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Development and Assessment of a Business Intelligence-based Management Accounting Information System Model: A Structural Equation Modeling Approach

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ABSTRACT

Non-academic models have been used to examine the importance of business intelligence (BI) and business analysis in supporting business decisions, as well as their links with management accounting (MA). The structural equation modeling approach was used in this study to evaluate a conceptual business intelligence-based management accounting information system model.

The qualitative section of the study included qualitative content analysis and grounded theory to create a business intelligence-based management accounting information system model comprised of causal conditions, strategies, underlying conditions, intervening conditions, and outcomes. The quantitative section employed structural equation modeling to evaluate the effects of the identified parameters on the effectiveness of the management accounting information system. According to the findings, the identified factors had a substantial impact on the research variables.

Keywords: Management Accounting Information System, Business Intelligence, Grounded Theory, Structural Equation Modeling, Causal Conditions, Intervening Conditions, Underlying Conditions, Outcomes

1. Introduction

Senior financial managers and information technology (IT) managers in Iran and many other developing countries must now select a comprehensive accounting information system (AIS) and software that is tailored to the needs of organizations and financial stakeholders in order to gain a competitive advantage and increase profits. Business intelligence (BI) is a strategic IT component that emphasizes the value of data and information. Therefore, in addition to automation procedures, management accounting information systems (MAIS) must focus on decision support and business intelligence (BI). This necessitates the identification of requirements for decisions made based on accounting systems and software in areas of decision support and BI. Researchers must also evaluate firms' success in selecting appropriate information systems.

From a theoretical standpoint, the present study first identified the techniques impacted by the adoption of BI systems. The nature of the effect was assessed subsequently, and variations in management accountant expertise during the implementation phase were explained. This study clarified how information systems affect management accounting systems (MASs) through BI systems. Furthermore, from a practical standpoint, the study provided useful knowledge for customer-oriented consultants and companies involved in the implementation of BI projects by revealing factors that should be exploited (financial leverage) or avoided (barriers) when making changes in MAS through BI systems. Thus, this study supported management accountants seeking to improve their corporate MAS by leveraging the impact of BI systems on various management accounting techniques. The development and evaluation of an appropriate BI-based MAIS model is critical in today's business world. This model also introduced important notions to the realm of science.

This study covers the criteria and elements influencing decision support and BI systems within an integrated framework, thereby assisting other researchers in the development of new theories and the extension of the boundaries of knowledge. The identification of these criteria, together with the use of an appropriate AIS assessment approach, can offer scholars with a scientific foundation for producing applicable results.

First, the notion of a BI-based MAIS model was introduced and described in this study. The background of studies conducted on the BI-based MAIS model was provided next, followed by an explanation of the research procedure. Finally, after presenting the research findings, the results were discussed in the discussion and conclusion section.

Literature review

Business intelligence (BI) is a broad concept that specifies proper orientation of the entire organization, and enhances modern accounting tools such as management accounting and decision facilitation. Senior organizational managers must support and spread the notion of BI throughout the organization. Moreover, BI can be used in conjunction with other information systems, such as management accounting systems, to optimize the positive effects of these systems on BI components (Nespeca and Chiucchi, 2018).

The term "business intelligence" refers to the collecting, management, and analysis of a huge set of data on partners, goods, services, consumers, suppliers, and activities, as well as the interactions between these business elements. In other words, BI is a systematic and organized organizational process that seeks to analyze and disseminate business information derived from important internal and external operational and decision-making sources. It is a comprehensive concept that unites the entire organization to make the optimum use of information systems and obtain quality information in time in order to create competitive advantages (Sabokroo *et al.*, 2018).

In a study titled “The Impact of Business Intelligence Systems on Management Accounting Systems”, Nespeca and Chiucchi (2018) showed that BI systems can introduce new decision-making techniques; therefore, these systems can increase the expertise of management accountants and improve management accounting techniques.

Nikoomaram and Mahmoodi (2012) conducted a study titled “An Assessment of Effect of Management Accounting Information System Based on Decision Support and Business Intelligence in Stock Exchange Companies”. They found significant relationships between “forward and backward reasoning process” and “optimal return-based decision making process”, “group decision making and summarization process”

and "risky decision making process", "intelligent agent, graphic reports, group decision making and summarization process" and "decisions based environmental conditions" at 95% significance level.

