the following ways: first, by creating awareness that the supplier risk perceptions at different hierarchical levels within an organization may differ substantially; second, by explaining that this difference in visibility is a natural phenomenon and exists because of the differences in roles, responsibilities, and contexts of the organizational members; third, by differentiating between two types of dependencies (negative and positive) among various supplier risks; fourth, by discussing the cause-effect relationships among risks to understand the influences of both positive and negative dependencies; and, finally, by discussing the implications of these dependencies to understand when silo-based risk management is problematic and when it is plausible for organizations to manage risks in silos.

1. Introduction

In today's context of globalization, outsourcing, and contract manufacturing, suppliers play a key role in determining an organization's success [1]. Suppliers' faults or disruptions are critical, because these events can have serious impacts on their clients' business. For example, because of a fire incident in 2000, Philips, a semiconductor supplier of Ericsson, failed to deliver some critical components. The incident not only caused Ericsson a reported loss of \$400 million [2] but also drove it out of the cell phone market [3]. Moreover, the toy manufacturer Mattel was forced to recall \$94 million due to unsafe levels of lead in toys designed for toddlers by a Chinese manufacturer [4]. The incident cost the company \$110 million [5]. Recently, faulty airbag components manufactured by Takata Corporation caused Toyota to recall 2.3 million vehicles. The inadequate quality control

by Takata Corporation made it difficult to identify the vehicles with defective airbags, resulting in a fine of more than \$70 million for the corporation [6]. In addition, Honda is reported to have spent \$360 million on recalling airbags also manufactured by Takata Corporation [7].

Theoretically, risk management consists of at least five rational steps. The starting point is to assemble a cross-functional team of risk experts. The second step is to convene a cross-functional team for brainstorming purposes to identify the portfolio of enterprise risks. The third step is to filter, assess, and prioritize risks, and the fourth step involves making a decision regarding the most appropriate treatment strategies for handling each risk item, including possible mitigation measures for the "actionable risks". The final step is to monitor the changes in the network, customer needs, technologies, partner strategies, and competitors to update the assessment of risk. Over the years, the

above approach to managing risks has been advocated by a number of researchers [8]–[11].

However, while this mainstream approach is primarily based on theoretical reasoning, empirical studies have shown that in corporate practice risk management is often silo based [12]. This implies that risk management is sub-optimized in the departmental structures; that is, an IT division primarily addresses IT risks while a finance division mostly addresses financial risks and so on. [13]. Thus, in practice organizations seem to be unable to reap the benefits of the prescribed integrated approaches of the literature [14]. Furthermore, there seems to be a misalignment between researchers' theoretical presumption concerning risk management and organizations' management of risks in practice.

To understand this misalignment, this paper focuses its attention on the internal visibility of risks among organizational

members. “Internal visibility” in this paper means the internal line of communication and agreements between different actors engaged in the supply chain management process of the purchasing firm [15]. Anchored in an extensive case study of the supply management processes of a major multinational manufacturing corporation, the paper investigates why the silo structures persist in risk management activities. To understand the causes of silo-based risk management practices, the paper poses the following research questions:

- (1) How are different supplier risks visible among the actors within a purchasing firm?
- (2) Why is the visibility of supplier risks different for different actors?

The paper is based on the assumption that risk management strategies and other activities in organizations are situational [16]. Therefore, drawing on Halldorsson et al.'s [17] observation that

there is no single “right” theory for explaining an empirical phenomenon in the supply chain, in this paper the empirical findings are analysed through two complementary theoretical lenses: bounded rationality and contingency theory. While bounded rationality reveals that human actions are rational within the limits of the situational factors of organizations [18], the contingency theory approach [19] directs our attention to how these situational actions are constrained and influenced by technology and organizational contexts [20].

The paper proceeds in the following stages. First, the theoretical background section discusses the concept of supplier risks and their visibility as well as our two theoretical lenses. Second, the empirical setting and the method adopted for collecting and analysing the data are presented. Thereafter, the findings are discussed in accordance with the two theoretical lenses to distil the factors that

lead to risk management silos. Finally, the paper concludes with a discussion on the implications of risk management silos in large global organizations.

2. Theoretical background

2.1 Supplier risks

Risk has been discussed to a great extent within the discourse of supply chain management [21]. Different authors use different risk concepts, often with different connotations, such as disruption, vulnerability, uncertainty, disaster, peril, and hazard [22]. However, this paper focuses on supplier risks and uses the definition provided by Jung et al. [23], which is “an unexpected event that occurs from an upstream supplier and spreads to the downstream of the supply chain”. Drawing on this ontological definition of risk, it is possible to identify a wide array of supplier risks that have been discussed in previous research. Table 1 provides some examples.

