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Examining the Impact of Performance Measurement Systems (PMSs) on the Performance of the Jordanian Industrial Estates' Companies

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Abstract

With growing competition in today's business environments, organizations rely on Performance Measurement Systems (PMSs) to address challenges, assess progress, and enhance performance. While PMSs have been extensively researched, their impact on organizational performance remains a topic of debate, particularly in developing countries like Jordan, where relevant research is scarce. This study investigates the effects of Comprehensive PMSs (CPMSs) on organizational effectiveness and the financial and non-financial performance of the companies in the Jordanian Industrial Estates. Using Partial Least Squares Structural Equation Modeling (PLS-SEM), this study analyzes empirical data to test proposed hypotheses regarding the impacts of these systems on organizations' performance. The findings confirm that CPMSs significantly and positively influence overall organizational performance, organizational effectiveness, and both financial and non-financial performance. These results highlight the critical role of CPMSs in improving organizational outcomes, supporting their adoption for strategic decision-making. However, given the limited research on PMSs in developing economies, further studies are needed to explore contextual influences and long-term implications.

Keywords: performance measurement systems; performance management; financial performance; non-financial performance; organizational effectiveness; Jordan

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1. Introduction

In light of today's highly competitive business environment, organizations face immense pressure to meet their objectives. This dynamic environment is primarily shaped by evolving customer demands, globalization, and advancements in information technology. Consequently, organizational strategies are in a constant state of change. To thrive in these challenging conditions, companies employ various methods to assess their progress and enhance their performance periodically. Regular performance measurement plays a crucial role in determining an organization's position and the attainment of its long-term goals.

One widely adopted method in this regard is Performance Measurement Systems (PMSs). Since performance management was first introduced in the 1980s, numerous definitions and frameworks have emerged, and the field has been attracting considerable interest starting from the 1990s (Beyer, 2018). The growing interest in these systems among academics and practitioners is largely due to the current business environment. The primary goal of implementing any measurement system is to collect information related

to an organization's set of goals (Alegre et al., 2014), thereby significantly enhancing the likelihood of achieving these goals efficiently and effectively. It is widely agreed that businesses cannot improve their performance without measuring specific indicators, as management uses these results to make informed decisions and take corrective actions.

PMSs can be defined as "a set of performance measures that are used to quantify the efficiency and effectiveness of past actions" (Neely et al., 2002). These systems assist organizations in planning, measuring, and controlling their performance according to a pre-defined strategy (Johnson et al., 2007). PMSs generate information that is intended to reinforce strategic objectives and promote actions that address the diverse strategic and operational dimensions essential for organizational success (Bedford et al., 2019; Mahama & Wang, 2023). Furthermore, as highlighted in the literature, the primary function of PMSs extends beyond monitoring outcomes; they are instrumental in aligning organizational processes with strategic objectives and facilitating the translation of strategy into day-to-day operations (Fantozzi et al., 2022; Micheli & Manzoni, 2010).

Triggered by the changes in the world market (Eccles, 1991), PMSs have evolved from being unidimensional, now widely regarded as inadequate for capturing the complexity of organizational performance (Asiaei et al., 2021), into multidimensional systems. These systems have evolved from focusing primarily on financial objectives and measures, short-term metrics, and having a poor linkage with organizational strategies (Neely et al., 1995) to encompassing broader objectives and measures beyond just financial ones. Modern PMSs have shown positive effects not only on organizational strategy but also on communication and development (Franco-Santos et al., 2012). These systems influence various aspects of organizational performance, including employee behavior, organizational capabilities, and the performance of organizations, managers, and teams. Franco-Santos et al. (2012) further highlighted that PMSs enhance the decision-making process, thereby improving organizational performance and achieving competitive advantages, making them a valuable resource for organizations. The empirical studies, nevertheless, present conflicting results regarding the impact of PMSs on organizational performance (Endrikat et al., 2020; Guenther & Heinicke, 2019). This inconsistency underscores the need for further research into the effects of these systems on performance (Asiaei & Bontis, 2020; Bourne et al., 2013; Gomes et al., 2017; Micheli & Mura, 2017). Exploring the application and effectiveness of PMSs in various settings is crucial. The current body of the literature shows significant research interest in the diverse roles and efficiency of PMSs within organizational management. However, most of these studies are centered on developed countries. As highlighted by Othman and Mahmoud (2020), there is a notable lack of research on PMSs in developing countries, particularly in the Middle East, including Jordan. The limited research on PMSs restricts our comprehension of their utilization and adaptation to the specific organizational, cultural, and environmental factors in Jordan. The authors' review of the relevant literature further confirms this gap, consequently indicating a clear need for more empirical studies focused on the adoption, usability, impacts, and effectiveness of PMSs in the Jordanian context.

This research offers a more nuanced understanding of how PMSs function as contingent management tools tailored to organizational context, providing theoretical and practical insights beyond previous geographic and methodological scopes. While prior empirical studies have examined PMSs in various contexts, important differences distinguish this study. For example, Ahmad et al. (2023) focused on a developing country using multiple regression analysis, whereas Lucianetti et al. (2019) studied a developed country by combining cluster analysis with multiple regression. In contrast, this research applies Partial Least Squares Structural Equation Modeling (PLS-SEM) to assess the impact of PMSs, enabling simultaneous evaluation of measurement and structural models. This

study further advances the literature by applying a comprehensive measurement scale that explicitly captures multiple dimensions of performance measurement. The construct used here assesses the breadth and diversity of performance information, the documentation and evaluation processes, the integration of short- and long-term strategic alignment, and the interrelationships among business units.

The scarcity of studies on PMSs in Jordan leaves a gap in our understanding of their implementation, utilization, and impact on organizational performance within the Jordanian context. This knowledge gap not only impedes informed decision-making about PMS design and implementation in Jordanian organizations but also limits the ability of practitioners and policymakers to effectively use PMSs for performance improvement in the country. To address this issue, this research aims to investigate the effects of PMSs on organizational performance, responding to calls for further study in this area. The research focuses on the manufacturing sector in Jordan, examining the influence of PMSs on both financial and non-financial performance, as well as their overall impact on organizational effectiveness.

