Investigation of the effect of interactive and diagnostic approach on the selection of new management accounting activities and prioritization of techniques appropriate for public companies by ISM method

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Abstract

The main purpose of this study is to investigate the effect of interactive and diagnostic approaches in the use of management control systems on the acceptance of new management accounting activities. This study also aims to determine the most appropriate modern management accounting techniques in public companies of Iran. The statistical population of the research, in the qualitative part, includes experts, and in the quantitative part includes financial managers and heads of industrial accounting in Iranian public companies. The snowball method based on the views of 15 experts is used in the qualitative section. 384 financial managers and heads of industrial accounting are selected based on Morgan's table in the quantitative section. In this study, the field method, with the help of library studies and interviews, is used to collect data and determine indices. In the quantitative part, data were collected using specialized questionnaires. After data collection, the hybrid method was used to combine the results of systematic review studies and interviews. Interpretive Structural Model (ISM) was used to determine the appropriateness and importance of the study activities. Qualitative content analysis was performed using MAXQDA software. Structural equation modeling with the technique of partial least squares (PLS) was also used to test hypotheses. The results of hypothesis testing showed that the difference between interactive and diagnostic approaches affects the application of management control systems, selection of new management accounting techniques and public companies, and a crucial role in the success of these techniques in public companies.

Keywords: Interactive Approach, Diagnostic Approach, Management Control Systems, Management Accounting techniques, Public Companies
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1 Introduction

Management accounting is the product of developments in the business world and the redefinition of enterprise management methods in an effort to adapt to changes and respond to the information needs of stakeholders. Undoubtedly, the use of management accounting concepts, tools, and techniques to make value-making decisions will be inevitable when competition makes sense in our business environments, and the adoption of competitive strategies ensures the growth and sustainability of enterprises [2]. The role of management accounting is to provide relevant and useful information to help management to plan activities, implement management control and make rational decisions to achieve organizational goals. Given the need of people, organizations and communities for management accounting and the growth and development of the profession, it should be planned so that programs are developed for both student education and in-service training which in turn prepares the present and future employees to play a more dynamic role in organizations and helps them to cope with the changing nature of management accounting [12]. Previous studies have shown that these activities are less adopted while adoption of contemporary accounting management activities is necessary to change organizations of the public sector. As a result, given the low rate of its adoption, the study of factors related to the adoption of contemporary accounting management activities is an important research achievement in the theoretical and practical fields [26].

The data obtained in previous studies are based on probabilistic and industrial theories that examined the effective focus on the adaptation of contemporary accounting management activities. The focus of industrial theory studies is on the effect of coercive, imitative, and normative pressures. In contrast, the focus of probability-based studies is on structural factors, including the effect of organizational structure on integrated information and adaptation of activity-based practices, strategies for adaptation of non-financial performance measures, activity management activities, and creation of benchmarking, national culture affecting quality management, organizational culture affecting quality management, activity-based costing and the degree of integration between financial and non-financial measures, environmental uncertainty affecting non-financial performance measures, issues related to the approach and time affecting the adaptation of value engineering, competition for adaptation of target costing, and creation of measuring criteria and stages of organizational life cycle based affecting the use of activity-based costing [21]. Considering the increasing advances in all sciences, many advances have been made in management accounting, resulting in the emergence of advanced management accounting tools. Although a good management accounting system alone does not guarantee the success of companies, a poor management accounting system can significantly reduce the advantages and benefits of organizations. Moreover, accurate and relevant information is obtained through the use of management accounting tools which leads to effective and more accurate decisions by managers, each of which can affect the performance of the organization. Organizational performance can be investigated through the information of companies' financial statements [13].

Activities of traditional management accounting are more in line with traditional public sector needs, which is known for its bureaucracy and standard rules. In contrast, activities of contemporary management accounting are considered as a part of activities of innovative private sector management along with new public management reviews suggesting these activities should be transferred to the public sector [33]. Previous studies have examined the effect of behavioral and organizational factors on the success of activities of contemporary accounting management. There is a theoretical relationship between the rate of adaptation of new management accounting activities and their success rate based on the fact that an organization needs to use management accounting activities at a very high level in order to obtain the benefits of these activities [9]. In addition, there is a possibility of a relationship between the adaptation and success of new management accounting activities because the importance of information obtained through management accounting activities is reduced if these management accounting activities are used minimally [25]. Moreover, considering the goal of modern public management in changing public sector organizations into organizations with more focus on customer and quality, contemporary management accounting activities, such as total quality management, are known to be suitable for public sector organizations. The first goal of this study is to assist probability-based research by examining the relationship between interactive and diagnostic use of management control systems and adaptation of a number of contemporary accounting management activities in the public sector. The second purpose of this study is to address the issue of lack of research and the need to study in this field. Therefore, considering the very limited research on the adaptation and success of management accounting in public sector companies, this study examines the impact of an interactive and diagnostic approach on the selection of new managers' accounting activities and prioritization of techniques appropriate for interpretive structural modeling. The following questions were provided and investigated to achieve the main goal of the study:

What are the indices of interactive and diagnostic approaches for using management control systems and adaptation of new management accounting activities in public companies of Iran?

