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Inventory Management Practices and Challenges: An Exploratory Study

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Abstract: Inventory management is crucial for organizational performance, yet a significant gap exists between theoretical models and practical applications. This study explores the inventory management practices and challenges among Jordanian companies across various industries. Given the limited empirical research on this topic in Jordan, a qualitative approach was adopted using semi-structured interviews with representatives from 45 manufacturing, retail, and service companies. The findings reveal a significant gap between theoretical inventory management models and their practical application among participating companies. The common challenges of inventory management were also identified and found to include the lack of formal cost calculation methods, limited technological adoption, supply chain disruptions, and reliance on managerial intuition over data-driven decision-making. The study underscores the need to develop flexible, context-specific inventory models and enhance technological integration, particularly for Small and Medium-Sized Enterprises (SMEs). The study also found that company size significantly affects inventory management, where smaller companies lacked specialized personnel and relied on informal approaches using basic tools like spreadsheets, leading to inefficiencies and limited responsiveness to demand fluctuations. A set of recommendations for practitioners was provided, including adopting adaptable inventory strategies, investing in technology, improving demand forecasting, and strengthening supplier relationships. The study also highlights the importance of bridging the gap between inventory theory and practice, offering valuable insights for academics and practitioners aiming to optimize inventory management in developing economies like Jordan.

Keywords: Inventory Management Challenges, Inventory Management Practices, Jordan, Qualitative Research, Technology Adoption, Theory-Practice Gap

Introduction

Inventory serves as a buffer between supply and demand, absorbing demand fluctuations and preventing stockouts (Baganha and Cohen, 1998). Firms maintain inventories of raw materials, work-in-progress, and finished goods to anticipate the needs of both internal and external customers. Effective inventory management supports operational decisions regarding the quantity and timing of replenishments (how much and when to order) for various Stock-Keeping Units (SKUs). This practice ensures that customer demand is met while maintaining a specified service level and adhering to budget constraints (Goltsos et al., 2022).

Given its pivotal role, inventory management is a critical function that significantly impacts an organization's operations, customer satisfaction, cost structure, and overall financial performance (Koumanakos, 2008; Kamau and Kagiri, 2015). From a financial perspective, literature underscores the importance of inventory management in enhancing profitability (Gołaś, 2020), pricing strategies (Mashayekhy et al., 2022), and optimizing assets and working capital structure (Koumanakos, 2008; Basha et al., 2020). It also highlights its effect on the opportunity cost of capital (Singhal and Raturi, 1990) and cash flow management (Ali, 2011). Beyond financial metrics, inventory management influences productivity (Agu et al., 2016), sustainability (Becerra et al., 2021), market share (Kamau and Kagiri, 2015), and various other performance indicators (Musau et al., 2017; Chebet and Kitheka, 2019). On the other hand, research also examines the detrimental effects of neglecting or improperly implementing inventory control methods (Kritchanchai and Meesamut, 2015).

A significant proportion of the Inventory management literature aims to optimize these decisions of how much and when to order (Koumanakos, 2008). Demand characteristics are the most important elements in inventory management models (Munyaka and Yadavalli, 2022). Extensive research efforts investigated dependent demand approaches, such as Material Requirement Planning (MRP) (Azzamouri et al., 2021) and Just

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in Time (JIT) (Aycock, 2003), and independent demand approaches, such as Economic Order Quantity (EOQ), (Jaber and Peltokorpi, 2024).

Tiwari and Gavirneni (2007) discussed that real-world practitioners face complex and uncoordinated environments, which makes the simplistic assumptions used in academic research in inventory management less applicable. According to Kumar et al., (2013), most research considers single-item and single-stage inventory models that are hardly implemented in reality. Many other researchers have investigated the gap between theory and practice in the field of inventory management, (Boone et al., 2008; Bacchetti and Saccani, 2012; Ye et al., 2020). In addition to the inherent gap between inventory management research and practices, some factors might add to the complexity of applying inventory management theories. For example, due to various operational constraints, the practical application of the classical EOQ model is significantly limited (Alnahhal et al., 2024). Although the literature offers valuable insights into inventory management practices and challenges, there is a noticeable gap in research specifically addressing these practices and challenges within companies in developing country contexts, like Jordan.

To this end, this study aims to fill this gap by investigating the inventory management practices of Jordanian companies across various industries. More specifically, the research seeks to identify key challenges those companies face, examine the influence of company size on inventory practices, and assess the extent to which theoretical models align with practical applications in Jordan.

The research addresses the following questions:

- RQ1: What are the current inventory management practices employed by Jordanian companies?
- RQ2: What are the key challenges Jordanian companies face in implementing effective inventory management practices?
- RQ3: How do company characteristics influence inventory management practices in Jordanian companies?
- RQ4: To what extent is there a gap between inventory management theory and practice among Jordanian companies?

This research explores inventory management practices and challenges in Jordanian companies using semi-structured interviews with participants from 45 companies in different economic sectors. Economic challenges due to the COVID-19 post-pandemic effect (Abu-Mater et al., 2021) and supply chain disruption due to the recent region's political conflicts further complicated inventory management decisions for Jordanian companies. The exploration conducted in this research can guide the identification of further research opportunities that aim to bridge the gap between academic research and industry practice and influence practitioner actions to enhance inventory management practices. The remainder of the paper is structured as follows: Section 2 introduces the key concepts and significant previous research. In Section 3, the research methodology is presented. Section 4 discusses the main results of the study, and finally, Section 5 offers the primary conclusions along with recommendations for future research and practitioners, as well as an overview of the research limitations.

Theoretical background and literature review

The field of inventory management has evolved with the development of various theories and models aimed at optimizing stock ordering processes and reducing costs. Foundational models in the inventory management literature include dependent demand models and independent demand models. The EOQ model is the basic independent demand model, the most important dependent demand models include JIT and the MRP. Vendor Managed Inventory (VMI) is another popular approach in inventory management.

The Economic Order Quantity (EOQ) Model

The EOQ model, first introduced by Harris in 1913, remains a key optimization tool for inventory management by balancing the setup/ordering costs and the holding costs (Erlenkotter, 1990; Tracy and Knight, 2008). The model's core principle is that there is an optimal order quantity that minimizes total inventory-related costs, making it an effective framework for inventory management across various industries (Raju, 2022). The EOQ model serves as a fundamental principle in the fixed quantity system, where a consistent order size is maintained while the timing of orders varies based on inventory levels. This approach is designed to optimize ordering costs and holding costs by determining the ideal order quantity (Schroeder, 2000). Although EOQ primarily focuses on optimizing order size, it can also be useful in determining order intervals in systems that keep the time between orders fixed, adjusting the order size as needed based on stock levels (Roach, 2005). Furthermore, hybrid models combine the features of both fixed quantity and fixed interval systems, offering greater flexibility to respond to fluctuating demand and lead times, thus making inventory management more adaptable to changing conditions (Roach, 2005). In sectors dealing with perishable goods or industries where stockouts can lead to significant losses, such as pharmaceuticals, the EOQ model helps balance holding costs and service levels, ensuring optimal performance (Raju, 2022).

While the basic EOQ model is straightforward, it is built on a set of simplifying, static, and unrealistic assumptions, such as constant demand, single-item, fixed item price, fixed ordering and holding costs, and known lead time (Roach, 2005; Agarwal, 2014). As industries face more dynamic and unpredictable environments, modifications to the traditional EOQ model have become necessary. Extensions to the model now allow for considering fluctuating demand, back-ordering, price discounts, and perishability, making EOQ more applicable to real-world scenarios (Federgruen & Zheng, 1992; Poswal et al., 2022). However, recent research highlights how EOQ models need further adaptation in response to modern challenges, such as supply chain disruptions, imperfect processes, and sustainability considerations (Alnahhal et al., 2024; Khan et al., 2011; Battini et al., 2014). The COVID-19 pandemic, for example, caused significant disruptions in global supply chains, leading to stockouts, demand spikes, and delays in replenishment (Hidayatuloh et al., 2023). These disruptions make the traditional EOQ model less relevant. Similarly, political conflicts and other macroeconomic disruptions have highlighted the need for more effective EOQ model variants (Snyder, 2014; Salehi et al., 2016). In addition, the ability to enable real-time monitoring and optimization of inventory levels, provided by emerging technologies related to Industry 4.0, such as the Internet of Things (IoT) and Radio Frequency Identification (RFID), have further influenced EOQ adaptations (Mashayekhy et al., 2022; Bhadrachalam et al., 2011; Di Nardo et al., 2020). Moreover, the growing trend of implementing circular economy principles has pushed businesses to rethink their EOQ calculations (Rabta, 2020; Prameswari et al., 2024). One notable adaptation is the inclusion of fuzzy logic and probabilistic models, which account for uncertainty in demand and supply, making the model more resilient under variability conditions (Poswal et al., 2022).

