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CHALLENGES OF SUPPLY CHAIN VISIBILITY IN DISTRIBUTION LOGISTICS – A LITERATURE REVIEW

Abstract

Purpose: Complex supply chains characterise today's economic life, which is determined by uncertainties and risks. Managing those successfully requires the development of resilient and flexible structures and processes based on information transparency, which enables better decision-making, especially in times of global crises. In this context, supply chain visibility (SCV) is defined as the stakeholders' capability to have access to accurate and timely information about the flow of goods. Although the importance of SCV has been discussed in scientific literature and practice, challenges still inhibit improved SCV, particularly in distribution logistics. These have been scarcely investigated. The purpose of this study is to identify the challenges of SCV in distribution logistics and to provide implications to address them.

Methodology: A qualitative content analysis (QCA) spanning 26 scientific articles was used.

Results: We found evidence of challenges inhibiting SCV in distribution logistics within the three aggregated dimensions of *inappropriate processes & technologies and information systems, lack of communication & trust,* and *insufficient monitoring & decision-making metrics.* The findings show that trust can be seen as both a challenge and a prerequisite. Despite the possibilities of digitalisation, there exist trade-offs between manual processes and new technology implementation. Decision-making can be based on individual experiences, and monitoring can be difficult due to undefined metrics.

Conclusion: Practitioners may use the findings to better identify and address the challenges of SCV in distribution logistics. Further studies could extend the findings through empirical studies, which would allow practitioners to assess their level of SCV and derive initial solutions.

Keywords: Supply chain visibility, supply chain transparency, supply chain management

1. Introduction

Increasing complexity and dynamic changes in global supply chain networks are key reasons for growing uncertainties and risks in modern value chains (cf. Messina et al., 2018). The COVID-19 crisis demonstrated that supply chain visibility is critical for managing disruptive events (cf. Finkenstadt & Handfield, 2021; Norwood & Peel, 2021, p. 416; cf. Freichel et al., 2022). Furthermore, increased visibility is essential to sufficiently control supply chains (cf. Swift et al., 2019). Certain industries

and logistics phases require SCV. One example is the distribution logistics of pharmaceutical goods (cf. Papert et al., 2016). Another example is food distribution logistics, regarding quality and safety requirements (cf. Shi et al., 2010). Inventory availability is required to improve supply chain distribution processes in omni-channel logistics (Wollenburg et al., 2019, p. 12). Inventory allocation across fulfilment centres and offline and online retail warehouses requires channel-integrated availability information through appropriate ERP systems (cf. Hübner et al., 2016). Hence, SCV is an important topic in the field of distribution logistics and is currently receiving attention.

However, it still seems difficult for many companies to improve SCV (cf. Swift et al., 2019). SCV is based on accurate information exchange (Moshood et al. 2021, p. 20), which is often critical within and between companies (Williams et al., 2013, p. 551). Furthermore, digital infrastructures are a prerequisite for SCV (Moshood et al., 2021, p. 20). Technologies for information exchange have been discussed in academia and practice in recent decades, e.g. concerning electronic data interchange (EDI) (cf. Mossinkoff & Stockert, 2008), Blockchain (cf. Sander et al., 2018; cf. Grest et al., 2019; cf. Lustenberger et al., 2020; cf. Sternberg et al., 2021) and especially RFID (cf. Schmidt, 2006; cf. Straube et al., 2007; cf. Morenza-Cinos et al., 2019; cf. Kgobe & Ozor, 2021). Nevertheless, IoT-based technologies for SCV often have to cope with standardisation, security, and accurate information sharing (Ahmed et al., 2021, p. 20).