What is the pattern of relationship between the indices of interactive and diagnostic approaches in

the use of management control systems and the adaptation of new management accounting activities in public companies of Iran?

2 Theoretical Framework of the Study

In recent years, given the current situation, new methods and approaches in the field of management accounting, such as activity-based costing, target costing, and lean accounting, are trying to capture the true position of products or services in society and economy in terms of quality and price and to prevent a financial crisis with optimal cost management in organizations [24]. Management accounting is still in its infancy. In earlier times, this field played a secondary role in financial accounting, but the events of the past two decades have led to the development of management accounting and have been recognized as a separate area of specialization that is independent of financial accounting. Over the past two decades, the number of innovations in management accounting and cost accounting has been more than in the first two decades. This shows that the lack of innovation in management accounting and cost accounting has not been a problem in the last two decades. Accordingly, Argyris and Kaplan [4] emphasized that they witnessed a great change in innovation in terms of theory and management accounting methods in the 1980s and 1990s. In fact, nothing new has been observed in management accounting in the last fifty years. Given the changes that have taken place over the last 50 years, some of these tasks have remained unchanged. But today, management accounting has changed from applied duties to professional duties. In fact, this change can be considered a function of management accounting. Management styles changed dramatically in the last half of the nineteenth century. Issues like the environment were things that changed with the speed of technology. Management was used as a command and control structure in which any decision was made by the head of the work. Reports became decentralized, and the decision-making structure developed. Organizations today face multiple challenges and options. Therefore, it is necessary for management accountants to act and work as a part of a team at some level of it [36].

2.1 Diagnostic and Interactive Approach of Management Control Systems

An interactive approach to the use of management control systems can facilitate the adoption of contemporary management accounting activities with its emphasis on the expansion of organizational learning and the development of new ideas [14, 31]. While the interactive use of management control systems includes debate and communication, organizations that use management control systems in this form are more aware of and adopt the role of contemporary management accounting activities. It is clear that organizations emphasizing the use of management control systems interactively can use contemporary management accounting activities such as creating benchmarks to obtain organizational learning and new ideas development. In addition, by using contemporary management accounting activities as a tool to form strategies [20], their application is likely to be greater than when management control systems were used interactively. It is worth noting that the use of contemporary management accounting activities, such as costing and activity-based management, total quality management, and a balanced scorecard over time enable us to achieve key success factors such as innovation [18].

Considering the interactive use of management control systems as an incentive for innovation [17], organizations that use interactive management control systems are more likely to adopt contemporary management accounting. In addition, considering the interactive use of management control systems that encourages the independence of different parts of the organization, the use of interactive management control systems facilitates the adaptation of contemporary management accounting activities. Contemporary managerial accounting activities, such as creating benchmarks and a balanced scorecard, act as tools that enable the achievement of predetermined goals [1]. Accordingly, contemporary management accounting activities are used in companies with diagnostic management accounting systems. This is because the diagnostic approach emphasizes the use of management control systems as a feedback mechanism to create limitations and facilitate adaptation [17, 35]. Given the diagnostic use of management control systems related to controlling the performance of employees or departments, similarly, the contemporary management accounting activities provide information to organizations to facilitate such controlling. According to these explanations, the following hypotheses can be proposed and tested:

H1: There is a positive and significant relationship between the interactive use of management control systems and the adaptation of new management accounting activities.

H2: There is a positive and significant relationship between the diagnostic approach of using management control systems and the adaptation of new management accounting activities.

2.2 Adaptation and Success of New Management Accounting Activities

The relationship between adoption and the success of contemporary management accounting activities can be explained by system implementation literature, too [27]. The information system literature also shows that the rate of adaptation of systems affects the success of inter-organizational systems. The interactive use of management control indicates the direct involvement of team members in the management control process and also shows the evaluation of the performance of the entire workforce by examining the standards developed in the budget process and actual performance. In interactive management control, team members are active and constantly involved in the planning and decision-making process. In addition, the use of mutual management control allows members of the accounting and management team to discuss, plan, challenge and negotiate group activities [19]. Henri's requirements were: first, to emphasize the use of the interactive management control system by senior managers to pay attention to top managers to spend a significant portion of their time on the inputs, processes and outputs of management control systems, Second, to encourage the use of interactive management control system by the operational manager with the aim of reflecting higher-level executive managers who are heavily and frequently involved in the use of control systems, third, both senior and operational managers regularly observe and interact with outcomes over challenges and face-to-face discussions, fourth, to create and collect studies related to the effects of strategic uncertainty on business strategies, fifth, to show the non-aggressive, facilitating and co-coordinating role of executive managers that encourages, facilitates and inspires subordinates [17].

In the diagnostic use of management control system, the report of top managers and higher-level executive managers makes people less deeply involved in budget operations, and they are significantly involved only in an exceptional principle. In this situation, the workforce relies on others to learn about the special things that need to be noticed. As a result, there is minimal interaction between top managers, executive managers, and their subordinates. A possible relationship can be found between the diagnostic use of the budget and one of the reasons for managers' attention to the unnecessary budget activities by members of the organization and their inefficiency if the performance is calculated continuously and compared with the budget. We can see their close and complementary relationships by studying the relation between strategic risk and diagnostic and interactive control systems [16].