Insert table 1 about here

According to Hallikas et al. [24], risks appear in clusters and the nature of risks may take a hierarchical form. As a result, some risks can be caused by other risks. For example, quality and delivery risks might result from employee turnover risk [25]. Similarly, reputational damage can be caused by sustainability issues of the supplier [26]. Moreover, one effect factor can be caused by one or more causal factors. For instance, quality failures may occur because of employee turnover and/or sustainability issues at a supplier's premises [25], [26]. Hallikas et al. [24] further reveal that in reality the nature of risk consists of much more complex relationships. As a result, a host of ways to classify supply chain risks exists [27], [28], [29]. This paper adopts the classification by Hallikas et al. [24].

As the types of supplier risks vary (see table 1), so do the ways in which these risks are managed. The literature is filled with numerous methods and

techniques for identifying, evaluating, and mitigating the various kinds of supplier risks [25], [30]. However, as empirical studies have suggested, there is a sharp distinction between what researchers prescribe as the best way to manage risks and how risks are actually managed in practice. Consequently, this paper discusses the visibility of supplier risks among the various managers engaged in managing different kinds of supplier risks in the purchasing firm's supply management process.

2.2. *External versus internal visibility of supplier risks*

The identification of risks is one of the core aspects of any risk analysis. The ability to understand the dynamics of a supply chain and to foresee any possible deviation or disruption is crucial. Acquiring this ability to see from one end of the supply chain to the other end [15] is important to understand the identity ("what it is"), the location ("where it is"), and the status ("in what

condition”) of entities transmitting through the supply chain [31]. However, achieving this visibility is challenging due to the interconnected nature of supply networks. This “ability to see from one end of the supply chain to other” is referred to as “supply chain visibility” [15]. The significance of supply chain visibility is demonstrated in a survey of 149 companies, conducted by the Aberdeen Group in 2013, in which 63% of the respondents claimed that supply chain visibility was their top priority [32]. Improving supply chain visibility helps to reduce uncertainty, because more information is available about the identity, status, and location of the risk among the actors of the supply chain [15]. Hence, it is considered not only as a key risk mitigation strategy [33] but also as a vital capability for any firm [34].

Since a supply chain is an inter-organizational concept [17], mainstream supply chain research emphasizes the

coordination between, and collaboration among, various supply chain members. Supply chain visibility research is no different in this regard. So far it has primarily paid attention to the “external visibility”, that is, the identity, status, and location of supplier risks that are exogenous to the focal firm [15], [34]. With a few exceptions, for example Sheffi, Christopher, and Peck [15], supply chain visibility studies have not shed much light on the internal visibility of such risks among the actors within the focal firm.

This paper, therefore, focuses on the internal visibility from two perspectives: as an additional risk factor (i.e. a lack of visibility may cause or amplify risks) and as a capability for mitigating risk. “Internal visibility of risk” in this paper means the visibility of various supplier risks among different actors within an organization. The internal visibility is examined through two theoretical lenses:

bounded rationality and contingency theory.

2.3. *Bounded rationality*

The idea of bounded rationality was originally coined by Simon [35] as an alternative to the rational decision-making model of the economic man. In spite of the societal norms of rationality and rational decision making, all humans are bounded in their decisions and actions by limited information about possible situations, alternatives, consequences, and future preferences [18]. Thus, in organizations, all individuals work under the conditions of imperfect knowledge and can only act rationally within the limits of the known information at any particular time [36]. Moreover, organizations have hierarchies, structures, roles, norms, and standard operating procedures governing the different individual actions [37].

In spite of its broad impact on organization and management theories, the bounded rationality perspective is

sparsely used in the supply chain risk management literature. Highlighting this rarity of articles, Ghadge et al. [22] noted that behavioural dimensions such as bounded rationality could provide important perspectives for risk mitigation strategies. Thus, drawing on the bounded rationality perspective, this paper assumes that the differences in visibility of various supplier risks affect the way in which the different actors within an organization manage or take action on risks.

2.4. *Contingency theory*

Contingency theory represents a broad approach to organizations that rests on two basic assumptions: first, that there is no one best way to organize; and second, that no single way of organizing is equally effective in all situations [19]. Based on the above assumptions, contingency theory suggests that organizations must adapt their structures to fit the contextual factors to achieve a high level of performance [20].

Grötsch et al. [38] claim that the contingency approach forms a natural theoretical basis for proactive supply chain risk management. There are several examples of researchers using the contingency approach in the supply chain and operations management literature. For example, Danese [39] utilized contingency theory to identify the effects of contingency in collaborative planning; Trkman and McCormack [40] used contingency theory to develop a conceptual model for managing supply chain network risks; and Wagner and Bode [41] used contingency theory to determine the strategic fit between supply chain risks and different management strategies. Furthermore, drawing from the contingency theory perspective, Talluri et al. [42] posited that the appropriateness and effectiveness of risk mitigation strategies are contingent on the internal and external environments. In line with this approach, Stonebraker

and Afifi [43] discussed the importance of variations in supply chain technologies and suggested that a contingency approach is needed to address short-term, mid-term, and long-term strategies across a range of different business conditions. By taking a contingency perspective, Schoenherr et al. [44] theorized that institutional pressure moderates the relationship between the firm's environmental engagement and the strategic sourcing environment.

