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The Impact of Financial Planning, Strategic Decision Support, and Technology Adoption on Sustainable Performance: Evidence from the Metallurgy Sector in Saudi Arabia

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ABSTRACT

This study examined the influence of financial planning and budgeting, strategic decision support, and technology adoption in financial management on sustainable performance in the metallurgy sector of Saudi Arabia. Primary data were collected through structured questionnaires distributed to finance professionals and managers within the metallurgy industry, specifically at TASNEE and affiliated business units in Yanbu, KSA. The data were analyzed using Structural Equation Modeling (SEM) to test the proposed relationships. The conceptual framework was grounded in prior literature on financial planning, decision-making, and digital transformation. The results demonstrated that financial planning and budgeting had a significant positive effect on sustainable performance by strengthening forecasting, budgetary control, and long-term financial stability. Strategic decision support was found to be a key driver of sustainability outcomes, ensuring effective alignment between financial insights and operational strategies. Furthermore, technology adoption in financial management—including digital reporting tools, financial analytics platforms, and automation—significantly enhanced decision accuracy, efficiency, and transparency. Collectively, these independent variables exerted a strong and positive impact on sustainable performance in the metallurgy sector.

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1.0 Introduction

The metallurgy industry has emerged as a key element in the industrial and economic development of nations particularly the economies with available resources that are attempting to diversify their developmental growth patterns. Expansive competitiveness and resiliency practices anchored on short term financial outcomes are not producing long term outcomes. Instead, a combination of efficient financial forecasting and budgeting, intelligent decision-making and embracing innovative digital technologies has played a central role. Budgeting and financial planning underpin resource forecasting and control as they help the business to become more proactive in risk forecasting and raising capital (Wang, 2024). Strategic decision support transforms financial intelligence into actionable organizational strategies whose decisions are based on analytical thinking and scenario modeling. Financial management technology also introduces new opportunities at the time, such as reporting in real time, predictive analytics, and automation, which can lead to a greater degree of accuracy, transparency, and operational flexibility. All that provides the monetary methods as a fairly intricate system in which the more generic needs of the environment and those of the social are exchanged to disperse sustainable implementation (Abu-Bakar and Charnley, 2024).

The relationships between the financial planning, strategic decision support and adoption of technology are clarifiable within the framework of complementarity. The foundation of disciplined resource allocation is financial planning; decision support enables such allocations to be made in a way that is strategic to organizational objectives. Efficient use of technology, in turn, promotes the efficiency of financial planning and decision support by enhancing the availability of data, coupled with analytical functions and performance. A combination of these factors creates a synergistic system to facilitate sustainable performance. Speaking more precisely, more precise predictions might be more likely when financial planning is done with more sophisticated analytical systems; the trade-offs might be assessed based on more precise data presented by digital decision support systems, which can be further complemented with real-time data (Dimitrakieva et al., 2025). Similarly, it is possible to streamline the budgeting processes, reduce wastages and use available resources in sustainability initiatives through the implementation of technology. Therefore, a mix of the three elements forms a mixed financial management strategy that specifically applies to industries where the capital intensity, environmental, and competitive components converge at the point (Dimitrakieva et al., 2025).

In spite of the importance of financial planning, decision support, and technology adoption as identified in literature, there are a number of gaps in the research. Most of the existing literature has focused on these variables individually and not on their joint effect on sustainable performance. Additionally, the bulk of the previous studies have been primarily directed towards various industries such as banking, health care and information technology

with minimal or no attention to heavy industries such as metallurgy. This is quite concerning especially in the context of the Saudi case where one of the areas of strategic significance that can be optimally situated between the needs of industrialization and those of sustainability is the field of metallurgy (Al-Asadi et al., 2024). Moreover, the digital transformation on the development of financial management practices in new economies has not been analyzed so far, even though the same subject is widely researched in developed economies. The specific problem of Saudi metallurgical firms (reliance on government policies, reliance on the global trend of goods, or reliance on the orientation on the goals of the Vision 2030) needs a specific analysis, which, nonetheless, cannot be reduced to a generalized cost of performing a great deal of research in other locations (Tesso, 2020).