Peter et al. [29] study examined the role of environmental management control systems as a mechanism of transforming environmental strategy into environmental management performance. The results indicate the mediating role of environmental management control systems in the relationship between environmental strategy and environmental management performance. Contemporary management accounting activities such as creating benchmarks and a balanced scorecard are tools that play a role in achieving predetermined goals. Accordingly, contemporary management accounting activities are useful in companies that use diagnostic management accounting systems because the emphasis of the diagnostic approach is on the use of management accounting systems as a feedback mechanism to make limitations and facilitate adaptation [17, 35]. Similarly, given the diagnostic use of management accounting systems, they are related to the control of the performance of employees or the departments that provide contemporary management accounting information to organizations and facilitate such controlling. Also, the relationship between adaptation and success of modern management accounting activities can be described by the system implementation literature [27]. Moreover, the information system literature shows that the adaptability of systems affects the success of inter-organizational systems. So It can be said that:

H3: There is a positive and significant relationship between the rate of adaptation of new management accounting activities and their success.

3 Methodology

This study used the research method of exploratory projects. On the one hand, the current study is based on the purpose of fundamental research. On the other hand, considering library as well as field research methods such as interviews and questionnaires used in the present study, it can be said that it is a cross-sectional study in terms of the data collection method. Finally, it should be noted that this study will be based on quantitative and qualitative approaches. In the first part, the identification of indices of interactive and diagnostic approaches in the use of management control systems will be based on library studies and specialized interviews. After the qualitative analysis phase, the questionnaire is distributed, and the data are collected through experts in the field of financial management and industrial accounting and accounting experts, and the research enters the qualitative analysis phase. Therefore, from this point of view, the present study is a research with a mixed method. The statistical population of the study in the qualitative part includes experts and in the quantitative part includes financial managers and heads of industrial accounting in public companies of Iran. In the qualitative section, the views of 15 experts were used by

the snowball method, and in the quantitative section, 384 financial managers and heads of industrial accounting were selected based on Morgan's table. Library methods were used to collect data for review of literature and research background, while field methods were used to collect data for confirmation of the model and testing of research hypotheses. Quantitative data were collected using specialized questionnaires. A specialized questionnaire was used to test the research hypotheses, a fuzzy Delphi questionnaire was used to identify and screen the indices, a questionnaire of interpretive structural model was used to examine the relationship between the components, and a questionnaire of the structural equation was used to test the proposed model.

The main technique of this study is to review the research processes and findings to establish reliability and validity. The study's reliability is established by examining the consistency of study processes, and its validity is measured by assessing the internal coherence of the research product, i.e., data, findings, interpretations, and suggestions. Raw data, domain notes, theory tips, encryption guides, process tips, etc., are some of the elements that can be used in these assessments.

The review process is based on 5 steps: pre-registration, determination of reviewability, formal agreement, reliability (reliability and its approval), and negotiations. In the expert questionnaire, based on a pairwise comparison of all elements with each other, the probability of not considering a variable is zero. All criteria have been considered in this assessment, and the questionnaire maker may not have a specific orientation in constructing the questions. Therefore, questionnaires based on pairwise comparisons are valid in themselves. In this questionnaire, all model factors are considered and compared with each other. Therefore, all the possibilities related to not considering a variable will be eliminated. On the one hand, because the questionnaire compares and measures all the criteria in pairs, the maximum possible questions are asked from the audience with a favorable structure. On the other hand, because all the criteria have been considered in this assessment and the maker of the questionnaire does not have specific orientation in the questions, there will be no need for a reliability assessment [7]. The present study was performed in several stages using several techniques. Delphi technique, hierarchical analysis, and interpretive structural modeling were used to identify and design the pattern of index relations in this study. Data analysis methods are different in the two stages of the study. The first step is an attempt to analyze the data after collecting information from the meta-synthesis method and interpreting the results and implementing a qualitative model. The second stage, with a descriptive survey method, uses the structural-interpretive modeling method. The structural-interpretive modeling technique begins with identifying variables that are relevant to the topic under discussion. After variables identification, they are entered in the self-interactive structural matrix (SSIM). The group decision-making rule should be used to get a collective agreement on the relationship between each pair of elements such as A and B. Interpretive Structural Modeling (ISM) logic performs based on nonparametric methods and modes in frequencies. The achievement matrix is obtained by converting its interactive structural matrix to a double value matrix of zero and one. Once the initial achievement matrix is obtained, its internal consistency must be established. One possible strategy for the calculation of different paths of i to j is to obtain the T Achievement matrix.