The article is structured as follows. First, in the literature review, the related hypotheses are formulated based on the available literature. Section three then discusses the material and methods adopted in the research for the purpose of testing the developed hypotheses. The results of this study are then presented in the following section and followed by a discussion section that delves into explaining the significance and importance of the research findings. Finally, the paper concludes with a summary of the key insights, acknowledges the limitations of this study, and proposes directions for future research.

2. Literature Review

Performance measurement plays a pivotal role in organizational success, prompting the development of a wide range of frameworks, methodologies, and tools over time (Salazar Rua, 2023). Organizations use performance measurement not only to monitor progress but also to ensure strategic alignment, communicate objectives, support organizational learning, influence behavior, and drive actions that enhance returns. The choice of measurement methods can differ significantly between organizations, reflecting their unique strategic priorities and underlying values (Bourne & Bourne, 2023).

PMSs provide a structured means of quantifying both organizational efficiency and effectiveness, enabling decision-makers to manage and improve processes (Swart & Zincume, 2024). In doing so, it evaluates the extent to which activities are carried out effectively and the value generated from them (Norreklit & Cinquini, 2024).

These systems are considered more critical than before in the current business environment, especially in light of recent technological advancements. Such advancements are reshaping the performance measurement landscape and amplifying its challenges. Real-time access to employee, customer, and stakeholder data offers unprecedented opportunities, yet the surge of varied and complex data types has substantially increased organizational complexity (Grafton, 2024).

PMSs have various effects on organizations, influencing overall, financial, and non-financial organizational performance, employees' behavior, labor productivity, and firms' turnover. Additionally, they impact organizational learning, effectiveness, ambidexterity, and capabilities (Owais & Kiss, 2020).

This study draws on two complementary perspectives to conceptualize the role of Comprehensive PMSs (CPMSs) in organizational performance: the Resource-Based View (RBV) and Contingency Theory. CPMSs are systems that use a wide variety of broad financial and non-financial indicators to provide information covering different aspects of firms' operations (Micheli & Mura, 2017) and are integrated with strategy across the organization (Hall, 2008). The RBV suggests that organizations gain competitive advantage

by leveraging valuable, rare, inimitable, and non-substitutable resources (Barney, 2001). CPMSs are considered such strategic intangible resources that support monitoring, learning, and decision-making, contributing to superior long-term performance. Contingency theory emphasizes the importance of fit between management systems and organizational context (Donaldson, 2001), suggesting that CPMS effectiveness depends on alignment with firm size, industry, strategy, and contextual factors. This integrated theoretical lens underpins the hypotheses that CPMSs positively impact various aspects of organizational performance.

Hypotheses Development

The existing literature provides a comprehensive discussion of PMSs and their impacts on various organizational aspects. While numerous studies have supported the positive impacts, these effects differ in nature, ranging from direct and indirect to mediating and moderating influences. In research investigating the impacts of PMSs, relationships can take different forms. A direct effect occurs when one variable influences another without intermediary steps. An indirect effect arises when the influence is transmitted through a mediator, which is a variable that explains the mechanism by which the effect occurs. Meanwhile, a moderator affects the strength or direction of the relationship between variables, often indicating under what conditions an effect is stronger or weaker. This conceptual foundation is commonly used in organizational and performance-related studies to understand the nuanced relationships between measurement systems and outcomes. It is imperative to note that the mere presence of a PMS is not the sole factor assisting in explaining the relationships between PMSs and organizational outcomes. Other critical factors must also be taken into consideration, such as the system's sophistication level, its specific characteristics, and the type of PMS used. These elements significantly affect the extent to which PMSs can deliver organizational benefits. Researchers have explored PMSs across diverse contexts, further highlighting the complexity and variability of their impacts. For example, Bhatti et al. (2014) examined the impact of PMSs on Pakistani manufacturing organizations' performance. This study reveals that measuring performance in terms of financial, quality, delivery reliability, flexibility, safety, employee satisfaction, customer satisfaction, and environmental/community indicators has a positive and significant impact on the overall organizational performance. Another study in the context of the manufacturing companies investigated the relationship between Just in Time (JIT) practices and Malaysian companies' performance under the influence of PMSs. This study reveals that more extensive PMS is linked to higher benefits for the firm's performance, and firms implementing more advanced PMSs, including both financial and non-financial measures, along with the JIT practices achieve higher performance. While the association between JIT and organizational performance is positive and significant, this relationship is notably stronger in firms that use more advanced PMS compared to those using traditional ones (Rasit et al., 2018). The results indicate that organizations adopting more advanced performance measures outperform organizations that use traditional performance measures.

A notable example of PMSs that use more advanced performance measures are the CPMSs. According to Micheli and Mura (2017), CPMSs support the differentiation strategy and cost-leadership strategy to deliver higher performance than other PMSs, which focus on just financial or non-financial indicators. Another study by Lucianetti et al. (2019) also found that with more CPMSs, higher levels of organizational effectiveness are achieved in the context of the Italian firms. A recent study by Ahmad et al. (2023) on Malaysian manufacturing companies supports the view that using multidimensional performance measures helps companies evaluate their performance in terms of specific related activities, which subsequently assists them in enhancing their overall performance. Specifically, the findings revealed that using performance measures related to a diverse set of perspectives,

such as production efficiency, quality and customer, social responsibility, and innovativeness, is significantly related to improving firms' performance. The findings further indicate that the overall use of performance measures is significantly related to the company's overall performance. Thus, the results support previous findings that firms achieve greater performance with CPMSs.

One of the most widely adopted frameworks that embodies the principles of CPMSs is the Balanced Scorecard (BSC), which also integrates financial and non-financial performance indicators and aligns them with strategic objectives. Rafiq et al.'s (2020) findings on Chinese companies located in Pakistan revealed that the four BSC perspectives positively impact perceived organizational performance and that all BSC perspectives, except the financial perspective, have a positive impact on sustainable development. Sustainable development is described as improving economically while ensuring that natural resources are not depleted and environmental sustainability is not compromised. Additionally, it focuses on economic development, environmental sustainability, and social values. De Geuser et al. (2009) also emphasized that the BSC positively contributes to a firm's performance. Furthermore, implementing the BSC was found to have a positive and significant effect on increasing the performance of French SMEs in Mtar (2017)'s study. He explained that the use of BSCs has enhanced both firm turnover and labor productivity significantly. In the context of the SMEs, Länsiluoto et al.'s (2019) study concluded that PMSs have a significant and positive impact on both the financial and non-financial performance of Finnish SMEs.