Overall, EOQ remains a vital, adaptable tool in modern supply chains, continuously evolving to meet the challenges of contemporary business environments. These EOQ variants have made the model applicable across diverse industries, including manufacturing, pharmaceuticals, and food processing, where efficient inventory management is crucial to operational success (Chen et al., 2014). However, the growing variety of EOQ model variants designed to address specific industry needs and conditions has made the practical implementation of these models more complex and demanding and requires more detailed data and sophisticated analysis (Poswal et al., 2022; Battini et al., 2014). This complexity arises because businesses must evaluate which variant best suits their operational environment, and they often need to integrate multiple factors, such as uncertain demand or supply chain disruptions, into their calculations (Alnahhal et al., 2024). As a result, selecting and applying the appropriate EOQ variant requires deeper knowledge of both inventory theory and the unique challenges of the business, making the process more resource-intensive and analytically challenging (Khan et al., 2011).

Just in Time (JIT) Model

The JIT model, which evolved from Toyota Production System (Monden, 1983), is an influential production and inventory management philosophy that emphasizes improving efficiency by ensuring that materials and components arrive exactly when they are needed (Beard & Butler, 2000). The core principle of JIT is to synchronize production with actual demand, reducing the need for large inventories and avoiding overproduction (Jadhav et al., 2014). By focusing on small, frequent deliveries, JIT ensures that inventory levels remain low, while still maintaining a steady flow of materials and products through the supply chain (Gunasekaran, 1999). Lean manufacturing can be considered as an updated version of JIT (Jadhav et al., 2014). The importance of JIT lies in its ability to significantly reduce inventory holding costs and waste, which are common in traditional production models that rely on forecasting and large production batches (Manavizadeh et al., 2013). This system allows companies to become more flexible and responsive to changes in customer demand, enabling quick adjustments in production schedules without the burden of excessive stock (Beard & Butler, 2000). Furthermore, JIT encourages stronger relationships with suppliers since timely deliveries are critical to ensuring a smooth production process (Jadhav et al., 2014). Due to its benefits, JIT has been widely adopted by various types of organizations, including manufacturers, retailers, and service providers.

While the benefits of JIT inventory management are well-documented, its implementation poses significant challenges across various industries (Ezzahra et al., 2018). One of the primary obstacles is the need for a substantial cultural shift within organizations, as JIT demands high levels of employee involvement, commitment to continuous improvement, and a readiness to adapt to frequent changes (Jadhav et al., 2014; Kootanaee et al., 2013). Resistance to change among employees is common, driven by fears of job loss, lack of understanding, and discomfort with the reduction of autonomy due to JIT's strict production methods (Beard & Butler, 2000). Additionally, JIT's emphasis on minimizing inventory and eliminating safety stocks can be problematic for companies familiar with using buffers to manage demand variability and mitigate the risks associated with forecast errors and market volatility (Jadhav et al., 2014; Kootanaee et al., 2013). Supply chain coordination is another critical challenge, as JIT relies on frequent, small deliveries and precise scheduling, making it highly vulnerable to disruptions such as supplier delays, logistical issues, and external shocks like natural disasters (Gunasekaran, 1999; Qureshi et al., 2013). Balkhi et al. (2022) noted that many inventory management systems employing JIT methods were functioning effectively before the COVID-19 pandemic; however, the pandemic brought about unprecedented challenges, revealing these systems' vulnerability to large-scale disruptions. The absence of safety stocks increases the impact of any supply chain disruptions, causing potential halts in production (Kootanaee et al., 2013). In addition to these operational challenges, environmental concerns are increasingly relevant in implementing JIT, as minimizing waste and reducing the environmental impact are becoming critical factors in modern inventory management strategies (Singhal et al., 2024).

Top management commitment and effective change management are essential to overcoming these barriers, as the transition to JIT requires not only procedural changes but also a reshaping of organizational culture and practices (Beard & Butler, 2000). Overall, while JIT offers substantial benefits, its successful implementation requires careful planning, robust supply chain collaboration, and a commitment to overcoming both internal and external challenges (Jadhav et al., 2014; Kootanaee et al., 2013; Qureshi et al., 2013).

The Material Requirement Planning (MRP) Model

The MRP model is a widely recognized inventory management and production planning system that originated in the early 1960s as a computerized approach for managing materials acquisition and production (Aghazadeh, 2003). MRP coordinates inventory with production schedules, ensuring timely replenishment based on forecasted demand (Al Ruqeishi & Ullah, 2023), which has been especially useful in complex manufacturing systems. MRP uses information from the Bill of Materials (BOM), inventory records, and the Master Production Schedule (MPS) to calculate the precise quantities of materials needed and schedule their procurement (El Marzougui et al., 2020). MRP is designed to improve inventory management by ensuring that materials are available when needed while minimizing excess stock (Aghazadeh, 2003). MRP's development was also driven by the need to enhance production efficiency, reduce waste, and synchronize manufacturing processes (Kumar & Meade, 2002). Over time, MRP evolved into more sophisticated systems like Manufacturing Resource Planning (MRP II) and Enterprise Resource Planning (ERP), incorporating additional functionalities such as capacity planning and shop floor control to address broader operational needs (Kortabarria et al., 2018). This system helps companies respond more effectively to market changes, maintain lean inventory, and improve service levels, which are crucial in today's competitive environment (Azzamouri et al., 2021).

Implementing MRP systems presents several challenges that can hinder their effectiveness in production planning and inventory control. One major challenge is the dependency on accurate data, as MRP systems rely heavily on precise input data from the BOM, inventory records, and the MPS (Waters, 2008). Any inaccuracies in this data can lead to errors in material planning, causing shortages or excess inventory (Aghazadeh, 2003). Forecasting errors also pose a significant issue since MRP systems depend on demand forecasts to determine material requirements; poor forecasts can result in overproduction or stockouts, reducing the system's efficiency (Kumar & Meade, 2002). Additionally, complexity in system integration is a common obstacle, as MRP must align with existing processes and integrate smoothly with other software systems such as ERP or shop floor control systems. This

integration can be technically challenging and costly, often requiring significant customization and staff training (Kortabarria et al., 2018). High implementation and maintenance costs further complicate MRP adoption, particularly for smaller companies that may struggle with the financial and resource investment needed to keep the system running effectively (El Marzougui et al., 2020). Moreover, the rigidity of MRP systems can be problematic in dynamic environments, as the system's fixed schedules and batch processing may not respond well to sudden changes in demand or supply chain disruptions (Baker, 1993).

Finally, lack of user understanding and commitment can impede successful MRP implementation. Employees need to be well-trained and committed to following the procedures set by the MRP system, and any resistance or lack of understanding can undermine its effectiveness (Ihme, 2015). Addressing these challenges requires careful planning, investment in accurate data management, and a strong organizational commitment to leveraging MRP's capabilities fully. Despite its historical challenges, including issues with forecast inaccuracies and limited early-warning capabilities, MRP remains a foundational tool that has significantly shaped the landscape of inventory management and production planning (Kortabarria et al., 2018).

