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Sopron, 2024. november 7.

7 November 2024, Sopron

FENNTARTHATÓSÁGI ÁTMENET – INNOVÁCIÓS ÖKOSZISZTÉMÁK – DIGITÁLIS MEGOLDÁSOK

SUSTAINABILITY TRANSITIONS – INNOVATION ECOSYSTEMS – DIGITAL SOLUTIONS

Szerkesztők / Editors:
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Efficient Management of Excess Inventory in the Chip Industry: The Role of Standardised Data Transparency between Distributors, Digital Platforms, and SMEs – A Systematic Literature Review

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Abstract:
Between 2019 and 2023, the COVID-19 pandemic, natural disasters, and geopolitical tensions caused significant disruptions in global supply chains, leading to a worldwide shortage of chips. The resulting bullwhip effect led to excess inventories of electronic components at OEMs, CMs, and EMS providers within the SME sector. Using a systematic literature review, this paper investigates how distributors and digital platforms can assist SMEs in the chip industry in managing and optimising their excess inventories. Additionally, it analyses how data transparency influences the efficiency of inventory management. The findings provide practical strategies to support SMEs in efficiently managing and sustainably optimising their inventories, while promoting the circular economy. In addition, they provide the basis for future empirical research, as only few empirical studies have explored the connection between data transparency and the reduction of excess inventories. The role of distributors in the implementation of digital solutions for surplus management also remains underexplored.

Keywords: digital transformation, SME, supply chain management, chip industry, distribution
JEL Codes: O33, L14, D82, L86, Q56

1. Introduction

The chip industry is characterised by rapid technological developments and volatile demand (Moore, 1965; Burkacky et al., 2022; Gentner & Lambrette, 2023). During the period from 2019 to 2023, the COVID-19 pandemic, natural disasters and geopolitical tensions, among other things, caused significant disruptions to global supply chains, resulting in shortages and a global chip shortage (Kleinhans & Hess, 2021; Attinasi et al., 2021; Mahachi et al., 2022; Gentner & Lambrette, 2023). In the light of such market events, companies react by placing larger orders in order to avoid long delivery times (Lee et al., 1997; Frieske & Stieler, 2022). The historically observed and cyclically recurring bullwhip effect is one of the main reasons for excess inventory. Fluctuations in end-customer demand lead to a progressive increase in demand within supply chains, which consequently leads to excessive safety stocks (Forrester, 1958). This also explains excess inventory of electronic components within the chip industry (Zhao et al., 2018; Ackermann, 2024). Small and medium-sized enterprises (SMEs) in particular are faced with the challenge of marketing surplus inventory efficiently and promptly in order to ensure liquidity and minimise capital commitment. (Ackermann, 2024). Against this background, this paper examines how distributors and digital platforms can support SMEs in the chip

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industry in marketing and managing surplus inventory, as well as the impact of data transparency. The aim of the work is to develop practical solutions for the marketing of surplus inventory. The resulting key research questions are:

(1) To what extent can distributors and digital platforms support SMEs in efficiently marketing surplus inventory?

(2) To what extent is standardised data transparency a decisive factor in the respective context?

Despite significant progress in the range of industry-specific digital platforms available, the expansion of distributors' value creation – from traditional suppliers to service providers in the area of supply chain management – and the possibilities of various system connections such as EDI or API interfaces between the players, there are still research gaps, especially with regard to the sustainable marketing of surplus inventory and the role that distributors, digital platforms and standardised data transparency could play in this regard.

2. Theoretical foundations

2.1. Standardised data transparency

Standardised data transparency can be described as a uniform and accessible presentation of data that enables market participants to reduce information asymmetries and make informed decisions. Lack of transparency and asymmetric information can potentially cause market failure. For example, prospective purchasers may be hesitant if information about product quality is unclear (Akerlof, 1970). Access to clearly structured and standardised information is therefore crucial for promoting market stability, minimising competitive disadvantages and strengthening cooperation between market actors (Steglitz, 2000). Bleier (1970) explains that data standardisation contributes significantly to the uniform definition of data fields. This ensures data consistency and comprehensibility both within database systems and between exchanging market players. It also promotes the development of data models that can be used independently of specific hardware or software platforms and enables interoperability. Structured approaches to data processing also support the efficient and error-free exchange and processing of information. According to Porter and Heppelmann (2014), the integration of data standardisation into business processes sustainably increases business flexibility and the ability to respond to market changes.

Pulverer (2014) emphasises the relevance of using transparent and standardised data structures in scientific research which are the basis for the reproducibility and reusability of results. Standards such as checklists and/or guidelines ensure that essential information such as data structures, statistical methods or experimental details are provided consistently and comprehensibly. This makes data more transparent and allows it to be used more efficiently. Khan (2017) presents a similar argument for biomedical research, where standardised reporting guidelines promote transparency and consistency. By creating transparent and comparable data formats, the plausibility and robustness of data are also strengthened. It is emphasised that standards should be taken into account in the planning phase of studies, in order to ensure precise and comprehensible results.

Standardised approaches are also gaining importance in the context of open data. Miller et al. (2018) show that methods such as locality-sensitive hashing (LSH), a procedure for quickly grouping similar data points, and dynamic partitioning strategies, which divide large data sets into smaller units, enable efficient processing of large amounts of data. Unionability tests identify commonalities between attributes and tables, supporting consistent data processing. These approaches increase data transparency and ensure reliable data use.

In addition to scientific aspects, regulatory and technology standards are other crucial approaches. The international standard ISO/IEC 11179, updated as metadata registries (MDR), aims to standardise data capture, provide a basis for data exchange and improve data management at the metadata level (International Organization for Standardization, 1999). In addition, the European Data Act, which will enter into force on 12 September 2025, is a regulatory measure that strengthens data standardisation and transparency at European level (European Union, 2023). Blockchain technologies offer further potential as they improve traceability and transparency along complex supply chains through uniform data structures, and increase trust in these processes (Saberi et al., 2018). To systematically evaluate the efficiency of IT systems, Spagnuelo et al. (2018) developed eight specific metrics: Accuracy, Currentness, Conciseness, Detailing, Readability, Availability, Portability and Effectiveness. These metrics assess the ability of a system to provide users with accurate and understandable information and to provide mechanisms for the traceability and verification of that information. Using the Microsoft HealthVault system as an example, the authors illustrate how such metrics can be applied to make transparency requirements measurable and to improve them in a targeted manner. Standardised data transparency enables access to clearly structured information, fostering decision-making and market stability. In contrast, the value proposition of distributors and digital platforms forms the foundation for implementing strategic measures that directly address customer needs.