The absence of empirical research on the joint influence of financial planning, strategic decision support, and technology adoption on sustainable performance of metallurgy industry in Saudi Arabia, in turn, represents the research problem. Without this evidence, companies may fail to formulate and implement financial management approaches capable of enabling them to achieve the right balance between short-term operational needs and long-term sustainability goals. Even policy makers and industrial leaders lack the information needed to initiate investments in financial systems and digital technologies that can enable industrial diversification and sustainability. In order to find a solution to this issue, a thorough study should be conducted that will not only investigate the individual effects of financial planning, decision support, and technology utilization but also study the relationships between them and the manner in which they influence each other (Al-Emran and Griffy-Brown, 2023). By narrowing down to TASNEE and the business units associated with it in Yanbu, this paper is thus contextually based and therefore represents the facts of the Saudi Arabia metallurgical industry.

2.0 Literature Review

The theoretical framework is based on the merging of various supporting views which describe how financial planning, strategic decision support, and adoption of technology are likely to affect the performance of an organization, especially sustainable performance. Resource-Based View (RBV) is concerned with the ability of firm-based capabilities such as financial management practices to lead to sustainable competitive advantages. At the same time, according to the Dynamic Capabilities Theory, the organization must continuously change, restructure and redesign internal operations to effectively respond to the rapidly changing environment, and it is in this regard that the digital transformation offers the mechanism of achieving such a reaction (J Nair et al., 2024). The Stakeholder Theory introduces an additional layer by emphasizing that the organizational decision-making process should be adjusted to the needs of various stakeholders to introduce sustainability-related aspects to the financial strategies. Lastly, the Institutional Theory proposes that the external pressures that drive the

implementation of sustainability practices and digital tools by firms tend to include government regulations and the international sustainability standards. Together, all of the theoretical lenses provide an integrated basis of how the financial planning and decision support systems and the adoption of technologies can affect the sustainability of the companies within the heavy industries such as metallurgy in the long term (Zhang et al., 2023).

Empirical studies of the role of financial planning have continued to support its significance in the performance and survival of an organization. Initial research highlighted that financial planning is a control mechanism which allows firms to effectively allocate resources and deal with the risks that are involved in dealing with uncertain business environments. More recent studies have taken this a step further by connecting financial planning to sustainability results. Indeed, research in manufacturing industries indicates that effective budgeting activities contribute to the capacity of firms to invest in energy efficiency, waste minimization, and environmental compliance. It has been noted that financial planning in the Middle Eastern environment assists industrial businesses to deal with the fluctuating oil prices and instability of the global markets as a means of ensuring their liquidity in the short-run, and solvency in the long-run (Kathiarayan and Affandi, 2024). Financial planning is especially important in the metallurgy industry due to the capital intensity of the operations, the long duration of the project, and the risk of commodity price volatility. As empirical research reveals, companies that have developed financial planning practices are better placed to withstand the downward decline and yet make investments in innovation and sustainability programs. Financial planning can therefore be regarded as a source and facilitator of sustainable performance(Bonsu et al., 2025).

There are also numerous empirical studies on strategic decision support whose results highlight the central role of strategic decision support in harmonizing financial information with operational and strategic priorities. Financial analytics platforms and decision support systems (DSS) are increasingly being used to improve the accuracy of decision-making and scenario planning and to mitigate cognitive biases that often intervene in managerial judgment. Recent research indicates the increasing significance of big data analytics and artificial intelligence in financial decision support, which enables organisations to simulate complicated situations and appraise sustainability-related trade-offs in ways that are more effective. In the industrial industries, empirical research has demonstrated that decision support tools have the potential of supporting sustainability through increased integration of financial, environmental and operational information to enable common strategies (Al Maruf, 2025). The application of strategic decision support tools, in Saudi Arabia, whereby companies are under pressure to meet the sustainability goals of Vision 2030, has been proven to support a translation process of government policies into viable corporate strategies. Empirical research has shown that in the field of metallurgy, the more companies have integrated futuristic decision support systems, the

better they are able to align production and financial strategies with sustainability needs, including carbon reduction goals and resource efficiency. This suggests that besides being an engine of operational efficiency, decision support is a predictor of broader sustainability outcomes (Ragazou et al., 2023).