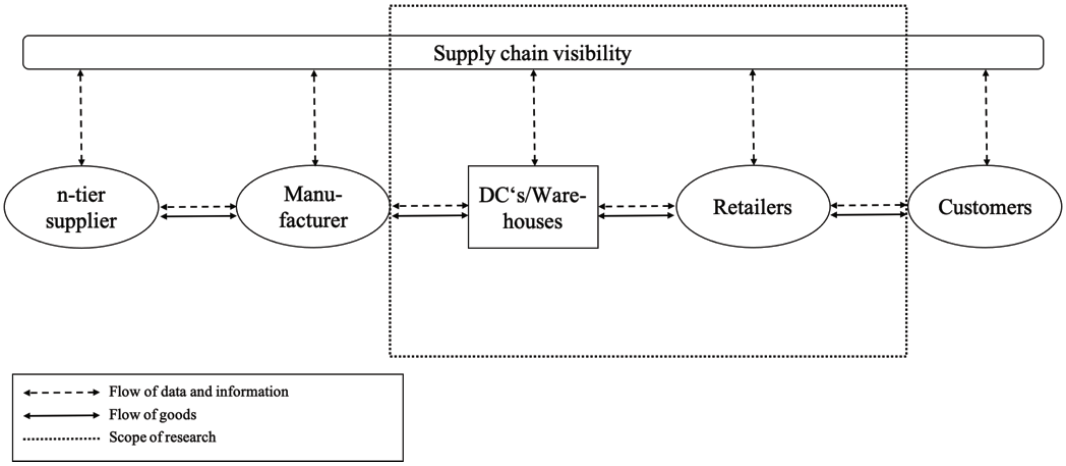
In the context of supply chain information sharing, Kembro et al. (2017, p. 78) define barriers as factors that are too difficult to cope with, while challenges are factors that are complex but can be overcome or solved. Kalaiarasan et al. (2022, p. 5) categorise barriers and challenges together. Thus, we use the term challenges of SCV as factors that hinder the improvement of visibility and transparency in supply chain management and are difficult to overcome.

Challenges of SCV first need to be identified and investigated to specify problem areas better and derive areas of action. Kalaiarasan et al. (2022) provide a holistic framework for SCV based on a literature review of SCV articles. The authors also synthesised barriers and challenges as one of four categories of their SCV framework. In particular, the challenges of SCV in distribution or retail logistics require more investigation.

Therefore, we provide a synthesis of SCV challenges in a systematic literature review, focusing specifically on distribution logistics. Therefore, the following research question is proposed: *"Which challenges inhibit SCV in distribution logistics?"*.

This study aims to identify these challenges and suggest potential areas of action. Figure 1 illustrates the scope of research of this article.

Figure 1 Scope of research within the supply chain



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This article is structured into the following sections: First, the theoretical background of SCV is explained. Then, the systematic literature review methodology is described before presenting the literature findings. Finally, the results and implications are discussed and summarised, and suggestions for further research are given.

2. Theoretical background

Supply chain visibility is known as a key success factor for modern supply chain management. Definitions are proposed rather ununiformed in academia. The following section gives a short overview and working definitions.

2.1 Conceptual understanding of SCV

SCV can be defined as the capability of companies to manage access to data and information. Moreover, it is the capability to identify locations and delivery status of entities in real-time to reveal planned and unplanned events (supply chain event management). This can improve decision-making (Francis, 2008, p. 182; Goh et al., 2009, p. 2549) and supply chain resilience (Roy, 2021, p. 25). Sodhi and Tang (2019) understand SCV as the ability of companies to identify information about entities transiting upstream and downstream supply chains, while supply chain transparency refers to the disclosure of information about products and operations to groups of interest such as consumers or investors (Sodhi & Tang, 2019, p. 2948).

SCV is both a prerequisite (cf. Otto, 2003; Roy, 2021, p. 25) and an outcome of information sharing (Moshood et al., 2021, p. 9). Moreover, visibility can be linked to specific elements. For example, Goh et al. (2009, p. 2550) specify SCV in terms of visibility of "process", "inventory", "demand," and "exception".

In summary, there are various definitions of the term SCV in scientific literature, which remain inconsistently defined. In this article, the definition of SCV is used in line with Francis (2008, p. 182), Goh et al. (2009, p. 2549), and Roy (2021, p. 25).

