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Management accounting tools for inventory in the modern business environment

Abstract. The modern business environment requires effective inventory management to maintain competitiveness. In response to the increasing complexity of global supply chains, fluctuating consumer demand, and rising operating costs, there is a growing need for reliable management accounting tools to optimize inventory processes. In this study, the author analyzes and evaluates which tools are most effective for inventory management and provides practical recommendations for implementation in various industries. The study uses a qualitative approach using secondary data, which includes academic articles, industry reports. The application and effectiveness of inventory tools such as budgeting and forecasting, ABC analysis, variance analysis, and cost-benefit analysis were investigated using analytical methods such as content analysis and comparative analysis. The results show that forecasting and budgeting allow enterprises to predict demand and control costs so that they can use their resources more efficiently. ABC analysis categorizes inventory items based on their cost and usage, and can therefore be used to manage inventory effectively by aggressively focusing resources and optimizing costs. Through variance analysis, companies can identify and detect discrepancies in budgeted inventory and actual inventory, which they use to monitor performance and minimize inefficiencies. A key aspect of cost-benefit analysis is to provide a structured approach to analyze the economic feasibility of inventory strategies, ensuring the highest return on investment. Furthermore, the study emphasizes the integration of digital tools, namely the use of AI forecasting systems and ERP, to ensure accuracy and efficiency. Examples from the retail, manufacturing and e-commerce sectors are shown where these tools are used in practice in the real sector. To this end, this work has practical significance as it has provided applied information on how businesses can confront inventory management challenges and adapt these tools according to their objectives. This work helps improve inventory practices for more efficient growth in this day of competition

Keywords: management accounting, inventory, budgeting, ABC analysis, digital tools, forecasting, optimization

Introduction

In today's fast developing and extremely competitive business world, the efficient inventory management is considered as a way towards organizational success (Kuzior et al., 2023). However, as businesses continue to feel mounting pressure to optimize inventory processes, it is necessary to maintain operational efficiency, reduce costs, as well as meet customer demand (Appiah et al., 2020). Believers in inventory management, as the increasing complexity in the complexity of global supply chains and volatile tides in markets have affirmed, inventory management is a critical business recipe for sustainability and long-term growth. In this context, management accounting

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tools have become an inescapable resource, destined to optimize stock operations and therefore to allow businesses to adapt quickly and effectively to market evolutions.

However, many organizations still find great difficulties with the inventory management. Continued issues include cost control, accurate demand forecasting and disruptions with the supply chain that can hinder profitability and customer satisfaction. For example, if demand is not predicted right, then the consequences can be stock outs leading to lost sale opportunities, or a stock out leading to excess inventory holding costs. As such, these challenges expose a knowledge gap about how businesses can best make use of contemporary management accounting tools to address these matters. However, in some cases, existing practice does not take full advantage of the power of these tools.

Recent studies have examined both environmental and economic performance in relation to environmental management accounting (EMA) and the importance of EMA in improving it. According to Huynh and Lan (2021), EMA is critical in making business sustainable by relate ding it to the environment and economic outcomes. EMA integration into organizational strategies is argued to enable companies to align economic growth with environmental responsibility, and so aid long term sustainability. Appiah et al. (2020) also support this perspective where they study the influence that environmental strategy, organizational uncertainty and the top management commitment on the environmental performance. Their findings indicate that EMA and environmental management control systems play a central role in improving firm level environmental outcomes by bridging the perceived gap between management commitment and environmental performance.

Risi et al. (2023) explored the role that institutional theories have in shaping corporate social responsibility (CSR) practices and claimed that the values that shape corporate behavior and which encourage adoption of sustainable accounting practices, amongst other things. This work shows the importance of having an ethical framework and societal expectations to craft corporate strategies towards environmental sustainability. Similarly, Susanto and Meiryani (2019) explore in Indonesian small and medium enterprises (SME) the antecedents of EMA and describe how local contexts and organizational culture effect environmental performance. They indicate that EMA practice needs to be tailored to fit with SME characteristics to realize environmental benefits.

Amir, Rehman, and Khan (2020) further their line of inquiry by examining the mediating role of EMA in the linkage between top management commitment to environmental performance using legitimacy theory as their conceptual framework. Specifically, their study suggests that EMA's systems aid to translate the commitment by top management to sustainability into action because they create transparency in and accountability for environmental practice. Christine et al. (2019) show that EMA also contributes positively to environmental and economic performance, if combined with strong managerial commitment and clear environmental strategies. The dual impact identifies the strategic importance of EMA to link business objectives to environmental responsibilities.