Adoption of technology in financial management has developed as a paradigm shift in research and practice in the field. There is an expanding collection of empirical data which illustrates the advantages of implementing digital reporting solutions, financial analytics solutions and automation to enhance accuracy, transparency and efficiency (Brynjolfsson & McAfee, 2014). Research in the manufacturing and energy industries has shown that technology-based financial management minimizes reporting mistakes, increases the speed of decisions made, and increases trust in stakeholders through real-time information. Later research focuses on the role of new technologies such as artificial intelligence and blockchain in advancing the field of financial management by modelling predictions and keeping records that are impossible to modify. Studies in the Gulf region indicate that not all companies implemented technologies in a similar way, with some companies being more advanced in the digital transformation than others because of cost-related or organizational factors (Aljedaani, 2024). The implementation of financial technologies is becoming a more and more perceived need in the metallurgy sector of Saudi Arabia, as the companies have to address the shareholder demands but to adapt to the new requirements of sustainability and reporting systems as well. Empirically, it has been shown that financial management technology allows metallurgical firms to trace the carbon emissions, monitor resource usage, and include sustainability indicators in the financial reporting, and, therefore, to relate operational and financial performance in more open and accountable ways (Litvinenko, 2020).

Empirical attention has also been given to the interrelationships between financial planning, decision support, and technology adoption, but frequently in an ad hoc fashion. Among these facts, one can mention that according to some studies, the presence of high-tech equipment can reinforce the financial planning procedure since the online tools allow making more accurate forecasts as well as the potential to modify the budget in the course of its implementation. Some of them also show that the implementation of decision support systems can be best supported by good financial planning since in such a way, we can make informed strategic decisions with the help of the appropriate utilization of financial data (Chukwuma-Eke et al., 2021). Similarly, it has been observed that the adoption of digital technologies enhances decision support by availing predictive analytics and interactive visualization tools to the managers. However, very few studies explore the interaction of all three factors as a whole, to promote sustainable performance, especially in intensive industries like metallurgy. The gap explains why it is necessary to perform studies that examine their general impact within particular national and industrial settings (Utouh & Kitole, 2024).

Notwithstanding the accumulation of literature, some research gaps are clear. First, a significant part of the empirical studies on financial planning, decision support and technology adoption have focused on the service oriented industries, including the banking, healthcare sectors, and information technology sectors with minimal focus on capital intensive industries such as metallurgy. Second, most of the research has been done in developed economies and there have been no studies done in emerging markets especially the Middle East. Third, although sustainability has emerged as a key agenda in organizational studies, there are still limited studies that directly relate financial management practices to sustainable performance results. Furthermore, the interaction between orthodox financial planning and digital transformation projects are under-researched, particularly within the framework of Vision 2030, which has placed Saudi companies in a unique position, at the junction of industrial development, economic diversification, and sustainability demands. The above gaps are an indication that empirical studies are needed which not only measure the effect of each of these factors of financial planning, decision support and adoption of technology but also discuss their overall effect on sustainable performance.

It is with the aim of filling these gaps that the current paper formulates a series of hypotheses that will be used to inform empirical research in the Saudi metallurgy industry. According to the previous studies, one of the hypotheses is that financial planning and budgeting will have a positive impact on sustainable performance through improved forecasting, budgetary control, and financial stability (H1). It is believed that strategic decision support will have a positive impact on sustainable performance because it will guarantee the optimal inclusion of financial insights in the operational strategies, and hence aligns short-term activities with long-term sustainability objectives (H2). The adoption of technology in financial management is postulated to have a positive impact on sustainable performance through enhanced accuracy, efficiency and transparency in decision-making processes (H3). Last but not least, due to the complementary character of these variables, it is assumed that their integrated usage will be more effective in influencing sustainable performance than an individual factor (H4). These hypotheses represent the hypothetical relationships between the variables as they address the research gaps identified, which in effect pre-empt empirical validation in the context of the metallurgy industry in Saudi Arabia.

3.0 Methodology

The quantitative research design is taken in the current study because the main aim is to analyze causal associations between financial planning and budget, strategic decision support, technology adoption in financial management, and sustainable performance. A quantitative design enables a systematic acquisition of numerical information and the use of statistical methods to test the theory-based and previous empirical research hypotheses. The research is based on the positivist philosophy of

research, which focuses on objectivity, measurement, and testing of hypotheses as a tool to form generalizable knowledge. The latter philosophical stance is particularly suitable when one is to outline the issue of causality and effect and the establishment of predictive models. The research process followed is organized, so the results obtained are replicable and can be used to develop theory in the financial management and sustainability field.

The target population of this study includes the finance stakeholders and the managers who are employed in the metallurgy industry in Pakistan. Pakistan has been chosen as the location of study due to the strategic character of the chosen metallurgy sector and the desire to investigate the financial management strategies in the emerging economies which are grappling with the balance between industrial growth and sustainability. The metallurgy sector in Pakistan includes a large steel, aluminum and other metal industry that is a major contributor to infrastructure, manufacturing and exports. Yet, it is a very challenging environment with unstable commodity prices, a lack of technological advancement, and an increasing sustainability burden, which is why it would be a correct context to examine how financial activities and sustainable performance interact.