The T achievement matrix is adapted using the following Boolean laws [38]:

$$
\begin{aligned}
& 0 + 0 = 0 \\
& 0 + 1 = 1; \ 1 + 0 = 1 \\
& 1 + 1 = 1
\end{aligned}
\tag{3.1}
$$

So to calculate the achievement matrix (T) we have:

$$
T = (I + D)^{n-1}; \ t_{ij} = \begin{cases} 1 & \text{If there is a path from variable 1 to variable 2} \\ 0 & \text{otherwise} \end{cases}
\tag{3.2}
$$

To determine the relationships and level of the criteria, the set of outputs and inputs of each criterion must be extracted from the received matrix. The set of outputs includes the criteria themselves and the criteria that affect them. After data collection, the meta-synthesis method was used to combine the studies obtained from the systematic review and interviews conducted on the research topic. MAXQDA software was used for qualitative content analysis. Also, structural equation modeling methods, i.e., partial least squares (PLS) method, were used in a quantitative part to test the measurement design and research hypotheses.

4 Findings

4.1 Meta-synthesis Results in Identification of Indices

In this study, the meta-synthesis method was selected. The purpose of this method was to analyze the findings of each study, discover the key points of them and combine the results into a more general alternative. Therefore, first, to analyze the findings of each study and discover the key points with the open coding method proposed by Sandowski and Brusso [30], all the key points and factors extracted from the documents as codes. Then, considering the meaning of each of the codes, they were compared with each other, and, by considering their common aspects, they were summarized and categorized by the researcher. In the next step, after reviewing the studies several times and correctly identifying the concepts and the relationship between them, in order to combine the results, the axial coding method by linking categories and strategies are used to relate the information to each other in a new way.

Finally, after examining the various aspects of the studies and determining the relationship between categories and strategies, the axial coding phase comes to an end. In the final step of the analysis, selective coding and creation of the final proposed model are performed. According to Creswell [11], the final model can be presented in the form of a diagram.

4.2 Screening of the study indices (Fuzzy Delphi)

17 indices were identified based on the meta-analysis of related texts. The fuzzy Delphi method was used to screen and ensure the importance of the identified indices and to select the final indices. Experts' opinions were used to assess the importance of the indices. Different methods were proposed to collect n respondents' opinions. In fact, these collection methods are experimental methods that have been proposed by various researchers. For example, a common method for collecting a set of triangular fuzzy numbers is considered as minimum l, geometric mean m and maximum u:

$$F_{AGR} = (\min\{l\}, \ \prod\{m\}, \ \max\{u\}) \tag{4.1}$$

$$F_{AGR} = \left(\min\{l\}, \ \left\{\frac{\sum m}{n}\right\}, \ \max\{u\}\right) \tag{4.2}$$

$$F_{AVE} = \left(\left\{\frac{\sum l}{n}\right\}, \ \left\{\frac{\sum m}{n}\right\}, \ \left\{\frac{\sum u}{n}\right\}\right) \tag{4.3}$$

Each triangular fuzzy number obtained from the collection of experts' views on the jth index is represented as follows:

$$\tau_j = (L_j, M_j, U_j)$$
$$L_j = \min(X_{ij})$$
$$M_j = \sqrt[n]{\prod_{i=1}^{n} X_{ij}}$$
$$U_j = \max(X_{ij}) \tag{4.4}$$

Where the i-index refers to an 'expert's opinion, so that:

- X_{ij} : The value of assessment of the ith expert of the jth index

- L_j : The minimum value of assessment for the jth index

- M_j : The geometric mean of the experts' assessment of the performance of the jth index

- U_j : The maximum value of assessments for the jth index

Table 1: Categorization of Identified Codes

Source	General Category	Identified concepts and codes
L3, L4,L5, L6, L8, L9, L10, L11, L12, L14, L15, L16, L17, L18, L19, L20, P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P12, P13		Identification of strategic uncertainty and development of operational plans
L3, L4,L5, L6, L7, L8, L9, L10, L11, L12,L13, L14, L15, L16, L17, L18, L19, L20, L21, P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12,		Face-to-face meetings between top managers and operational managers
L1, L2, L3, L4,L5, L6, L7, L8, L9, L10, L11, L12,L13, L14, L15, L16, L17, L18, L19, L20, L21, P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13,		Assessment of Managers Interactions
L1, L2, L3, L4,L5, L6, L7, L8, L9, L10, L11, L12,L13, L14, L15, L16, L17, L19, L20, L21, P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12		Producer of information forming important goals
L1, L3, L4,L5, L7, L8, L9, L10, L11, L12,L13, L14, , L16, L17, L18, L19, L20, P1, P2, P4, P5, P6, P7, P8, P9, P11, P12, P13,	Management control systems with the acceptance of new management accounting activities and the factors affecting it	Tracking progress towards goals and controlling results
L2, L3, L4,L5, L7, L8, L9, L10, L12,L13, L14, L15, L16, L17, L18, L19, L20, L21, P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P12, P13,		Planning towards strategic goals
L2, L3, L4,L5, L6, L7, L8, L9, L10, L11, L12,L13, L14, L15, L16, L17, L18, L20, L21, P1, P3, P4, P5, P6, P7, P8, P9, P10, , P12, P13,		Assessment of performance and evaluation of consequences
L1, L2, L3, L5, L6, L7, L8, L9, L10, L11, L12,L13, L14, L15, L16, L17, L18, L19, L20, L21, P1, P2, P3, P4, P5, P7, P9, P10, P11, P12, P13,		Activity-Based Management (MBA)
L1, L2, L3, L4,L5, L6, L7, L8, L9, L11, L12,L13, L14, L15, L17, L18, L19, L20, L21, P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12		Activity-Based Costing (ABC)
L1, L2, L3, L4,L5, L6, L7, L8, L9, L10, L11, L12,L13, L15, L16, L17, L18, L19, L20, L21, P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P12, P13,		Balanced Scorecard (BSC)
L13, P6, P11, P12		Total Quality Management (TQM)
L10, L17, L19, L20, L21		Total Quality Management (TQM)
L6, L13, L19, L20, L21, P11		Strategic Cost Management (SCM)
L15, P4,		Value Chain Analysis (CVA)
P12		Benchmarking
L6, L14, L16, L17, L19, L20, P1, P5, P7, P8,		In-service training classes
L2, L8, L9, L14, L17, L20, P10,		Communication Management