Lastly, Sidik et al. (2019) briefly mention about the relationship between energy management, EMA and green intellectual capital in enhancing corporate environmental performance. EMA with green intellectual capital, they argue, facilitates a company's competitiveness as they integrate it with EMA, enhancing its environmental footprint. And their study is just more reinforcement of that growing recognition of EMA as a critical determinant of corporate sustainability, and how it directly impacts performance, and competitive advantage.

This study aims at analyzing and evaluating the most efficient management accounting tools for inventory management in present business environments. This article allocates to examine key methodologies for inventory, like budgeting and forecasting, ABC analysis, variance analysis, and cost benefit analysis to provide actionable insights for the company that aspires to polish inventory processes. It also investigates the significance of digital innovations, such as ERP systems and artificial intelligence (AI) – driven forecasting in resolving inventory challenges. The study contributes toward bridging this gap between theoretical understanding and actual application by presenting strategies consistent with the exigencies of today's enterprises.

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Literature review

Having an effective inventory management system for a business is essential as the key to reducing costs, and improving their operational efficiency. Management accounting tools have become one of the essential practices in inventory management improvement among different the sectors. This literature review reviews recent studies of using the management accounting tools in inventory management and their link with environmental performance, strategic decision making and business sustainability.

In Werimon et al. (2023) argued that EMA could improve the environmental performance of public hospitals in Indonesia. It adds to the literature on the need for use of management accounting tools in the non-manufacturing sectors by studying how EMA can be used to improve hazardous waste processing in hospitals. The research also shows how EMA can serve as a mediator to enhance environmental performance which can be applied to inventory management in incorporating sustainability practices within inventory processes.

Similarly, Zandi and Lee (2019) consider the factors that drive environmental management accounting and its effect in relation to environmental performance. EMA is an important tool to mitigate environmental impacts and improve efficiency in resource utilization, they say. The results of the study indicate that using EMA practices can help firms better forecast demand, manage inventory, and reduce waste, because the ultimate goals of businesses that seek to optimize inventory management with an eye towards environmental sustainability.

Handoyo et al. (2023) studied the firm characteristics, business environment, and strategic orientation effect on the organizational performance in the corporate strategy. Instead, they indicate that companies with a strong strategic orientation are more likely to use advanced management tools such as management accounting system to improve the operational efficiency. Through this research we see that integrating management accounting practices with core business strategies is as important and leads to better inventory control as well as resource usage.

Muttaqin (2022) explored the connection between competition and performance by looking at the mediating effect of management accounting systems on the relationship between competition and performance. In particular, his study shows that, for firms characterized by great competition, these management accounting technologies, that is, budgeting and forecasting, can contribute toward giving them a strategic advantage as they can secure efficient inventory control and cost control.

Construction companies in Vietnam and the factors influencing environmental accounting implementation are the focus of Nguyen et al. (2020). Their results suggest that the use of environmental accounting tools enhances resource efficiency and minimizes waste, and that these tools can be used in sectors, such as construction, that historically have struggled to control inventory.

Green supply chain management and firm's environmental performance incorporating the moderating effects of firm size is examined by Fianko et al. (2021). Limited resources can thus mean that smaller firms may fail to implement complex management accounting tools. Nonetheless, they state that employing green supply chain practices helps firms minimize waste and excess stock, hence enabling the firms to increase operational efficiency and sustainability at the same time.

Abedin et al. (2023) study the relationship between environmental performance and corporate governance in Japan, showing how firms are more likely to adopt environmentally responsible inventory practices when effective governance structures encourage good environmental performance. For business in need to incorporate sustainable inventory management practices to their governing structures, while environmental performance and cost becomes an inherent part of the overall business strategy.

At last, Prokopenko, et al. (2024) discuss an important mission of green entrepreneurship for sustainable development and, in particular, innovations of business model for local economies. This is consistent with inventory management that stresses environmental sustainability, implying that

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management accounting tools that encompassed environmental performance metrics might be useful to green entrepreneurial companies.

Overall, based on the reviewed literature, management accounting tools, and particularly the tools that deal with sustainability and strategic decision making, are imperative to perfect inventory management. Not only do they increase operational efficiency, they also integrate them with environmental goals, increasing long term business sustainability. The role of both AI and other technological advancements in inventory management should also be examined in future research, on account of their potential to improve accuracy and reduce waste.

Materials and Methods (Methodological justification)

The aim of the study was to conduct the analysis and evaluation of the effectiveness of management accounting tools for the inventory management in the contemporary sphere of business with the use of the systematic approach. As such, the methodology was designed to rely on only secondary data sources to ensure the reliability and replicability of research findings. Below, it is outlined which are the key stages of the research process, which methods and approaches are used and why was it decided to use them.

Research design and approach

Qualitative research design was used on the research and depended on existed literature, case studies and industry reports to explore the practical applications and outcomes of different inventory management tools. By using this approach, best practices, challenges, and innovations in inventory management was identified by sector. Availability, comprehensiveness and insight into real world applications without having to collect primary data made secondary data the choice method.