Purposive sampling is the sampling strategy to use in this study because it is suitable when the research seeks the opinion of individuals who have specific knowledge and expertise. The target respondents identified were finance managers, accountants, and individuals directly involved in the financial planning, budgeting, and decision-making processes based on the direct contact involvement in the design and implementation of financial management practices. In purposive sampling, some convenience sampling elements were also taken into consideration because of the logistic limitations of reaching a big and geographically dispersive population. The sample population size was determined by selecting several metallurgy companies in various regions of Pakistan with preference on big and medium sized companies. The sample size was selected according to the Structural Equation Modeling (SEM) needs, which imply a certain amount of observations is required to make the estimates. In accordance with the prescriptions of methodological researchers, at least 200 responses were identified, but more than that number was aimed to collect in order to increase the strength of the analysis.

This study used a structured survey questionnaire as its method of data collection because it was essential to seek answers to the main constructs of financial planning, strategic decision support, adoption of technology, and sustainable performance. Questions were designed to fit into a section based on each construct, and the questions were measured on a five-point Likert scale, where strongly disagree was rated on one end and strongly agree was rated on the other end. This format enabled the respondents

to report their degree of agreement to the statements referring to the financial management practices and sustainability outcomes of their firm. The questionnaire has been constructed on the basis of previously tested scales with some of the questions being adjusted to suit the situation of the metallurgy industry in Pakistan. To achieve content validity, academic scientists in the field of finance and sustainability and the industry practitioners were consulted to review the questionnaire. The instrument was tested on a small group of respondents to determine ambiguities and implement refinements to the pilot test before the instrument could be distributed at large scale. To ensure that more companies participated and to enhance the response rate, the survey was conducted not only through a physical method where the questionnaires were sent to the companies operating in the industrial hubs, but also through electronic means via email and online survey tools.

4.0 Results

Reliability and Convergent Validity (Outer Model)

Table 4.1 Reliability and Convergent

Construct	Item	Factor Loading	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Financial Planning (FP)	FP1	0.82	0.87	0.90	0.65
	FP2	0.84			
	FP3	0.78			
Strategic Decision Support (SD)	SD1	0.81	0.88	0.91	0.67
	SD2	0.85			
	SD3	0.80			
Technology Adoption (TA)	TA1	0.83	0.89	0.92	0.70
	TA2	0.87			
	TA3	0.84			
Sustainable Performance (SP)	SP1	0.86	0.90	0.93	0.72
	SP2	0.88			
	SP3	0.84			

The outcomes of the reliability analysis and convergent validity analysis prove that all constructs within the model fit the recommended levels and the measurement model is robust. Factor loadings used in financial planning are: 0.78 to 0.84; their alpha is 0.87; their cronbach reliability (CR) is 0.90, and the average variance extracted (AVE) is 0.65, which means that internal consistency is high and convergent validity is satisfactory. Similar performance is observed in strategic decision support, the loading is 0.80 to 0.85, Cronbach alpha is 0.88, CR is 0.91 and AVE is 0.67, which means that the construct is well measured. The indicators of technology adoption show even better results, with loadings of 0.83-0.87, Cronbach alpha of 0.89, CR of 0.92 and AVE of 0.70, which prove reliability and validity. Sustainable performance is also very reliable and valid, with loadings of 0.84-0.88, Cronbach alpha of 0.90, CR of 0.93 and AVE of 0.72, well above the minimum. All in all, the findings prove that both constructs have acceptable factor loadings (>0.70), Cronbachs alpha (>0.70), CR (>0.70) and AVE (>0.50), thus making the study highly reliable and convergently valid.

Discriminant Validity (HTMT Ratios)

Table 4.2 Discriminant Validity

Constructs	**FP**	**SD**	**TA**	**SP**
Financial Planning (FP)	—			
Strategic Decision Support (SD)	0.72	—		
Technology Adoption (TA)	0.68	0.70	—	
Sustainable Performance (SP)	0.65	0.74	0.71	—

The outcome of the HTMT discriminant validity test shows that the constructs are not significantly overlapped and thus the validity of the measurement model is supported. Values of HTMT between financial planning and the other constructs lie in the range of 0.65 to 0.72, and the correlation of strategic decision support with technology adoption and sustainable performance are 0.70 and 0.74, respectively. Likewise, technology adoption has a sustainable performance of 0.71. The value of all the values are below the conservative value of 0.85 that each construct is measuring a distinct concept without much overlapping. These results indicate that financial planning, strategic decision support, technology adoption and sustainable performance are empirically different,

which is necessary to accurately test hypothesized structural relationships within the model.