The literature differentiates between two uses of PMSs: interactive and diagnostic. While interactive systems are described as "systems used by top managers to regularly and personally involve themselves in the decision activities of subordinates" (Simons, 1994), diagnostic systems are "formal feedback systems used to monitor organizational outcomes and correct deviations from pre-set standards of performance" (Simons, 1994). In the context of mid-sized German enterprises, Guenther and Heinicke's (2019) study revealed that when the PMS's sophistication level is controlled, the emphasis on both uses of PMSs has a positive, direct, and significant relation with the achieved benefits. Notably, the interactive use of PMS demonstrated a higher path coefficient in its relationship with benefits compared to the diagnostic use of PMS. Moreover, according to Zhang and Yu's (2020) study, the interactive use of PMS was found to have a positive impact on organizational learning and job performance. Yuliansyah et al. (2017) studied the impacts of Strategic PMSs (SPMSs) on Indonesian organizational performance. These are systems that facilitate strategy implementation and enhance organizational performance by translating strategy into easily and clearly communicated objectives and measures (Bisbe & Malagueño, 2012). Although a direct relationship between the reliance on interaction strategic SPMSs and the organizational performance was not found in their study, an indirect relationship through business strategy was present.

An interesting area of research in the corporate performance management literature is understanding PMSs and their impact on organizational effectiveness (Franco-Santos et al., 2012; Koufteros et al., 2014; Maestrini et al., 2018). Although the positive effects of these systems on organizational effectiveness have been supported by previous research (Upadhaya et al., 2014), Maestrini et al. (2018) raised a concern regarding the limited amount of empirical information in the literature that investigates the relationship between CPMSs and organizational effectiveness.

Based on what has been discussed, four hypotheses have been formulated as follows:

Hypothesis 1 (H1). *CPMSs positively affect companies' overall performance.*

Hypothesis 2 (H2). *CPMSs positively affect companies' financial performance.*

Hypothesis 3 (H3). *CPMSs positively affect companies' non-financial performance.*

Hypothesis 4 (H4). *CPMSs positively contribute to organizational effectiveness.*

3. Materials and Methods

3.1. Sampling and Data Collection

This study was conducted in normal settings, within the natural corporate environment. The primary data were collected by questionnaires adopted from previous studies and modified to suit the current study. The research mainly involved top managers of manufacturing companies in Jordan. Most of the questions were close-ended. Some open-ended questions and blanks were provided to give respondents the freedom to elaborate on their points of view if needed.

The questionnaires were paper-based and sent to the targeted population. To increase the response rate, they were filled anonymously. The questionnaires were handed in person to the general directors' assistants of the two second-largest industrial estates. For the rest of the estates, the main office of the Jordan Industrial Estates Company (JIEC) made arrangements to deliver the questionnaires. The data collection process took almost four months, from August 2023 to November 2023.

Sampling and the decision about which companies to include in the sample size are crucial for the research method (Maxwell, 2012). A specific criterion was pre-identified for conducting this study on medium- and large-sized companies. This criterion has been set to increase the possibility that CPMS has already been implemented in such companies. An enterprise is classified as medium-sized if it has between 50 and 249 employees, whereas large enterprises employ 250 or more employees (European Commission, 2005). Taking this criterion into account, that resulted in the total population being 137 companies.

JIEC is the legal successor to the Jordan Industrial Estate Corporation; it was established in 1980 to contribute to the national economy. Over its 25-year history, JIEC has played a vital role in promoting Jordan as an attractive investment destination by collaborating closely with private sector institutions. Significant developmental and strategic milestones have been achieved, such as earning ISO certification, the King Abdullah II Award for Excellence, and various international and national honors.

3.2. Variable Measurement and Questionnaire Design

The questionnaire consisted of five sections. Section 1, the introduction, introduced the questionnaire topic and its aim and assured the respondents' privacy. Section 2 intended to collect general information about the respondents and their representative organizations. Section 3 covered questions regarding the comprehensiveness level of the systems used, while Section 4 had questions to measure the effectiveness level of the organization. Moving forward to Section 5, the respondents were asked to rate their organization's performance compared to their competitors. The entire questionnaire used a 7-point Likert scale. This study consisted of five constructs: CPMSs, organizational effectiveness (ORGEFFECT), organizational performance (ORGPER), financial performance (FIN), and non-financial performance (NON-FIN).

To measure the comprehensiveness level of the PMSs, nine items were adapted from Chenhall (2005) and Hall (2008) to suit the current research objectives. Four items (CPMS 2, 4, 6, and 8) were developed by Chenhall (2005) to measure the level of integration of the measures used with organizational strategy and across the value chain. The remaining five items (CPMS 1, 3, 5, 7, and 9) were developed by Hall (2008) to measure the extent to which the used PMSs deliver various performance information covering important parts of the organization's operations. The questions started as "Please rate the extent to which

your PMS. . .". A 7-point Likert scale (1: not at all; 7: to a great extent) was used. Table 1 represents the CPMS construct along with its corresponding item labels as designated in SmartPLS.

Table 1. CPMS construct's items and labelling.

Construct (Labelling) Item	
Comprehensive PMS (CPMS)	
CPMS1	The extent to which your PMS provides a broad range of performance information about different areas of the organization's field of work.
CPMS2	The extent to which your PMS is produced in a fully documented form, which provides a record for evaluating performance.
CPMS3	The extent to which your PMS provides a diverse set of measures related to the key performance areas of the organization's field of work.
CPMS4	The extent to which your PMS provides consistent and mutually reinforcing links between the current operating performance and the long-term strategies of the organization (how the current operating performance supports the achievement of the organization's long-term strategies, and how the long-term strategies influence and guide the short-term decisions and actions).
CPMS5	The extent to which your PMS provides information on different dimensions (different aspects or perspectives of the organization's performance that are relevant to its success: financial and non-financial) of the organization's performance.
CPMS6	The extent to which your PMS links together the activities of different business units to the achievement of the goals and objectives of the organization.
CPMS7	The extent to which your PMS provides a variety of information about important aspects of the organization and different business units' operations.
CPMS8	The extent to which your PMS shows how the activities of a specific business unit affect the activities of other units within the organization.
CPMS9	The extent to which your PMS provides a range of measures that cover the critical areas of the different business unit's operations.