In a study titled "Explanation of Business Intelligence Model in Management Accounting Information System", Rahnamay Roodposhti and Mahmoodi (2010) highlighted the importance of developing a model based on BI in AISs.

The results of Guy.H. Gassner and Linda Volonio (2005) research show that providing timely information in response to customers increases the return on investment in business intelligence. Especially by managing transactions and dealing with customers and identifying the right offers to customers at the right time, a greater share of the customer will be obtained. A key element of business intelligence strategy is the management of organizational data, which enables economic units to recognize changes in customer behavior so accordingly, the customer will send a signal when there is a high probability of a positive response to the offer.

In the field of evaluation and especially the selection of management accounting information systems, it suffers from a lack of focus on business intelligence and decision support. In recent research on the evaluation of accounting information systems, due to the importance of the issue for organizations, it has been suggested that specialized evaluation and special evaluation models be developed for functional and non-functional needs.

Given that no researcher has previously developed and evaluated a business intelligence-based management accounting information system model in Iran, this is the first study in the country to employ grounded theory to design and evaluate a BI-based MAIS model.

Research questions and hypotheses

The primary goal of this study was to evaluate a conceptual BI-based MAIS model using structural equation modeling. Accordingly, the primary study question was, "How can one design and evaluate a conceptual BI-based MAIS model?" Additionally, given the adoption of the grounded theory paradigm model approach, the research questions examined the components of the paradigm model including "categories", "causal conditions", "underlying conditions", "intervening conditions", "strategies", and "outcomes". Due to the homogeneity of causal, underlying, and intervening conditions, these three components were considered as factors influencing a BI-based MAIS. The research questions and hypotheses listed below are proposed:

Question 1: What are the causal, underlying, and intervening conditions associated with a BI-based MAIS?

Question 2: What strategies must be adopted to implement a BI-based MAIS?

Question 3: What are the outcomes of implementing a BI-based MAIS?

Question 4: How should one design a suitable model for explaining components of BI-based MAIS?

Hypothesis 1: Causal conditions affect the strategies employed for the implementation of a BI-based MAIS.

Hypothesis 2: Intervening conditions affect the strategies employed for the implementation of a BI-based MAIS.

Hypothesis 3: Underlying conditions affect the strategies employed for the implementation of a BI-based MAIS.

Hypothesis 4: Strategies affect the outcomes of implementation of a BI-based MAIS.

Definitions and concepts

A. Management accounting information system (MAIS)

Accounting information system (AIS) is a corporate component that processes financial events and information in order to provide internal users with appropriate decision-making information. AIS can be thought of as the logical junction of two larger topics: accounting and management information systems (MIS). Accounting and management information systems (MIS) are both heavily focused on information. MIS, on the other hand, is primarily concerned with information systems that generate information, whereas accounting is more concerned with information itself (Nikoomaram and Mahmoodi, 2012). MAISs provide organizations with both financial and non-financial information. Financial information includes revenues, expenses, and profits, and non-financial information includes production volume, production capacity, total wastes, and market share (Simon, 1987).

B. Business intelligence

Business intelligence (BI) is the notion of a managerial tool that assists organizations in managing and refining business information in order to make more successful decisions (Goshal and Kim, 1986; Gilad, 1986). It has also been characterized as a complete concept that unites the entire organization in order to make the best use of information systems and collect quality information in a timely manner in order to gain competitive advantages (Sabokroo *et al.*, 2018).

Research method

This study employed an integrated-ethod (quantitative and qualitative) research strategy. In the qualitative section, grounded theory (Strauss and Corbin, 1990) was adopted to collect and analyze the qualitative data. Strauss (1987) and Strauss and Corbin (1998 and 1990) introduced a set of procedures for inductive development of theory in a qualitative method using accurate and systematic data analysis. Experts have created several models of grounded theory. The present study employed the systematic procedure presented by Strauss and Corbin (1989 and 1990). This procedure focuses on data analysis through a systematic coding procedure including open, axial, and selective coding methods, and emphasizes the development of a rational paradigm or visual picture of the evolving theory. This method is used when 1) there is little known about the field of study; 2) the researcher seeks to understand participants' perceptions and experiences about a particular issue, and 3) the researcher aims to develop a new theory (Abolmaali, 2012). The structural equation modeling approach was used to evaluate the research model in the second section.