Source Column: This column contains codes of data or, in fact, the study number from which the data was extracted, along with the name of the database.

In this study, we used the fuzzy mean method. The aggregated mean of triangular and trapezoidal fuzzy numbers

can usually be summarized by a single value which is the best-related mean. This operation is called defuzzification.

There are several methods for defuzzification. In most cases, the following simple method is used for defuzzification:

$$x_m^1 = \frac{L + M + U}{3} \tag{4.5}$$

Another simple method for defuzzification of the mean of fuzzy triangular numbers is as follows:

$$
\begin{aligned}
&F_{ave} = (L, M, U) \\
&x_m^2 = \frac{L + 2M + U}{4}; \ x_m^3 = \frac{L + 4M + U}{6} x_m^1 = \frac{L + M + U}{3}; \\
&\text{Crisp number} = Z* = \max(x_{\max}^1, x_{\max}^2, x_{\max}^3)
\end{aligned} \tag{4.6}
$$

$x_{\max}^i$ Values do o not differ much and are always numerically close to the value of M. M is the mean of the sum of possible m values from different triangular fuzzy numbers. However, the definite value of the largest amount calculated $x_{\max}^i$ will be considered. In this study, the center of area method is used for defuzzification as follows:

$$DF_{ij} = \frac{[(u_{ij} - l_{ij}) + (m_{ij} - l_{ij})]}{3} + l_{ij} \tag{4.7}$$

According to the results of fuzzy mean and defuzzification output, the defuzzy value greater than 0.7 is confirmed, and any index with a score less than 7 is rejected. Although experts use their mental competencies and abilities to make comparisons, it should be considered that the traditional process of quantification of individuals' opinions does not fully reflect the style of human thinking. Triangular fuzzy numbers were used in defuzzification of 'experts' views. Experts' views on the importance of each index are collected with a 7-degree fuzzy spectrum. Based on the results of Table 2, it was found that the difference is less than 0.2 in all cases, so the Delphi rounds can be completed.

Table 2: The distance between the final value of the first round and the second round

Indices	Result of round 1	Result of round 2	Difference	Result
Item 1	0.778	0.795	0.017	Agreed
Item 2	0.738	0.806	0.069	Agreed
Item 3	0.741	0.790	0.049	Agreed
Item 4	0.777	0.853	0.076	Agreed
Item 5	0.813	0.852	0.040	Agreed
Item 6	0.803	0.808	0.005	Agreed
Item 7	0.928	0.908	0.021	Agreed
Item 8	0.890	0.890	0.000	Agreed
Item 9	0.741	0.790	0.049	Agreed
Item 10	0.918	0.894	0.024	Agreed
Item 11	0.731	0.817	0.085	Agreed
Item 12	0.866	0.849	0.017	Agreed
Item 13	0.708	0.754	0.047	Agreed
Item 14	0.932	0.897	0.035	Agreed
Item 15	0.741	0.790	0.049	Agreed
Item 16	0.847	0.830	0.017	Agreed
Item 17	0.827	0.799	0.008	Agreed

4.3 Interpretive Structural Model

The Interpretive Structural Model (ISM) is used in the first phase of this study. This method classifies the elements and identifies the relationships between the indices. New management accounting techniques that are more suitable for use in public companies can be determined based on the results of this section, and the order of importance of the application of each of these techniques is determined.