In spite of the significant contributions from all the previous articles, contingency theory has so far not been applied to understand how the contextual factors affect the internal visibility of supplier risks among different actors within an organization. Hence, this paper is anchored on the contingency theory for two reasons. The first is to identify contextual variables that may affect the internal visibility of diverse supplier risks. The second is to

explain how and why the risk management silos are created in organizations.

3. Methodology

3.1. Empirical setting – The case

This paper is based on serendipitous findings from an extensive case study of supply chain risk management. Case research, compared with traditional research methods (e.g. surveys, simulations, and quantitative modelling), is deemed appropriate for gaining insights into complex systems such as organizations [45]. Since large organizations are presumed to adopt more sophisticated risk management practices than small organizations, a major multinational manufacturing corporation was chosen for an in-depth study. The case company was a large global group with more than 43,000 employees, a large number of product brands, and operations in 70 countries all around the globe. The group owned over 200 individual companies under its

corporate umbrella. Many of these companies, as well as the group as a whole, held leading positions in various customer segments. Because of its large size and the decentralized nature of its operations, the group applied a divisional management structure consisting of five divisions. Each division was responsible for coordinating the operations of a large number of subsidiary companies so that each company was able to conform to the group's overarching visions, missions, and objectives. The five divisions differed in terms of sales, number of employees, regions, product types, number of suppliers, and number of subsidiary companies (see table 2).

 Insert table 2 about here

The overall supply management process of the case organization was chosen to be the unit of analysis for this study. Consequently, five different supply management processes, each representing one division of the

multinational corporation, were studied. Though a single case study has limited generalizability, it can provide rich insights that can contribute to the theory-building process [46]. Therefore, a single case is preferred for this study to gather deep insights and understanding of the phenomenon (e.g. risk management silos) under study. In addition, since the case is a world leading multinational corporation in the manufacturing industry, with a global presence and a multitude of successful products, it is an adequate empirical setting for studying risk management silos. The decentralized nature of the case organization along with its diverse product portfolio and global activities within a single organizational set-up provided the required opportunities to collect substantial information on risk management silos. Thus, without claiming generalizability of this study, it seems plausible for the current findings

to be valid for other similar settings as well.

3.2. Data sources

The study applied multiple data collection methods to assist in information triangulation [47]. Data were primarily gathered from three sources: (1) semi-structured interviews; (2) archival internal documents (e.g. risk reports and internal presentations), as well as publicly available external documents (e.g. financial and sustainability reports); and (3) direct observations made during internal corporate meetings and a field trip to one of the significant manufacturing units of the corporation.

Overall, 18 informants were interviewed, representing 3 distinct hierarchical levels of the case organization: the corporate group level, the divisional level, and the subsidiary/company level (see table 3).

Insert table 3 about here

The corporate level of the organization was represented by four respondents: the Corporate Chief Technology Officer (CTO), Group Supply Chain Director, Quality and Sustainability Manager, and Risk Insurance Manager. The twelve divisional-level interviews were split equally among sourcing directors and category managers from around the world (except Division A, which did not have any category managers). Finally, two purchasing managers (one each from Division B and Division C) represented the individual company level.

Most of the informants were met at least twice, the first time during a formal interview and the second time (or more) during internal meetings. The interviews were semi-structured and conducted according to a predefined interview guide (see Appendix A). Most interviews were held face to face. Due to the diverse locations of the divisional sourcing

directors, they had to be interviewed by telephone. The length of the interviews and meetings averaged approximately 2 hours.

To warrant reliability of the collected information, two measures were taken. First, most of the informants were asked to provide documents and presentations describing their work processes. Second, follow-up issues were raised for clarification purposes when the respondents were met for the second time.

4. Results

The supplier risks are mapped against the interviews with the respondents at various levels of the case organization in the following subsections to answer the first research question: how are different supplier risks visible among the actors within a purchasing firm? Therefore, this section is structured according to the risk visibility observed at the three organizational levels.

4.1. Risk visibility at the group level

The group-level members were located at the relatively small headquarters of the corporation. They belonged to the same organizational context, even though their roles and responsibilities varied significantly. The group-level members were top managers of the organization who rarely dealt with the suppliers directly. Their knowledge of the supply base of the group was shaped by reports generated in the divisions or in the various subsidiary companies as well as through personal interactions with middle managers (e.g. divisional sourcing directors or company plant managers) of the organization. Table 4 presents the key supplier risks reported by the respondents at the group level.

 Insert table 4 about here

The chief technology officer highlighted the importance of the innovation capability of the group's suppliers. Innovation was one of the core corporate strategies for growth, and the

corporation had just earned a position in the Forbes list of the 100 most innovative companies in the world. The group had its own R&D operations, but, according to the CTO, it was hard to maintain a technology leadership position in the industry by being solely dependent on the group's own R&D competence. Therefore, if the suppliers of the group were not innovative enough, they might jeopardize the group's leading position with respect to innovation.