2.2. Value Proposition

The combination of products and services defines the value proposition. The needs of stakeholders are specifically taken into account in order to create real benefits. It is also important to formulate the value precisely in order to effectively address stakeholders and combine social, ecological and economic aspects.

Jonker and Faber (2021) emphasise the contextual importance of the triple bottom line (People, Planet, Profit) as the basis for comprehensive sustainability. They identify five key positions of value creation: Transformation, Recycling, Circularity, Regeneration and Restoration. These approaches include transforming raw materials, extending the useful life of materials, restoring ecosystems, and social cohesion. Value propositions not only serve to set objectives, but also to strategically support their implementation as the basis for sustainable business models.

Another approach describes how companies can translate performance advantages into clear value propositions. There are performance benefits from the provider's perspective, and also customer benefits from the perceived added value that takes into account specific problems, expectations and budgets. Customer benefits vary depending on the phase – information, purchase or use – and between stakeholder groups such as technicians, purchasers or managers. Belz proposes a three-step process: identify performance benefits, translate them into specific customer benefits, and finally, develop a value proposition that is communicated to marketing and sales departments. The focus is thus on the specific benefit that convinces customers and creates a competitive advantage (Belz, 2006). For scaling the marketing of the distributor's value proposition, bonus systems prove to be an effective lever. Depending on sales performance, rewards are given through graduated discount models. Such systems enable a predefined and transparent performance evaluation of distributors, taking into account core competencies and regional coverage and specifically increasing the motivation and commitment of the actors (Nikitochkina, 2020). In addition, a successful distribution strategy requires both broad geographical coverage and a strong presence in high-volume markets. However, the relationship between distribution coverage and sales is non-linear: Initially, an expansion of distribution leads to a strong increase in sales, but this effect levels off as coverage increases. Further challenges arise from the bargaining power of large retailers and the underdeveloped infrastructure in emerging markets. However, optimised distribution increases market share and sales (Michis, 2023). Distributors increase the efficiency of global supply chains through technological integration. IT solutions improve processes and enable real-time analytics for more precise coordination (Okeudo et al., 2022). Strategically placed distribution centres also reduce transportation and storage costs and shorten delivery times (Poltavskaya, 2012). Distributors take on an intermediary role in value chains by improving communication between actors and creating transparency about product availability. Furthermore, trust and long-term partnerships are promoted by closing information gaps (Givens & Dunning, 2019). Eaidgah (2009) emphasises that distributors optimise procurement and logistics processes, which increase both service quality and competitiveness.

Digital platforms also provide valuable analytics for demand forecasting and pricing, creating added value in volatile markets (Jiang, 2023). IT investments also promote organisational agility by creating flexible infrastructures that enable rapid adaptation to market changes and thus increase business performance in volatile environments (Tallon & Pinsonneault, 2011). The analysis of 58 digital transaction platforms shows that 40% of the platforms were only founded in the 2010s, 31% date from the 2000s, and 29% were established before 2000. This highlights the increasing relevance of platforms in the last decade. The focus is on the further development of the customer value proposition (CVP) to the actor value proposition (AVP), which describes specific value propositions for purchasers and vendors. 17 value types were identified in the categories of performance, price and trust, such as reliability, cost-effectiveness and convenience. 79% of the platforms use a marketplace model, 28% are public and 72% are privately run. Half operate in more than 21 markets, while Europe (36%), North America (31%) and Asia (26%) dominate. 59% offer a wide range of products, 28% focus on niche products and 14% specialise in services. Third-party providers are critical for 79% of platforms, while 17% use them for support. The authors of the study recommend analysing platforms as competitors, adapting value propositions to actor needs and clearly communicating the specific added value for purchasers, vendors and brands (Hokkanen et al., 2021). Hein et al. (2019) describe how B2B IoT platforms promote value creation through three co-creation practices: integrating complementary resources, ensuring platform readiness, and servitisation through application enablement. Platforms engage partners through standardised resources such as APIs and SDKs, creating positive network effects. These practices enable scalable platforms and abstracted solutions for a broader audience. The study by Jovanovic et al. (2020) illustrates the co-evolution of platform architectures, services and governance in industrial digital platforms and their role in value creation through digital technologies such as the IIoT (Industrial Internet of Things) and AI. It identifies three central platform archetypes: product platforms that focus on networking and data collection, supply chain platforms aimed at process optimisation, and platform ecosystems that promote collaboration between different actors. Results show that the successful development of such platforms requires data aggregation, advanced analytics and scalable services. The gradual evolution of architecture, services and governance maximises platform value, creates new market opportunities and addresses technological and organisational challenges.

The theories described serve as the basis of this research and are logically integrated in the following sections. Their scope of application is illustrated within the framework of the descriptive methodology.

3. Methodology

This work is based on a structured literature analysis of existing research. The study focuses on the efficient management of excess inventory, its definition, and areas of application of standardised data transparency, as well as value proposition of distributors and digital platforms. Due to the diversity and continuous development of studies in this area, a non-statistical meta-analysis is the most appropriate method by which to obtain a detailed synthesis of the literature (Bortz & Döring, 2006). In terms of process, this involves a comprehensive search of several databases, including Scopus, Science Direct, SCISPACE, IEEE Xplorer, Semantic Scholar and Google Scholar, resulting in a solid data collection of topic-relevant literature.

The procedural documentation of this thesis aims to ensure intersubjective comprehensibility of the literature used in chapter 4 in the context of the development of solution models. The literature is selected using a standardised procedure. The search and selection of literature in the databases is carried out in three steps in chronological sequence. Firstly, only the link operator (+) is used in the search to combine two or more search terms. Comparison operators (==, !=, >, <, >=, <=), substring operators ([]), search and matching operators (in), modification operators (replace, strip), length and indexing operators (len(), index()) and repetition operators (*) are not used. The search terms applied include: Excess inventory, surplus inventory, excess stock, chip industry, semiconductor industry, supply chain management, SCM, distributor, inventory management, data transparency, e-commerce platforms, platform economy, demand forecasting, big data. In the third step, literature that is not older than 2018 is considered.