Table 3: Symbolization of Indices

Elements	Symbol
In-service training classes	C1
Face-to-face meetings between top managers and operational managers	C2
Assessment of Managers Interactions	C3
Producer of information forming important goals	C4
Tracking progress towards goals and controlling results	C5
Planning towards strategic goals	C6
Value Chain Analysis (CVA)	C7
Activity-Based Management (MBA)	C8
Activity-Based Costing (ABC)	C9
Balanced Scorecard (BSC)	C10
Total Quality Management (TQM)	C11
Strategic Cost Management (SCM)	C12
Benchmarking	C13
Assessment of performance and evaluation of consequences	C14
Identification of strategic uncertainty and development of operational plans	C15
Cost and time management	C16
Communication management	C17

The interpretive structural model can be drawn by specifying the level of the elements. For this purpose, first, according to the final achievement matrix, the initial model is designed, and then by removing the transition relations, the final model is obtained. The initial model is made available to experts and modified by using their opinions.
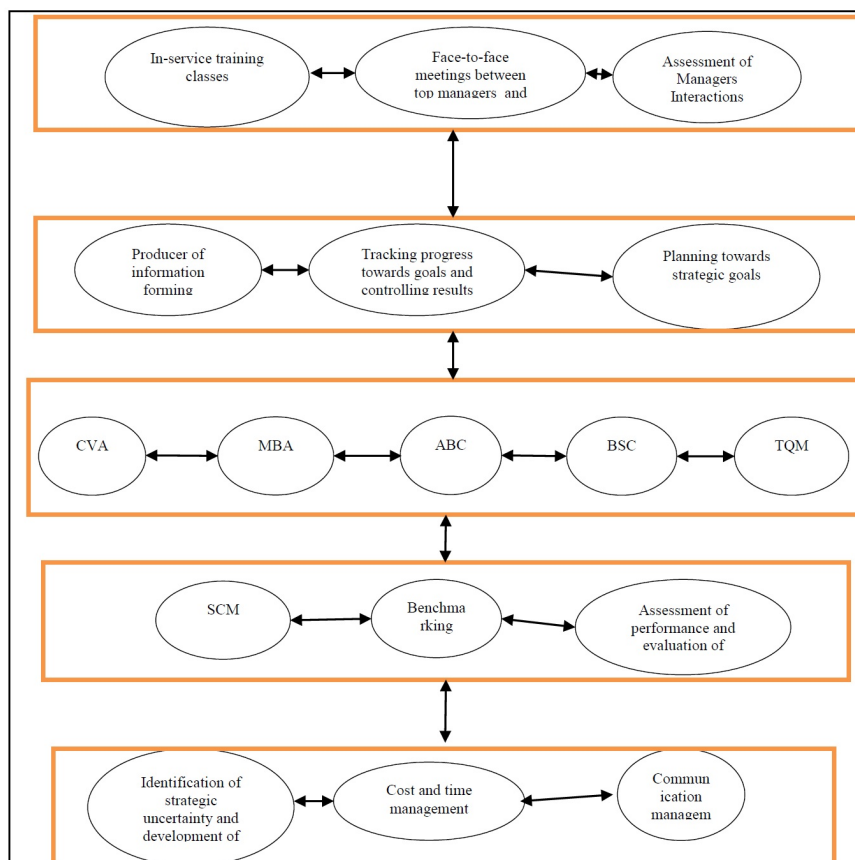

Figure 1: Interpretive structural model

4.4 Analysis of the path of structural equations model

In the present study, methods of structural equation modeling, i.e., partial least squares (PLS) method, were used to test the study hypotheses. The relation between the studied variables in each of the hypotheses is tested based on a causal structure with the PLS partial least squares technique. The overall goodness of fit index model (GOF index) is related to the overall part of structural equation models. This means that by this index, the researcher can control the overall section fit after examining the fit of the measurement part and the structural part of the general research model. The GOF index was developed by Tenenhaus et al. [34] and is calculated according to the following formula:

$$GOF = \sqrt{Avg(\text{Communalities}) \times R^2} \qquad (4.8)$$

Communalities show the mean of the common values of each structure and also the mean value of the explained variance of the endogenous structures of the model. According to Tenenhaus et al. [34], the GOF index in the PLS model is a practical solution to this problem by examining the overall fit of the model and acts like the fit indices in covariance-based methods and it can be used to check the validity or quality of the PLS model in general.

Wetzels et al. [37] presented three values of 0.1, 0.25, and 0.36 as a weak, medium, and strong values for GOF. Calculation of GOF index [34] is as follows:

$$GOF = \sqrt[2]{0.629 \times 0.335} = 0.459 \qquad (4.9)$$

R^2 coefficient is an index linking the measurement part and the structural part of modeling of structural equations. This coefficient indicates the effect that an exogenous variable has on an endogenous variable. The higher the value of the endogenous structures of a model, the better the fit of the model will be. Chin [10] identifies three values of 0.19-0.33-0.67 as a weak, medium, and strong values of the model. The R^2 value for structures of the model is 0.629. According to three values, the goodness of the fit of the structural model will be determined:

$$Avg(R^2) = 0.629 \qquad (4.10)$$

According to the results, all obtained path coefficients are higher than 0.5, and also, the t-statistic related to each path coefficient is greater than 1.96. Therefore, all the assumed relations in this model are confirmed. The relationship of the studied variables in each of the study hypotheses is tested based on a causal structure with the partial least squares (PLS) technique. The general model of the study is shown in Figure 2. It is the output model of Smart PLS software. In this model, a summary of the results related to the standardized factor loading of the variables is presented. The t-statistic and the bootstrap value for measuring the significance of the relations are also shown in Figure 3.