Vendor Managed Inventory (VMI)

VMI is an inventory management strategy where the supplier takes full responsibility for maintaining the inventory levels of the buyer, often using real-time data shared by the buyer to make replenishment decisions (Zhao, 2019). VMI represents a shift from traditional inventory management practices, emphasizing a collaborative approach between suppliers and buyers to streamline inventory processes and reduce costs. This strategy enhances supply chain efficiency by improving inventory visibility, reducing stockouts, and optimizing replenishment cycles (Radzuan et al., 2018). In addition to retailing, VMI is adopted by various industries, including automotive, pharmaceuticals, and consumer goods, due to its ability to reduce lead times, lower inventory carrying costs, and improve overall service levels (Radzuan et al., 2018; Govindan, 2013). The importance of VMI in inventory management is underscored by its role in mitigating the bullwhip effect, enhancing demand forecasting, and fostering closer supplier-buyer relationships that lead to mutual benefits, such as cost savings and improved responsiveness to market changes (Zhao, 2019; Marquès et al., 2010). Additionally, VMI enables suppliers to manage their production schedules and logistics better, contributing to more efficient and responsive supply chains (Beheshti et al., 2020).

Implementing VMI systems presents several challenges that can hinder their success and limit their potential benefits. VMI requires substantial investment in information technology infrastructure for seamless data exchange between suppliers and buyers. The associated high costs and the need for continuous updates and maintenance can be a significant burden, particularly for SMEs (Beheshti et al., 2020). Accurate and timely data exchange is crucial, and any lapses in communication can result in misaligned production schedules, stockouts, or excess inventory (Lee et al., 2015). Additionally, the cultural and organizational changes required to adopt VMI can face resistance from employees and management, who may be reluctant to adjust established workflows and responsibilities. This resistance is compounded by the need for close collaboration between suppliers and buyers, which can be hindered by differing corporate cultures and priorities (Radzuan et al., 2018; Beheshti et al., 2020). Absorbing inventory carrying costs, managing surplus, and dealing with product obsolescence adds further complexity to VMI implementation (Govindan, 2013). The reliance on third-party logistics (3PL) providers to manage certain aspects of VMI, such as inventory control and data management, introduces additional layers of dependency and potential misalignment of strategic goals between the involved parties (Marquès et al., 2010; Beheshti et al., 2020). While VMI offers significant advantages in improving inventory management and supply chain efficiency, its implementation requires careful planning, significant investment in technology, and strong collaborative efforts to overcome these challenges effectively.

Inventory Management in Jordan

Limited literature exists on inventory management practices in Jordan. However, some researchers have highlighted key approaches and challenges Jordanian companies face. In developing economies like Jordan, businesses often encounter unique challenges, including unpredictable demand and high logistical costs, necessitating adaptations to established inventory models. The adoption of modern inventory systems, while beneficial, must consider these contextual factors to achieve efficiency (Al Ruqeishi & Ullah, 2023). Jordanian firms, particularly in the industrial sector, frequently face significant barriers to implementing advanced inventory management systems due to limited technological infrastructure, insufficient supplier coordination, and a general lack of awareness and training in modern inventory practices (Al-Matarneh, 2012). Furthermore, studies reveal that many Jordanian companies still rely on traditional inventory methods, often resulting in higher costs and inefficiencies (Atieh et al., 2016). In a case study analyzing laptop spare parts inventory management in a Jordanian company, Al-Dulaime & Emar (2020) identified issues with the professional understanding of proper inventory management techniques.

The application of JIT has garnered significant attention in studies focusing on Jordanian companies. Smadi (2012) analyzed lean supply practices in the Jordanian garment manufacturing sector, emphasizing key variables such as supplier feedback, JIT delivery, supplier development, customer involvement, and the facilitation of JIT production. Al-Matarneh (2012) explored the prerequisites for JIT implementation in Jordanian industrial companies, identifying major barriers, including unreliable suppliers and insufficient human resources, despite the presence of quality assurance elements. The author recommended increased investment in employee training and education to enhance understanding of JIT's benefits, such as waste reduction, inventory minimization, and cost efficiency, while maintaining quality to boost profitability and competitiveness. In addition, Khaireddin et al. (2015) investigated the impact of various JIT manufacturing practices; including JIT delivery, setup time reduction, equipment layout, preventive maintenance, daily schedule adherence, and supplier quality; on the strategic performance of Jordanian pharmaceutical manufacturing firms. The findings indicated that these firms apply JIT practices to an acceptable level. Another study by Abu-Khalifa and Al-Okdeh (2021) further examined the effect of JIT on the profitability of small and medium-sized industrial enterprises in Jordan, underscoring the need to raise awareness about the advantages of JIT among Jordanian companies. Furthermore, Alzuod and Al-Odeh (2023) assessed the impact of JIT and its related dimensions, such as material flow, JIT commitment, and supply management, on the performance of Jordanian garment manufacturing companies, demonstrating positive effects on operational outcomes. Overall, these studies highlight that while JIT adoption offers numerous benefits, its implementation in Jordanian companies faces considerable challenges, primarily due to inadequate supplier

reliability and limited support systems, making it difficult for firms to fully optimize production processes and inventory management (Al-Matarneh, 2012).

MRP, MRP II, and ERP systems have also gained considerable attention among researchers examining Jordanian companies. Chan et al. (2011) studied the readiness of Jordanian industrial companies for ERP implementation, focusing on the integration of core ERP functionalities with Supply Chain Management (SCM), Supplier Relationship Management (SRM), Customer Relationship Management (CRM), Partner Relationship Management (PRM), and Knowledge Management (KM) using e-business technologies. Their findings indicate that while most Jordanian companies possess essential ERP components, they struggle with significant integration issues, lack CRM and PRM, and have insufficient KM and business intelligence support. Aloqaily (2021) further explored ERP implementation in Jordanian SMEs, highlighting that the effectiveness of ERP could be enhanced through ongoing capacity-building for management and staff and by embedding ERP systems into long-term business strategies. Shakhatreh et al. (2023) investigated the impact of inventory policies on Corporate Social Responsibility (CSR) practices among companies listed on the Amman Stock Exchange, particularly in the manufacturing sector. Their study suggests that while inventory optimization can improve customer satisfaction, companies face challenges in balancing inventory levels due to market volatility and regulatory constraints, underscoring the complex interplay between inventory management and CSR.

Other researchers have investigated the issues related to inventory management system automation. Efforts to automate warehouse management systems have shown the potential to enhance inventory control and reduce operational costs; however, these initiatives often require substantial investments in technology and staff training, which are beyond the reach of many smaller firms (Atieh et al., 2016). In recent years, there has been increasing recognition of the importance of advanced inventory strategies and automated systems to boost supply chain performance and meet market demands (Aloqaily, 2021). Despite this, the adoption rate remains slow due to cultural resistance to change, financial constraints, and the need to integrate inventory management practices across the supply chain (Smadi, 2012; Chan et al., 2011; Aloqaily, 2021). Smadi (2012) also highlighted unreliable suppliers and a lack of supply chain integration as additional barriers. Alzuod and Al-Odeh (2023) further examined the impact of automated inventory control systems, finding that while these systems can reduce operational costs and enhance supply chain performance, high initial investments and the need for specialized training limit widespread adoption. Despite these challenges, there is a growing acknowledgment among Jordanian companies of the strategic importance of modern inventory management systems for improving competitiveness and meeting market demands, underscoring the need for continued investment in technology and supply chain integration.

Ali et al. (2024) conducted a comprehensive survey of 350 representatives from engineering companies to examine the complex interactions between various supply chain system attributes, real-time data, and inventory practice efficiency. Alrjoub and Ahmad (2017), using data from 48 firms between 2010 and 2016, investigated the impact of inventory types on the relationship between inventory management and firm performance. Their findings suggest that companies should consider the cost of capital when selecting inventory types and adjust inventory control strategies to align with changes in the business environment.

Methodology

This study aimed to explore inventory management practices and challenges among Jordanian companies across various industries. Given the exploratory nature of the research and the limited empirical studies on inventory management in Jordan, a qualitative approach was deemed appropriate. Qualitative methods are effective in gaining an in-depth understanding of complex phenomena by capturing participants' experiences and perspectives in their own words (Bryman, 2016). This approach allowed for a comprehensive exploration of the research questions and facilitated the emergence of rich, detailed insights.