All the divisional sourcing directors reported to the Group Supply Chain Director. Hence, he had a high-level overview of all the divisions. He discussed the importance of the nature of the source. Relating this to the classical model presented by Kraljic [48], he highlighted the case of a motor supplier. The Kraljic [48] model is based on the construct of power and dependence [49], which explains how the purchasing power of buyers plays a role in the nature of the dependency in the buyer-supplier

relationship. Despite the corporation's leading position in its industry, it was a small player in the electronics component market, meaning that its purchasing power was quite low in this segment. Thus, if anything happened to a major supplier, there was a significant risk of a shortage of critical parts, because the supplier in question might give priority to its largest customer and not the case organization.

The Group Quality and Sustainability Manager emphasized various types of sustainability risks, such as workers' rights, health and safety, the environment, and management systems. He was responsible for ensuring that sustainability audits were conducted at key suppliers' sites on a regular basis. His mandate came from one of the top strategic objectives at the corporate level, which was to build a sustainable supply base. To ensure sustainable sourcing, each year a number of sustainability audits were carried out,

especially among the low-cost country suppliers of the corporation.

The Group Risk and Insurance Manager handled the insurance company, which provided insurance for the manufacturing plants of the corporation. He had no direct contact with suppliers and did not deal directly with anyone involved in the supply management process. Hence, his visibility of risks from suppliers depended on two sources: first, the group's experiences of insurance claims due to supplier failures; and second, reports generated by the insurance provider that contained information about the various supplier risks to which the different manufacturing units were exposed. He was mainly concerned with the environmental risks that might cause property damage at a supplier's site. This was the only kind of supplier risk that the corporation transferred through insurance. Since one of the manufacturing units had recently

encountered supply disruptions due to a fire at a supplier site, fire risk emerged from the interview as the most significant supplier risk.

4.2. Risk visibility at the divisional level

At the divisional level, two types of actors who were responsible for the supply management process of the group were interviewed: sourcing directors and category managers. Table 5 highlights the primary supplier risks indicated by the sourcing directors.

 Insert table 5 about here

The sourcing directors were responsible for ensuring that the subsidiary companies within the respective division were able to meet the corporate objectives for the supply management process. The category managers were responsible for coordinating purchases among the subsidiary companies under each division to reap the potential benefits of large-volume purchases from suppliers.

While the responsibilities of the sourcing directors were to set directions for strategic sourcing, the responsibilities of the category managers were to ensure that those strategic sourcing directions were met for the categories within each division. Table 6 presents the primary supplier risks mentioned by the category managers.

 Insert table 6 about here

Even though the roles and responsibilities of the sourcing directors and the category managers differed within the divisions, their respective roles displayed strong similarities across the divisions. As a result, the effects of the contextual factors on the visibility of risks were prominent in their responses. For instance, Divisions A, B, and C had similar kinds of products but differed in size, customer base, and sourcing environment. Division D, on the contrary, produced advanced technical products, such as electronic ID cards,

mobile access systems, and was significantly smaller than the other divisions. As a result, this division was highly dependent on its suppliers in terms of technical capabilities and sometimes even required suppliers to deliver goods directly to the customers. Moreover, because this division had government organizations as customers, it had to be very careful with the product delivered to these critical customers. Errors in delivery from suppliers to such customers might cause reputation problems and easily destroy the business relations with a particular country.

In addition, because of the nature of the products sold by Division D, the category manager of this division had numerous suppliers located in China. Every year during the Chinese New Year, a large share of the Chinese manpower leaves for holidays and never returns. He mentioned that the Chinese suppliers sometimes lose as much as 50% of their current workforce, making

them unable to adhere to the promised delivery schedules. Consequently, the primary risk discussed by the category manager of Division D was the employee turnover at the supplier's production site.

Furthermore, the interviews from Division B revealed a variety of risks due to differences in the sourcing environments within this division. The category managers from this division mentioned three different risks as being the most critical: economic risk, cost risk, and dependence risk (due to the volume of business undertaken). This could be explained by differences in the purchases of raw materials between the categories. For example, steel and brass were the raw materials for stamping. According to the category managers, both of these materials were highly sensitive to price volatility. Consequently, cost was mentioned as the main concern by the category manager of stamping. For the lock case category, on the contrary, the supplier base was

highly concentrated; only 2% of the suppliers covered 80% of the spending (see table 6). As a result, the lock case category manager recognized this dependence on suppliers as the primary risk.

which made them very risky for the division.