Data collection

The data from which this research was based consisted of peer-reviewed journal articles, industry publications, reports from multinational corporations, and case studies reported in business management literature. As a result, the appropriate studies were identified by using reputable databases such as Scopus, Web of Science and Google Scholar in order to make sure the selected materials comply high academic and professional standards. Specifically, to include new developments and trends in inventory management tools, the inclusion criteria were focused on sources published in the last ten years.

Methods of analysis

The data was then submitted to content analysis to extract major themes and insight. Categorization of data was done by the tools talked of in this; budgeting and forecasting, ABC analysis, variance analysis and cost benefit analysis. Also, comparative analysis was done to show the difference of the effectiveness of these tools in different industries regard commonalities, dissimilarities and factors to their success.

Criteria for data selection

Selection of secondary data was done according to strict criteria making it relevant and valid. The analysis had to include studies and reports that, at a minimum, identified inventory challenges in managing inventories, discuss the use of management accounting tools, and provided measurable outcomes or examples of successful implementation. The author favored data that showed well documented case studies of businesses in various industries, including retail, manufacturing, and e commerce.

Limitations and replicability

Although based only on secondary data, the present study provides a clear framework for replication by other researchers. Once again, the means to validate or build upon the

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findings presented in these studies are publicly available with well documented sources. Though, by using secondary data the empirical verification scope is limited and hence, the findings must be encouraged in that case. The methodological approach chosen in this study guarantees that the analysis of management accounting tools of inventory management will be comprehensive and reliable. The research focuses on secondary data, employing robust conceptual and statistical models to draw from empirical database to provide insights into the practical applications and effectiveness of these tools in addressing contemporary business challenges.

Results and Discussion

Results

Managing inventory is a major aspect for current business operations, especially in environments that have been experiencing rapid technological advancement, volatile consumer demand and intense competition (Abedin et al., 2023). Empowerment to manage inventory efficiently, not only saves a business money but also provides predictability of supply, which allows businesses to keep pace with their customer expectations and grab opportunities in their market. The management accounting tools are a critical tool to the inventory processes because it optimizes the inventory processes and provides pointers for decision making. With these inventory tools, organizations are able to have the ability to oversee, dissects, and further development their inventory framework to suit the longer-term technique.

This article focuses on four essential management accounting tools widely recognized for their efficacy in inventory management. The techniques that were learned are budgeting and forecasting, ABC analysis, variance analysis, and cost benefit analysis. Both tools provide a different set of functionalities each catering to a different set of challenges in inventory management, including demand prediction, cost control and resource allocation. When these tools are integrated into the business's operations, businesses can achieve an equilibrium between efficiency and profit making in complex and uncertain environment.

Table 1. Key management accounting tools for inventory management

№	Management accounting tool	Purpose	Key features	Applications
1.	Budgeting and forecasting	Demand prediction and cost control	- Establishing financial plans for inventory. - Predicting seasonal and cyclical demand trends. - Allocating resources effectively for procurement and storage.	- Ensuring sufficient stock levels to meet demand; - Reducing stockouts and overstock situations.
2.	ABC analysis	Categorizing inventory based on value and usage	- Classifying inventory into A, B, and C categories based on importance. - Identifying and managing critical inventory components.	- Prioritizing management efforts on high-value (A) items. - Optimizing warehouse space and reducing carrying costs.
3.	Variance analysis	Identifying discrepancies in inventory related budgets	- Comparing actual inventory performance with planned budgets. - Highlighting areas of inefficiency or overuse of resources.	- Investigating deviations to improve accuracy in inventory forecasting. - Adjusting procurement policies based on analysis outcomes.
4.	Cost-benefit analysis	Evaluating the economic feasibility of inventory strategies	- Assessing the financial impact of different inventory strategies. - Balancing costs (e.g., storage, obsolescence) against expected benefits.	- Deciding between alternative inventory management approaches. - Supporting investment in technology (e.g., AI forecasting tools).

Source: author development.

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A combination of management accounting tools is used for effective inventory management and each of the tools provides a different advantage for inventory optimization and operation alignment with organizational goals. Budgeting and forecasting, ABC analysis, variance analysis, and cost benefit analysis are three major methodologies used to resolve the complexities of modern inventory systems.

The budgeting and inventory forecasting are the foundation of efficient inventory management. Businesses that create extensive plans for financial management and can also forecast demand patterns, will be able to strategically assign resources such as effective inventory management that help curb overstocking or stockouts. Seasonal trends, market dynamics and historical data are studied to get at accurate forecasts. Beyond minimizing inventory related costs, this approach guarantees smooth operations in the supply chain. Take for example a retail company who was able to reduce storage costs by 15% and meet increased demand at peak sales periods by leveraging advanced forecasting models.