A combination of convenience sampling and snowball sampling was employed to select participants. Initially, convenience sampling was used to approach companies readily accessible and willing to participate, ensuring timely data collection. This method is suitable when researchers seek to collect data from conveniently available subjects (Etikan et al., 2016). In addition, snowball sampling was utilized to expand the participant pool by requesting initial participants to refer other companies that fit the study criteria. Snowball sampling effectively reaches populations that are difficult to access and can help gather a more diverse sample (Naderifar et al., 2017). This method enabled the inclusion of hard-to-reach sectors. It enriched the diversity of the sample, which included 45 companies across manufacturing, retail, and service industries, ranging from small businesses with under 10 employees to large organizations with over 1,000 employees. This diversity ensured a broad understanding of inventory management practices across different industries and organizational sizes. Key personnel responsible for inventory management—such as supply chain managers, logistics coordinators, and procurement officers—were identified as participants due to their direct involvement in inventory-related decisions. While the sample was not statistically representative, it included a wide variety of companies and practices, providing a comprehensive understanding of inventory management challenges in Jordan. This diversity enhances the transferability of the findings to similar developing economies.

Data were collected through in-person semi-structured interviews conducted over several months. Each interview lasted between 50 minutes to two hours, allowing in-depth exploration of the topics while maintaining participant engagement. The semi-structured format provided flexibility, enabling participants to discuss relevant issues while ensuring that all key aspects were covered (Kallio et al., 2016). An interview guide was developed based on the inventory management literature, comprising five main sections: general information about the company and the industry, inventory management system description, inventory-related costs, inventory management techniques, and other inventory management issues. The questions were designed to elicit detailed responses regarding the practices, systems, and challenges associated with company inventory management. The guide was validated through pilot interviews with industry experts to ensure relevance, clarity, and comprehensiveness.

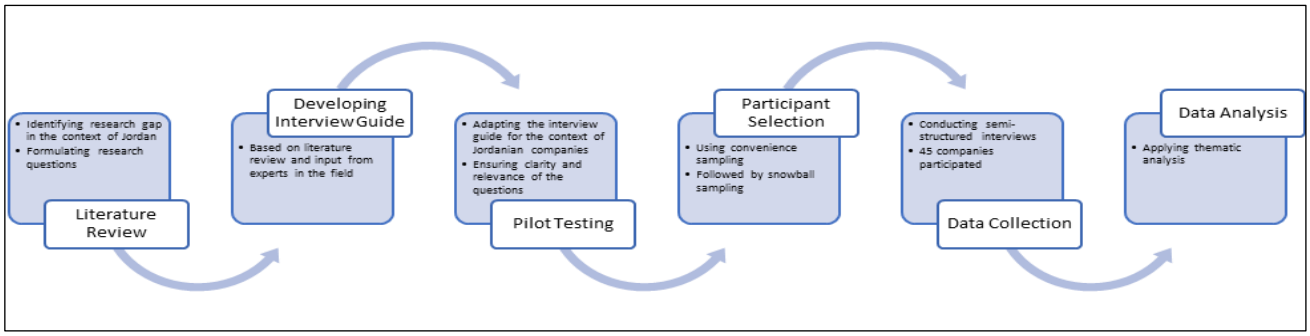

Figure 1. Research Methodology Flowchart.

The qualitative data from the interviews were analyzed using thematic analysis, which is suitable for identifying and interpreting patterns within qualitative data (Braun & Clarke, 2006). The analysis followed a systematic process involving familiarization with the data, coding, theme development, and refinement. While some interviews were audio-recorded with participant consent and transcribed, other interviews depended on comprehensive notes taken by the interviewer. Researchers reviewed the transcripts and notes multiple times to be more familiar with the data and identify initial ideas related to inventory management practices and challenges. Codes were assigned to specific excerpts that captured key aspects, such as the use of technology, calculation of costs, challenges in demand forecasting, and adaptations to market conditions. These codes were then grouped into broader themes based on patterns observed in the data. For example, codes related to technological adoption formed the theme "Technology Use in Inventory Management," while those related to cost calculations were grouped under "Costs Associated with Inventory Management." The themes were refined to ensure they accurately reflected the data and were distinct from one another.

The findings were contextualized within the broader theoretical framework by comparing them with existing studies on inventory management. For instance, the adoption of the EOQ model and its limitations in the participating companies were discussed in light of literature critiquing the static assumptions of EOQ models in dynamic market conditions (Alnahhal et al., 2024). Similarly, challenges faced in implementing JIT practices were linked to established knowledge of the vulnerabilities of JIT to supply chain disruptions (Gunasekaran, 1999; Kootanaee et al., 2013). This integration allowed for a comprehensive discussion of how inventory management practices in Jordan align with or diverge from global standards, highlighting unique contextual challenges Jordanian companies face.

Ethical protocols were strictly adhered to throughout the research process. Before data collection, explicit permissions were obtained from all participants. They were informed about the study's purpose, the voluntary nature of their participation, and their right to withdraw at any time without consequence. Confidentiality and anonymity were assured by assigning codes to each participant and company and by removing any identifying information from the transcripts and reports. Data were stored securely and accessed only by the research team.

To enhance the validity and reliability of the study, methodological triangulation was employed by combining data from interviews with observations and document reviews where available (Blee and Taylor, 2002). Data analysis was conducted collaboratively by the research team to minimize individual bias. Themes were cross-checked among researchers to ensure consistency and accuracy. Using direct quotations and detailed descriptions added to the transparency and trustworthiness of the findings (Rapport, 2004).

The methodological approach adopted in this study provided a systematic and rigorous means of exploring inventory management practices among Jordanian companies. By employing semi-structured interviews and thematic analysis, the research captured rich insights into the strategies, challenges, and contextual factors influencing inventory management in diverse organizational settings. The combination of convenience and snowball sampling facilitated access to a diverse range of companies, enhancing the generalizability of the findings within the context of qualitative research. Integrating the findings with existing literature contributes to both academic understanding and practical applications, offering valuable implications for improving inventory management practices in Jordan and similar contexts. The research methodology employed in this study is outlined in Figure 1.

Results and discussion

This section presents findings from interviews with 45 Jordanian companies, analyzing their inventory management practices. It explores how factors like company size and industry type influence strategies, examines methodologies employed (EOQ, MRP, JIT, VMI), and assesses their adaptation to operational needs. The analysis covers associated costs, the role of technology, and key challenges faced. Additional insights highlight the influence of external economic factors, customer satisfaction priorities, and managerial experience on inventory decisions. The results underscore gaps between theoretical models and practical applications in the Jordanian context, offering implications for practitioners and academics.

Companies Characteristics Analysis

Table 1 provides a detailed profile of the companies that participated in the study. It includes key characteristics such as the number of employees, industry type, the presence of dedicated inventory management departments, inventory decision-making authority, inventory management methodologies employed, and software utilization.

Figure 2. The Relationship Between Company Size and Employing a Dedicated Inventory Management Department

The analysis of interview results indicates that larger organizations are more likely to maintain dedicated inventory management departments and employ established methods like EOQ and MRP. Figure 2 shows the relationship between company size represented by the number of employees and employing a dedicated inventory management department.

These methods are typically supported by computerized systems, notably ERP systems, which facilitate real-time tracking and optimization of inventory levels. Such integration enhances operational efficiency and responsiveness to market demands. In contrast, smaller companies often lack dedicated inventory management departments.

Table 1: Participating Companies' Profile Overview.