2.2 Benefits and characteristics of SCV

Various reasons lead to the need for increased supply chain visibility. In complex supply chain networks, SCV enables improved planning of activities and business processes or strategic competencies of companies (Bartlett et al., 2007, p. 308f.; cf. Somapa et al., 2018). This can lead to increased efficiency, profitability, cost reductions, and higher market valuation (Sodhi & Tang, 2019, p. 2949f.; Swift et al., 2019, p. 423f). Moreover, increased SCV can improve supply chain performance (Bartlett et al., 2007, p. 308f.). SCV can improve customers' perception, especially in case of reputation loss (Sodhi & Tang, 2019, p. 2949f.). In addition, it can enhance customers' loyalty through offered and disclosed information enabled by SCV (Pundir et al., 2019, p. 0156f.).

Supply chain performance indicators such as service level, cost, quality, and time have been assessed to measure SCV (Caridi et al., 2014, p. 2). Furthermore, theft or loss and counterfeiting of goods can be avoided by functioning SCV. Specific physical information about goods transhipped, such as temperature or humidity, can be controlled (Pundir et al., 2019, p. 0156f.). Therefore, a higher level of SCV leads to improved supply chain risk management (Sodhi & Tang, 2019, p. 2949f.).

Somapa et al. (2018, p. 329) distinguish characteristics of SCV between automational, informational, and transformational characteristics. The first characteristic refers to companies' ability to access information through the automatic and electronic capture and transmission of data and information. The second characteristic encompasses the need for a certain quality of information in terms of "accuracy, timeliness and completeness of information" (Somapa et al., 2018, p. 329). Caridi et al. (2010, p. 600f.) described information quality in terms of time-related aspects, which refer to novelty, timeliness, and validity aspects regarding accuracy. The last characteristic refers to the exchange of information in terms of its real use (Somapa et al., 2018, p. 329).

3. Methodology

The methodology of this article follows a qualitative content analysis (QCA) to build a literature review. Qualitative approaches are especially appropriate in supply chain research, as they offer the possibility to deeply understand, extract and systemise the complex supply chain reality into explicit knowledge and theory due to the interpretative paradigm of qualitative research. In doing so, they offer a better understanding of supply chain complexities and operations (Trautrims et al., 2012, p. 838f.). Qualitative approaches allow identifying elements and

their interrelations in the investigated area from an informant-centred perspective, as those persons are forming the specific reality, which is under research. For this reason, there is qualitative rigour, as the theoretical findings are based on informant-centred findings (Gioia, 2021, p. 23f.).

For extracting information from already existing studies, we use both guidelines for systematic literature analyses (cf. Tranfield et al., 2003; cf. Watson et al., 2018) and the methodology of qualitative content analyses (cf. Schreier, 2012; cf. Gioia et al., 2013; cf. Mayring & Fenzl, 2019; cf. Gioia, 2021). The former is for the selection process of the articles to be included, the latter for their in-depth analysis.

3.1 Data Collection

Relevant articles for the subsequent QCA need to be identified by planning an appropriate data search process, which is based on the research question of this article, mentioned in section 1. This is followed by a selection of search terms and databases. In addition, a search strategy is needed to select articles based on inclusion and exclusion criteria. Therefore, the search terms are selected and linked with "OR" and "AND" to either alternate or combine them as follows:

TITLE-ABS-KEY (("Supply chain" OR "logistics") AND ("visibility" OR "transparency") AND ("retailing" OR "distribution" OR "fulfilment" OR "fulfillment")).

These search terms must be in the title, abstract and keywords of articles and were searched in the Scopus database, resulting in 457 articles. Then, filters were selected by documentation type: academic journal and conference paper; publication stage: final; subject area: business, management and accounting; language: English; and publication years: 2000-2022.