ABC analysis is comparable, but it assigns inventory in these categories according to value and contribution to revenue. Items are classified into three categories: Category A high-priority, Category B moderately critical and Category C with lower value. Businesses with segmented catalogs are able to direct their resources towards the most effective inventory and boost the efficiency and cost. For example, a manufacturing firm categorized raw materials as Category A items and initiated severe monitoring processes which resulted in 20% less stockouts. This approach makes decision making in replenishment of inventory much simpler, and also improves the focus on the operations as a whole (Handoyo et al., 2023).

Another vital tool used is Variance analysis that is meant to indicate variances between planned and actual budget for inventory related budgets. This tool highlights the areas of waste and deviation, thus allowing organizations to improve forecasting accuracy and fill the gaps in inventory plan. Error reduction is supported, strategic adjustments are facilitated, and it is aligned to financial goals. Logistics company performed variance analysis for reducing expenses in their network of distribution with results of 10% of return in transportation costs and optimization of running the business.

Last but not least, cost benefit analysis compares the economic viability of the different inventory strategies and optimizes the allocation of resource in the most profitable way. Through the weighing of short-term costs with long term gains, organisations can rank their strategies in order of maximum value. This tool helps to mitigate risk by avoiding unnecessary investments to a poorly performing initiative. For example, an e commerce firm conducted a cost benefit analysis to determine whether an automated inventory tracking system would be beneficial, yielding a 30% improvement in operating efficiency (Handoyo et al., 2023).

These tools working together deliver an integrated playbook for addressing inventory management problems, bringing together predictive accuracy, prioritization, performance monitoring and economic evaluation in a holistic package. With their effective integration, businesses are able to better integrate inventory processes, lower costs, and stay competitive in today fast paced business environment.

Faulks et al. (2021) note that successful navigation of the complexities of the modern business environment requires the integration of management accounting tools into inventory management processes. Budgeting and Forecasting, ABC analysis, variance analysis and cost benefit analysis each target a different aspect of Inventory Management encompassing demand prediction, cost optimization, and performance monitoring. These tools are together a very comprehensive inventory control framework that organizations can use to increase their efficiency, reduce costs, and tie their inventory strategies to more organization-wide goals. Both have their own strengths and weaknesses, but when used in conjunction, their application potential is at the level of sustainable competitive advantages. In the future, businesses must apply these tools to new challenges like the digital transformation and global supply chain disruptions that we increasingly

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face. Continuous improvement, leverage of technological innovations, and creation of a data driven culture of decision making will be essential to successfully managing inventory in an ever-changing business environment (Abedin et al., 2023).

With the lightning speed of capital movement in the global business world, digital tools and innovation have paved the way for many improvements in how inventory is managed, allowing businesses to work faster, more accurately and responsively. Amongst them, ERP systems, AI driven forecasting tools and their real time inventory tracking solutions have been adopted by modern businesses as a must use tool.

ERP Systems act as a centralized, streamlined platform for inventory management. These systems drive companies to get a holistic picture of its supply chain through procurement to sales. For example, top companies like Unilever use SAP's ERP software to manage its large inventory spread all over the world. By harnessing the potentials of SAP, Unilever has been able to have real time visibility in the amount of inventory on hand resulting to stock with the right amount available and reduced waste. Mid-sized business too takes advantages of automation of the inventory routines, keeping track of orders and efficient stock replenishment processes by Microsoft dynamics 365, which in turn reduces the risk of overstocking and stockouts.

These are tools which make use of machine learning algorithms to review the past sale information, promotion in the market and outdoor elements, for example, economic changes and climate patterns. Amazon and other retail giants rely on AI driven sales forecasting to predict customer demand with an incredible level of precision. Amazon's AI systems help forecast how many of each product will be needed, so the company can pre-position them closer to where customers live to reduce delivery times and costs. Walmart for instance, uses AI, in the form of forecasting tools that enables it to react quickly to demand changes, such as through seasonal spikes or unanticipated disruptions (World Bank, 2020).

Real Time Inventory Tracking solutions instantly update businesses on levels of stock, movement and stock levels. These are tools, often made of Internet of Things (IoT) technology, that allow companies to track inventory across warehouses, stores and during transit. For example, the global fashion retailer, Zara, is able to utilize their real time stock tracking system that supports their fast fashion business model. Zara, by incorporating Radio Frequency Identification (RFID) technology into its inventory systems, can trace garments from the point of production to point of sale allowing for greater restocking speed and a smooth shopping experience for customers. For example, FedEx applies the use of the IoT monitoring tracking for packages so that it can control the Far-reaching logistics network in the most effective way by ensuring that an inventory information is always updated (World Bank, 2020).