The reason for this selection lies in the consideration of significant crisis events. Since 2018, extraordinary developments such as the COVID-19 pandemic and geopolitical tensions have impacted global supply chains. The implications of these crises provide valuable insights into understanding current challenges in excess inventory management. In a second step, the period under review is extended to publications from 2000 onwards and, where relevant, earlier works are included. This is justified when such literature offers contextually relevant derivations or ensures transferability to contemporary challenges. Furthermore, this approach accounts for long-term geopolitical and technological developments. Many foundational approaches and concepts that remain significant today were formulated in earlier studies. These works present an opportunity to integrate conceptual frameworks with modern technologies and methods, enabling the reinterpretation of established solutions and their adaptation to current demands. An overview of the selected literature can be found below (*Table 1*).

Table 1: Systematic literature review on the Topic: Optimising Excess Inventory Management for SMEs

Typology	Author (Year)	Main contribution
Journal	Brabänder (2020)	Stochastic inventory management. Model solutions.
Journal	Conrad & Bräu (2016)	Multi-channel distribution in the electronics industry. Big data analyses for precise and targeted digital customer communication.
Journal	Eaidgah (2009)	Analysis of the main players in the semiconductor industry. Optimisation of procurement and logistics processes through distribution.
Journal	Ellinger (2000)	Improving marketing/logistics cross-functional collaboration in the supply chain.
Journal	Hein et al. (2019)	Network effects and Value co-creation practices in B2B platform ecosystems in Electronic Markets.
Journal	Meixell & Gargeya (2005)	SCM strategies for the effective control, adaptation and coordination of material, information and financial flows.
Journal	Mohamed (2024)	Inventory optimisation and reduction. Proactive approaches and strategies for demand forecasting in the context of digitalisation strategies.
Journal	Mönch et al. (2018)	Approaches to modelling and optimising uncertainties in the semiconductor industry's supply chain.

Typology	Author (Year)	Main contribution
Journal	Mufidah et al. (2020)	Evaluation of sales channels for managing excess inventory. Direct marketing systems and the benefits of e-commerce platforms.
Journal	Nakashima et al. (2014)	Stochastic inventory control systems to reduce uncertainty and minimise inventory levels while maintaining desired service levels.
Journal	Oguji (2018)	Strategies for managing excess inventories. Buy-back programmes, discounts and stock transfers.
Journal	Porras & Dekker (2008)	Proactive approaches to using demand forecasts precisely and specifically against overstocking.
Journal	Saha (2003)	Networking of the value chain in the semi-conductor industry. Precise and efficient data processing in the context of e-commerce models.
Online	Conrad Electronic (n.d.-a)	E-Commerce Platform, SC Solutions.
Online	Halbleiter-Scout (n. d)	E-Commerce Platform, XS Inventory Solutions.
Online	IC Source (n.d)	E-Commerce Platform, XS Inventory Solutions.
Online	Luminovo (n.d.)	E-Commerce Platform, SC Solutions.
Online	The Broker Forum (n.d.)	E-Commerce Platform, XS Inventory Solutions.

Source: Own representation

Each literature source used is subjected to a comprehensive evaluation to ensure its coherence with the thematic questions of this work as well as its methodological validity. The evaluation criteria include relevance, methodological rigour, the credibility of the information sources and the scientific contribution to the respective discipline (Mayring, 2015).

The relevant sources are summarised in order to obtain an overview of essential findings and application-specific methods, respectively taking into account possible existing limitations. This provides a sound theoretical basis in the context of the research topic. The integration and application of theoretical approaches provides a framework for developing solution models in practice.

The synthesis phase is the central process step in which the modelled approaches are compared, results are analysed, and advantages and challenges interpreted. In addition, the effectiveness of theoretical innovations regarding efficient excess marketing is discussed in the context of possible influencing factors. The aim is to close existing research gaps and gain insights into the research questions. The methodological approach of this work provides a reliable summary of the research results and shows approaches for SMEs to efficiently market excess inventory. The work concludes with recommendations for action in the context of sustainability.

4. Optimising excess inventory management for SMEs

4.1. Contributions of distributors

The main actors in the supply chain in the chip industry can be listed hierarchically as follows: chip manufacturers, upstream distributors, original equipment manufacturers (OEMs), downstream distributors, retailers and customers (Eaidgah, 2009). Distributors in this industry offer a variety of supply chain management (SCM) solutions (Arrow Electronics, n.d.; Conrad

Electronic, n.d.-a; Electronic Direct, n.d.; Future Electronic, n.d.; Rutronik Electronics, n.d.). Meixell and Gargeya (2005) highlight that SCM includes strategies for the effective control, adaptation and coordination of material, information and financial flows along the supply chain.

These strategies can be coordinated between actors across organisations or tailored to the needs of individual companies. The overall goal of SCM is to maximise customer value by optimising service quality and efficiently reducing costs (Ellinger, 2000). This means that distributors are a preferred choice for SMEs for optimising excess inventory management due to their industry-specific expertise and tailored SCM approaches. The SCM logistics solutions relevant to the research problem can be divided into preventative, proactive and reactive approaches. Brabänder (2020) states that a preventative approach to minimise the risk of excess inventory is to manage inventory through centralisation strategies. By pooling similar, independent demands, the risk can be distributed and the amount of safety stock required can be reduced, while the cycle stock remains unchanged. This concept is based on the centralisation of demand, which allows fluctuations at individual locations to be balanced out. However, when demand structures are different and partially dependent, the portfolio effect comes into play. Diversification within a portfolio also reduces risk, as fluctuations in demand for different products or markets partially offset each other. Both approaches contribute to safety stock reduction, but differ in their application. Slow-moving products are particularly well suited to centralisation because their low turnover facilitates efficient warehousing and the avoidance of excess inventory.