Division E revealed a specific situation. This division had grown at a fast pace due to numerous acquisitions in recent years. Consequently, the number of suppliers added to this division was extremely high compared with the other divisions. Consequently, the need to aggregate suppliers among the subsidiaries in this division was also considerable. However, because of the long switching time from one supplier to another, such aggregation was very costly. In addition, many suppliers were required to provide spare parts for after-sales services. According to a category manager of this division, many of these after-sales products were highly profitable but mostly single sourced,

4.3. Risk visibility at the company level

The corporation had a highly decentralized management structure. Under the umbrellas of the five divisions, each subsidiary company was responsible for its own purchasing and had its own purchasing manager. The role of these purchasing managers at the company level was to ensure that the incoming materials from the contracted suppliers met the production requirements. The purchasing managers reported periodically to the middle managers (e.g. category managers and sourcing directors) on suppliers' performance. Thus, even though the two purchasing managers interviewed belonged to two different divisions, their positions, as well as their visibility of risks, showed a strong resemblance. Their roles did not vary much due to the context in which they operated, most likely because of the generic reporting requirements on suppliers' performance. Consequently, both the purchasing

managers mentioned quality failures and delivery failures from suppliers as their primary concerns. The information obtained from the purchasing managers was further substantiated when documents from Division D also revealed these two risks as the key risks from suppliers at the company level.

5. Discussion

The results section reveals how different types of supplier risks were visible to the actors working at different hierarchical levels, and with different responsibilities, within the case organization. Such visibility, or lack of visibility, of supplier risks shaped their perceptions and actions regarding which risks to manage and when. In this section the reasons behind these differences in visibility are discussed by analysing the results through two theoretical lenses to answer the second research question: why is the visibility of supplier risks different for different actors? Next, different supplier risks are clustered

according to the various hierarchical levels of the organization. Last, the implications of risk management silos are discussed at length.

5.1. Bounded rationality and differences in internal visibility

The bounded rationality perspective suggests that decisions and actions are based on the amount and type of information that a decision maker has at a particular point in time [35]. In the empirical case, it is observed that the type of information sought by an organizational actor is highly dependent on the roles and responsibilities that s/he has been asked to perform. For example, the Quality and Sustainability Manager at the group level was responsible for carrying out sustainability audits that accumulate suppliers' sustainability-related information. Therefore, he was concerned with sustainability risk because he was mandated by the organization's norm for maintaining a sustainable supply base. Likewise, the

CTO was responsible for the innovation function at the group level. Consequently, he wanted to know whether the suppliers were innovative enough and feared an innovation capability risk from the suppliers.

Furthermore, the managers at the divisional levels were responsible for strategic sourcing. Hence, their main concern was sourcing risks, and they were constantly seeking information on how to mitigate these risks from the suppliers. Finally, since the purchasing managers primarily interacted with their suppliers to ensure material deliveries, they assembled information on quality risks and delivery risks, which made these risks more visible and prominent to them.

Thus, the current findings revealed that the internal visibility of the external supplier risks was dependent on differences in the roles, responsibilities, and hierarchical levels of the respondents. This suggests that,

depending on the differences in roles and responsibilities, actors in a complex organization form individual sets of conceptualizations of risk, which, in the long run, may create role-specific overconfidence in the specific set of risk mitigation strategies related to each type of role. Consequently, risk management silos are created.

5.2. Contingency theory and differences in risk visibility

Differences in risk awareness were apparent among the respondents, for which the bounded rationality due to the organizational position of the respondents had little explanatory power. For instance, in spite of the generic roles, such as the sourcing directors and the category managers, which were standardized across the divisions, their interviews displayed significantly different perceptions of supplier risks. Instead of role specificity, these differences reflected differences in the immediate contexts in which each

sourcing director and category manager operated. Two contingency variables were important specifically in this respect: the technology [43] and the strategic sourcing environment [44].

For instance, the effect of technology as the contingency factor was visible in the risks mentioned by the Division D respondents. Since the products of Division D had a higher degree of technical sophistication than those of the other divisions, the sourcing directors of Division D emphasized technology and reputational issues as key risks from their suppliers (see table 5). While some of the responses from the other divisions were common (e.g. both Division C's and Division E's sourcing directors mentioned switching time as the key risk), none of the respondents from the other divisions mentioned risks similar to those of Division D.

Likewise, the effect of the strategic sourcing environment as a contingency factor was visible in the responses of

category managers from different divisions. For instance, for the category managers of Division B, different concentrations of the supply base resulted in risks such as economic risk, cost risk, and volume dependence risk from suppliers. On the contrary, for the category manager of Division D, the context of having the key supply base in China translated into risk such as employee turnover. In addition, the responses of the category managers of Division B revealed that the differences in the strategic sourcing environments may also vary within a division. Even though they belong to the same division, their operational context varied considerably. When the supply base concentration was moderately high (e.g. for the category manager of lockset and stamping), the primary concerns were cost and economic risk from suppliers. On the contrary, when the supply base concentration was extremely high (e.g. for the category manager of lock cases),

the principal risk perceived was the volume of purchases from each supplier, since this easily creates high dependence on single suppliers.