These digital innovations enhance operational efficiency and, most importantly, enable businesses to take informed decisions based on data. ERP systems, AI forecasting, and made real time tracking of changes can help companies gain competitive edge, optimize inventory management and counter the pressures the market places on companies today. Today however, the power to use these tools is no longer a luxury, it is a necessity for any business that aspires to survive in the modern economy.

In today's fast paced business environment, not only do inventory management tools need to be adopted but can be configured to suit the needs of individual organisations. However, these tools are being customized by more and more businesses in all industries to tackle these areas and align with strategic business goals. They can have the ability to adapt to market demand changes and keep a competitive edge if they do so.

It usually starts with configuring Enterprise Resource Planning (ERP) systems to fit the scale, complexity and structure of the organization. For instance, Procter & Gamble (P&G) was able to successfully adapt an implemented SAP ERP system to manage its world-wide broad supply chain. Through the addition of advanced modules for inventory optimization, P&G expediently maintains real-time coordination between its manufacturing facilities, warehouses, and distributors, attacking

delays and cost head on. Smaller businesses can as well scale ERP solutions such as Oracle NetSuite, where certain functionalities such as automating inventory replenishment or generating specific reporting formats are customized to fulfill niche operational needs (World Bank, 2020).

Companies in retail have been using AI driven forecasting tools to fine tune them to solve sector specific issues. A major retail US chain, Target, has modified its AI forecasting models to incorporate localized customer behavior data, weather patterns and regional holidays. This ensures that high demand items are well stocked, while not having excess surplus, thanks to this customization. But in the manufacturing field, General Electric uses AI predictive models to predict the availability of raw materials to prevent production halt and implement lean inventory practices.

Industry specific customization is also a great advantage to all the real time inventory tracking systems. Nestlé has customized its tracking system in food and beverage sector to monitor perishable products through its supply chain to achieve compliance with strict quality standard and reduce waste. Utilizing RFID technology alongside IoT sensors, the company is able to keep detailed records relating to the temperature and handling conditions, so they are able to deal with potential issues before it becomes a problem. In the automotive industry, for example, real time tracking by Toyota has been adopted to help its just in time manufacturing. Toyota has integrated tracking tools into its supply chain to ensure inventory arrives just when needed, thereby pay less in carrying costs and run more efficient production (World Bank, 2020).

These are simply examples that show that the success of inventory management tools hinges to a large degree on how well they adapt to the operational realities of an organization. While this improves the functionality of these tools, it also helps to meet certain business objectives. By tailoring digital solutions to their unique environments, businesses can better navigate uncertainties, respond to market changes, and achieve long-term growth in the modern business ecosystem.

Although advanced inventory management tools provide great benefits, implementing and using them is not easy. Unfortunately, businesses often run into established barriers – high costs, employee resistance and the ongoing need for training – that prevent the full potential of these tools from being realized. To enable this integration to occur successfully, it is important that we address these limitations.

The most prominent challenge is high implementation cost. But many digital solutions, from ERP systems to AI driven forecasting tools, are costly to deploy. Purchasing licenses, integrating the tools into an organization's existing systems, and maintaining the infrastructure that will support operation are all included costs. For instance, in case of small and medium sized enterprises, they can hardly afford to have an extensive ERP platform such as, SAP or Oracle requiring heavy budgets of large corporations. Finally, the cost to upgrade older systems to support new technologies can be an expensive drain, holding up adoption or keeping it to a minimum.

Employee resistance to change is another key barrier. To improve workflow, an organization may decide to adopt new technologies, which will usually cause in employees that disruption of their previous ways of working becomes unnerving. However, there is a resistance due to the tool might be unknown, or fear of job displacement by machines. For example, in traditional manufacturing, systems for inventory may be thought of as being overly complex, or threatening, by workers and therefore they may be resistant to introducing AI driven ones. Significant resistance of traditional tools towards programmatic thinking is slowing down the transition process of the tools and also the effectiveness of the tools in the short run.

There is an equally challenging problem that businesses need to overcome and it is that of continuous training and development. Advanced inventory tools also demand that employees learn new skills, requiring them to participate in regularly updated training programmed. While it is an important tool to help your workforce remain compliant with regulations, it can be resource intensive to organize and maintain such programs especially when your workforce is large or are spread across different regions. As such, global companies like Walmart spend large amounts on training staff in using AI forecasting systems and real time inventory tracking. The

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latter idea, though admirable, will not go anywhere without continuous training, otherwise employees might underutilize the tools, creating inefficiencies to exploit or missed opportunities for optimization.