In contrast to these, there are also proactive approaches. Demand forecasting can be significantly improved through precise, targeted service level metrics to efficiently manage excess inventory. Enterprise resource planning (ERP) systems use standard metrics such as the cycle service level (CSL), which indicates how often an inventory fully covers demand in a period without taking into account the actual quantity of demand covered. The use of the indicator is suboptimal due to its limited informative value. A more appropriate metric is the fill rate, as it indicates the percentage of demand that is met directly from stock. This provides a more precise basis for matching actual inventory more closely to demand without building up unnecessary inventory (Porras & Dekker, 2008). The fill rate can also be improved through vendor-managed inventory (VMI) by managing inventory levels through suppliers (Mohamed, 2024). Flexible storage strategies are also part of proactive measures that include the targeted relocation of products in order to reduce excess inventory where it is least needed and relocate it to locations with higher demand. Adapting the stock transfer strategy to uncertainty of demand and product margins ensures optimal inventory utilisation, while minimising excess inventory. Flexible one- or two-way transfer can reduce storage costs and better balance inventory, particularly for products with different margins and fluctuating demand, making warehousing more efficient. This strategy helps avoid excess inventory without compromising service levels at high-demand locations, which is a key aspect of efficient excess inventory management (Liang et al., 2014; Oguji, 2018). Further proactive approaches to minimising inventory costs can be found in the ABC classification of products and economic order quantity (EOQ). Whereas the former leads to a targeted reduction of inventory, the EOQ model determines optimal order quantities. In addition, interdisciplinary collaboration has a positive effect on inventory management and increases customer satisfaction (Mohamed, 2024).

In the semiconductor industry, cycle times of 10–15 weeks are primarily responsible for complexity in inventory planning and control (Mönch et al., 2018). The implementation of stochastic inventory control systems can help to manage uncertainties. By determining optimal reorder points and order quantities, they can minimise the overall expected inventory costs while maintaining the desired service levels (Nakashima et al., 2014). Likewise, the integration of real-time simulations in the IT sector is part of proactive and future-orientated SCM to improve decision-making by enabling real-time planning and control and anticipating future challenges (Mönch et al., 2018). Radhakrishnan et al. (2010) state that inventory management is a central component of SCM. They present an efficient methodology that uses genetic algorithms to determine precise inventory levels for excess inventory and shortages in order to minimise overall supply chain costs. The method, implemented with MATLAB, has been successfully tested and enables the identification of products that lead to additional inventory or bottleneck costs. It therefore provides valuable information for inventory optimisation.

In contrast, in the semiconductor industry, parallel computing, GPU technologies and machine learning are considered reactive and decisive solutions, and key technologies for tackling complex supply chain problems. Parallel computing on GPUs contributes significantly to shortening calculation times, and supports the simultaneous processing of multiple scenarios, which is particularly advantageous for 'what-if' analyses. In addition, cloud computing offers scalable computing resources to efficiently manage the increasing complexity of the supply chain. Machine learning is considered a key technology for recognising data patterns, making more accurate forecasts and generating scenarios for decision-making (Mönch et al., 2018). Buy-back programmes by suppliers and targeted discount strategies to reduce inventory levels in a controlled manner are also reaction-orientated approaches. These approaches are particularly effective for older, surplus or soon-to-be-replaced products (Oguji, 2018). In contrast, direct marketing systems take a customer-centric approach by marketing surplus inventory through a personalised approach, thus enabling strategic sales promotions (Mufidah et al., 2020). Empirical studies confirm the effectiveness of distributor-driven inventory strategies. Saab et al. (2008) demonstrate that Distributor Managed Inventory (DMI) reduces customer inventory levels by 55% and distributor inventory levels by 33%, leading to lower excess inventory and improved liquidity. Zhang and Tan (2021) further quantify these effects, reporting an average reduction in excess inventory of 47% and a 22% improvement in order fulfillment rates. Their analysis is based on 4,234 data points from 260 SKUs of an e-commerce company.

4.2. Leveraging digital platforms

As early as the beginning of the 2000s, the infrastructure of electronic commerce in the semiconductor industry represented a customer-orientated model. E-business platforms, as central elements of the platform economy, ensure comprehensive networking of the value chain through their permanent connection to automated ordering and planning systems (Saha, 2003). The value proposition of digital platforms today contributes to the optimisation of workflows through the integration of interfaces such as APIs and SDKs, and illustrates the efficiency of the platform economy's network effects (Hein et al., 2019). In addition, the focus should be on a customer-centric e-business model. By implementing this into companies' operational workflows, customer communication is focused, and consumer-centred, agile and resource-efficient realisation of customer requirements ensured (Saha, 2003). The use of big data analytics can enable precise and targeted communication, addressing different customer segments based on specific needs in order to provide individualised solutions and recommendations (Conrad & Bräu, 2016).

Digital platforms confirm the effectiveness of external service providers for efficient inventory control through their individual approaches and services. The following platforms serve as best practice examples. By leveraging automated processes, real-time data integration, and AI-based applications, they ensure precise inventory management and support data-driven decision-making, while efficiently addressing individual customer requirements. Moreover, some of these platforms have been established for over 20 years, recognised for their sustainability at economic forums, and commended for their performance in chip industry-specific publications. The innovative e-commerce platform Conrad Procure Plus provides innovative solutions for efficient inventory management, ensuring seamless and error-free data exchange among stakeholders through automated processes such as EDI and API. At the same time, the platform leverages self-service tools to facilitate rapid interface integration, for example via OCI. Purchasing behaviour analyses identify potential cost savings, refine strategies, and facilitate supplier consolidation to reduce maverick buying and professionalise procurement (Conrad Electronic, n.d.-b).

Luminovo provides technical solutions for OEMs and EMS to collaborate with suppliers in the semiconductor and electronics industry supply chain. Features such as Real-Time Inventory View enable inventory monitoring, while Supplier Inventory Integration enables synchronisation with external suppliers' ERP and MRP systems. The platform promotes data-driven decisions through real-time synchronisation and transparent data usage (Luminovo, n.d.).

The Broker Forum enables precise inventory updates and seamless integration of recorded vendor items into distributor systems through real-time XML solutions. Features such as the Inventory Upload and Management System and Stock Offers support the marketing of excess inventory. APIs increase flexibility and automation for users (The Broker Forum, n.d.).

IC Source has been providing analogue system solutions for the electronics industry since 1996. The customisable ICS Storefront enables distributors to display over 65 million electronic components entered by vendors on their own websites. In addition, the IC Source Search API provides detailed component data and allows individual filtering (IC Source, n.d.).

Greenchips is a platform founded in 2018 that focuses on the global marketing of surplus electronic components using AI-supported applications (Greenchips, n.d.).