Study population and sample

To get detailed information about the participants, theoretical sampling was used. In this method, the researcher uses the findings to select the next sources (Golding, 2002), and theoretical sampling continues until the categories reach theoretical saturation. Management accounting experts, senior accountants, accounting faculty members, financial managers, and IT experts working in firms involved in business intelligence comprised the research population. In the qualitative section, 15 accounting and management graduates with more than 10 years of work experience were interviewed. The interviews were continued until the concepts and categories were entirely saturated. Each interview began with a general question, followed by more detailed and specialized questions as the interview progressed. After analyzing the collected data and extracting key concepts, the research model was created. In the quantitative section, the study population included 1340 participants with associated academic degrees, of whom 135 were selected using the sampling formula.

Temporal scope

The preliminary studies were carried out in April 2019 in order to establish the research plan. The project of developing a BI-based MAIS model was then confirmed, and the research was finally completed in March 2020.

Data analysis

The data were evaluated in three steps of open, axial, and selective coding to construct the final research model. The coding process and its implementation in this study are described in the next section. Moreover, the key analyses are offered to clarify how the interviews are examined and relevant concepts and categories are extracted.

Open coding

During this process, each sentence/paragraph derived from interviews or panel discussions was assigned a conceptual label at the most basic level. For example, interviewee No. 10 noted, "One cannot aspire to improve a corporate MAIS unless firm owners and managers obtain enough knowledge and comprehension of the benefits and strategies of business intelligence."

"Knowledge and comprehension of the benefits and strategies of business intelligence" was the conceptual term applied to the preceding statement. Accordingly, from the interviews and discussions, appropriate concepts (subcategories) were identified. After analyzing and coding the research data, 1100 concepts, 115 main categories, and 40 macro categories were extracted. These items were classified to the categories of causal conditions, processes, strategies, outcomes, underlying conditions, and intervening conditions using the axial coding approach.

Axial coding

Strauss and Corbin (1998) state that researchers must categorize the identified items into the following categories. This step is called axial coding.

Causal conditions are variables or events that trigger the occurrence or development of a phenomenon.

Strategies are outcome-oriented activities that are carried out in order to influence a phenomenon in a specific context and despite the presence of intervening factors.

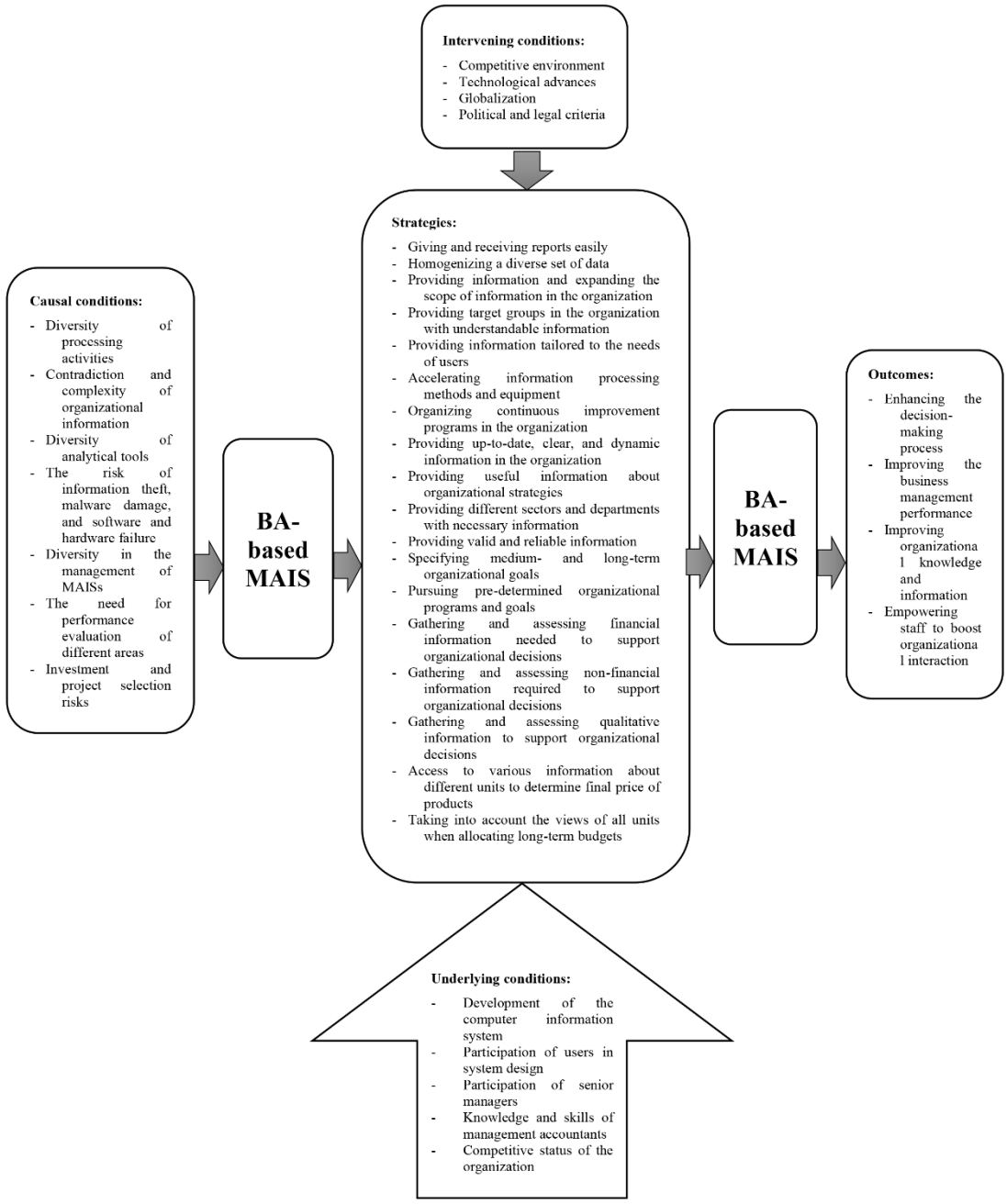
Outcomes are the results of implementation of strategies.