4.5 Hypothesis analysis

Hypothesis one - Interactive use of management control systems has a significant effect on the adaptation of new management accounting activities

The obtained standard operating loading of the interactive use of management accounting systems on the adaptation of new management accounting activities was 0.340. Also, the value of the t-statistic was 5.999. Therefore, it can be claimed that this hypothesis is confirmed by a confidence of 95%.

Table 4: Examination of Hypothesis One

Independent variable	Dependent variable	Loading factor	t-Statistics	Result
Interactive use of management accounting systems	Adaptation of new management accounting activities	0.340	5.999	Confirmed

Hypothesis 2 - Diagnostic use of management accounting systems has a significant effect on the adaptation of new management accounting activities.
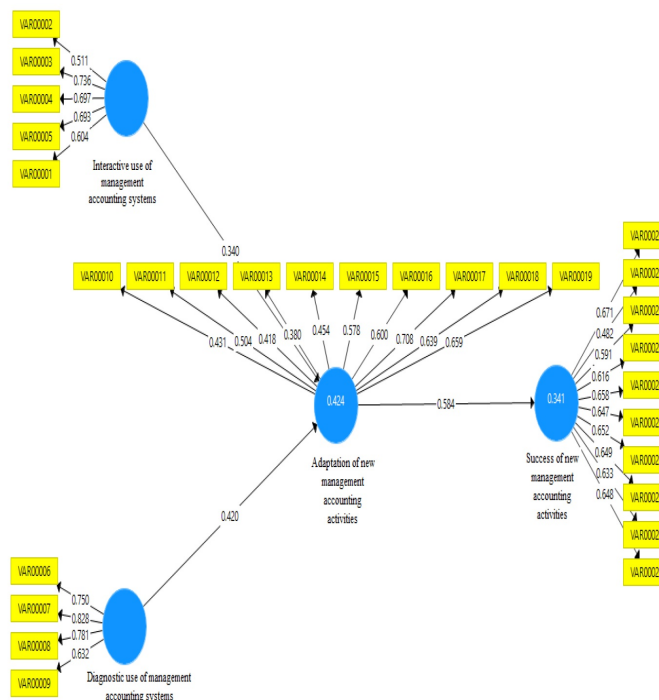
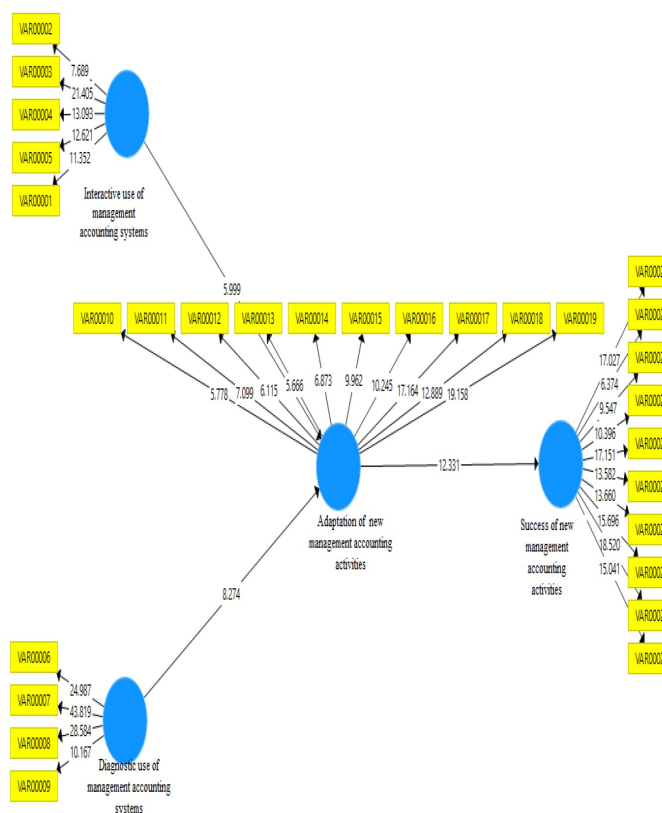Figure 2: Validation output of the model with partial least squares method

Figure 3: Significance of relationships of variables with partial least squares method (bootstrapping)

The obtained standard operating loading of the diagnostic use of management accounting systems on the adaptation of new management accounting activities was 0.420. Also, the value of the t-statistic was 5.999. Therefore, it can be claimed that this hypothesis is confirmed by a confidence of 95%.

Table 5: Examination of Hypothesis Two

Independent variable	Dependent variable	Loading factor	t-Statistics	Result
Adaptation of new management accounting activities	The success of new management accounting activities	0.420	8.274	Confirmed

Hypothesis 3 - Adaptation of new management accounting activities has a significant effect on the success of new management accounting activities.

The obtained standard operating loading of the effect of adaptation of new management accounting activities on the success of new management accounting activities was 0.584. Also, the value of t-statistic was 12.331. Therefore, it can be claimed that this hypothesis is confirmed by a confidence of 95%.