Company	Interviewee's Position	Number of Employees	Industry	Dedicated Inventory Management Department	Who Makes Inventory Decisions	Inventory Management Method	Software used
1	Owner/ Manager	16	Tire distribution and trade	No	Top Manager and the Financial Advisor	EOQ	Excel
2	Medium Level Manager	20	Furniture components and accessories	No	Procurement	NA	No
3	Logistics Assistant	45	Automotive/ tire distribution	No	Logistics Managers	NA	Customized System
4	Area Sales Manager	14000	Diversified	Yes	Inventory Manager	EOQ and MRP	ERP System
5	Logistics Manager	20	Automotive spare parts distribution	No	Logistics Department	MRP	Customized System
6	Operations Manager	4	Textile and advertisement materials	No	Warehouse Manager	NA	Zoho
7	Sales Engineer	20	Tires and spare parts distribution	Yes	Inventory Manager	EOQ	Customized System
8	Supply Chain Engineer	175	Wooden Industries	No	Supply Chain Department	EOQ	No
9	Spare Parts Manager	70	Automotive trade	Yes	Inventory Manager	EOQ	Autoline
10	Owner	7	Warehousing and storage	No	Manager/Owner	VMI and MRP	Bonanza
11	Executive Director	40	Food Manufacturing (Pickles)	No	Procurement	EOQ	Excel
12	Procurement and Logistics	700	Manufacturing and Services	No	Warehouse Manager	MRP	ERP System
13	Warehouse Supervisor	70	Warehousing and third-party logistics	No	Cross-Functional Team	JIT	No
14	Manager	17	Restaurant	Yes	Inventory Manager	VMI	No
15	Development Manager	25	Retail (clothing)	Yes	Inventory Manager	JIT	ERP System
16	Engineer	80	Agricultural equipment manufacturing	Yes	Inventory Manager	EOQ	No
17	Owner	35	Grocery and consumer goods	No	Manager/Owner	NA	No
18	Inventory Officer	12	Coffee shop	Yes	Inventory Manager	MRP	No
19	Human Resources & Administration	55	Financial Services	No	Finance Team	MRP	Oracle
20	Operations Manager	28	Shipping and logistics	No	Accountant	EOQ	No
21	Administration	45	Retail (grocery)	No	Cross-Functional Team	EOQ	Customized System
22	Administration	45	Retail (shopping mall)	No	Top Managers	VMI	Customized System
23	Employee	4	Pharmacy and healthcare	Yes	Inventory Manager	VMI	NA
24	Operations Manager	30	Retail (hypermarket and fresh products)	No	Procurement	JIT	Global Technology System (GTS) / POS
25	Logistics Department Member	4200	Garment and textiles industry	No	Procurement	MRP	SAP
26	Warehouse Manager	83	Series of roasteries	No	Cross-Functional Team	MRP	SAP
27	Owner and General Manager	10	Printing, packaging, and design	No	Warehouse department	MRP	No
28	Procurement Manager	1300	Manufacturing and real estate	No	Cross-Functional Team	EOQ	SAP
29	Managing Director	8	General trading	No	Logistic Department	JIT	No

30	Supply Manager	150	Construction materials	Yes	Inventory Manager	JIT	Customized System
31	Warehouses Manager	800	Manufacturing / hygienic paper	Yes	Inventory Manager	EOQ	Oracle
32	Commercial Manager	100	Food industry	Yes	Inventory Manager	NA	No
33	Manager	50	Automotive industry	No	Warehouse Manager	NA	Customized System
34	Inventory Control in Charge	96	Retail	Yes	Inventory Manager	NA	Microsoft Dynamics
35	Storage Manager	29	Manufacture of paints and insulating materials	No	Store Manager	MRP	ERP System
36	CEO	13	Trade	Yes	Inventory Manager	EOQ	ERP System
37	Logistics Manager	50	Manufacturing	Yes	Inventory Manager	EOQ and MRP	ERP System
38	CEO	25	Manufacture of paper and sanitary products	Yes	Inventory Manager	EOQ	SAP
39	COO	55	Manufacturing and trade	Yes	Inventory Manager	EOQ	POS
40	Supply Chain Coordinator	30	Agriculture	No	Cross-Functional Team	EOQ	Excel
41	Product Manager	15	Retail	No	Procurement	EOQ	Microsoft Dynamics
42	Inventory Manager	45	Sanitary ware company	Yes	Inventory Manager	NA	Excel
43	Supply Chain Manager	49	Electrical and telecom cabinets	No	Supply Chain Manager	MRP	Odoo
44	Supply Chain Director	9	Sanitary ware company	No	Supply Chain Director	NA	Excel
45	Inventory Manager	350	Fast food industry	Yes	Inventory Manager	EOQ	POS

Inventory decisions in these settings are frequently made by owners, top managers, or cross-functional teams within procurement, warehousing, operations, supply chain, or logistics departments, reflecting a more informal approach that can be described as fragmented logistics management (Murphy & Knemeyer, 2018). These organizations rely on simpler inventory management methods or customized systems tailored to their specific needs, often utilizing tools like Point of Sale (POS) systems or spreadsheets such as Microsoft Excel. This reliance on less sophisticated tools can result in a lack of standardization and potentially less efficient operations, limiting their ability to analyze data effectively or respond swiftly to fluctuations in demand. The difference in software utilization further emphasizes the differences between larger and smaller firms. Larger companies are more likely to invest in advanced technological solutions like ERP systems to streamline processes and reduce errors. In contrast, smaller companies often depend on basic inventory tracking and management tools. Overall, the analysis underscores the critical role that company size and industry context play in shaping inventory management strategies, influencing both decision-making processes and the tools employed for effective inventory management. Notably, out of 45 companies surveyed, 27 reported not having a dedicated inventory management department, instead relying on cross-functional teams or individual managers for inventory management decisions. These findings suggest that smaller and family businesses may benefit from adopting more formalized inventory management practices and investing in advanced systems to improve operational efficiency and market responsiveness.

Inventory Management Practices

The analysis of inventory management practices among participating enterprises reveals diverse strategies tailored to specific operational needs and market conditions. Companies employ a combination of traditional models like EOQ, MRP, JIT, and VMI. Implementing these methods varies significantly across organizations, influenced by factors such as company size, industry sector, and supply chain dynamics.

Interviewed companies determined how much and when to order by leveraging historical sales data, demand forecasting, inventory monitoring, and lead time considerations. Many firms rely on previous sales forecasts to inform their ordering decisions. For instance, the owner and manager of Company 1 stated, "Sales forecasts can provide us with enough information to know precisely how much of a specific product is needed and when to order it." Lead time is particularly critical for companies that import materials; a manager in Company 2 that produces furniture noted that their company "consider lead time before ordering, importing wooden boards mainly from Turkey and Europe." Some companies set specific reorder points to automate the ordering process. The operations manager in Company 6 mentioned, "Certain reorder points are set for each item; if the stock reaches the reorder point, the system automatically notifies for another order to happen." Collaboration across departments is also common, with monthly meetings involving various teams to decide on ordering quantities. A tire distributor (Company 3) described this process: "We have a monthly meeting with the heads of every department... to decide how much stock to order. We take into consideration current stock, lead time, and what our fast-selling sizes are." In smaller companies or family businesses, owners or top managers often make inventory decisions, focusing on customer preferences and seasonal needs. One small business, Company 17, owner explained, "Taking into consideration the customer's preferences and the seasonal needs for certain goods, (the manager) decides what to order and when to order." This practice aligns with the findings of Kamau and Kagiri (2015), who highlighted the influence of company size and management structure on inventory practices.

The findings reveal that companies generally understand dependent and independent demand concepts and apply them appropriately. Companies dealing with raw materials or

components essential for producing final products use the dependent demand approach. For example, the executive director of Company 11, a pickle manufacturer, stated, "We use the dependent demand approach because we order raw material, which enters into several processes to become a final product (pickles)." Conversely, companies selling finished goods directly to consumers often use the independent demand approach. An administrator in a retail store (Company 21) noted, "We use the independent demand approach, as all goods are finished products sold separately and do not depend on each other." Some companies adopt both approaches depending on the item. The CEO of Company 36 explained, "Our company employs a combination of approaches depending on the nature of the items: dependent demand for raw materials and components, and independent demand for finished goods sold directly to customers."

Figure 3 illustrates the distribution of inventory management method employed among the participating companies. The methods used for inventory management among the participating companies include EOQ, MRP, JIT, VMI, and combinations thereof. While many firms adopt the EOQ model to minimize total inventory costs, several companies implement MRP systems to synchronize material requirements with production schedules. JIT is employed to reduce holding costs and respond to demand fluctuations, the development manager in Company 15, a clothing retailer, explained, "We use the JIT method so we don't hold large amounts of stock that may be outdated," highlighting the method's focus on minimizing inventory levels and aligning closely with actual demand (Aycock, 2003). However, the implementation of JIT in participating companies faces challenges due to unreliable suppliers and insufficient support systems, as noted by Al-Matarneh (2012). VMI is mainly used for perishable products, with suppliers responsible for replenishing stock. However, some companies, particularly smaller firms like companies 2, 6, and 44, indicated no clear method for inventory management (listed as NA in Table 1), reflecting a lack of knowledge in this area. Additionally, some firms employ practices that align with established inventory management methods but lack familiarity with the scientific terms, indicating limited awareness of whether their practices are optimal or can be improved.