Organizational effectiveness was measured by asking the respondents to rate the extent to which their organization has achieved 13 benefits after implementing the PMSs: "Please rate the extent to which your organization has attained the following benefits after implementing the PMS". The scale was adapted from Lucianetti et al. (2019), it used a 7-point Likert scale (1: completely disagree; 7: completely agree). The scale measures organizational effectiveness across three aspects. The first, aligning, reflects how the organization adapts its life to its intended strategy. The second, exploiting, reflects how organizations maximize and use their existing resources and capabilities to exploit the intended strategy. The third aspect, mobilizing, reflects the impact of PMSs on fostering enhanced communication and motivation and achieving a consensus around the organization's vision and strategy. Table 2 illustrates the organizational effectiveness construct along with its corresponding dimensions and their item labelling as designated in SmartPLS.

Table 2. Organizational effectiveness construct's items and labelling.

Construct (Labelling) Item	
Organizational Effectiveness (ORGEFFECT)	
Aligning	
AL1	Translating strategy into operational goals
AL2	Aligning the organization with the strategy
AL3	Making strategy everyone's daily job
AL4	Improving employees' knowledge of how they are evaluated
AL5	Making the linkages between short- and long-term objectives clearer
Exploiting	
EX1	Spending more time and effort on strategic-related issues
EX2	Adopting new performance measures
EX3	Explicating cause-and-effect relationships
EX4	Increasing the participation of top management in the formalization of the strategy
EX5	Linking performance measures to corporate strategy
Mobilizing	
MO1	Improving internal communication among people
MO2	Motivating human resources (in comprehending their role within the organization)
MO3	Building consensus around the organization's vision and strategy

For organizational performance, it was measured in two dimensions: financial and non-financial performance. A total of 16 items were used to measure organizational performance in the two dimensions. The BSC framework identified the performance measures representing financial and non-financial performance. These measures are considered generic measures, commonly used by manufacturing firms. The BSC was chosen as it is a widely used, theory-backed framework that captures performance from multiple perspectives: financial, customer, internal processes, and learning and growth (Kaplan & Norton, 1996). This multidimensionality aligns with the study's aim to assess performance beyond financial returns and is especially relevant to manufacturing contexts, where operational efficiency and strategic alignment are critical. The selection of the BSC over alternative frameworks, such as models relying solely on accounting-based measures or unidimensional operational metrics, was motivated by its ability to integrate both lagging and leading indicators. This integration is essential for medium and large manufacturing firms, where sustaining competitive advantage requires balancing financial outcomes with ongoing improvements in customer relationships, process efficiency, and workforce capabilities.

Specifically, the financial performance dimension includes profitability and return-related indicators such as operating income, ROI, and net cash flows. The non-financial dimension incorporates indicators from the customer, process, and learning-growth perspectives, such as customer satisfaction, Overall Equipment Effectiveness (OEE), employee training, and IT usage, to provide a broader view of performance outcomes. In total, 10 items of the scale were compiled from previous studies (Barroso et al., 2016; Hoque et al., 2001; Santos & Brito, 2012), and the remaining six items were self-constructed. The added items were compiled from the literature, consultations with some manufacturing sector experts, and the pilot study results. The respondents were asked, "How would you rate your performance relative to your competitors in terms of each of the following?" on a scale from 1: clearly worse to 7: clearly better. The organizational performance construct

with its corresponding dimensions and their item labelling as designated in SmartPLS are shown in Table 3.

Table 3. Organizational performance construct's items and labelling.

Construct (Labelling) Item		
Organizational Performance (ORGPER)		
Financial Performance (FIN)		**Source**
FIN1	Operating income	(Hoque et al., 2001)
FIN2	Sales growth	(Hoque et al., 2001)
FIN3	ROI	(Barroso et al., 2016)
FIN4	Net cash flows	Self-constructed
Non-financial Performance (NON-FIN)		
NONFIN1	Market share	(Barroso et al., 2016)
NONFIN2	Number of complaints	(Santos & Brito, 2012)
NONFIN3	Customer satisfaction	(Santos & Brito, 2012)
NONFIN4	Customer growth	Self-constructed
NONFIN5	Manufacturing lead time	(Hoque et al., 2001)
NONFIN6	Level of errors	Self-constructed
NONFIN7	Response time to business issues	Self-constructed
NONFIN8	OEE	Self-constructed
NONFIN9	Employee satisfaction	(Santos & Brito, 2012)
NONFIN10	Training per employee	(Santos & Brito, 2012)
NONFIN11	Level of IT used	Self-constructed
NONFIN12	Employee Turnover	(Santos & Brito, 2012)

Prior to the pilot study, the content validity of the questionnaire was assessed. For this purpose, two academics and three professionals working in the manufacturing industry have reviewed the questionnaire and its content validity. As a result, rewording of some of the questions was suggested to improve the clarity and understanding of the questionnaire questions, in addition to suggesting adding some items to measure organizational performance.

The pilot sample consisted of 25 questionnaires collected from top managers in Jordanian manufacturing companies. The main aim was to test the questionnaire's reliability. These companies are not part of the main study population, and the responses were used only to assess the statistical reliability of the constructs.

Cronbach's α was assessed to measure the reliability of the study constructs. SPSS software version 29 was used to assess the instruments' internal consistency. The results showed that all constructs' Cronbach's α values were higher than the 0.7 threshold, ranging between 0.795 and 0.935, thus validating the reliability of the research constructs.

3.3. Empirical Analysis Methods

The Partial Least Squares (PLS) method was adopted in this research. SmartPLS 4.1 software is used for the purpose of analyzing the data empirically and testing the proposed hypotheses. PLS-SEM is a variance-based approach to SEM and is particularly useful when the sample size is small, when the researcher has to deal with complex models incorporating many indicators and relationships, or when the data distribution is not normal, as PLS-SEM makes no distributional assumptions (Hair et al., 2022).

PLS-SEM consists of two models, the measurement and the structural model, which are evaluated separately. Reflective measurement models are assessed based on indicator reliability, internal consistency reliability, convergent validity, and discriminant validity.