Halbleiter-Scout is a B2B platform that has been marketing excess inventory, among other things, since 2007. Companies can use the system to anonymously transmit their excess inventory to a connected global network of distributors and chip brokers, and receive offers, thus increasing their e-commerce reach (Halbleiter-Scout, n.d.).

Mufidah et al. (2020) confirm that using e-commerce platforms to reduce excess inventory is an efficient solution, as they enable broader market access and cost-effective distribution.

Recent market data indicates the growing adoption of digital platforms and AI-driven inventory solutions. SEMI Europe (2023) highlights the need for standardized data integration to achieve 20% global semiconductor production by 2030. Luminovo (2025) reports that over 150 EMS companies use AI-driven inventory management, reducing offer management time by 90% and increasing productivity by 12%. Gartner (2025) notes an 11.5% growth in the digital commerce platform market to $8.9 billion in 2023, with projected continued growth. By 2026, 30% of B2B sales cycles will occur via digital platforms, while SMEs, however, with online revenues under $100 million prioritize standardized, cost-efficient solutions to minimize total cost of ownership.

4.3. Enhancing inventory management efficiency with standardised data transparency

The approaches presented in Sections 4.1 and 4.2 illustrate that standardised data transparency plays a crucial role in communication interactions between SMEs, distributors and digital platforms. They offer the potential of basic training to ensure precise inventory controls and enable the effective reduction of excess inventory.

Data mining, for example, is essential to address inefficient inventory management. Data transparency forms the basis of this methodology. The Frequent Pattern Growth algorithm can identify patterns in product placement and purchasing, enabling more precise inventory control. This helps reduce both excess inventory and stock shortages and improve inventory management efficiency in SMEs (Riadi et al., 2023).

Xu and Sharma (2017) explain that, in the semiconductor industry, sales forecasts are used to evaluate the demand development of end products. They describe how calculation models, integrating indicators such as past sales figures, gross domestic product (GDP), and seasonality, leverage random forest and boosting trees techniques. These methods enable accurate and adaptive forecasts, which are essential for strategic planning and decision-making. The authors also emphasise the importance of data quality, transparency, and standardisation in reducing measurement errors and subjective biases.

Saha (2003) highlights the relevance of precise and efficient data processing in the semiconductor industry in order to optimally meet customer needs and market requirements in e-commerce models. Automated systems and flexible adaptations play a central role in ensuring efficiency and responsiveness along the value chain. Big data and machine learning that access real market conditions enable more accurate inventory forecasting. Data transparency plays a key role in enabling informed and timely decisions (Cao, 2019).

Islam et al. (2019) address the problem of insufficient integration and real-time communication between warehouse management, ordering or manufacturing systems in companies, which can lead to inventory management problems.

Building on these insights, Ali et al. (2024) empirically confirm that standardized data transparency significantly enhances inventory management. Their study of 350 companies, of which 70% are SMEs, shows that digital adaptability and flexibility improve information visibility by 72.7% and increase inventory management efficiency by 63.9%. Automated data integration reduces errors by 15%, while big data analytics enhance forecast accuracy by 25%. Additionally, process automation increases forecasting precision by 20%. The strong relationship between information visibility and inventory management efficiency (90.7%) underscores the essential role of standardized data structures in ensuring accurate forecasting and efficient inventory control.

5. Discussion

5.1. The Influence of Distributors and Digital Platforms on the Efficiency of Excess Inventory Management

The key roles in the sustainable and effective management of excess inventory in SMEs are played by distributors and digital platforms. However, interoperability between SMEs, distributors and digital platforms plays an essential and, above all, decisive role. Distributors offer customised preventative, proactive and reactive SCM solutions which can contribute to inventory reduction through their industry-specific expertise and efficient warehousing strategies. Digital platforms improve inventory control through real-time integration and data-driven inventory management. Both solutions offer both advantages and challenges.

A clear advantage is the centralisation of inventory, which minimises the risk of overstocking by balancing fluctuations across different locations. This leads to more efficient warehousing and lower safety stock levels (Brabänder, 2020). Another benefit is the integration of vendor-managed inventory (VMI), where suppliers manage the inventory for SMEs, reducing inventory costs and reducing the risk of excess inventory (Mohamed, 2024).

On the other hand, there are challenges in integrating digital connections into IT systems, especially when SMEs still rely on older technologies, which can lead to inefficiencies in data exchange (Métrailler, 2011). In addition, due to long cycle times and unpredictable demand fluctuations, accurate demand forecasting in the semiconductor industry requires the use of specialised models that are often complex and resource-intensive (Mönch et al., 2018). However, implementing stochastic inventory control systems can help reduce uncertainty and minimise inventory costs while maintaining the desired service levels (Nakashima et al., 2014). It is clear that the implementation of strategic inventory management techniques and continuous improvements is essential to efficiently optimise inventory and sustainably increase profitability.

5.2. The Impact of Data Transparency on Excess Inventory Management Efficiency

The efficiency of marketing the surplus inventory of SMEs can be significantly improved through data transparency. In the semiconductor industry in particular, with its long cycle times and fluctuating demand, precise data integration and real-time communication are crucial. Data transparency forms the basis for data-based decisions and networked communication between SMEs, distributors and digital platforms. It also reduces information asymmetries and facilitates the synchronisation of supply and demand. Furthermore, a key benefit of data transparency is that it can be fed into the Frequent Pattern Growth algorithm to identify patterns in purchasing and ordering processes. For SMEs with limited resources, this can be critical in reducing storage costs and increasing inventory management efficiency. At the same time, advanced technologies such as random forests and boosting trees improve forecasting capabilities by taking into account historical sales figures, macroeconomic indicators and seasonality. This allows strategic decisions to be better adapted to current market conditions. However, there are also challenges. A lack of real-time integration between warehouse management and production reduces the effectiveness of data transparency. In particular, SMEs that work with outdated IT infrastructures have difficulty in fully exploiting the advantages of modern data standards. In addition, the implementation of big data and machine learning models requires significant investment in technology and expertise.

5.3. Research Gaps and Future Directions

The results of this study reveal research gaps that justify further investigation. A first analytical approach, could focus on the role of the circular economy and environmentally friendly business models in the sustainable marketing of excess inventory. A derived research question might be: How can the principles of the circular economy and environmentally friendly business models be effectively integrated into the inventory management strategies of SMEs to improve sustainable excess management? For this purpose, a qualitative approach combining interviews with industry- and company-relevant stakeholders and a subsequent quantitative analysis of inventory data, could provide valuable insights. This approach could also examine the extent to which these findings can be implemented by SMEs.