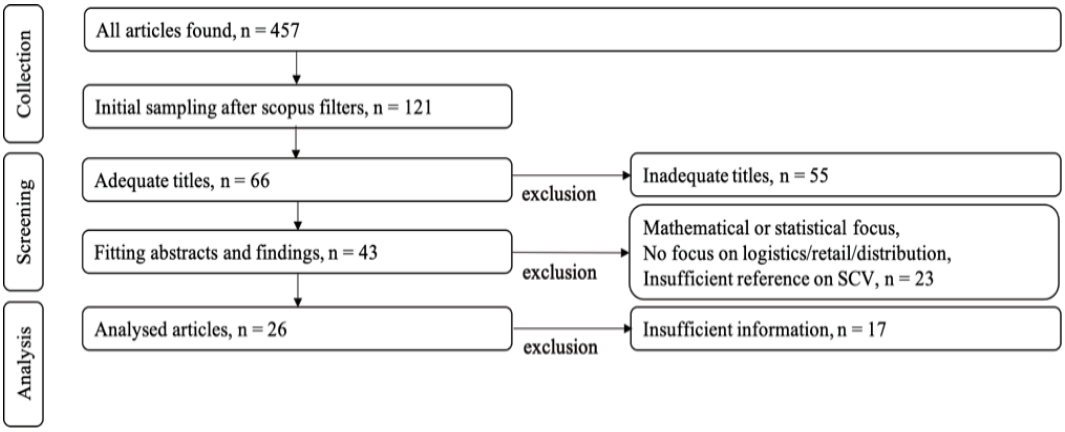
An initial sample of 121 articles remained. All 121 articles were downloaded into a Microsoft Excel spreadsheet. To reduce the number of articles to suitable titles, abstracts and findings that match the research question and scope, articles with the following criteria were excluded:

- Mathematical or statistic models/simulations without thematic reference to SCV;
- No focus on logistics or retail/distribution;
- Insufficient reference on the topic of SCV in general.

43 articles remained. During the reading process, 17 articles were excluded as they did not contain information relevant to this research.

Finally, 26 articles remained that were appropriate for the coding frame of the QCA (Figure 2).

Figure 2 Search strategy for article selection



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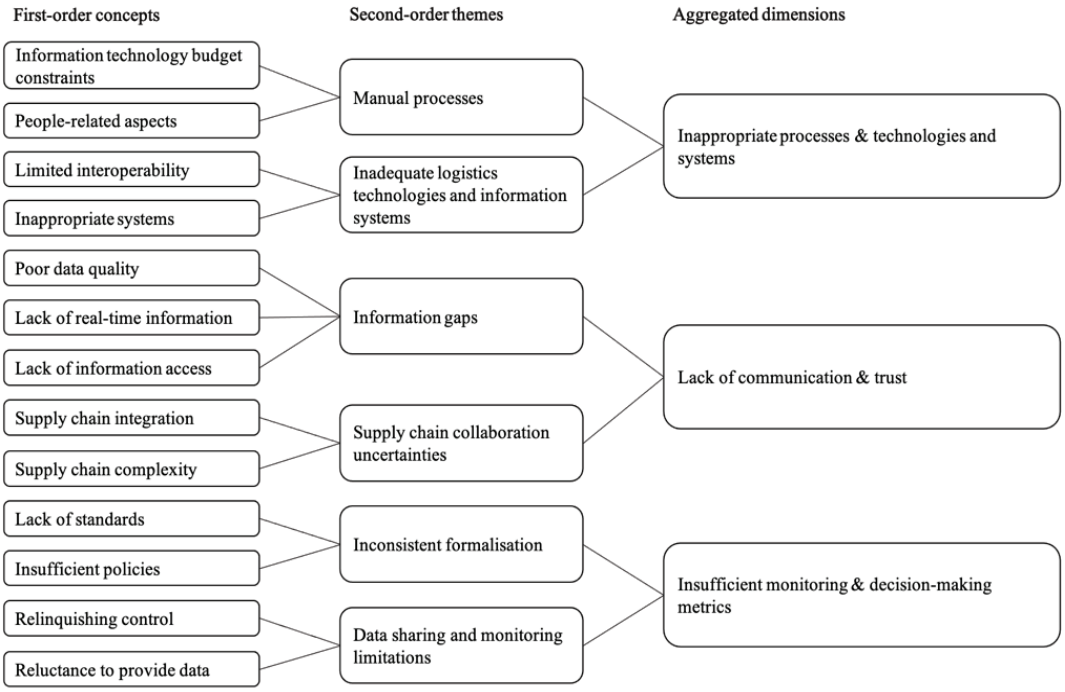
3.2. Data Analysis

The tool MAXQDA was used for conducting the QCA. Therefore, the 43 articles were uploaded to the MAXQDA application. By analysing all 26 articles line by line, relevant information (=codes) regarding our research question was systematically extracted. By iteratively reviewing the gathered information, patterns of unique and common aspects emerged, which allowed the further systematic aggregation of information into higher level knowledge in an inductive way (Schreier, 2012, p. 60; Gioia, 2021, p. 24).