Assessing the structural model involves four steps: assessing the model for collinearity issues, evaluating the significance of the structural model relationships, and evaluating both the model's explanatory and predictive powers.

To determine the minimum required sample size for PLS-SEM, several methods exist. One commonly used rule of thumb is the "10-times rule", which suggests that the minimum sample size should be 10 times the maximum number of arrows pointing at a construct in the model (Goodhue et al., 2012). In our model, the maximum number of arrows pointing at any construct is one, indicating a very simple structural path design. Based on this rule, the minimum required sample size would be 10.

4. Results

4.1. Sample Description

Out of the 137 companies, five refused to take part due to privacy policy or the required long procedure to grant the board's agreement. In the end, 118 questionnaires were returned, and seven of them were disregarded due to missing data of more than 20% (Weiber & Mühlhaus, 2014) or straight-lining responses. The remaining 111 responses were retained for this study.

The distribution of companies across various industry sectors, shown in Table 4, reveals a diverse range of manufacturing sectors. The most represented industries were Food (24.32%) and Textile (19.82%), followed by Packaging, Engineering, Plastic, Pharmaceutical, Chemical, Wood/Furniture, and Construction materials. Although some sectors had greater representation than others, the overall composition captures a range of operational contexts and manufacturing environments, offering a balanced view of the sectoral characteristics present in this study.

Table 4. Companies' field of industry.

Industry	Frequencies	Percentage (%)
Food Industries	27	24.32%
Textile Industries	22	19.82%
Packaging Industries	14	12.61%
Engineering Industries (Metal and Electric)	12	10.81%
Plastic and Rubber Industries	11	9.91%
Pharmaceutical Industries	10	9.01%
Chemical Industries	8	7.21%
Wood and Furniture Industries	5	4.51%
Construction and Building Materials Industries	2	1.80%
Total	111	100%

4.2. Evaluating the Measurement Model

4.2.1. Indicator Reliability

The indicator reliability is assessed based on the outer loadings; all items, except CPMS9 and MO2, have outer loadings of more than 0.7. As suggested by Hair et al. (2022), items with outer loadings between 0.4 and 0.7 should be removed only if their removal would significantly increase the internal consistency reliability and convergent validity. The items were eventually retained in the model, as the items' removal did not lead to any

significant increase. Figure 1 illustrates the research model, including each construct with its corresponding items and outer loadings.

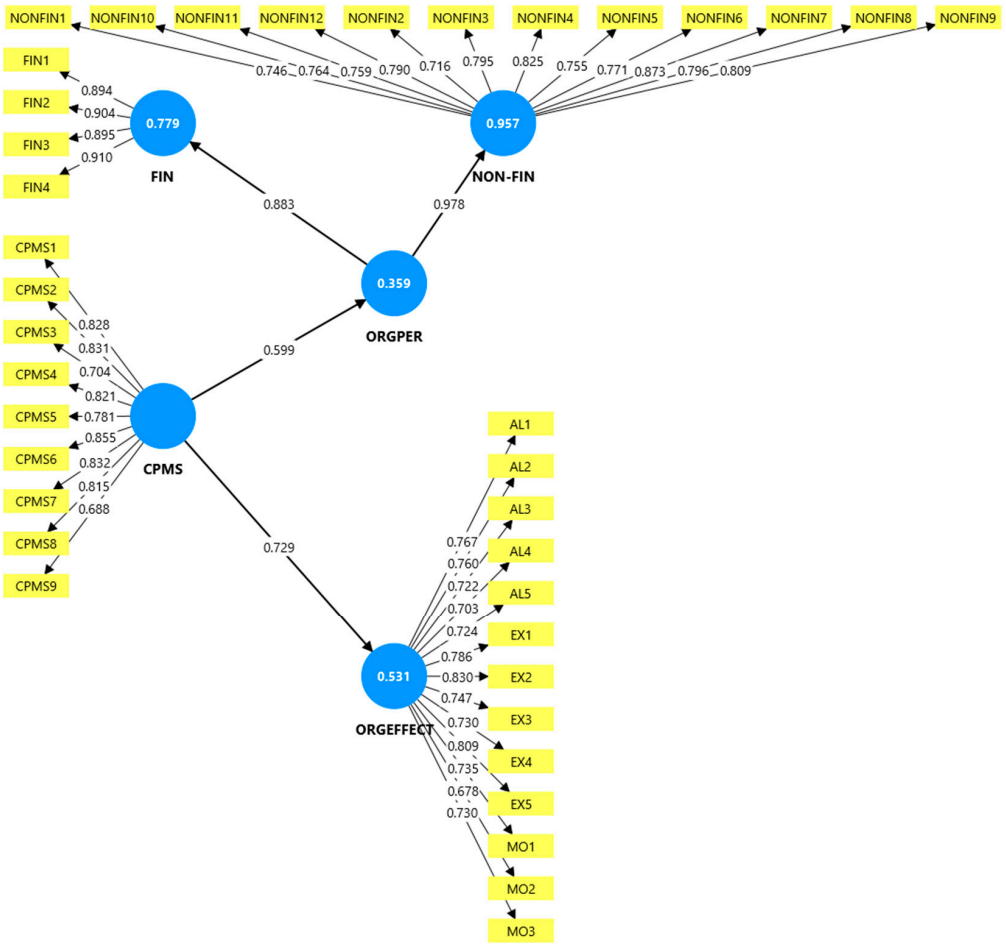

Figure 1. Path model and outer loadings.

4.2.2. Internal Consistency Reliability and Convergent Validity

Cronbach's α, composite reliability (CR), and the reliability coefficient (rho_A) were checked to assess the internal consistency reliability. All values fell within the recommended range between 0.7 and 0.95. Cronbach's α values ranged between 0.868 and 0.943, CR values ranged between 0.938 and 0.95, and the rho_A values ranged between 0.870 and 0.944, indicating an adequate internal consistency.

Average Variance Extracted (AVE) was further used to test for convergent validity. All values were above the minimum value of 0.5, ranging from 0.561 to 0.883. Table 5 presents the results of the model's constructs' internal consistency, reliability, and convergent validity.

Table 5. Model's constructs' internal consistency reliability and convergent validity.