The identified items were categorized using this classification method.

Selective coding

The purpose of this step is to select the core category relate it with other categories. The researcher selects the core category in a methodical and objective manner, and all other categories are somehow related to this category (Strauss, 1987). The researcher systematically relates the core category to other categories, validates relationships, and improves categories (Strauss and Corbin, 1990).

Other categories will then become subcategories and descriptors of the core category. Finally, the grounded theory is developed by illustrating the relations of the core category with sub-categories and concepts in an integrated process (Noori and Mehr Mohammadi, 2011). The core category in this study was the "business intelligence-based management accounting information system (BA-based MAIS)." This basic category can be explained by all other categories.



Business intelligence-based management accounting information system model

Research findings and discovered relationships

The following paragraphs describe the model developed using the aforementioned coding processes:

1. Causal conditions: The following items were extracted from the interviews as the main causal conditions: diversity of processing activities, contradiction and complexity of organizational information, diversity of analytical tools, the risk of information theft, virus damage, and software and hardware failure, diversity in the management of MAISs, the need for performance evaluation of different areas, and investment and project selection risks.

2. Core category: The core category was business intelligence-based management accounting information system (BA-based MAIS).

3. Strategies: The following items were selected as the most significant strategies for a BA-based MAIS by the experts interviewed: giving and receiving reports easily, homogenizing a diverse set of data, providing information and expanding the scope of information in the organization, providing target groups in the organization with understandable information, providing information tailored to the needs of users, accelerating information processing methods and equipment, organizing continuous improvement programs in the organization, providing up-to-date, clear, and dynamic information in the organization, providing useful information about organizational strategies, providing different sectors and departments with necessary information, providing valid and reliable information, specifying medium- and long-term organizational goals, pursuing pre-determined organizational programs and goals, gathering and assessing financial information required to support organizational decisions, gathering and assessing non-financial information required to support organizational decisions, gathering and assessing qualitative information to support organizational decisions, access to various information about different units to determine final price of products, and taking into account the views of all units when allocating long-term budgets.

4. Intervening conditions: As previously noted, the intervening conditions include competitive environment, technological advances, globalization, and political and legal criteria.

5. Underlying conditions: Development of the computer information system, participation of users in system design, participation of senior managers, knowledge and skills of management accountants, and competitive status of the organization were the main underlying conditions required for proper implementation of the proposed strategies.

6. Outcomes: The main outcomes of design and implementation of a BA-based MAIS include enhancing the decision-making process, improving the business management performance, improving organizational knowledge and information, and empowering staff to boost organizational interaction.

Quantitative findings

The study sample in this segment included 135 individuals. The data was first analyzed using the mean, standard deviation (SD), and normality test indices.