In brief, the above findings suggest that risk mitigation strategies need to be contextualized, not only on the organizational level but also due to various operational contexts within an organization. Consequently, one risk mitigation strategy may not fit all types of organizations and not even all organizational units under the same corporate umbrella.

5.3. Different silos at different levels of hierarchy

As highlighted in the theoretical background section, risks in organizations appear in clusters and the nature of the dependency among risks may take a hierarchical form. Moreover, the nature of relationships (e.g. cause and effect) among risks in reality is particularly complex [24]. By analysing the risks mentioned in the interviews

using the conceptualization of risk by Hallikas et al. [24], it was possible to identify a pattern in silo-based risk management in relation to the respondents' hierarchical positions.

Various clusters of risks seem to appear at different hierarchical levels (see table 7), and these risk clusters appear to be closely related to the organizational functions performed at each hierarchical level. For example, the risks of quality and delivery failures primarily appeared in interviews with respondents at lower hierarchical levels. The nature of this type of risks is operational. Consequently, these risks were identified, assessed, and mitigated where the operations of supply management were carried out on an everyday basis, that is, primarily in various subsidiary companies.

 Insert table 7 about here

Contrarily, strategic risks, for example issues concerning innovation,

the environment, and sustainability, appeared in the interviews with the respondents at the group level (table 7). These risks also reflected the organizational positions, responsibilities, and functions performed at the corporate headquarters. Furthermore, at the intermediate level, that is, the divisional level, the main responsibility of the divisional management was to handle issues related to various sourcing decisions. Consequently, sourcing-related risks, such as risks related to the nature of the source, the switching time, and employee turnover, primarily appeared in the interviews with the respondents at the divisional level.

Consequently, the current findings suggest that there are different kinds of risk management silos at different levels of the organizational hierarchy. In large and complex organizations, all the actors may work with limited visibility of the supplier risks. As a result, the division of

labour that is created to handle the supply management process may direct the actors involved to specialize and focus on their specific cluster of risks. Thus, in large organizations, risk management silos occur as a side effect of the division of labour and the functional differentiation.

To summarize, this research indicates that silo-based risk management may be a consequence of complex structures in large global organizations. Because of the differences in the organizational roles and responsibilities and the operational contexts, the internal visibility of supplier risks among the various actors involved in the supply management process changes and, consequently, the measures to tackle those risks are performed in silos. However, in theory, effective risk management is claimed to be a holistic, enterprise-wide process involving all the key stakeholders in, for example, finance, senior management, internal

auditing, and risk management [50].

Therefore, it is crucial for large global organizations to understand the implications of silo-based risk management to deal with various risks effectively and efficiently.

5.4. Implications of silo-based risk management

Hallikas et al. [24] argued that the cause and effect relationships among numerous risks are complex in practice.

The results of this study extend this argument further by revealing the differences in visibilities of various supplier risks across different hierarchical levels. This difference in visibility adds to the complexity and can be comprehended by understanding the types of dependencies among various risks. Observably, there are two types of dependencies among risks: a positive dependency and a negative dependency. A positive dependency means that removing a risk will help to eliminate one or several risks. A negative

dependency, on the contrary, means that removing one risk may cause (create) one or several other risks. Figure 1 depicts these two types of dependencies across various hierarchical levels in the case organization.

Insert figure 1 about here

As depicted in figure 1, risks such as quality failures and delivery failures at the subsidiary company level may be caused by one or several other risks, such as sustainability risk, employee turnover risk, or environmental risk, that are visible at the group or at the divisional level. Hence, it may not be problematic to manage such risks in silos, because it can eventually assist organizations in avoiding quality and delivery failures while carrying out operations. Similarly, reputational damage may occur due to the lack of sustainable practices at suppliers' sites. Therefore, managing sustainability risk by performing regular

sustainability audits in isolation at the corporate level may not be problematic.

On the contrary, the innovation capability (see figure 1) of suppliers (the prime risk visible to the CTO at the corporate level) may potentially conflict with switching risk and cost risk (the prime risk visible to the sourcing directors and category managers at the division level). Therefore, if the sourcing directors and category managers who are positioned in the diverse divisions around the world are not aware of such a risk that is visible to the CTO at the corporate level, they may end up selecting a non-innovative supplier and as a result unintentionally jeopardizing the corporate vision of the group to be the innovation leader in the industry. Similarly, a supplier may have high technological capability but may fail to deliver the required quality and delivery specifications. Thus, removing such a supplier because of a quality failure or a delivery failure at the company level

may potentially create a technology risk at the corporate/group level. Therefore, in cases in which there are negative dependencies among risks at different hierarchical levels, managing risks in silos can be problematic.