Construct	Cronbach's α	CR	rho_A	AVE
CPMS	0.927	0.940	0.931	0.635
FIN	0.923	0.945	0.924	0.811
NON-FIN	0.943	0.950	0.944	0.615
ORGEFFECT	0.935	0.943	0.939	0.561
ORGPER	0.868	0.938	0.870	0.883

4.2.3. Discriminant Validity

The Fornell–Larcker criterion, the cross-loadings, and the heterotrait-monotrait (HTMT) ratio were tested to establish discriminant validity.

The Fornell–Larcker criterion assesses discriminant validity by comparing the square root of the AVE for each construct with the correlations between that construct and other constructs in the model. According to the criterion, discriminant validity is established if the square root of the AVE for each construct is greater than its correlations with other constructs. Table 6 depicts that this criterion was met, as the square root of the AVE for each construct exceeded its correlations with other constructs in the model, indicating that each construct shares more variance with its own indicators than with indicators of other constructs (Hair et al., 2022).

Table 6. Fornell–Larcker criterion.

Construct	Construct				
	CPMS	**FIN**	**NON-FIN**	**ORGEFFECT**	**ORGPER**
CPMS	0.797				
FIN	0.543	0.901			
NON-FIN	0.577	0.766	0.784		
ORGEFFECT	0.729	0.613	0.736	0.749	
ORGPER	0.599	-	-	0.737	0.774

For the cross-loadings, it is checked if the indicator's outer loading with the associated construct is higher than its correlation with other constructs. The assessment confirmed that every item's loading on its construct is higher than its loading on any other construct.

The final indicator to establish discriminant validity is the HTMT ratio. As shown in Table 7, all values were below the most conservative threshold of 0.85 (Henseler et al., 2015).

Table 7. HTMT.

Construct	Construct			
	CPMS	**FIN**	**NON-FIN**	**ORGEFFECT**
CPMS				
FIN	0.582			
NON-FIN	0.610	0.816		
ORGEFFECT	0.757	0.650	0.784	
ORGPER	0.660	-	-	0.795

Thus, all constructs met the quality criteria by being valid and reliable, and thus can continue with the structural model evaluation.

4.3. Evaluating the Structural Model

Step 1: Check for Collinearity Issues

To check for collinearity issues in the model, the Variance Inflation Factor (VIF) values are calculated and checked. All VIF values were below the preferable value of 3 (Hair et al., 2019). Table 8 shows that the highest VIF value is 1; thus, no multicollinearity issue exists, and the model can be further examined.

Table 8. VIF values for multicollinearity assessment.

Construct	Construct				
	CPMS	**FIN**	**NON-FIN**	**ORGEFFECT**	**ORG-PER**
CPMS		1	1	1	1
ORGPER		1	1		

Step 2: Evaluating the Significance of the Structural Model Relationships

The results reveal that CPMS significantly and positively affects organizations' overall performance (β = 0.599, t = 9.231, $p < 0.001$). Thus, the first hypothesis is accepted. The results further provide strong support for the effects of CPMS on organizational effectiveness (β = 0.729, t = 14.402, $p < 0.001$), which stands out as the highest among all tested relationships. This robust coefficient underscores the profound impact of CPMS on enhancing organizational effectiveness, thereby providing strong support for H4.

To test the hypothesis related to the specific effects on financial and non-financial performance, the following model depicted in Figure 2 was assessed and used.

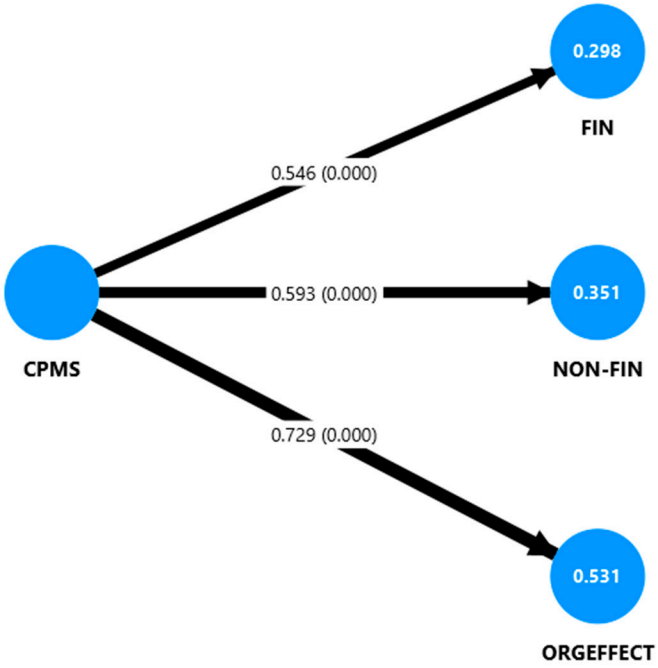

Figure 2. Model Used for Testing Specific Effects on the Financial and Non-financial Performance.

In terms of the specific direct effects of CPMS on financial and non-financial performance, the results reveal the existence of positive and significant relationships. Specifically, CPMS affects financial performance (β = 0.546, t = 7.937, $p < 0.001$) and non-financial performance (β = 0.593, t = 9.612, $p < 0.001$); therefore, H2 and H3 have also been supported.

Step 3: Evaluating the Model's Explanatory Power

In this step, the explanatory power of the model was examined using the coefficient of determination. According to Chin (1998), all of the model's constructs, except for the FIN, had a moderate R^2 ranging from 0.351 to 0.531. The FIN construct has a weak coefficient of determination. Table 9 shows these results.

Table 9. Coefficient of determination (R^2).

Construct	R^2	R^2 *adj*	
ORGEFFECT	0.531	0.527	Moderate
ORGPER	0.359	0.353	Moderate
FIN	0.298	0.292	Weak
NON-FIN	0.351	0.345	Moderate

In addition to R^2, the effect size (f^2), shown in Table 10, was also assessed according to Cohen's (1988) recommendations. The largest effect is for CPMS on ORGEFFECT (1.134), followed by the effect of CPMS on ORGPER (0.560), CPMS on NON-FIN (0.542), and lastly, CPMS on FIN (0.425).

Table 10. Effect size (f^2).