Table 6: Examination of Hypothesis Three

Independent variable	Dependent variable	Loading factor	t-Statistics	Result
Adaptation of new management accounting activities	The success of new management accounting activities	0.584	12.331	Confirmed

5 Discussion and conclusion

In the qualitative part of this study, factors affecting the management control systems were identified by the adaptation of new management accounting activities and their affecting factors. Finally, 17 indices were identified: identification of strategic uncertainty and development of operational plans, face-to-face meetings between top managers and operational managers, assessment of managers interactions, producer of information forming important goals, tracking progress towards goals and controlling results, planning towards strategic goals, assessment of performance and evaluation of consequences, activity-based management (MBA) [6], activity-based costing (ABC)[28], Balanced Scorecard (BSC) [32], Total Quality Management (TQM)[8], Total Quality Management (TQM)[5], Strategic Cost Management (SCM)[26], Value Chain Analysis (CVA) [23], Benchmarking [22], in-service training classes [3] and communication management [15]. The increasing use of information, communication, and technology-based tools and their development has brought about dramatic changes in the business world, especially in the field of accounting and finance. Meanwhile, the increasing need for companies to increase the level of communication and information, as well as the availability of new information and communication tools, has led to the development of technology-based advances more rapidly. Therefore, the use of these tools and management of financial resources as one of the important organizational resources allows companies to access sustainable financial resources with fewer fluctuations. Human resources are one of the factors that in today's competitive world can create a competitive advantage for organizations. The success or failure of any organization depends to a large extent on the people of that organization. Given the changes in today's world, those organizations that play an acceptable flexible role in these changes can survive. In this regard, it should be noted that the reason for the difference between human resources and other organizational resources is that the human resources of an organization have capabilities such as learning, variability, innovation, and creativity. With proper management, they can ensure the long-term survival of organizations. The importance of creating a new accounting system, and consequently the effective management of human resources, is due to the fact that a large share of the costs of any organization annually consists of its operating costs, a significant part of which is related to human resources. In the industrial age, organizations are focusing on their physical assets. On the contrary, today, due to the environment and the emergence of a knowledge-based economy, human capital is a significant part of the value of the organization. Accordingly, human capital should be presented as a balance sheet asset so that based on the resulting quantitative analysis, appropriate decisions can be made by management, and the necessary actions may be taken.

According to the proposed model of this study, the criteria for identification of strategic uncertainty, time and cost management, and communication management are the main criteria of the interactive and diagnostic approach model in using management control systems with the adaptation rate of new management accounting activities. Management accounting and control systems are related to the identification, measurement, interpretation and controlling of organization activities to ensure the proper use of organizational assets. By using communication management control, time and cost management, as well as identification of strategic uncertainty, the most important goals of management

accounting and control systems can be met. In the last part, this model deals with evaluation and improvement methods such as meetings, decision making, and training. In the second and third steps of this model, appropriate control techniques are proposed. The use and implementation of one or more control systems improve the rate of modern management accounting activities. Finally, according to the results of hypothesis testing, it is shown that the difference in the interactive and diagnostic approach in the application of management control systems is effective in the selection of new management accounting techniques in public companies. It also plays a crucial role in the success of these techniques in public companies. Obtaining the information needed to lead and control operational activities can be one of the most important consequences of this model. The model also helps managers in leading and controlling operational activities, motivating employees and managers to work for the organization. Measuring and evaluating the performance of organizational units, managers, and other employees of the organization is another application of the proposed model. Finally, it can be concluded that organizations, in order to maintain a competitive advantage, must adapt to changes whether in external resources such as competitors, customers, government and changing laws, or changes in internal resources such as cost reduction and quality improvement. Management accounting can help managers make the right decisions in a dynamic business environment.

Management, with the correct planning approach in line with organizational goals, and accounting, by considering appropriate methods and employing financial experts, take steps towards organizational improvement. They try to prevent financial crises by the implementation of an appropriate financial system and evaluating managers. In general, management in the organization has two aspects: one refers to the "organizational goals," and the other leads to the "organizational goals." Planning, organizing, coordinating, and controlling are tasks directly leading to the goals of the organization while motivating and mobilizing forces to help people achieve their goals. It can be said that improving management means paying attention to the manager's duties in order to achieve the goals of the organization. In other words, the growth, maturity, and development of indicators and parameters that are needed to achieve the development of management are the entire basis for the improvement of the organization and the achievement of goals. That is to say while providing a performance improvement model can be at the top of management development programs, it should be borne in mind that when we try more to plan for the development of system components of management, it will automatically achieve the same amount of organizational progress. All the current crises have raised awareness about the value of accounting, professional accounting and its services. According to the heads of accounting organizations, the need for the services of professional accountants on issues related to financial crises will increase, and the international community is very hopeful of overcoming these crises with the support and cooperation of the accounting profession. Today, the role of the accounting profession in maintaining global economic policy is increasingly understood. Today, the role of the accounting profession in maintaining global economic policy is increasingly understood. With the development of new technologies in industry and changes in production systems, organizations have faced severe complexities and changes. As a result, management alone cannot get enough knowledge about the environment in the organization. That is why it is necessary to create a system that helps management identify the problem, set goals, define possible solutions, and evaluate and select the optimal solution and perform it. This is the focus of providing management accounting services that require attention.

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