Table 1: Mean and standard deviation of the main variables

Variable	Mean	SD
Causal conditions	3.53	0.85
Intervening conditions	3.66	0.76
Underlying conditions	3.73	0.63
Strategies	3.40	0.68
Outcomes	3.68	0.82

According to Table 1, the mean score of all research variables was greater than the moderate score (3), indicating that all variables had a moderate to high mean score. Variables of strategies (3.40) and underlying conditions (3.73) had the lowest and highest mean scores, respectively. In addition, the mean scores of causal conditions, intervening conditions, and outcomes were 3.53, 3.66, and 3.68, respectively.

Table 2: Results of normality tests

Variable	P-value of Kolmogorov-Smirnov test	Skewness	Kurtosis
Causal conditions	0.071	-0.561	-0.621
Intervening conditions	0.072	-0.543	-0.112
Underlying conditions	0.123	-0.112	-0.863
Strategies	0.088	-0.917	0.162
Outcomes	0.094	-1.10	0.811

The Kolmogorov-Smirnov (K-S) test results showed that all the research variables have a normal distribution (all p-values > 0.05). The skewness and kurtosis values obtained for all research variables fell between -2 and +2; thus, it can be said that all these variables have a normal or an almost normal distribution.

Reflective measurement model

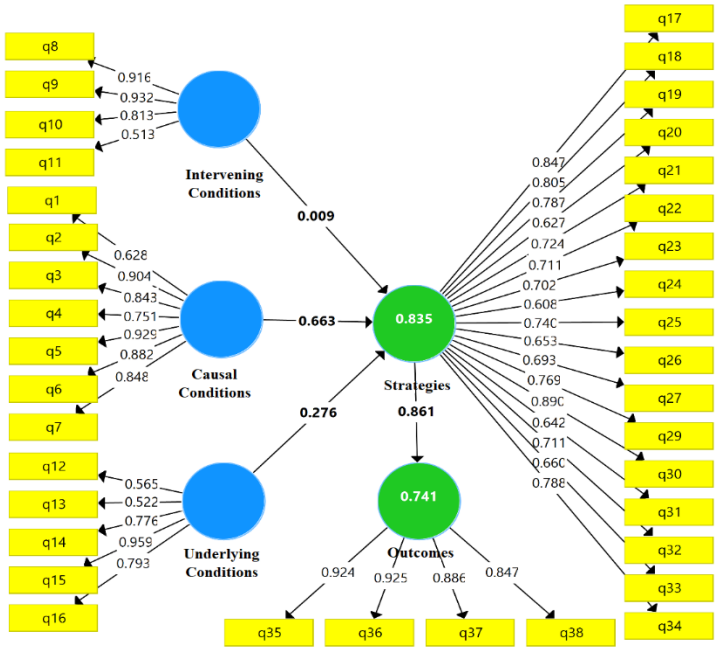


Figure 1: Research model with standardized path coefficients

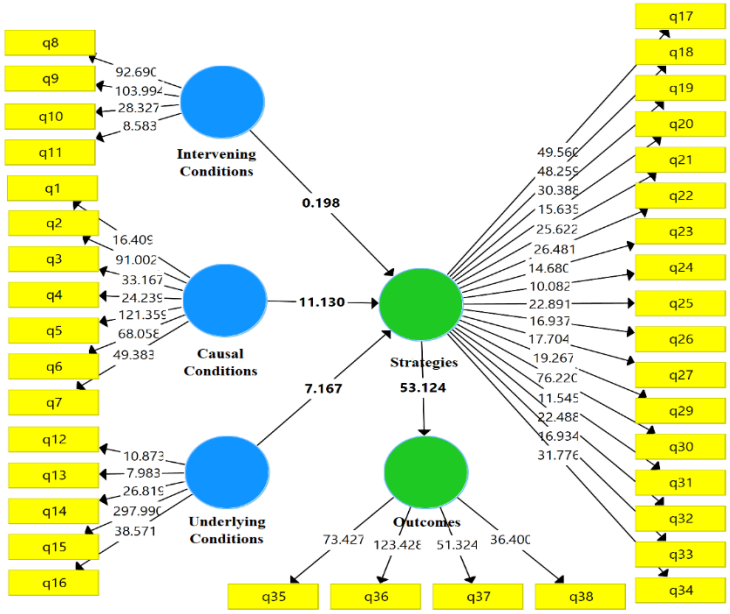


Figure 2: Research model with significant path coefficients (t-value)

Reliability assessment

According to Fornell and Locker (1981), in PLS method, reliability is measured by calculating factor loadings, Cronbach's alpha coefficients, and combined reliability (CR).