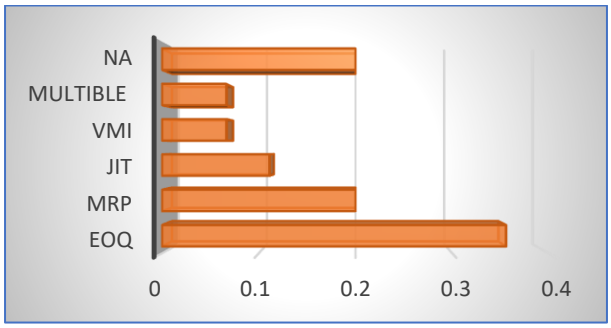

Figure 3. Distribution of Utilization of Inventory Management Methods Among Participating Companies.

Interestingly, some patterns observed in the practices of interviewed companies are inconsistent with traditional inventory management theories. For instance, despite the theoretical emphasis on minimizing inventory levels to reduce holding costs (Schroeder, 2000), several companies reported intentionally maintaining high stock levels due to supply chain uncertainties. The operations manager in Company 6 explained, "Due to the global supply chain issues, keeping a high stock level is required to prevent short- and long-term shortages. Also, given that the cost of raw materials fluctuates, keeping a high stock level might save the business from increased supply cost." Moreover, while JIT emphasizes reducing inventory levels and requires reliable suppliers (Jadhav et al., 2014), its implementation in Jordan appears to be challenging due to supply chain disruptions and unreliable suppliers, as previously highlighted in the literature (Al-Matarneh, 2012; Smadi, 2012). Some companies adopt JIT despite these challenges, which may increase the risk of stockouts and production delays, contradicting the benefits outlined in JIT literature. Additionally, the adoption of advanced inventory management software is less prevalent than might be expected based on literature emphasizing its benefits (Atieh et al., 2016). While some companies use software solutions, many rely on manual methods or basic tools. This limited use of technology could hinder the efficiency and accuracy of inventory management, diverging from the trend of digitalization in supply chain management advocated in contemporary research (Bhadrachalam et al., 2011).

The findings suggest that while the companies are aware of established inventory management methods, their application is often adapted or modified due to local constraints and challenges. This adaptation may result in practices that are inconsistent with traditional theories, highlighting the need for flexible and flexible inventory models to the specific conditions of developing economies like Jordan.

Costs Associated with Inventory Management

The calculation and management of inventory-related costs among the participating companies exhibit significant variability, reflecting differences in company size, industry sector, and operational practices. Companies approach the calculation of inventory holding costs, reordering costs, shortage costs, and trade-offs among these costs in diverse ways, often influenced by resource availability and market conditions. Many of the interviewed companies include components in their calculations of inventory holding, ordering, and shortage costs that contradict established inventory management theories, suggesting a limited understanding of these theories. For instance, one company calculates holding costs by adding capital, storage, labor, transportation, insurance, taxes, administration, depreciation, obsolescence, and shrinkage over one year. While comprehensive, this method does not align precisely with the traditional models that typically focus on holding costs as a percentage of inventory value without aggregating all operational expenses (Gołaś, 2020). Company 11 includes components like "the cost of materials consumed in manufacturing, such as plastic buckets, plastic bags, and employees' wages" in their holding cost calculation. This approach mixes production costs with holding costs, which contradicts the theoretical separation of inventory holding costs from production or manufacturing expenses (Koumanakos, 2008).

Some participating companies stated that they do not calculate inventory holding or reordering costs. For example, Company 2 admitted, "They don't have a straightforward way to calculate the holding cost." The same company mentioned, "They don't make any trade-offs between costs because they don't calculate them." This absence of formal cost calculation affects their ability to make informed inventory management decisions. It indicates a lack of awareness about the importance of considering costs as a critical factor in inventory management. Without understanding holding and ordering costs, companies may struggle to optimize order quantities and frequencies, potentially leading to increased total inventory costs (Tiwari and

Gavirneni, 2007). Regarding shortage costs, a significant number of participating companies (approximately 33%) mentioned that they do not calculate or stated that they have no shortage costs. For instance, the operations manager in Company 6 noted, "We don't usually have a shortage in our stock, but if we have, we ensure the customer is satisfied quickly." Without calculating shortage costs, these companies cannot effectively balance the cost of holding stock with the cost of not holding enough stock. This lack of calculation hinders their ability to determine optimal inventory levels that minimize total costs while meeting customer demand (6). The inability to quantify shortage costs presents a clear problem, as companies may either overstock, incur unnecessary holding costs, or understock, leading to lost sales and customer dissatisfaction. Furthermore, the lack of cost trade-off analysis limits their ability to optimize inventory management decisions. By not evaluating the interplay between holding costs, ordering costs, and shortage costs, companies miss opportunities to reduce total costs and improve service levels (Schroeder, 2000).

Overall, the approaches to calculating inventory-related costs and making trade-offs among them in the participating companies are inconsistent and often deviate from theoretical models. This inconsistency may be attributed to limited awareness or understanding of comprehensive cost accounting in inventory management, as suggested by Al-Matarneh (2012). The variation in practices indicates a need for better integration of theoretical models into practical applications, reinforcing the gap between academic research and industry practice highlighted by Tiwari and Gavirneni (2007). Addressing this gap could enhance profitability and operational efficiency, supporting findings in the literature that effective inventory management positively impacts financial performance (Koumanakos, 2008).

Use of Technology in Inventory Management

The utilization of technology for inventory management among the participating companies reveals significant disparities influenced by company size, resource availability, and strategic priorities. While some companies have adopted advanced ERP systems, others rely on basic tools such as spreadsheets or customized POS systems tailored to their needs. Several companies reported using ERP systems to enhance their inventory management processes. This adoption aligns with the literature emphasizing the benefits of ERP systems in integrating various business functions, including inventory management, accounting, and customer relationship management (Kortabarria et al., 2018; Chan et al., 2011). However, many of the "customized systems" mentioned by participating companies are simple POS systems that have been slightly modified to meet the organization's and its products' specific needs. A manager in Company 2 described their system: "They don't have software that determines when to order and how much, but they do have a system tailored for the business's day-to-day operation; it keeps track of the sales and monitors the stock of each SKU. When it reaches a certain level (reorder level), (they) be alerted to order that SKU." While these systems assist in basic inventory tracking and sales monitoring, they may lack advanced functionalities such as demand forecasting, integration with supply chain partners, or analytics capabilities.

Smaller organizations, in particular, face obstacles in investing in improving their technological infrastructure. The warehouse supervisor in Company 13 highlighted this challenge: "Due to the low inventory rate, no computerized system is used in the company, and most inventory choices are made by the employees in charge." The commercial manager in Company 32 noted, "There is some part that is computerized, but we depend highly on the manual." These statements reflect the financial and resource constraints that smaller firms encounter when adopting advanced inventory management systems. The literature corroborates this issue, indicating that high implementation and maintenance costs can be prohibitive for smaller companies, limiting their ability to leverage technology for inventory optimization (El Marzougui et al., 2020; Aloqaily, 2021). The reliance on basic tools such as spreadsheets is also prevalent among some participating companies. The limited technological adoption among smaller firms can impact their competitiveness and operational efficiency. Companies may struggle with real-time inventory tracking, accurate demand forecasting, and integration with suppliers and customers without advanced systems. This gap highlights the need for increased investment in technology and training to enhance inventory management practices, particularly for SMEs (Chan et al., 2011; Aloqaily, 2021). In contrast, larger companies or those with more resources have implemented comprehensive ERP systems that integrate various aspects of their operations. Such integration facilitates better communication, reduces errors, and enables data-driven decision-making, improving inventory management and overall operational performance (Kortabarria et al., 2018). However, even among companies that have adopted technology, there may be limitations due to customization or lack of advanced features.