After extracting the codes, they were summarised into paraphrases to condense them and avoid redundancies (Schreier, 2012, p. 107; Gioia et al., 2013, p. 20-22). Then, these paraphrases were iteratively reviewed and categorised into first-order concepts based on their commonalities and differences. These were again combined and assigned to second-order themes (Gioia, 2021, p. 25). In the next step, the second-order themes are aggregated into aggregated dimensions. First-order concepts, second-order themes, and aggregated dimensions build a data structure which captures the methodological and theoretical development of the analysed data from raw material to the aggregated dimensions (Gioia et al., 2013, p. 20-22). The aim is a data structure that can lead to a better understanding of how all concepts and dimensions are related (Gioia, 2021, p. 24-26). In the following chapter, the findings of the analysis are described based on the data structure represented in Figure 3.

Figure 3 First-order concepts, second-order themes, and aggregated dimensions



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4. Analysis

Our analysis indicates that the challenges regarding SCV are routed in the dimensions of "inappropriate processes & technologies and systems", "lack of communication & trust", and "insufficient monitoring & decision-making metrics". They are presented in-depth in the following section.

4.1 Inappropriate processes & technologies and systems

4.1.1 Manual processes

Information technology budget constraints

Information technology is an enabler for SCV (Somapa et al., 2018, p. 313). However, there is also a lack of simple and cost-effective solutions for small and medium enterprises (Azevedo et al., 2004). Advances in RFID and other technologies have been made in retail logistics (Gaukler et al., 2008), but they remain cost-intensive (Kwok et al., 2010; Ahmed & Omar, 2019). Therefore, profitability varies (Bertolini et al., 2012) and cost-benefit trade-offs hinder technology adoption (Goebel & Günther, 2009). For instance, RFID is only profitable in distributing high-value products, e.g. expensive consumer electronics and apparel (Goebel & Günther, 2009). Another example shows that quality estimation of bacteria in food is more cost-effective (Shi et al., 2010).

People-related aspects

Manual processes such as barcode scanning can be cost-intensive due to labour requirements (Gaukler et al., 2008). In addition, inefficiencies in existing operations occur due to manual procedures, leading to the loss of information, duplicate and incorrect data, or their unauthorised disclosure (Choy et al., 2007; Schenk & Clausen, 2020). Hence, it is important to encourage employees in new system implementation (Chen et al., 2014). Acceptance of new technologies is, however, a challenge for creating transparency. For this reason, local automotive vendors, for example, delay system implementation (Ahmed & Omar, 2019).

4.1.2 Inadequate logistics technologies & information systems dimension

Limited interoperability

Improvement of SCV can be limited regarding the technical interoperability of information technologies. For example, barcodes do not provide rewritable data storage, and data loggers do not provide an identification function (Papert et al., 2016). Furthermore, barcodes have limited information density (Papert et al., 2016). Other information identification technologies, such as RFID, can be read automatically compared to barcodes, but active RFID tags are limited due to their limited lifetime, larger size, and higher cost (Delen et al., 2007). Dealing with the amount of real-time data, e.g. converting RFID data into usable information for new decision-making tools, can be challenging (Ranky, 2007).

Moreover, information and data storage technologies, such as cloud systems, are not always compatible with other key information systems (Suherman & Simatupang, 2017).

Information technologies can be limited due to disruptions in information transmission beyond distribution sites. Goods and their location status are often not visible during transportation (Suherman & Simatupang, 2017). Information at the distribution centre level can be transmitted via a wireless connection to the internet. However, during transport, information transmission depends on satellite communication or cellular network infrastructure, which is less cost-intensive but has lower coverage (Shi et al., 2010).