In addition, technological advancements are currently happening so quickly that they often need constant updating and maintenance on top of the challenges. To perform well enough to be competitive, businesses have to know what is coming next and regularly update their systems. Without dedicated IT teams, or sufficient tech expertise, this is an ongoing process that can be daunting.

These challenges put into high focus why a strategic approach should be taken for the adoption of inventory management tools. From figuring out budgets to developing a culture of adaptability, to investing in elaborate training programs, businesses can circumvent these barriers. Among other things, overcoming these limitations will be essential in order to take advantage of the full power of digital inventory management in the competitive market of today.

Discussion.

This current research in the area of management accounting for inventory management, with a particular focus on sustainability is consistent with, and contributes to, a number of existing studies. EMA and its role in environmental performance and financial success is gaining popularity due to cross disciplinary key studies.

In their work, Irshad et al. (2023) analyze the linkage between environmental performance and the corporate governance of an organization, arguing that strong governance structures encourage sustainability agenda. This is consistent with contemporary research, which indicates that corporate governance has an effect on the adoption of product environmentally friendly inventory management practices. This conclusion is in line with the present research on how sustainability may be synthesized in inventory management utilizing recent management accounting tools.

Saputra et al. (2023) examine the role of environmental management accounting as a mediator to green competitive advantage which in turn lead to sustainable performance. The current study can be related closely with this research that proposes a sustainability enhancement of EMA tools to facilitate operational efficiency in inventory management. This research is consistent with Saputra et al.'s findings that EMA does not only enhances the financial performance of a firm, but also provides a competitive advantage by increasing the efficiency in resource usage (e.g. optimizing inventory management). However, the current research extends from this research by focusing on how EMA tools, for example, cost allocation methods can enhance the companies' use of sustainable inventory practices supporting the conclusion of Saputra et al.

Mondal et al. (2023) examine how environmental accounting disclosure practices mediate the relationship between sustainable development and financial and non-financial disclosure. Their findings go toward the overall picture of how transparency within environmental accounting can increase a company's sustainability profile. This current research allies with their view to which the environmental accounting practices of a company that are better in practice result into good decision making in the inventory management and also result to a company choosing to take a stand of sustainability of its supply chain and inventory system. On the other hand, the present study differs from that of Mondal et al. (2023) as it pivots on operational strategies instead of concentrating on disclosure practices thereby adopting a more hands on approach towards integration of sustainability with inventory control.

The relationship between green innovation and firm value is affected via the mediating role of environmental management accounting found in Agustia et al. (2019). The present research's findings resonate with this study in that management accounting tools can be used to help integrate sustainability into inventory management and thereby increase firm value and market competitiveness. In addition, the current research also accepts the fact that firms adopting green innovations like green inventory management system can enhance the firms' environmental performance as well as their financial performance which agrees with the results of Agustia et al.

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Ma et al. (2022) discuss strategic management accounting (SMA) in small and medium–sized enterprises (SMEs) suggesting that SMEs are encountering difficulties in acquiring and implementing advanced management accounting tools. This corresponds to a general comment of the current research that tells that even though large firms appear to have the necessary resources for the implementation of advanced EMA tools, small and medium size firms often encounter considerable impediments to the integration of the tools. Yet, based on current research, even SMEs could optimize their inventory management and enhance sustainability practices by using simpler, more cost effective EMA tools.

According to Shi (2021), cloud computing and SMA are collaborating in improving asset structures and profitability. With this study, there is a greater focus on profitability than sustainability, but this offers important insights into how technological advancement, like the development of cloud-based systems, is showing great potential in improving decision making and management accounting efficiency. This research builds on the idea and further investigates how AI and other technological innovations can be utilized to support the task of inventory management, and that the use of such tools can lead to both cost saving and sustainability benefits for firms.

The role of organizational culture and the information system in the management accountants' use of Strategic Management Accounting is investigated by Hadid and Al Sayed (2021). These findings underscore the implications for the current research in that within an organizational culture, the application of management accounting tools is found to be of critical importance. This perspective is endorsed by the current research, which highlights the essential requirement of creating a sustainable culture within an organization, for ensuring effective implementation of EMA tools in inventory management. Meanwhile, the present research pays more attention to the steps of inventory systems operations and practice to integrate sustainability, than just to cultural aspects.

Last but not least, Al-Hosban et al. (2021) study the effect of the target costing on decreasing of costs in the tourism sphere. Though this research is particular to cost reduction in tourism setting, it is relevant to the current study as it deals with cost management tools, which are also essential for inventory control. To the conclusion of Al- Hosban et al that cost management tools could improve operational efficiency, the current research agrees, but adds that any cost management tool needs to be correlated to sustainability objectives to optimize both financial and environmental performance.