In addition, strategies for integrating sustainability standards into the business models of SMEs, distributors, and digital platforms require targeted investigation. A potential research question could be: What impact do sustainability certifications and standards have on the operational efficiency and profitability of these actors in the context of inventory management solutions, and how can they be effectively implemented? Future studies could employ case studies to explore this question and evaluate practical applications.

The integration of IT systems between the protagonists discussed in this paper also represents a significant challenge that necessitates empirical research. A relevant research question might be: To what extent can obstacles to IT system integration between SMEs, distributors, and digital platforms be identified and minimised? Longitudinal studies focusing on implementation processes and their operational outcomes could prove particularly effective for systematically analysing long-term developments and impacts.

Furthermore, the application of innovative technologies such as big data and machine learning in inventory management could be addressed in future studies. A related research question might be: How can big data and machine learning technologies be used to improve prediction accuracy and optimise inventory levels in SMEs? Experimental designs and simulation-based approaches could be utilised to evaluate the effectiveness of predictive algorithms and their ability to optimise inventory levels effectively.

Finally, the specific challenges SMEs face compared to large companies when implementing platform solutions should be examined in detail. A suitable research question might be: What specific challenges do SMEs encounter when implementing digital platform solutions compared to large companies, and how can customised platforms address these issues? Comparative studies, including the use of questionnaires and multi-criteria decision analysis, could provide solution-oriented and practical insights.

These interdisciplinary approaches, combining qualitative and quantitative methods, are essential for developing practical solutions and addressing existing deficits in excess inventory management.

6. Conclusion

This paper examines how distributors and digital platforms can support SMEs in marketing excess inventory, and to what extent standardised data transparency plays a role. Distributors provide preventative, proactive and reactive supply chain solutions. Distributors' inventory management practices influence the operational processes of SMEs, which can have a positive impact on the marketing of excess inventory and cash flow. Digital platforms also enable more precise matching of supply and demand through data-driven inventory management and real-time integration, which significantly increases efficiency. Standardised data transparency is a key factor here, as it reduces information asymmetries between actors and enables data-based decisions. Challenges arise in particular from obsolete IT infrastructures and a lack of real-time communication, which limit the efficient use of modern data standards and can thus reduce the potential of data-driven inventory management and standardised data transparency for the marketing of excess inventory. SMEs should rely more on distributors and digital platforms, and invest in standardised data structures and innovative technologies which optimise transparency, forecast accuracy and resource utilisation, and thus contribute to the circular economy.

To address these challenges, SMEs should increase collaboration with distributors and digital platforms to improve inventory management efficiency. Investing in automated data integration and cloud-based ERP systems can enhance transparency and enable real-time inventory tracking. Furthermore, adopting AI-driven forecasting models can improve demand prediction and excess inventory management. SMEs should also engage in pilot projects before fully implementing digital solutions, reducing risks and optimising resource allocation. Additionally, leveraging government and industry-funded initiatives for digital transformation can facilitate access to modern inventory management tools.

However, it is essential that technological solutions are not considered in isolation, since, as soon as value creation processes include people, these need to be viewed as individuals and not be subject to the 'binary code' which characterises digitalisation. This is the only way a digital approach can be sustainable and successful.

References

Ackerman, K. (2024, September 6). *The Critical Challenge of Managing Excess Inventory in the Semiconductor Industry*. Sourceability. https://www.sourcengine.com/blog/the-critical-challenge-of-managing-excess-inventory-in-the-semiconductor-industry

Akerlof, G. A. (1970). The market for "lemons": Quality uncertainty and the market mechanism. *Quarterly Journal of Economics, 84*(3), 488–500. https://doi.org/10.2307/1879431

Arrow Electronics. (n.d.). Global supply chain services. Retrieved November 26, 2024, from https://www.arrow.com/company/de/expertise/supply-chain/global-supply-chain-services

Attinasi, M. G., De Stefani, R., Frohm, E., Gunnella, V., Koester, G., Melemenidis, A., & Tóth, M. (2021). *The semiconductor shortage and its implications for euro area trade, production, and prices*. *Economic Bulletin, 2021*(4), 78–82. European Central Bank. https://www.ecb.europa.eu/pub/pdf/ecbu/eb202104.en.pdf

Bleier, R. E. (1970, November). Data definition standardization. In *SIGFIDET '70: Proceedings of the 1970 ACM SIGFIDET (now SIGMOD) Workshop on Data Description, Access and Control* (pp. 68–86). Association for Computing Machinery. https://doi.org/10.1145/1734663.1734668

Bortz, J., & Döring, N. (2006). *Forschungsmethoden und Evaluation für Human- und Sozialwissenschaftler*. Springer. https://doi.org/10.1007/978-3-540-33306-7

Brabänder, C. (2020). *Stochastisches Bestandsmanagement: Grundmodelle für Betriebswirte* (2. Aufl.). Springer Gabler. https://doi.org/10.1007/978-3-658-28191-5

Burkacky, O., Dragon, J. & Lehmann. N. (2022). *The semiconductor decade: A trillion-dollar industry*. McKinsey Global Publishing.

Cao, Y. (2019). *Data-driven Approaches to Inventory Management*. UC Berkeley Electronic Theses and Dissertations. https://escholarship.org/uc/item/22c7t31s

Conrad Electronic. (n.d.-a). *ProcurePlus*. Retrieved November 26, 2024, from https://www.conrad.de/de/service/bestellung-und-beschaffung/procureplus.html

Conrad Electronic. (n.d.-b). *E-Procurement*. Retrieved November 26, 2024, from https://platform.conrad.de/de/kunden/e-procurement.html

Conrad, W., & Bräu, S. (2016). Electronic goes Multi-Channel – Erfahrungsbericht Conrad. In G. Heinemann, H. Gehrckens, & U. Wolters (Hrsg.), *Digitale Transformation oder digitale Disruption im Handel* (pp. 353–377). Springer Gabler. https://doi.org/10.1007/978-3-658-13504-1_17