Table 3: Results of the reliability test (Cronbach's alpha method)

Variable	Cronbach's alpha	Composite reliability
Causal conditions	0.92	0.94
Intervening conditions	0.81	0.88
Underlying conditions	0.78	0.85
Strategies	0.94	0.95
Outcomes	0.92	0.94

Validity assessment

All variables' convergent and divergent validity were evaluated. Based on the results, all four conditions of convergent validity are established.

Condition 1: Factor loadings must be significant. T-values show the significance of the effects of variables on one another, and t-values should not fall between -1.96 and +1.96. According to Figure 2, none of the t-values of the research variables fall between -1.96 and +1.96; therefore, all factor loadings are significant, and the first condition of convergent validity is established.

Condition 2: Factor loadings are all research variables must be greater than 0.7. Based on the results, the second condition of convergent validity is also established.

Condition 3 and condition 4: According to Magner *et al.* (1996), convergent validity is confirmed if all average variance extracted (AVE) values are greater than 0.5.

Table 4: Comparison of CR and AVE values

Variable	Condition 3: AVE > 0.5		AVE > CR
	AVE	CR	
Causal conditions	0.69	0.94	Confirmed
Intervening conditions	0.66	0.88	Confirmed
Underlying conditions	0.55	0.85	Confirmed
Strategies	0.53	0.95	Confirmed
Outcomes	0.80	0.94	Confirmed

The four conditions of convergent validity were all established; therefore, the convergent validity of the reflective measurement model was confirmed.

Divergent (discriminant) validity

This complementary concept is measured in PLS path modeling using cross-loading method and the Fornell and Larcker test (1981). Table 5 shows the relationships among the five main research variables (including causal conditions, intervening conditions, underlying conditions, strategies, and outcomes) along with the results of the Fornell and Larcker test.

Table 5: Correlation matrix and Fornell and Larcker test results

Variable	Causal conditions	Intervening conditions	Underlying conditions	Strategies	Outcomes
Causal conditions	0.83				
Intervening conditions	0.58**	0.81			
Underlying conditions	0.41**	0.57**	0.74		
Strategies	0.69**	0.31**	0.63**	0.73	
Outcomes	0.52**	0.29**	0.58**	0.71**	0.89

($P \leq 0.01$**, $P \leq 0.05$*)

The Pearson correlation test results showed significant positive relationships between all research variables ($p < 0.05$). The dependent variable of outcomes had positive relationships with other four variables. Strategies ($r = 0.71$) and underlying conditions ($r = 0.58$) had the strongest relationships with the dependent variable of outcomes. All independent variables, including causal conditions, intervening conditions, and underlying conditions, were associated with the mediating variable of strategies, where the

strongest relationships were established with causal conditions (r = 0.69) and underlying conditions (r = 0.63), respectively.

Table 3 presents the results of the Fornell and Larcker test. In this method, discriminant validity is confirmed if the square root of the AVE of each construct is greater than the correlation between that construct and other research constructs.

Table 3 shows the square root of each AVE along the diagonal as well as the correlation coefficients between the research variables. As shown in the table, the square root of the AVE of each variable is greater than the correlation between that variable and other research variables; therefore, the divergent (discriminant) validity of the model is also confirmed.

The above findings and the outputs of SmartPLS software confirm the desirable convergent and divergent validity as well as suitable reliability (factor loadings, composite reliability, and Cronbach's alpha coefficient) of the measurement models.

Structural model

The structural research model was evaluated after various aspects of the measurement models were evaluated. The structural model, in contrast to the measurement model, only investigates latent variables and their interrelationships.