Consequently, it is elemental for organizations to comprehend the nature of the dependencies (e.g. positive or negative) among different types of risks to tackle the risk management silos that may exist at various hierarchical levels within an organization. Understanding the positive dependencies among risks will assist organizations in carrying out risk management activities in silos without much need for integration. Identifying the negative dependencies among risks will support organizations in recognizing cases in which managing risks in silos is counterproductive. Negative dependencies are critical, because the adverse impact of silo-based risk management is the largest for such cases. As revealed in the previous

section, risk management silos are formed according to the function performed at different hierarchical levels. Managing risks in one such functional silo can potentially affect risks in another silo. Since this hierarchical nature of organizations is ubiquitous, organizations need to have some responsible levels with awareness of internal visibility and risk dependencies, especially for tackling the negative dependencies among risks.

6. Conclusion

This paper aimed to answer two research questions. First, how are different supplier risks visible among the actors within a purchasing firm? Second, why is the visibility of supplier risks different for different actors? The findings suggest that different actors working at the different hierarchical levels of the organization do indeed see different risks from suppliers, firstly because the organizational actors are bounded by their roles, their responsibilities, and the

rules of the organization and secondly due to the contingencies, such as technology and the strategic sourcing environment, that make certain types of risks critical for specific individuals. In other words, organizational hierarchies are encapsulated in different roles and responsibilities, which may lead to visibility imbalances. Therefore, it might be difficult to avoid risk management silos; hence, they must be managed. To set up the most effective risk management approach (e.g. silos vs integrated systems), it is critical for organizations to understand the types of dependencies among risks. In the case of a positive dependency among risks, whereby removing one risk from one silo may help the removal of risks from other silos, managing risks in silos can be quite efficient and effective. In cases of a negative dependency, whereby removing one risk from one silo may create new risks in other silos at different hierarchical levels, managing risks in

silos can be counterproductive. Hence, organizations have to take measures such as cross-functional integration and communication among different hierarchical levels that may potentially increase the internal visibility of risks among the stakeholders involved in the supply chain management process.

It is not possible to claim generalizability based on a single case study. However, given that the case is a representative sample of a large, global corporation in the manufacturing industry, it is plausible to assume that the phenomenon (e.g. risk management silos) and the explanations (e.g. why the silos of risk management persist) are also valid in many other complex organizations. Admittedly, though, silos of risk management may come in diverse shapes and forms in different industrial set-ups because of the variations in roles, responsibilities, and context; thus, studying silos in other organizations can be an avenue for future research.

Furthermore, the multi-faceted empirical picture of supplier risk management that is provided in this paper implies that there is a latent need for in-depth case studies to gain rich insights into the realities of organizations operating in the supply chain context. The findings suggest that these realities vary considerably among the actors working at different hierarchical levels of the organization. Quite surprisingly, the current supply chain research portrays a single, homogeneous, and monolithic view of organizations. However, from an in-depth understanding of supplier risk management in practice, this study reveals that future research needs to take account of the heterogeneity of perspectives that exist even in a single organization (e.g. a focal firm). This means acknowledging the presence of an internal variety of perspectives (from the CTO to the sourcing manager, to the category manager, and to the purchasing

manager) in present-day purchasing organizations and configuring risk management processes accordingly.

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*Table 1: Examples of Supplier Risks in
the Literature*

Supplier Risk	Definition	Prior Research
Economic	Risk related to economic issues of supplier, insolvency, bankruptcy, lack of financial stability	[21], [23]
Environment	Risk due to uncertainty in the supply chain environment, accidents such as fires, social political actions, natural disasters	[21], [22]
Technology	Risk of technology issues, e.g. suppliers are not technologically competitive	[21]
Sustainability	Violation of socially and ecologically sound production at a supplier's site, e.g. child labour, workers' health	[26]
Innovation capability	Suppliers are not innovative enough	[1]
Employee turnover	Incapability of keeping employees, resulting in a massive loss of employees	[25]
Cost	Change in the price of purchase goods due to scarcity, unavailability in the market, or a wilful increase of the supplier	[51]
Switching time	Amount of time taken to replace an existing supplier	[23]
Volume of business given	Dependence on suppliers in terms of high spend	[40]
Nature of sources	Number of supplier sources available in the market: sole, single, dual, multiple	[52]
Quality failures	Purchase goods do not meet the quality specifications	[51]
Delivery failures	Delivery failures of purchased goods, such as missing on-time delivery, missing full-quantity delivery	[51]
Reputation damage	Risk of the corporate reputation being damaged by the supplier due to sustainability issues, quality of products, etc.	[53]

Table 2: Differences among the Divisions in the Case Organization

Attributes	Regional Division A	Regional Division B	Regional Division C	2. Divisiona		Insurance Manager
				1 level Global Product in Division D	6	Global Product Division E
Sales	21%	28%	14%	directors	24%	Division
Number of employees	6,620	10,260	15,284		3,029	A, B, C, E 7,429
Regions	North and South America	Europe, Middle East, Africa	Asia, Australia, New Zealand		Global	Directors – Division D Global
Products	Mechanical and electromechanical locks, cylinders, and security doors			Category managers	Secure issuance of cards, RFID identification technology	managers – Division B after-sales category manager –
Number of subsidiary companies	40	42	30		17	Division C, D, E
Number of suppliers	2500	3400	1200	3. Company level	500	2
						managers of subsidiary companies – Divisions B and C
Total						18