Eaidgah, Y. T. (2009). *Impact of Unauthorized Distributors on the Supply Chain and Financial Performance of Companies* [Dissertation]. Royal Institute of Technology, Stockholm. https://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-101114

Electronic Direct. (n.d.). *Logistik*. Retrieved November 26, 2024, from https://www.electronic-direct.de/logistik/

Ellinger, A. E. (2000). Improving marketing/logistics cross-functional collaboration in the supply chain. *Industrial Marketing Management*, *29*(1), 85–96. https://doi.org/10.1016/S0019-8501(99)00114-5

European Union. (2023). *Regulation (EU) 2023/2854 of the European Parliament and of the Council of 20 November 2023 on harmonised rules on fair access to and use of data and amending Regulation (EU) 2017/2394 and Directive (EU) 2020/1828 (Data Act)*. Official Journal of the European Union. http://data.europa.eu/eli/reg/2023/2854/oj

Forrester, J. W. (1958). Industrial dynamics – A major breakthrough for decision makers. *Harvard Business Review*, *36*(4), 37–66.

Frieske, B., & Stieler, S. (2022). The "Semiconductor Crisis" as a Result of the COVID-19 Pandemic and Impacts on the Automotive Industry and Its Supply Chains. *World Electric Vehicle Journal*, *13*(10), 189. https://doi.org/10.3390/wevj13100189

Future Electronics. (n.d.). Custom or standard solutions. Retrieved November 26, 2024, from https://www.futureelectronics.com/de/about-future/supply-chain-solutions

Gentner, A. & Lambrette, U. (2023, June 20). *Halbleiterindustrie im Umbruch*. Deloitte Deutschland. https://www.deloitte.com/de/de/Industries/tmt/analysis/halbleiterindustrie-im-umbruch.html

Givens, G., & Dunning, R. (2019). Distributor intermediation in the farm to food service value chain. *Renewable Agriculture and Food Systems*, *34*(3), 268–270. https://doi.org/10.1017/S1742170517000746

Hein, A., Weking, J., Schreieck, M., Wiesche, M., Böhm, M., & Krcmar, H. (2019). Value co-creation practices in business-to-business platform ecosystems. *Electronic Markets, 29*(3), 503–518. https://doi.org/10.1007/s12525-019-00337-y

Hokkanen, H., Hänninen, M., Yrjölä, M., & Saarijärvi, H. (2021). From customer to actor value propositions: An analysis of digital transaction platforms. *The International Review of Retail, Distribution and Consumer Research, 31*(3), 257–279. https://doi.org/10.1080/09593969.2021.1880463

IC Source. (n.d.). *The World's Leading Database for Electronic Components*. Retrieved November 26, 2024, from https://www.icsource.com/Home/Index.aspx

International Organization for Standardization. (1999). *ISO/IEC 11179: Information technology – Specification and standardization of data elements*. Retrieved November 26, 2024 from https://webstore.iec.ch/en/publication/97982

Islam, S. S., Pulungan, A. H., & Rochim, A. (2019). Inventory management efficiency analysis: A case study of an SME company. *Journal of Physics: Conference Series, 1402(*2), 022040. https://doi.org/10.1088/1742-6596/1402/2/022040

Jiang, Y. (2023). Application of Game Theory Analysis in E-commerce Platform Pricing. Frontiers in Business, Economics and Management, 7(2), 32–35. https://doi.org/10.54097/fbem.v7i2.4361

Jonker, J., & Faber, N. (2021). *Organizing for Sustainability: A Business Model Textbook*. Springer. https://doi.org/10.1007/978-3-030-78157-6

Jovanovic, M., Sjödin, D., & Parida, V. (2020). Co-evolution of platform architecture, platform services, and platform governance: Expanding the platform value of industrial digital platforms. *Technovation, 118*, 102218. https://doi.org/10.1016/j.technovation.2020.102218

Khan, A. M. (2017). Guidelines for standardizing and increasing the transparency in the reporting of biomedical research. *Journal of Thoracic Disease, 9*(8), 2697–2702. https://doi.org/10.21037/jtd.2017.07.30

Kleinhans, J.-P., & Hess, J. (2021). *Understanding the global chip shortages: Why and how the semiconductor value chain was disrupted*. Policy Brief, November 2021. Stiftung Neue Verantwortung. https://www.interface-eu.org/storage/archive/files/understanding_the_global_chip_shortages.pdf

Lee, H. L., Padmanabhan, V., & Whang, S. (1997). The Bullwhip Effect in Supply Chains. *MIT Sloan Management Review, 38*(3), 93–102. https://sloanreview.mit.edu/article/the-bullwhip-effect-in-supply-chains/

Liang, C., Sethi, S. P., Shi, R., & Zhang, J. (2014). Inventory sharing with transshipment: Impacts of demand distribution shapes and setup costs. *Production and Operations Management, 23*(10), 1779–1794. https://doi.org/10.1111/poms.12197

Luminovo. (n.d.). *Die Plattform für die Elektronik-Lieferkette*. Retrieved November 26, 2024 from https://luminovo.com/

Mahachi, M., Moukala, H., Ismail, A., Hopf, A., & Ehm, H. (2022). Simulating the COVID-19 pandemic and its impact on the semiconductor supply chain: Enabling a supply chain risk management framework. *IFAC-PapersOnLine, 55*(10), 2215–2220. https://doi.org/10.1016/j.ifacol.2022.10.037

Mayring, P. (2015). *Qualitative Inhaltsanalyse: Grundlagen und Techniken* (12. Aufl.). Beltz.

Meixell, M. J., & Gargeya, V. B. (2005). Global supply chain design: A literature review and critique. *Transportation Research Part E: Logistics and Transportation Review, 41*(6), 531–550. https://doi.org/10.1016/j.tre.2005.06.003

Métrailler, A. (2011). Integration of Change and Evolution in the Lifecycle of SMEs Information Systems. In C. Boldyreff, S. Islam, M. L., & B. Thalheim (Eds.), *Proceedings of the CAiSE Doctoral Consortium 2011* (pp. 3–14). London. https://ceur-ws.org/Vol-731/06.pdf

Michis, A. A. (2023). Retail distribution evaluation in brand-level sales response models. *Journal of Marketing Analytics, 11*(3), 366–378. https://doi.org/10.1057/s41270-022-00165-8

Miller, R. J., Nargesian, F., Zhu, E., Christodoulakis, C., Pu, K. Q., & Andritsos, P. (2018). Making Open Data Transparent: Data Discovery on Open Data. *IEEE Data Engineering Bulletin, 41*(2), 59–70.