Inappropriate systems

Information systems can be inappropriate for improving SCV. For example, ERP systems can be unsuitable for dynamic supply chain management and may become a strategic disadvantage if not fully exploited, according to Seethamraju (2009). In addition, legacy systems or systems that are not integrated can become a major obstacle (Howard et al., 2005). Systems should be driven by suitable aspects, e.g. by orientation towards order demand instead of inbound or production logistics (Howard et al., 2005).

Moreover, software packages may not always provide the full support required due to clear gaps in planning and coordination activities (Azevedo et al., 2004).

Finally, inadequate implementation of information systems leads to inefficient visibility and transparency (Suherman & Simatupang, 2017; Ahmed & Omar, 2019).

4.2 Lack of communication & trust

4.2.1 Information gaps

Poor data quality

Information can be unreliable and unavailable (Ahmed & Omar, 2019). Consequently, a lack of information quality can affect performance measurement (Choy et al., 2007), especially if the metrics are not well defined (Munoz & Clements, 2008).

Lack of real-time information

Lack of correct, accurate, and timely information leads to various issues regarding supply chain uncertainties (Choy et al., 2007). Current systems may not fully provide real-time information across supply chain networks, which is required for promised delivery due dates to customer orders, early warning systems across the supply chain network, large overstocks, long throughput times, and reduced responsiveness to unplanned events (Azevedo et al., 2004). In addition, inaccurate inventory information due to poor process quality, theft, and spoilage require real-time information (Delen et al., 2007), which can reduce bullwhip effects (Jonsson & Mattsson, 2013). However, supply chain metrics are not sufficiently related to customer satisfaction, and metrics are not regularly monitored (Munoz & Clements, 2008).

Lack of information access

Information sources and access to information can vary, leading to information asymmetries (Ahmed & Omar, 2019). In particular, event information can still be exchanged via email or telephone, according to Ranky (2007). In addition, separate systems used by trading partners can lead to duplicate data (Howard et al., 2005).

Lack of process flexibility in adapting to changing supply chain configurations, inadequacies of technology interfaces to complement enterprise systems, lack of trust between supply chain partners, and lack of advanced decision support capabilities are challenges (Seethamraju, 2009). The latter, in particular, is often based on incomplete data, which leads to decision-making based on individual experience. Furthermore, these are entered manually into the system (Schenk & Clausen, 2020). Consequently, individual decision-making can lead to perturbation in the flow of goods (Munoz & Clements, 2008).

4.2.2 Supply chain collaboration uncertainties

Supply chain integration

Within supply chains with a large number of members, insufficient information sharing in terms of unclear and unreliable information due to a low level of integration leads to information distortion. This leads to asymmetries in collaboration (Ahmed & Omar, 2019). Therefore, effective information sharing depends on supply chain integration (Fatorachian & Kazemi, 2021). Moreover, trust is considered an important challenge in supply chain risk management (Seethamraju, 2009). On the other hand, trust is a prerequisite and enabler for visibility and transparency (Seethamraju, 2009; Hammervoll & Bø, 2010; Chen et al., 2014; Ahmed & Omar, 2019). Jüttner & Maklan (2011) suggest visibility as part of supplier contracts to avoid information not being shared. However, Ahmed & Omar (2019) note that trust cannot be guaranteed through contracts.

Supply chain complexity

Uncertainties in information flows are caused by complexities in supply chain networks. These can generally result from a lack of adequate legislation, different currencies, different economic policies, different business cultures, different technical standards, and different infrastructure (Bogataj & Bogataj, 2004).

Moreover, real-time information is essential for accurate monitoring by track and trace but cannot be fully transferred to the entire supply chain network (Schenk & Clausen, 2020). It is, for example, impossible to identify the flow of goods and source detection of counterfeit distribution, according to Kwok et al. (2010).

4.3 Insufficient monitoring & decision-making metrics

4.3.1 Inconsistent formalisation

Lack of standardisation

Standards play an important role to ensure global readability. For example, a data matrix code is intended for counterfeit-proof labelling of medicine in the EU (Papert et al., 2016). However, collaboration can be restricted by the lack of standards (Seethamraju, 2009). Both developed and underdeveloped countries seek greater transparency to improve business, operations, finance, legal, and purchasing. Therefore, formalisation enables transparency in other countries (Ahmed & Omar, 2019). Thus, a lack of standards of protocol and data formats, such as EPC, can become a major barrier for suppliers if not used (Howard et al., 2005). For instance, the EPC standard is RFID's most commonly used data representation (Delen et al., 2007).