Overall, the use of technology in inventory management among the participating companies reflects a spectrum of adoption levels. While some companies leverage advanced systems to enhance their inventory processes, others rely on basic or manual methods, which may limit their operational efficiency and ability to compete in dynamic markets. The findings suggest a need for support in adopting modern inventory management technologies, particularly for smaller organizations, to bridge the gap and enable them to benefit from improved inventory control and supply chain integration.

Key Challenges in Inventory Management

The participating companies face several challenges in their inventory management practices, affecting their operational efficiency and profitability. The following are the key challenges:

1. Inadequate cost calculations and theory-practice gap: A prevalent challenge is the absence of formal methods for calculating inventory-related costs, reflecting a gap between theoretical models and practical applications. Many companies admitted they do not calculate holding, reordering, or shortage costs. The owner of Company 10 stated that, "There is no basic formula for calculating the holding, reordering, or shortage costs." Similarly, the commercial manager in Company 32 mentioned, "We do not calculate holding cost since we own the warehouse." Additionally, responses revealed that companies 4, 10, 12, 14, 16, 17, 25, and 45 do not calculate shortage costs; companies 12, 23, and 25 do not calculate holding costs; and companies 10, 12, 17, and 25 do not calculate reordering costs. This lack of cost awareness hampers informed decision-making, as companies cannot effectively balance ordering, holding, and stockout costs. They risk suboptimal inventory levels without quantifying these costs, leading to increased total costs and decreased customer satisfaction (Tiwari and Gavirneni, 2007). Moreover, some organizations implement practices that contradict theoretical principles in calculating inventory-related costs, for example, the inventory

control manger in Company 34 mentioned that they include, "cars and drivers and its expenses" in calculating inventory holding costs.." This gap hinders the optimization of inventory levels and cost-reduction efforts (Tiwari and Gavirneni, 2007).

2. Technological limitations and resistance: Many companies, especially smaller ones, struggle with investing in technological infrastructure for advanced inventory management, exhibiting resistance to technological integration. They often rely on basic tools like spreadsheets or simple POS systems. The warehouse supervisor in Company 13 stated that "Due to the low inventory rate, no computerized system is used in the company, and most inventory choices are made by the employees in charge." An administrator in Company 21 admitted, "I realized that the company hesitates to integrate technology, affecting productivity." This resistance may stem from a lack of technical expertise, fear of change, or concerns about cost and complexity. The reluctance to adopt technology limits the ability to implement efficient practices such as real-time tracking, automated reordering, and data analytics for forecasting (Atieh et al., 2016; Chan et al., 2011; Aloqaily, 2021).
3. Supply chain vulnerabilities: External factors like the COVID-19 pandemic, geopolitical tensions, and fluctuating fuel prices have introduced significant volatility into supply chains. Companies reported challenges such as increased lead times, higher transportation costs, and unpredictability in supply availability. The operations manager in Company 6 highlighted, "Heavy supply chain issues are present due to the COVID-19 pandemic, the Chinese trade war, the Russian war, and the increase in fuel prices. More complex decisions are required from an inventory management perspective." Additionally, reliance on a limited number of suppliers exposes companies to risks associated with supply disruptions and lack of bargaining power. Company 16 faced challenges during geopolitical conflicts: "We rely on two leading suppliers... when the Saudi-Qatari conflict was on, these huge companies were competing to give the best price, so basically, we, as a company, were waiting for the best price at the last minute." Diversifying supplier bases and developing stronger relationships can mitigate these risks (Abu-Mater et al., 2021; Smadi, 2012).
4. Overstocking and demand forecasting challenges: To avoid stockouts and maintain customer satisfaction, some companies maintain high inventory levels, often due to challenges in demand forecasting. The supply chain engineer in Company 8 stated, "The company is mainly concerned with customer satisfaction, so it tends to increase the amount of stock to always be available." Companies dealing with perishable goods face additional difficulties, needing to balance sufficient stock without incurring losses from spoilage. The owner of Company 17 mentioned, "Experience, proper collecting data, and correct data analysis" as crucial for managing their inventory, highlighting reliance on experience over systematic forecasting methods. Overstocking ties up capital and increases the risk of obsolescence, especially for perishable goods (Koumanakos, 2008).
5. Human resource limitations and communication gaps: In several companies, inventory management lacks dedicated personnel or departments, with responsibilities dispersed among employees who may lack the necessary expertise. The area sales manager in Company 4 stated "I find it hard to describe the definitions, and it's weird that the companies teach the employees how to use the system without describing essential definitions for the job that I am doing." Effective inventory management also requires seamless communication across departments and with suppliers, but some companies struggle with internal coordination and supplier relationships. The supply chain engineer in Company 43 observed, "Departments should always be related to each other and always keep up to date regarding any information or inquiry that happens in the company; thus, it makes everything else easier and more convenient." Without specialized staff and proper communication, companies may face inefficiencies and increased costs (Kamau and Kagiri, 2015; Radzuan et al., 2018).

The challenges identified highlight the need for companies to improve cost calculation methods, adopt advanced technology, and invest in specialized personnel. Bridging the gap between theory and practice through training and better communication with suppliers will optimize inventory management and improve competitiveness.

Additional Inventory Management Insights

Analyzing companies' responses provides several insights beyond the challenges discussed, revealing how various factors influence their inventory management decisions. More specifically,

1. Many companies prioritize customer satisfaction by ensuring product availability, sometimes at the expense of higher holding costs. As the supply chain engineer at Company 8 stated "The company is mainly concerned with customer satisfaction, so it tends to increase the amount of stock to always be available."
2. In the absence of formal systems, several companies depend on managerial intuition. Participants from companies 15, 17, 21, 41, 42, and 45 stressed the importance of experience in managing inventory, suggesting that personal expertise compensates for the lack of systematic processes. However, staff lack of foundational knowledge can hinder effective inventory management. An administrator in Company 21 stated, "Inventory decisions are often made by the owner or top managers based on their understanding of customer preferences and seasonal needs."
3. Government regulations affect inventory practices, an engineer in Company 16 shared, "The government has a rule that defines the height of the storage house..." leading to inefficient space utilization. While companies recognize the importance of accurate demand forecasting, implementation is challenging. Suggestions include adopting advanced methods: "Invest in advanced predictive analytics to refine demand forecasting" as suggested by the inventory control in charge in Company 34. Companies operating in volatile markets or with perishable goods emphasize flexibility. For example, Company 40 relies on "flexible production schedules and alternative markets during low-demand seasons to minimize obsolescence costs." Proactive market trend analysis

also helps adjust inventory decisions, as the inventory and logistics specialist in Company 42 noted, "Always studying the market and staying up-to-date with every single trend... data analysis is very important."

4. Effective inventory management requires collaboration across departments and the utilization of data analytics. A supply chain engineer in Company 43 observed, "Departments should always be related to each other and always keep up to date regarding any information... it makes everything else easier and more convenient." Also, the development manager in Company 15 emphasized, "Our ERP system develops reports that help us analyze which items sell the most... which allows us to increase our sales." These practices highlight the benefits of integrated processes and data-driven strategies.

These insights underscore the multifaceted nature of inventory management and the necessity for companies to balance external factors, customer satisfaction, technological adoption, internal communication, and customized strategies to develop effective practices.

conclusions, recommendations, and limitations

This section summarizes the key findings on inventory management practices among Jordanian companies, presents recommendations for future research and practitioners, and outlines the study's limitations.