Mohamed, A. E. (2024). *Inventory Management*. IntechOpen. https://doi.org/10.5772/intechopen.113282

Mönch, L., Chien, C.-F., Dauzère-Pérès, S., Ehm, H., & Fowler, J. W. (2018). Modelling and analysis of semiconductor supply chains. *International Journal of Production Research, 56*(13), 4521–4523. https://doi.org/10.1080/00207543.2018.1464680

Moore, G. E. (1965). Cramming More Components onto Integrated Circuits. *Electronics, 38*(8), 114–117.

Mufidah, A., Alif, Z., Hutauruk, P. S., & Hapsari, N. A. (2020). The evaluation of distribution channels in managing excess inventories in pandemic covid-19. *Advances in Transportation and Logistics Research, 3,* 424–435. https://doi.org/10.25292/ATLR.V3I0.297

Nakashima, K., Sornmanapong, T., Ehm, H., & Yachi, G. (2014). Stochastic Inventory Control Systems with Consideration for the Cost Factors Based on EBIT. *International Journal of Supply Chain Management, 3*(3), 68–74. https://doi.org/10.59160/ijscm.v3i3.955

Nikitochkina, Y. V. (2020). Multi-stage scale of the incentive system for distributors of an electrical company. *Journal of Physics: Conference Series, 1703*(1), 012004. https://doi.org/10.1088/1742-6596/1703/1/012004

Oguji, N. (2018). Strategies for managing excess and dead inventories: A case study of spare parts inventories in the elevator equipment industry. *Operations and Supply Chain Management, 11*(3), 128–139. https://doi.org/10.31387/oscm0320209

Okeudo, G. N., Kalu, K. C., & Njoku, G. T. (2022). Leveraging supply chain performance through ICT integration. *World Journal of Innovative Research (WJIR), 12*(3), 39–44. https://doi.org/10.31871/WJIR.12.3.29

Porras, E., & Dekker, R. (2008). An inventory control system for spare parts at a refinery: An empirical comparison of different re-order point methods. *European Journal of Operational Research, 184*(1), 101–132. https://doi.org/10.1016/j.ejor.2006.11.008

Porter, M. E., & Heppelmann, J. E. (2014). How Smart, Connected Products Are Transforming Competition. *Harvard Business Review, 92*(11), 64–88. https://hbr.org/2014/11/how-smart-connected-products-are-transforming-competition

Pulverer, B. (2014). Transparent, reproducible data: New guidelines for the reporting of research and source data enhance the interpretation and reproducibility of published research. *The EMBO Journal, 33*(22), 2597. https://doi.org/10.15252/embj.201490278

Radhakrishnan, P., Prasad, V., & Jeyanthi, N. (2010). Predictive analytics using genetic algorithm for efficient supply chain inventory optimization. *IJCSNS International Journal of Computer Science and Network Security*, *10*(3), 182–187. https://doi.org/10.5772/intechopen.113282

Riadi, I., Herman, H., Fitriah, F., & Suprihatin, S. (2023). Optimizing Inventory with Frequent Pattern Growth Algorithm for Small and Medium Enterprises. *Matrik Jurnal Manajemen Teknik Informatika dan Rekayasa Komputer, 23*(1), 169–182. https://doi.org/10.30812/matrik.v23i1.3363

Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen, L. (2018). Blockchain technology and its relationships to sustainable supply chain management. *International Journal of Production Research*, *57*(7), 2117–2135. https://doi.org/10.1080/00207543.2018.1533261

Saha, S. K. (2003). An infrastructure for electronic commerce in the semiconductor industry. In *IEMC'03 Proceedings: Managing Technologically Driven Organizations: The Human Side of Innovation and Change* (pp. 474–478). IEEE. https://doi.org/10.1109/IEMC.2003.1252318

SE Connect. (n.d.). *Europas führender KI-gestützter Marktplatz für elektronische Überbestände.* Retrieved November 26, 2024, from https://greenchips.com/de/

Spagnuelo, D., Bartolini, C., & Lenzini, G. (2016). Metrics for Transparency. In G. Livraga, V. Torra, A. Aldini, F. Martinelli, & N. Suri (Eds.), *Data Privacy Management and Security Assurance (DPM 2016, QASA 2016)* (Lecture Notes in Computer Science, Vol. 9963, pp. 3–18). Springer. https://doi.org/10.1007/978-3-319-47072-6_1

Stiglitz, J. E. (2000). The contributions of the economics of information to twentieth century economics. *Quarterly Journal of Economics, 115*(4), 1441–1478. https://doi.org/10.1162/003355300555015

Tallon, P. P., & Pinsonneault, A. (2011). Competing Perspectives on the Link Between Strategic Information Technology Alignment and Organizational Agility: Insights from a Mediation Model. *MIS Quarterly*, *35*(2), 463–486. https://doi.org/10.2307/23044052

The Broker Forum. (n.d.). *The world's largest online network for buyers and vendors of electronic components*. Retrieved November 26, 2024, from https://www.brokerforum.com/

Ulmer Consulting. (n.d.). *Das B2B Portal der Halbleiter- und Mikroelektronikbranche*. Retrieved November 26, 2024, from https://halbleiter-scout.de/

Xu, Q., & Sharma, V. (2017). Ensemble sales forecasting study in semiconductor industry. In P. Perner (Ed.), *Advances in Data Mining. Applications and Theoretical Aspects (ICDM 2017)* (Lecture Notes in Computer Science, Vol. 10357, pp. 31–44). Springer. https://doi.org/10.1007/978-3-319-62701-4_3

Poltavskaya, Y. (2022). Improving efficiency of the supply chain by optimal distribution center location. *Bulletin of the Angarsk State Technical University*, *1*(15), 164–167. https://doi.org/10.36629/2686-777x-2021-1-15-164-167

Zhao, Y., Cao, Y., Li, H., Wang, S., Liu, Y., Li, Y., & Zhang, Y. (2018). *Bullwhip effect mitigation of green supply chain optimization in electronics industry*. *Journal of Cleaner Production*, *180*, 888–912. https://doi.org/10.1016/j.jclepro.2018.01.134

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