Insufficient policies

Policies can influence SCV requirements (Papert et al., 2016). From a global point of view, there is a lack of regulatory aspects in the use of IoT-based data, e.g. policies and laws on data sharing (Srivastava et al., 2019). For instance, traceability requirements may be voluntary rather than mandatory, resulting in less traceability due to reduced participation (Shi et al., 2010). Insufficient information-sharing incentives can lead to information manipulation and distortion (Wan & Sanders, 2017).

In addition, RFID technology is dependent on the transmitting power, which is influenced by legal regulations of different countries, e.g. different frequencies (Kwok et al., 2010).

4.3.2 Data sharing and monitoring limitations

Relinquishing control

Trust and confidence are important for both suppliers and customers (Choy et al., 2007). However, implementing information-intense concepts like VMI or CPFR can result in a lack of trust between trading partners (Thron et al., 2006).

Trading partners can be afraid of relinquishing control. They struggle to share sensitive information. For instance, OEMs sell products to competing retailers. Therefore, the retailers do not want to share sensitive information with the OEM (Thron et al., 2006).

Reluctance to provide data

Given the risk of losing business, there is a conflict between sharing sensitive data and value creation (Seethamraju, 2009). Therefore, trading partners are reluctant to communicate and exchange formal and informal information (Hammervoll & Bø, 2010). Consequently, data sharing needs to be consistent, otherwise, visibility undermines trust, which has a negative impact on relationship management and monitoring. Thus, it proves to be a major challenge (Gunasekaran & Ngai, 2004).

5. Discussion

The results underline that cost-benefit trade-offs hinder the implementation of new technologies and systems (Goebel & Günther, 2009). However, manual or semi-manual processes, such as barcode scanning, can lead to inefficiencies due to loss of information or duplicate data. Despite the existing opportunities for greater digitalisation, there are still activities where information is manually entered into systems instead of using automated solutions (Choy et al., 2007; Schenk & Clausen, 2020).

In addition, the transmission of information through legacy systems leads to inconsistent information sources. There is a trade-off between cost-intensive manual processes, the use of legacy systems, and the cost-intensive or time-consuming adoption of new technologies and systems.

However, encouraging and empowering employees to adopt technologies and systems proves to be a challenge. Practitioners should take time to train their employees and focus on adequate and comprehensive onboarding programmes to avoid a lack of understanding of technologies.

RFID technology appears very frequently in the articles analysed. Thus, there has been a strong interest in RFID in combination with SCV in recent years (cf. Chanchaichujit et al., 2020). This technology may have the potential to improve SCV, but it also has its drawbacks, e.g., cost-benefit trade-offs, different frequencies, and standards on a global level. RFID can be a suitable technology for real-time information visibility, but it has its technical and regulatory limits for implementation across a whole supply chain network. Thus, RFID may be appropriate for (finished) high-value products (cf. Goebel & Günther, 2009).

Even though RFID appears very frequently in the analysis, it is not the only solution. Practitioners should investigate which technologies are suitable for themselves, their suppliers, and customers to enable the integration of technologies and information systems for improved SCV.

Trust is a frequently mentioned aspect regarding challenges in the analysis. Trust is a challenge for SCV, especially for the customer- and supplier-related factors (Choy et al., 2007; Thron et al., 2006). In this context, there is a fear of relinquishing control between trading partners (Thron et al., 2006). The results show that trading partners have difficulties in communicating and sharing information. Trust can be an enabler and prerequisite of SCV, e.g., as a basis for information sharing. Both perspectives, trust as a challenge and trust as a prerequisite, should be equally considered for improving SCV. Thus, communication between trading partners should be improved. For instance, neutral enti-

ties that provide communication and data-sharing platforms between trading partners may support this.