Path	f^2	*Remark*
CPMS → ORGEFFECT	1.134	Large
CPMS → ORGPER	0.560	Large
CPMS → FIN	0.425	Large
CPMS → NON-FIN	0.542	Large

Step 4: Evaluating the Model's Predictive Power

Subsequently, the model's predictive power was assessed. Q^2 for the endogenous constructs were higher than 0, as depicted in Table 11, thus indicating a predictive relevance (Sarstedt et al., 2017). Furthermore, applying the $PLS_{predict}$ procedure, Q^2 $_{predict}$ values were greater than 0, and the majority of the root mean squared error (RMSE) values from the PLS-SEM were lower than the RMSE values from the linear regression model (LM), thus indicating an intermediate predictive power of the model (Hair et al., 2022).

Table 11. Predictive relevance (Q^2).

Construct	Q^2
ORGEFFECT	0.517
ORGPER	0.342
FIN	0.277
NON-FIN	0.331

5. Discussion

5.1. Main Outcomes

Based on the theoretical background, this study proposed that CPMSs have positive and significant effects on several aspects of companies' performance. Four hypotheses were developed studying the impacts of these systems on organizational effectiveness, financial, non-financial, and overall performance. Following on the modern PMSs frameworks, such as the BSC, it was important to assess the financial and non-financial performance separately and then opt for the overall performance to capture the comprehensive and interconnected impacts of these systems.

The results of this study strongly support all four hypotheses. They reveal that the implementation of CPMSs in manufacturing companies in Jordan Industrial Estates significantly improves financial, non-financial, and overall performance. These findings align with prior research. For instance, Ahmad et al. (2023) also used perceived performance indicators, including ROI, customer satisfaction, and product quality, which correspond to several dimensions in our framework, analyzing them through multiple regression analysis.

Gomes et al. (2017), employing regression models, explored PMS use in public-sector agencies using indicators such as efficiency, service quality, internal cohesion, staff motivation, and societal responsiveness. While their context differs from ours (public sector vs. manufacturing), the overlapping focus on internal processes, effectiveness, and quality indicates that these performance dimensions are relevant across diverse organizational settings. Likewise, Länsiluoto et al. (2019) applied path analysis, a subset of SEM, to study PMS adoption and firm performance in SMEs and used measures such as ROI, profitability, cost control, market share, and employee development, indicating a similar mix of financial and non-financial metrics.

Even Mtar (2017), using Rubin's (1974) causal model and the economic matching method along with some contemporary methods, though focused on French SMEs and using firm turnover and labor productivity as outcomes, supports the notion that integrated measurement systems (e.g., BSC) contribute positively to key performance dimensions.

These consistencies reinforce the value of multidimensional PMSs across sectors and contexts. By incorporating diverse metrics that go beyond traditional financial indicators, CPMSs enable a more holistic and strategic assessment of performance. Our findings highlight that these systems are not merely tools for monitoring outcomes but serve as strategic enablers that enhance decision-making, adaptability, and long-term planning, an insight aligned with Fantozzi et al. (2022).

Ultimately, our study contributes to theory by showing that the integration of diverse, multidimensional performance indicators into PMSs significantly enhances organizational outcomes. It validates the growing consensus in the literature that performance cannot be fully captured by financial metrics alone and provides empirical evidence from the under-researched context of manufacturing firms in developing economies.

In line with Lucianetti et al. (2019), this study further reveals that such systems contribute significantly to organizational effectiveness. The findings suggest that they affect it in several critical ways emphasized in the literature. First, CPMSs facilitate strategic alignment by ensuring that organizational activities and operations are closely tied to clearly defined strategic objectives. When this alignment is achieved, it ensures that all departments and employees are working toward common goals, reducing redundancy and increasing coherence across the organization. Second, these systems help in utilizing organizational resources and capabilities in the most optimal way; by identifying strengths and weaknesses through performance data, this enables managers to allocate resources more efficiently and focus improvement efforts where they are most needed. Furthermore, CPMSs play a vital role in enhancing internal communication, as performance metrics and reports serve as a common language across departments, fostering better understanding and coordination among teams. This shared understanding contributes to more effective decision-making and smoother implementation of strategic initiatives. Additionally, by setting clear expectations and tracking progress in a transparent manner, CPMSs can increase employee motivation and engagement. Employees are more likely to feel a sense of ownership and accountability when they see how their contributions are measured and linked to broader organizational goals. This study's findings suggest that beyond tracking results, these systems may enhance employee engagement and cross-departmental collaboration by clarifying objectives and expectations. This is particularly valuable for manufacturing firms that rely on operational integration to optimize productivity and resource use. Therefore, the positive impact observed in Jordan may serve as a basis for similar implementations in other emerging economies aiming to improve performance.

Overall, these findings reinforce the notion that CPMSs are not merely tools for measuring outcomes but are integral to building a high-performance culture. By promoting

alignment, efficient resource use, communication, and motivation, they significantly enhance the organization's ability to execute its strategy and achieve sustained effectiveness.

5.2. Theoretical Implications

This study contributes to the body of knowledge by filling some research gaps in the literature in the field of PMSs, for instance, it was conducted in the context of manufacturing companies in a developing country, Jordan. To the best of the researchers' knowledge, studies conducted in the Middle East, and specifically in Jordan, are scarce. This scarcity of research in the region underscores the significance of the present study in contributing to the understanding of PMS's effects within a unique socio-economic context. Additionally, exploring the application of PMSs in Jordan provides valuable insights that can inform both theory and practice in similar contexts across the Middle East and other developing regions. Hence, this study offers a significant contribution to the existing literature by examining the PMS's impacts on companies' performance within Jordanian industrial estates, thereby enhancing the global understanding of this subject matter.

The findings of this study further contribute to and extend the RBV by empirically demonstrating that CPMSs function as valuable strategic resources that enhance overall, financial, and non-financial performance, as well as organizational effectiveness. This confirms the RBV assertion that firms leveraging such intangible assets can achieve sustained competitive advantage.

Moreover, the results highlight the nuanced role of contextual fit as proposed by contingency theory. The positive effects observed in medium and large Jordanian firms suggest that the alignment of CPMSs with firm-specific characteristics is critical for realizing their full benefits. This supports the contingency perspective that no one-size-fits-all system exists; rather, PMSs must be tailored to organizational contexts.

This study also underscores the importance of integrating multiple perspectives—financial and non-financial measures, strategic alignment, and organizational learning—within CPMSs, echoing calls in the literature for multidimensional performance management frameworks.