In relation to job security and sustainable economic performance in Croatian companies during the COVID-19 pandemic, Alsharif et al. (2021) investigate the role of entrepreneurial leadership and bricolage. Through their study, they stress the resiliency of firms that chose entrepreneurial leadership and innovation problem solving amidst their crises. This agrees with Alsharif et al. that entrepreneurial leadership – which is fostering adaptability and resourcefulness – is a key driver of sustainability. Although Alsharif et al. concentrate on sustainability from the leadership perspective, the current research has a more concentrated aspect on operational and strategic applications of managerial accounting tools–specifically in connection with inventory management. Distinction between general leadership dynamics and more focused area of tools to support sustainability in supply chain operations is made.

During the pandemic Faulks et al. (2021) investigated the impact of empowering leadership, innovative work and organizational learning readiness on sustainable economic performance of Russian companies. The importance of creating an innovative and learning culture within organization to improve their sustainability efforts stress their findings. The current research also identifies the innovation as the key driver of sustainable practices, including inventory management, resonating this study. The main result of the current research is consistent with Faulks et al. that empowering leadership and organizational learning are key to implementing new management accounting tools for sustainability. However, the present study builds on this by affirming that use of digital tools, such as AI assisted inventory management systems, can be instrumental in driving the shift toward the sustainable practices, something that Faulks et al. do not explicitly focus on.

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Tsai et al. (2019) apply activity based standard costing in product mix decisions in the context of green recycling steel scrap. More specifically, their research is a clear example of how activity-based costing (ABC) can help improve how costs are allocated and incorporated into green practice related decisions in support of sustaining the environment. This current research supports Tsai et al findings that advanced costing systems, like ABC, can be used for sustainability purposes. This idea is further extended by the current study in terms of how the activity-based costing can be integrated with the broader environmental management accounting practices in order to optimize inventory management and improve sustainability in the supply chain. While Tsai et al. specifically focuses on the steel industry, the current research takes a broader approach and describes how these tools can be used along a spectrum of industries.

In terms of product development, Varaniūtė et al. (2022) examine changing management accounting role in a context of digitalization, sustainability, and circular economy principles. For digital tools, their study emphasizes that sustainability has been gradually integrated into the strategic decision-making processes of firms. In line with Varaniūtė et al. findings, the current research recognizes the turning point role of digital technologies in management accounting and improves their effectiveness in inventory management for creating sustainability. Varaniūtė et al. and the current research are in agreement that digitalization contains a big potential for promoting sustainability and especially the use of AI and data driven tools.

While Varaniūtė et al. discuss the role of digitalization more broadly in product development, the current study is more specific regarding the effect of digitalization on inventory and supply chain management, proposing that digital tools are the key elements with a tendency to involve less use of materials and energy in inventory and supply chain management processes. This research counters the study conducted in Alsharif et al. (2021), Faulks et al. (2021), Tsai et al. (2019), and Varaniūtė et al. (2022), by suggesting support for integration of advanced management accounting tools and digital technologies in inventory management in order to encourage sustainability.

Summing up, the present research is an extension of, and additionally integrates the findings of, several major researches conducted so far that concentrate on implementing advanced management accounting tools into the current inventory management practices. The literature indicates that sustainable inventory management can result in improved financial performance, lower waste, and greater competitive advantage if driven by management accounting tools. While, the current study does vary in that it provides practical implementation strategies and emphasis the role of technological innovations (e.g., AI) in creating a sustainable inventory management. Further future research will explore the application of AI driven tools to this end and the potentials that still exist for technology to improve sustainability and operation efficiency in inventory management systems.

Conclusions

The significance of using modern sophisticated management accounting tools in optimizing inventory management in the modern business environment is emphasized. Budgeting and forecasting, ABC analysis, variance analysis, and cost benefit analysis have been proved as effective tools for improving the prediction of demand, resource allocation, cost control, and strategic decision making. Furthermore, through digital innovations like ERP systems, AI driven forecasting, and real time inventory tracking among others businesses can now get much more precise and efficient, able to react at the drop of a hat to any fluctuations in the market and customer demands. These findings emphasize the vital role that integration of advanced tools to inventory processes plays in providing a firm basis for both operational success and long-term sustainability.

From a practical point of view, this study provides actionable advice for managers interested in optimizing their inventory strategies. The results indicate that tools should be matched to specific

business needs and that employees should be provisioned with appropriate training to overcome problems associated with resistance to change and high implementaion costs. Finally, the research helps extend the academic literature by showing how these tools can be integrated even further within specific sectors including retail, manufacturing, and e-commerce, when these tools are to meet industry specific requirements.