Table 3: Positional Level of the Informants of the Case Organization

Levels	Number of interviews at each level	Informants
1. Group level	4	Chief Technology Officer, Group Supply Chain Director, Group Sustainability and Quality Manager, Group Risk

Table 4: Risk Visibility at the Corporate Group Level

Informants	Roles	Primary supplier risks	Examples of quotes from interviews
Chief Technology Officer	Executive board member . In charge of sustainability, innovation, and supply management processes	Innovation capability	“Product innovation is one of our key strategies. For example, some of our sensors are developed by mobile phone manufacturers. We have to ask our suppliers to develop those sensors”
	To design and develop supply management of the group	Nature of the market	“We are a very small player in motors. We need to compete against big companies”
Group Quality and Sustainability Manager	To carry out sustainability audits among suppliers of the group	Sustainability	“Whether suppliers are doing any unethical practices such as having child labour, not meeting working hour regulations, etc.”

Informants	Roles	Primary supplier risks	Examples of quotes from interviews
Group Risk and Insurance Manager	To procure insurance for the group	Environmental	“We had a fire incident due to one of the suppliers who was located within our plant premises”

Table 5: Risk Visibility of the Divisional Sourcing Directors

Informants	Context	Primary supplier risks	Examples of quotes from interviews
Supply Chain Director, Division A	Large, decentralized division with a manual and semi-automatic product range	Economic	“The factor I find most critical is financial stability of the supplier”
Vice President, Supply Management Division B	Large, centralized division with a manual and semi-	Nature of source	“Some categories are more difficult to source than another

Informants	Context	Primary supplier risks	Examples of quotes from interviews	Informants	Context	Primary supplier risks	Examples of quotes from interviews
	automatic product range		. For example, because we are located in Europe, it is easier for us to source for the machining category. However, for the lock case, we need to go to low-cost countries like China and sourcing becomes difficult”		and semi-automatic product range		difficult to switch because they are developing products with us and it would take a long time to develop another supplier like that”
				Supply Management Director, Division D	Small division with a highly technical product range	Technology	“We need to select and partner with suppliers which have high technical capabilities but it is also risky. We have some suppliers in Japan and we
Director, Global Supply Chain Division C	Large, decentralized division with a manual	Switching time	“There are some suppliers that are very				

Informants	Context	Primary supplier risks	Examples of quotes from interviews	Informants	Context	Primary supplier risks	Examples of quotes from interviews
			are trying to develop alternatives in Korea”	Category Manager Lock Set, Division B	Large supply base, but concentrated (15% of the suppliers cover 80% of the volume purchased)	Economic	“We are responsible for keeping the supplier alive”
Director Strategic Sourcing, Division D	Government as a customer base	Reputation damage	“If we have any issues such as delivering wrong labels when selling to the government we will have a bigger loss”	Category Manager Stampi ng, Division B	Large supply base, but concentrated (13% of the suppliers cover 80% of the volume purchased)	Cost	“We had to let one supplier go due to price increase issues. However, we needed some time to switch to other suppliers”
Procurement Director, Division E	Division is growing very fast with a high acquisition rate	Switching time	“Risk of switching is unfortunately high”	Category Manager Lock Case, Division B	Large supply base, but extremely concentrated (2% of the	Volume of business given	“Finding alternative sources of supply is difficult for

Table 6: Risk Visibilities of the Divisional Category Managers

Informants	Context	Primary supplier risks	Examples of quotes from interviews	Informants	Context	Primary supplier risks	Examples of quotes from interviews
	supplier covers 80% of the volume purchased)		some categories. To identify and qualify second sources are difficult”				loss of manpower affects quality and delivery”
Category Manager, Division C	Most of the supply base is in low-cost countries	Nature of source	“Some categories, like screws, are easy to source. Some categories, like trading products, are difficult to source”	Category Manager, Division E	After-sales services generate high revenues	Nature of source	“We need to have dual sources for our high-profit products; otherwise, it is risky for us”
Category Manager, Division D	Key suppliers are in China	Employee turnover	“During the Chinese New Year, 50% of the manpower leaves and never comes back. This				

Table 7: Risks Identified at Different Levels of the Case Organization

Supplier Risks	Group	Di
Innovation capability	*	
Nature of sources	*	
Environment	*	
Sustainability	*	
Economic		
Employee turnover		
Cost		
Technology		
Switching time		
Volume of business given		
Reputation damage		
Delivery failures		
Quality failures		

* denotes at which level a particular risk is mentioned and the number of stars denotes how many time it is mentioned at a particular level

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