5.3. Practical Implications

The findings of this study offer valuable insights that can be practically applied by manufacturing companies and practitioners in Jordan and beyond. Some practical implications derived from this study are as follows:

1. Enhancing PMSs: The research highlights the importance of comprehensive and adaptable PMSs in enhancing organizational performance and effectiveness. Manufacturing companies in Jordan can utilize these findings to assess and refine their existing PMSs, ensuring they cover a wide variety of performance measures and align with organizational strategies. By enhancing their PMSs, companies can better monitor progress, identify areas for improvement, and make informed decisions to achieve their goals more effectively.
2. Guiding strategic planning: The research provides valuable insights for strategic planning and decision-making processes within manufacturing companies. By understanding the relationships between PMSs and organizational performance, companies can develop strategic initiatives that leverage these factors to drive success. Additionally, companies can use the findings to identify areas for improvement in their performance management practices and develop targeted strategies to address them.

6. Conclusions, Limitations, and Future Recommendations

PMSs have become increasingly prevalent in organizations as a means to enhance performance. These systems are designed to provide valuable information about an organization's performance and help guide decision-making processes. They offer a structured approach to monitor and evaluate the achievement of organizational objectives, develop effective strategies, and enhance performance. However, these systems' effectiveness and impact on companies' performance have been a topic of debate among researchers and practitioners.

The main goal of this study was to examine the effects of using PMSs on companies' performance. Specifically, manufacturing companies in the context of Jordanian industrial estates were studied to determine the relationship between CPMSs and companies' financial, non-financial, and overall performance. Furthermore, the effect of these systems on organizational effectiveness was also explored. Quantitative methods were utilized to fulfill this aim and answer the research questions.

For testing the research hypotheses, a questionnaire was developed and distributed to manufacturing companies in the Jordanian industrial estates. A model was then developed using the SmartPLS software to explore the relationships between the different research constructs.

In conclusion, the findings of this study underscore the significant role of PMSs in organizational performance enhancement. The research has shed light on the interplay between CPMSs and their impact on companies' performance. By providing a structured framework for goal setting, progress monitoring, and improvement identification, PMSs serve as key enablers for organizational effectiveness when aligned with strategic goals.

While this study provides valuable insights into the effects of using PMSs on companies' performance, it is important to acknowledge certain limitations. First, this study focused on selected manufacturing companies in Jordan, which may limit the generalizability of the findings to other contexts. Data were collected from seven out of the eight existing and operating industrial estates in the country. The 8th estate, located in Aqaba, was not included due to two main reasons: (1) no company-level information was available on the Jordan Industrial Estates Company (JIEC) website, and (2) data collected from the JIEC office did not include any data about companies operating in that estate. It is also worth noting that this estate appears to be managed by a separate entity, PBI Aqaba Industrial Estate LLP., which may further explain the unavailability of data. Moreover, Aqaba's geographical distance from Amman posed logistical challenges in accessing companies directly. Future research could explore the effects of PMSs on companies' performance in different industries and countries to provide a more comprehensive understanding.

Second, this study primarily relied on self-reported data from surveys, which may introduce response bias and subjectivity. Future research could consider using objective measures and longitudinal designs to strengthen the validity of the findings.

Third, due to the extremely low response rate achieved through attempts to collect data using online questionnaires, the decision was made to collect data from the manufacturing companies located in the Jordanian industrial estates. As a result, the final sample included 111 responses. Although this represents over 80% of the eligible population, it might not fully represent the population of manufacturing companies in Jordan. In particular, this study did not include small enterprises, and thus, the findings cannot be applicable to such firms. It is also important to clarify that the classification of small, medium, and large-sized enterprises in this study followed the definition provided by the European Commission (2005), recognizing that different definitions in the literature may lead to different categorizations and, consequently, different sample compositions.

Fourth, although the sample included a variety of manufacturing sub-sectors, the specific operational and strategic differences across these industries were not the primary focus of this study. Such sector-specific dynamics may influence how PMSs are implemented and perceived, and this remains an area for further exploration. Additionally, a slight overrepresentation of specific sectors was observed, which may have introduced a degree of imbalance in sectoral representation. Nonetheless, efforts were made to ensure representativeness and diversity within the sample. Future research should aim to obtain a larger and more diverse sample size to improve the generalizability of the findings.

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Institutional Review Board Statement: This study did not involve any medical procedures, experiments, interventions or the collection of sensitive personal data that could identify respondents. The purpose of the study was to analyze professional practices and perceptions related to performance measurement systems, organizational performance and organizational effectiveness. Data were collected through the completion of anonymous and voluntary questionnaires by adult professionals, ensuring that no identifiable or sensitive personal information was collected. As the research involved only anonymous, non-sensitive survey data, formal Institutional Review Board (IRB) or ethics committee approval was not required for this type of non-interventional, minimal-risk research. Furthermore, the research adhered to the ethical principles outlined in the Declaration of Helsinki (revised 2013). The study was also conducted in alignment with the ethical expectations of the Doctoral School of Management and Business at the University of Debrecen, Hungary. All participants were fully informed about the study's purpose and the voluntary and anonymous nature of their participation. Additionally, a confidentiality statement approved by the University of Debrecen was provided to respondents upon request, ensuring that the data collection process respected privacy and data protection principles.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Due to the prospective use of the dataset in upcoming publications, the data cannot be shared at this stage.

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Abbreviations

The following abbreviations are used in this manuscript:

PMSs	Performance Measurement Systems
CPMSs	Comprehensive Performance Measurement Systems
PLS-SEM	Partial Least Squares Structural Equation Modeling
PLS	Partial Least Squares
JIT	Just in Time
BSC	Balanced Scorecard
SPMSs	Strategic Performance Measurement Systems
JIEC	Jordan Industrial Estates Company
ORGEFFECT	Organizational Effectiveness
ORGPER	Organizational Performance
FIN	Financial Performance

NON-FIN	Non-financial Performance
OEE	Overall Equipment Effectiveness
AVE	Average Variance Extracted
HTMT	Heterotrait-monotrait
VIF	Variance Inflation Factor
R^2	Coefficient of Determination
f^2	Effect Size
RMSE	Root Mean Squared Error
LM	Linear Regression Model

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