Collinearity Assessment (VIF)

Table 4.3 Collinearity Assessment

Path	VIF
FP → SP	2.10
SD → SP	2.35
TA → SP	2.20

The findings of the collinearity assessment demonstrate that all the variance inflation factors (VIF) values of the predictor constructs, namely, financial planning (2.10), strategic decision support (2.35), and technology adoption (2.20) are lower than the generally accepted threshold of 5, which means that there is no concern regarding multicollinearity in the model. This implies that the predictors are moderately correlated, but each construct has a contribution in explaining sustainable performance without multicollinearity or inflating standard errors. As a result, the estimates of the regression in the structural model may be said to be stable and reliable and give confidence in the interpretation of the hypothesized relationships.

Model Fit Indices (PLS-SEM).

Table 4.4 Model Fit Indices

Fit Index	Recommended Threshold	Obtained Value
SRMR (Standardized Root Mean Square Residual)	< 0.08	0.056
NFI (Normed Fit Index)	> 0.90	0.92
d_ULS (Unweighted Least Squares)	Acceptable if lower than HI95	0.89
d_G (Geodesic Distance)	Acceptable if lower than HI95	0.76

The model fit indices show that the proposed structural model has an acceptable overall fit. The value of SRMR of 0.056 is less than the standard value of 0.08 which confirms that the difference between the observed and the predicted correlations is not significant. Likewise, the NFI value of 0.92 is higher than the benchmark of 0.90 indicating that there is high comparative fit between the hypothesized model and a null model. dULS (0.89) and dG (0.76) are both within reasonable limits, being lower than the HI95 values used to assess the model, which further substantiates the model sufficiency. Taken together, these indices give very strong evidence that measurement and structural elements of the model are well-specified and that the proposed relationships can be interpreted in a meaningful way.

Structural Model Results (Hypotheses Testing)

Hypothesis	Path	β	t-value	p-value	Result
H1	FP → SP	0.31	4.12	0.000	Supported
H2	SD → SP	0.29	3.88	0.000	Supported
H3	TA → SP	0.34	4.55	0.000	Supported

The results of the structural model are strongly empirical and support all the hypothesized relationships. Financial planning has a large positive impact on sustainable performance ($b = 0.31$, $t = 4.12$, $p < 0.001$), which means that strong forecasting, budgeting, and financial control systems have direct positive impacts on long-term sustainability performance. There is also a positive significant effect on strategic decision support ($b = 0.29$, $t = 3.88$, $p < 0.001$) which demonstrates the need to incorporate financial perspective in both operational and strategic decisions. The uptake of the technology is the most predictive ($b = 0.34$, $t = 4.55$, $p < 0.001$) and the need to use digital tools and automation to enhance accuracy, transparency, and efficiency in managing finances and to become sustainable cannot be overstated. Together, the combined impact of these three variables captures 61% of the variation in sustainable performance ($R2 = 0.61$), indicating that their interaction effect is strong and supports the argument that financial planning, strategic decision support, and technology adoption should be combined to realize sustainable performance in the metallurgy sector.

5.0 Discussion and Conclusion

The results of this paper demonstrate the inter-relationship and importance of financial planning, strategic decision support, and technology adoption to create sustainable performance in the metallurgy industry. The findings show that financial planning has a significant positive impact on sustainability, which supports the thesis statement that long-term stability and reliability cannot be achieved without systematizing budgeting, predicting, and financial control. This is in line with previous studies that highlight that a well-organized financial system helps organizations distribute resources more effectively, reduce risks, and implement growth strategies despite uncertainty in the market. Financial planning offers the foresight and flexibility necessary in the face of external shocks (variable commodity prices and increasing energy costs) in the context of the metallurgy industry in Pakistan to ensure that even when the industry faces disruptions, the firm remains committed to its sustainability programs (environmental compliance and social responsibility). More significantly, the investigation proves strategic decision support to be of significant importance in improving sustainable performance due to the integration of financial data and analytical insights in the decision-making process of the manager.

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