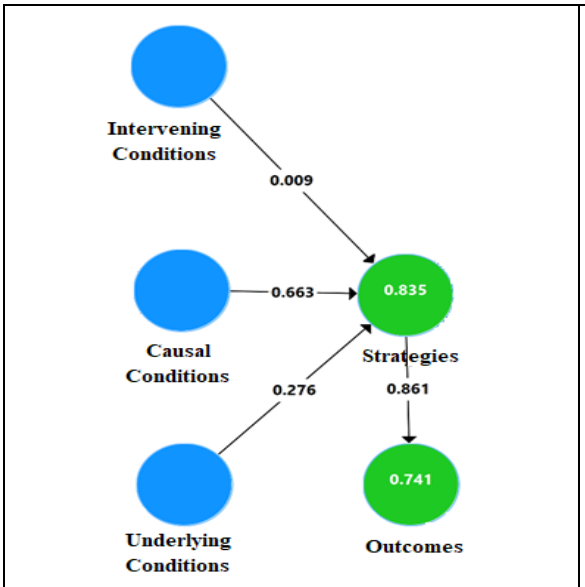


Figure 3: Structural model with standardized coefficients

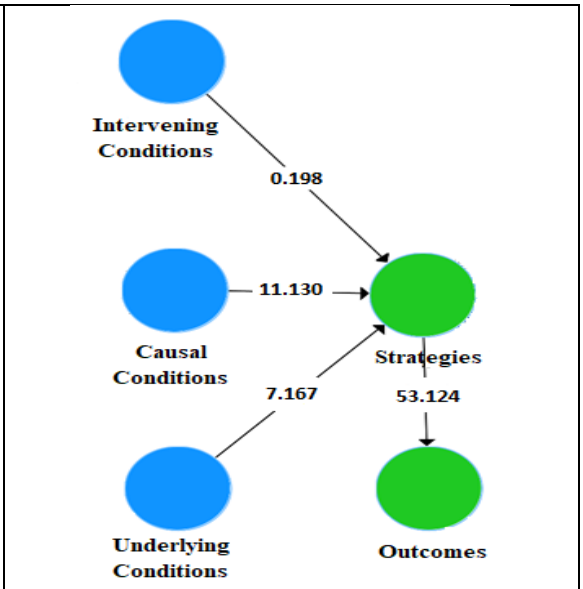


Figure 4: Structural model with significant coefficients

Goodness of fit assessment

Table 6 presents the indices used to assess goodness of fit of the research model.

Table 6: Goodness of fit indices

Dependent variable	Coefficient of determination (R^2)	Predictive relevance (Q^2)	GOF
Strategies	0.83	0.41	0.47
Outcomes	0.74	0.56	

For the dependent variable of outcomes and the mediating variable of strategies, coefficient of determination was 0.74 and 0.83, respectively; therefore, the independent variables explained an acceptable amount of variance of the dependent and mediating variables. The independent variables explained 74% of variance of outcomes and 83% of variance of strategies, indicating the high explanatory power of the research model.

Predictive relevance (Q^2) for the variables of outcomes and strategies was 0.56 and 0.41,

respectively. Since these values are positive and greater than 0.15, it can be stated that the model has a good predictive power.

The obtained goodness of fit (GOF) index was 0.47, which is greater than the standard value of 0.36; thus, the designed model fitted the data very well. In general, the model's goodness of fit, as well as its validity and reliability, were confirmed; therefore, the research model fitted the data and the study sample well.

Hypothesis testing

As shown in Table 7, the following standardized path coefficients, t-values, and p-values were obtained to test the research hypotheses and analyze the relationships between the research variables. Based on the results, 3 out of 4 relationships and paths (hypotheses) were confirmed ($p < 0.05$).

Table 7: Hypothesis testing results (standardized coefficients, t values, and p-values)

Effect	Standardized coefficient	t-value	p- value	Result
Effect of causal conditions on strategies	0.66	11.13	0.001>	Confirmed
Effect of intervening conditions on strategies	0.01	0.198	0.843	Rejected
Effect of underlying conditions on strategies	0.28	7.17	0.001>	Confirmed
Effect of strategies on outcomes	0.86	53.12	0.001>	Confirmed

Hypothesis 1: Causal conditions have a substantial impact on the strategies employed for implementing a BI-based MAIS. As shown in Table 7, t-value (11.36) is greater than 1.96, the upper and lower limits of CI are both positive, and the respective p-value (0.001) is smaller than 0.05; therefore, the null hypothesis is rejected and the research hypothesis is confirmed. Accordingly, it can be said that causal conditions have a significant positive effect on the variable of strategies.

Hypothesis 2: Intervening conditions significantly affect the strategies employed for the implementation of a BI-based MAIS. According to the above table, t-value (0.28) is smaller than 1.96, and the respective p-value (0.782) is greater than 0.05; thus, the null hypothesis is confirmed and the research hypothesis is rejected. Therefore, it can be stated that intervening conditions have no significant effect on the strategies employed for the implementation of a BI-based MAIS.