Insufficient incentives for truthful data or information sharing can lead to complexities based on cultural or infrastructural differences across the supply chain and low supply chain integration. These can result in low levels of SCV. Moreover, policies related to traceability requirements can be more voluntary rather than mandatory, leading to low participation and, thus, less transparency. Practitioners and researchers should examine technical and regulatory limitations on a use-case basis to find detailed solutions for appropriate incentives to achieve greater visibility.

A lack of real-time information needed for early warning systems and decision-making capabilities can lead to decision-making based on individual experiences, resulting in disruptions in the flow of goods (Munoz & Clements, 2008; Schenk & Clausen, 2020). Thus, there is a lack of adoption of advanced decision-support capabilities (Ranky, 2007; Seethamraju, 2009).

Poor data quality can result from undefined and not regularly monitored metrics, leading to a lack of knowledge and negatively impacting performance measurement. However, accurate monitoring across multiple nodes in a supply chain network is very difficult to achieve due to the complexity of supply chain structures (Schenk & Clausen, 2020). Both practitioners and researchers should investigate existing metrics and look for appropriate metrics for performance measurement and decision-making. The changes that have taken place in recent years in terms of operational processes, technologies, big data, and external circumstances require appropriate metrics for regular monitoring of physical and information flows to enable better decision-making.

6. Conclusion

In this article, a literature review of existing articles on SCV was conducted. 26 articles from an initial sample of 121 articles were analysed through qualitative content analysis. The research question "which challenges inhibit SCV in distribution logistics?" can be answered with our above-mentioned aggregated dimensions "inappropriate processes & technologies and systems", "lack of communication & trust", and "insufficient monitoring & decision-making metrics". The following presents the theoretical contribution, managerial implications, limitations of this study, and further research areas.

The main findings show that trust between trading partners is both a prerequisite and a challenge for SCV. Better communication and more trust could be achieved through neutral entities. RFID technology can have great potential for SCV, but implementing it in a whole network is a challenge. Thus, RFID might be appropriate for (finished) high-value products. Which SCV technology is suitable for users and their suppliers and customers should be investigated on a use-case basis. Furthermore, despite the possibilities of digitalisation, manual processes will remain because of a trade-off between the costs of existing manual processes and the costs of implementing new technology. Focusing on appropriate training, onboarding and empowerment could be a way to gain employees' understanding and trust. Decision-making can be based on individual experiences. Metrics can be undefined or insufficiently monitored. However, accurate monitoring across an entire supply chain network can be challenging, e.g., due to the complexity of the supply chain and the limitations of supply chain integration. Technological and regulatory occurrences require improved incentives to enable SCV. In addition, metrics should be reconsidered and adapted to current requirements for monitoring to improve decision-making on performance measurement and SCV.

The results provide an overview of SCV challenges in distribution logistics. Kalaiarasan et al. (2022) provide a holistic SCV framework, which also suggests dimensions and sub-dimensions of challenges. Our findings complement this existing framework related to distribution logistics. Thus, the challenges of SCV in distribution logistics are synthesised and can serve as an overview and extension of the current literature on SCV. Our findings can be considered for further studies. For example, detailed solutions to overcome the challenges can be sought in the recommended fields of action. To complement our findings, further studies could expand the research scope by considering procurement, production, and reverse logistics. Another idea for further studies is that industry-specific challenges could be analysed and compared.

This study is limited in scope. In general, the selection of search terms already limits the articles found for the analysis at the beginning. A literature review

with other search terms may find other articles and thus different or additional results. Therefore, we ask for further studies to investigate if the results are also meaningful for other logistics phases. In addition, the analysis includes publications from the year 2004. Therefore, synthesised statements may be outdated in practice. Empirical research on our SCV challenges can lead to both further and current challenges and their solutions to address them. Moreover, RFID technology appears very frequently in the results of this study because it has received strong interest in the academic literature in recent years. Further studies should focus on other information technologies regarding the challenges of SCV.

New developments regarding technologies like 5G networks, connecting physical units like pallets, boxes, and parcels using telecommunication devices, camera-based vision systems at point-of-sale and in warehouses, avoiding manual scanning as well as information exchange, using blockchains or Artificial Intelligence (AI) and Big Data analytics all impact and drive SCV. However, further challenges may arise with the implementation, which should be thoroughly assessed.

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