Conclusions

The study explores inventory management practices among Jordanian companies, revealing significant gaps between theoretical models and practical applications affecting their ability to contribute effectively to sustainable economic growth and responsible production patterns. The main research conclusions are as follows:

1. There is a significant disconnect between established inventory management theories and their practical implementation within Jordanian companies. While organizations are aware of methodologies like EOQ, MRP, JIT, and VMI, their application is often inconsistent with theoretical principles. This observation aligns with Tiwari and Gavirneni (2007) and Kumar et al. (2013), who noted challenges in applying academic models to complex real-world environments.
2. Company characteristics, especially company size, significantly influence inventory management practices.
3. Adopting advanced inventory management software and technology is less prevalent than expected, particularly among smaller companies. Financial constraints and resistance to change contribute to limited technological integration, affecting operational efficiency, data accuracy, and the ability to implement efficient practices such as real-time tracking and automated reordering. This limitation ultimately impacts competitiveness, corroborating findings by Atieh et al. (2016) and Chan et al. (Chan et al., 2011).
4. Many companies do not calculate inventory-related costs such as holding, ordering, and shortage costs or fail to trade off these costs effectively. This issue reflects a limited understanding of the importance of cost considerations in inventory management, as Gołaś (2020) discussed.
5. Supply chain disruptions caused by external factors have introduced significant volatility. Companies often respond by maintaining high inventory levels to hedge against uncertainties, resulting in increased holding costs and potential over-stocking issues.
6. Several companies rely heavily on managerial experience and intuition for inventory decisions. While valuable, this approach may not substitute for data-driven decision-making facilitated by advanced inventory management techniques, leading to suboptimal inventory practices.
7. Companies, especially those dealing with perishable goods, face challenges in accurate demand forecasting.
8. Government regulations, such as restrictions on storage methods, and external economic factors like currency fluctuations significantly influence inventory management decisions. Companies must navigate these constraints, which can increase operational costs and complicate inventory strategies.
9. Poor internal coordination and challenges in supplier relationships affect inventory management effectiveness. Dependence on a limited number of suppliers exposes companies to risks associated with supply disruptions and a lack of bargaining power. Strengthening supplier relationships and enhancing supply chain integration can mitigate these risks, aligning with strategies proposed by Smadi (2012).
10. A strong focus on customer satisfaction drives some companies to maintain high inventory levels to avoid stockouts. While this reduces the risk of shortages, it leads to increased holding costs and can mask underlying issues in demand forecasting and supply chain management.
11. Companies often tailor their inventory management practices to specific operational contexts, addressing unique challenges associated with different products, demand patterns, and supply chain complexities. This customization underscores the need for flexible inventory models that adapt to varying conditions.

Recommendations

The study's findings highlight several areas where further research is necessary to enhance inventory management practices among Jordanian companies and bridge the gap between theory and practice, as shown below:

1. Future research should focus on developing inventory management models tailored to the specific conditions of developing economies like Jordan. Considering local constraints such as unreliable suppliers, supply chain disruptions, and financial limitations can make these models more applicable. This aligns with the need identified by Tiwari and Gavirneni (2007) for adaptable models that practitioners can effectively implement in complex real-world environments.
2. Investigating the obstacles that SMEs face in adopting advanced inventory management technologies is crucial. Studies could examine financial constraints, resistance to change, and lack of technical expertise, providing strategies to facilitate technology integration. This supports the suggestions of Chan et al. (2011) and Aloqaily (2021) on enhancing technological adoption to improve operational efficiency.

3. Research is needed to identify effective demand forecasting methods suitable for Jordanian companies, especially those dealing with perishable goods. Exploring advanced predictive analytics and machine learning algorithms could improve accuracy, as emphasized by Goltsos et al. (2022), thereby reducing overstocking and stockouts.
4. Future studies should explore strategies to enhance supply chain resilience against external disruptions like pandemics and geopolitical tensions. Investigating approaches such as supplier diversification, local sourcing, and inventory buffering can help companies mitigate risks, reflecting concerns noted by Abu-Mater et al. (Abu-Mater et al., 2021).
5. Examining the role of training programs and educational initiatives in improving the understanding and application of inventory management theories among practitioners is essential. Research could assess how capacity-building efforts influence inventory practices, supporting Al-Matarneh's (2012) recommendation for enhanced training.
6. Research should analyze the impact of government regulations on inventory management, identifying how policy frameworks can be adjusted to support efficient practices without compromising regulatory objectives. This could help companies navigate constraints that currently complicate inventory strategies.
7. Conducting longitudinal research to track changes in inventory management practices in Jordan can reveal how companies adapt to technological advancements, market dynamics, and global economic conditions. This can inform strategies for continuous improvement and innovation.
8. Comparative analyses between different industries within Jordan or between Jordanian companies and those in other developing economies can identify best practices and common challenges. Such studies can facilitate knowledge transfer and collaborative problem-solving.

By addressing these areas, future research can contribute to developing more effective, contextually relevant inventory management practices. This will enhance operational efficiency and competitiveness among Jordanian companies and provide valuable insights applicable to similar developing economies.

In addition, the following are some recommendations for practitioners in inventory management in Jordanian companies.

1. Practitioners should invest in understanding and applying established inventory management theories such as EOQ, MRP, JIT, and VMI. Tailoring these models to local conditions can enhance inventory optimization and cost reduction efforts. Training programs and workshops can facilitate this understanding, aligning practice with theory and improving decision-making processes (Tiwari and Gavirneni, 2007).
2. Adopting advanced inventory management technologies can significantly improve operational efficiency, data accuracy, and responsiveness to market changes. Scalable and cost-effective technological solutions are available even for smaller companies, enabling real-time tracking, automated reordering, and better data analysis (Chan et al., 2011; Aloqaily, 2021).
3. Developing systematic approaches to calculating inventory-related costs is essential. Understanding these costs enables informed decision-making and helps optimize inventory levels, enhancing profitability
4. Employing advanced demand forecasting methods, possibly integrating predictive analytics and data analysis tools, can improve accuracy. Accurate forecasting reduces the risks of overstocking and stockouts, leading to better inventory management and higher customer satisfaction (Goltsos et al., 2022).
5. Developing stronger relationships with multiple suppliers can mitigate risks associated with supply disruptions. Diversifying the supplier base, fostering collaboration, and establishing clear communication channels are crucial. Implementing supply chain risk management strategies enhances resilience against external shocks like pandemics and geopolitical tensions (Smadi, 2012).
6. Investing in human resources by hiring specialized personnel and providing regular training can improve inventory management practices. Encouraging continuous learning keeps staff updated on the latest developments in inventory management theories and technologies, enhancing overall competence (Al-Matarneh, 2012).
7. Maintaining high product availability is important to satisfy customers, but it must be balanced with inventory holding costs. Inventory optimization helps achieve optimal service levels without incurring excessive costs, ensuring customer satisfaction and profitability (Koumanakos, 2008).
8. Staying informed about government regulations and economic factors affecting inventory management is vital. Proactively adjusting inventory strategies to comply with regulations and mitigate economic risks improves operational stability and reduces unforeseen expenses.
9. Fostering a culture that embraces change and innovation facilitates adopting new inventory management practices and technologies. Leadership should promote openness to new ideas and support initiatives to improve inventory efficiency and competitiveness.

By addressing these recommendations, researchers and practitioners can contribute to narrowing the gap between inventory management theory and practice. Researchers can develop more applicable models that consider the complexities highlighted by Boute et al. (Boute et al., 2022), while practitioners can implement strategies that enhance operational efficiency and competitiveness. Together, these efforts can lead to improved inventory management practices better suited to the challenges faced by companies in developing economies like Jordan.

Research Limitations

This study provides valuable insights into the inventory management practices and challenges in Jordanian companies but has some limitations that should be acknowledged. The use of convenience and snowball sampling methods, along with a sample size of 45 companies, may limit the generalizability of the findings to the broader population of Jordanian firms. The qualitative nature of the research, relying on semi-structured interviews, introduces subjectivity and potential biases in data

interpretation. Additionally, the study offers a cross-sectional perspective without capturing changes over time, limiting the understanding of how inventory management practices evolve in response to market dynamics or external shocks. Potential interviewer bias and cultural or organizational sensitivities may have affected participants' openness, impacting the completeness of the data. The absence of quantitative inventory performance measures restrict the ability to correlate practices with performance outcomes. These limitations suggest that caution should be exercised when generalizing the results, and they highlight the need for future research employing larger, more representative samples, incorporating quantitative data, and utilizing longitudinal and mixed method approaches to enhance the robustness and applicability of the findings.

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Availability of data and materials

Detailed interview responses are available upon request, subject to approval from the respondents' respective companies.

Author's contribution

Conceptualization, Alsoussi, A. and Tahboub, K.; methodology, Alsoussi, A. and Tahboub, K.; formal analysis Alsoussi, A.; investigation, Alsoussi, A.; data curation, Alsoussi, A. and Tahboub, K.; original draft preparation, Alsoussi, A.; review and editing, Alsoussi, A. and Tahboub, K.; supervision, Alsoussi, A. and Tahboub, K.

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