Hypothesis 3: Underlying conditions significantly affect the strategies employed for the implementation of a BI-based MAIS. As shown in the table, t-value (6.78) is greater than 1.96, the upper and lower limits of CI are both positive, and the respective p-value (0.001) is smaller than 0.05; therefore, the null hypothesis is rejected and the research hypothesis is confirmed. Accordingly, it is concluded that underlying conditions have a significant positive effect on the variable of strategies.

Hypothesis 4: Strategies significantly affect the outcomes of implementing a BI-based MAIS. Based on the results, t-value (8.90) is greater than 1.96, the upper and lower limits of CI are both positive, and the respective p-value (0.001) is smaller than 0.05; thus, the null hypothesis is rejected and the research hypothesis is confirmed. Therefore, it can be said that strategies have a significant positive effect on the outcomes of implementation of a BI-based MAIS.

Discussion and conclusion

The present study investigated the impact of business intelligence systems on management accounting information systems using qualitative content analysis, structural equation modeling, and statistical tests. In other words, the study improved our understanding of the impact of business intelligence systems on accounting information system management techniques. Finally, it shed light on the process through which BI systems affect MAISs, and identified factors that may contribute to/prevent changes in BI-based MAIS techniques.

Using the results of in-depth interviews and statistical tests, the identified concepts and categories were classified into causal conditions, strategies, intervening conditions, underlying conditions, and outcomes. Causal conditions consisted of the items of diversity of processing activities, contradiction and complexity of organizational information, diversity of analytical tools, the risk of information theft, virus damage, and software and hardware failure, diversity in the management of MAISs, the need for

performance evaluation of different areas, and investment and project selection risks. Strategies consisted of the items of giving and receiving reports easily, homogenizing a diverse set of data, providing information and expanding the scope of information in the organization, providing target groups in the organization with understandable information, providing information tailored to the needs of users, accelerating information processing methods and equipment, organizing continuous improvement programs in the organization, providing up-to-date, clear, and dynamic information in the organization, providing useful information about organizational strategies, providing different sectors and departments with necessary information, providing valid and reliable information, specifying medium- and long-term organizational goals, pursuing pre-determined organizational programs and goals, gathering and assessing financial information required to support organizational decisions, and gathering and assessing non-financial qualitative information required to support organizational decisions. Intervening conditions included factors of competitive environment, technological advances, globalization, and political and legal criteria. Underlying conditions included factors of development of the computer information system, participation of users in system design, participation of senior managers, knowledge and skills of management accountants, and competitive status of the organization. Finally, outcomes included items of enhancing the decision-making process, improving the business management performance, improving organizational knowledge and information, and empowering staff to boost organizational interaction.

Regarding the effect of business intelligence systems on existing management accounting information system techniques, it can be stated that BI systems play an important role in accelerating changes made in budgeting and reporting practices. In addition, the implementation of BI-driven workflows will make the process more structured, rational, and efficient. Studies highlight how business intelligence can affect reporting content in light of current changes in reporting content. Reports can be tailored based on the needs of decision makers through the adoption of BI systems. They can also be improved by including new analytical dimensions. The observed changes are frequently incremental, demonstrating an improvement in existing management accounting techniques; yet, management accounting principles remain unchanged.

The present findings also provide empirical evidence on how the strategic management process is improved via BI systems. BI systems play a significant role in expediting the usage of the Balanced Scorecard, an advanced management accounting tool. Even if we cannot prove that these fundamental changes are the product of BI deployment, we can claim that BI employs this management accounting technique to alter the management accounting rationale of more strategically oriented organizations.

BI systems can also assist scholars in calculating indicators of an integrated management system. In this process, BI systems: first, provide real-time data, and thereby influence the quality of the data used in the calculation process, and second, affect the calculation process by enabling companies to calculate relevant indicators in an automated process and updating the data using the Balanced Scorecard strategy.

Management accountants anticipate that BI systems will have an impact on their role. These changes will not occur unless senior management provides financial support, and individuals' reluctance to share their data will prevent the occurrence of modifications and improvements in management accounting systems. Nonetheless, the concerns of senior management's financial support and individuals' unwillingness to share their information and knowledge have been extensively researched in the management literature.

However, scientifically, the accuracy and generalizability of the results of this study beyond the level of the sample can be evaluated in future research. Obviously, more research in this area, such as evaluating and updating research results based on a survey of a wider community of experts, to more accurately estimate the components of business intelligence, can be done on the quality of decision making.

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