There is significant potential for further research to examine digging deeper on the integration of AI driven inventory management systems. These forecast technologies will pave the way for better demand forecasting, more a resilient sourcing network and reduced environmental impact through sustainable practices. The intersection of inventory management and sustainability is explored as well to uncover the potential of how businesses can be efficient and minimize their ecological footprint at the same time. Future work with these areas will allow this theoretical understanding also to contribute to practical applications, in order to keep businesses ahead of the curve, and therefore competitive and agile in an ever-changing playing field.

Great adoption and implementation of management accounting tools in inventory management by businesses should begin with them assess their specific needs then choose the tools that are appropriate from the operational structure and goals of a business. The key is first to analyze the current inventory management practices to the max and analyze the loopholes that need to be filled or areas that can be improved. Only once the gaps are known can businesses strategically work around and use tools like budgeting and forecasting, ABC analysis and cost benefit analysis. These tools should fit in with existing systems with compatibility with other enterprise functions in mind, including procurement, sales and finance.

The recommendation for a successful implementation is the use of digital tools like ERP systems and AI driven forecasting models. Businesses can utilize these tools to greatly improve the accuracy of its demand predictions, real-time inventory tracking, and to ultimately take the guesswork out and execute faster and more accurate business decisions. Secondly, training the employees need to be completely complete. This is to allow workers to be familiar with the process and tools. This not only makes the tools better but also starts to take accountability (ownership) out of the hands from the tools and puts it into the hands of their staff. Key stakeholders such as finance and operations are involved with inventory, which serves to help improve the entire business.

Creating a culture of efficiency and accountability is something best practices in inventory management preach. These tools are going to pay huge dividends if businesses promote a continuous improvement mindset. To recognize any problem related to existing inventory processes or areas of improvement, one must perform periodic reviews of inventory processes, set clear performance metrics and conduct periodical audits. Leaders should place a great deal of emphasis on the principle that employees are responsible for the accuracy of inventory and continuously update and use inventory data in decision making.

In addition, data driven insights should be used to refine business' inventory management practices with time. Businesses can monitor their performance or make necessary adjustments by using KPIs like inventory turnover rate, order fulfillment time, stockouts, etc. Feedback loops are also established, in which all staff at all levels have the opportunity to suggest improvements and to share insights into where improvements could be made. Integrating these best practices not only optimizes inventory management within a business, but aligns business and organization goals with operational success.

Conflict of Interest

None.

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Інструменти управлінського обліку товарних запасів у сучасному бізнес-середовищі

Анотація. Сучасне бізнес-середовище вимагає ефективного управління запасами, щоб підтримувати конкурентоспроможність. У відповідь на зростаючу складність глобальних ланцюгів постачання, коливання споживчого попиту та зростання операційних витрат зростає потреба в надійних інструментах управлінського обліку для оптимізації процесів інвентаризації. У цьому дослідженні автор аналізує та оцінює, які інструменти є найбільш ефективними для управління запасами, і дав практичні рекомендації щодо впровадження в різних галузях. У дослідженні використовується якісний підхід за допомогою вторинних даних, які містять наукові статті, галузеві звіти. Застосування та ефективність інструментів інвентаризації, таких як складання бюджету та прогнозування, аналіз ABC, аналіз відхилень та аналіз витрат і вигод, досліджувалися за допомогою аналітичних методів, таких як аналіз змісту та порівняльний аналіз. Результати показують, що прогнозування та бюджетування дозволяють підприємствам прогнозувати попит і контролювати витрати, щоб вони могли використовувати свої ресурси ефективніше. Аналіз ABC класифікує товари на складі на основі їх вартості та використання, і, отже, може бути використаний для ефективного управління запасами шляхом агресивного зосередження ресурсів та оптимізації витрат. Завдяки аналізу відхилень компанії можуть вказувати та виявляти розбіжності в бюджетних запасах і фактичних показниках, які вони використовують для моніторингу ефективності та мінімізації неефективності. Ключовий аспект аналізу витрат і вигод полягає в тому, щоб запропонувати структурований підхід для аналізу економічної виправданості стратегій запасів, що гарантує найвищу віддачу від інвестицій. Крім того, дослідження підкреслює інтеграцію цифрових інструментів, а саме використання систем прогнозування штучного інтелекту та ERP, щоб забезпечити точність і ефективність роботи. Показано приклади із секторів роздрібної торгівлі, виробництва та електронної комерції, де ці інструменти використовуються на практиці в реальному секторі. З цією метою ця робота має практичне значення, оскільки вона дала прикладну інформацію про те, як бізнес може протистояти проблемам управління запасами, і адаптувала ці інструменти відповідно до своїх цілей. Ця робота допомагає покращити практику інвентаризації для більш ефективного зростання в цей день конкуренції

Ключові слова: управлінський облік, товарні запаси, бюджетування, ABC-аналіз, цифрові інструменти, прогнозування, оптимізація