Research Paper

A Data Envelopment Analysis Model to Provide a Dynamic Accounting Information System for Measuring the Financial Effectiveness of Management Accounting System

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ABSTRACT

The secret to achieving your organization's goals in complex and challenging environments is to make the right managerial and rational decisions. In this regard, the accounting information system as one of the sources of information for the decision of managers is of particular importance. Therefore, in order to achieve these goals, it is necessary to have an accounting information system with dynamic capabilities. The dynamic capability of the accounting information system (hidden variable) was measured by the observed variables of flexibility, continuous evaluation, continuous investment and system variability. Therefore, based on this argument, the aim of the present study is to provide a dynamic capability model of the accounting system based on the financial effectiveness of the management accounting system. Data envelopment analysis is a well-known methodology that is applied to evaluate the selected firms based on the most important features. The results of analysis of the proposed method on 86 companies listed on the Tehran Stock Exchange and analysis and analysis of data by structural equation modeling show that the dynamic capability of the accounting information system consists of (flexibility, continuous evaluation, continuous investment and system variability). The result indicate that the management accounting system is effective.

1 Introduction

One of the key questions for researchers in the field of information systems is how technology and information systems can generate competitive advantage and superior performance, especially in competitive and dynamic environments [1]. Since the present study seeks to investigate the performance effects of dynamic accounting information system capability, achieving this goal requires the use of theory that can provide a perspective to identify factors and analyze the mechanism of superior performance and competitive advantage in changing and dynamic environments. This is possible in the theory

of dynamic capabilities. Therefore, the theoretical basis of this research is based on the theory of dynamic capabilities [2]. Factors and mechanisms of performance improvement and creation of competitive advantage by organizations is one of the main areas of study in the field of strategic management [3]. Data Envelopment Analysis technique was presented in the CCR paper by Charnes et al. [4], and since then has been developed by various researchers. In this method, the relative efficiency of a set of DMUs which use similar types of (multiple) resources to produce similar types of (multiple) outputs is computed. Finally, DMUs are divided into two groups of efficient and inefficient DMUs. In ordinary DEA models, the input and output values are assumed to be definite [5]. Managers have always considered DEA to be a suitable instrument for evaluation of organizations' performance. This method as a nonparametric method which does not need the function of identified production, can enable managers and directors of organizations having corrective evaluation of self-set to have recognitions of capacity of self-power and weakness points in corrective path to attain the goals.

Evaluating the overall performance and monitoring the financial condition of commercial banks has been the focus of numerous research studies. This methodology was proposed by Charnes et al. [4] for the first time and it is based on Farrell's [6] idea. Charnes et al. [4] proposed the first DEA model that was based on the constant returns to scale (CRS) assumption and it is called the CCR model. Then, Banker et al. [7] developed CCR model based on the variable returns to scale (VRS) assumption and they called it the BCC model. In this regard, over the past three decades, many efforts have been made, one of the most important results of which is the introduction of the theory of dynamic capabilities [8]. This theory has been developed to explain the causes and factors of gaining a sustainable competitive advantage in changing environments; In fact, it is the developed perspective of resource-based theory (Barney [9]) that helps us understand how the organization's resources develop over time and how to maintain a competitive advantage [10]. Teece et al. [8] defined dynamic capability as the firm's ability to integrate, create, and reconfigure internal and external competencies to address a rapidly changing environment. In this definition, the term "dynamic" refers to the capacity to renew competencies in order to adapt to a changing business environment. The term "capability" also emphasizes the key role of strategic management in the adaptation, integration, and limited configuration of organizational resources and competencies in order to adapt to the requirements of a changing environment [8]. The purpose of the Dynamic Capabilities Framework is to explain the sources of an organization's competitive advantage over time, and to that end, it provides guidance to managers to avoid the zero-profit conditions that result from competing firms in a competitive market [2].

According to Nekouizadeh et al. [3], the concept of dynamic capabilities is designed to achieve sustainable competitive advantage, profitability and performance. Accounting information system as an important and vital organizational mechanism for effective decision making and control of the organization [11], can be used in all stages of the decision making process and by identifying potential problems and situations that need to be investigated, reduce uncertainty in identifying and selecting Optimal solutions, providing analytical and comparative information and many other methods, help to make accurate and fast decisions and correct implementation of programs and be effective in the performance of the organization and its efficiency [12,13]. Obviously, the higher the quality of information output from accounting information systems, the better the performance of the organization as a product of the implementation of management decisions and programs. Thus, the value of the accounting information system is due to its role in improving accounting processes and providing information related to decisions that affect the performance of the entire organization [12]. Therefore, the present study seeks to provide a model of dynamic capability of the accounting information system on the effectiveness of the management accounting system. For its part, this research will attempt to theoretically take steps in the

field of management accounting innovation and accounting information systems. Therefore, it is expected that the present study will lead to changes in the effectiveness of management accounting system by identifying the factors of dynamic capability of accounting information systems. Accordingly, in the continuation of the present study, after reviewing the theoretical foundations and research background, the research hypotheses were expressed; Then, the research methodology is presented and at the end, the data will be analyzed and the research results and suggestions will be presented.

2 Theoretical Foundations and Research Background

An adaptive management accounting system can be improved through the effectiveness of the management accounting function. Adaptability is essential because the environment in which organizations operate is constantly changing. According to contingency theory and the discussions in the previous sections, due to changes in technology, market conditions, organizational style and strategy, a change in management accounting practices is also necessary [14]. Inability to adapt due to changes may cause the management accounting system to no longer be considered relevant or appropriate. This may not provide relevant information for the decision-making and control process. Therefore, the efficiency of a compatible management accounting system is much higher than a static management accounting system [15]. Management Accounting Information System is an internal structure of accounting information required to plan, execute, control and organize business activities for managers, which is also used for all organizations, including manufacturing, non-profit and service businesses [16, 17]. On the other hand, due to rapid global changes in production processes, increasing customer tastes and consumer demand, competition in large markets and efforts to maintain the organization's unpredictability of the market has led to special attention to managed accounting information systems [18].

The purpose of creating information by accounting systems is to assist management in making effective business decisions by the management accounting system [19]. Fading factors such as the relevance and different attitudes of different companies and industries to modern management accounting practices have intensified the interest in making changes in management accounting and innovation. The source of change in management accounting is theories such as contingency theory, institutional theory, social constructivist theory and network theory of actors [20]. For example; According to contingency theory, changes in management accounting practices are also necessary due to changes in technology, market conditions, organizational style and strategy. In this regard, according to contingency theory, in proportion to the changes that occur in the internal and external conditions of an organization, the evolution of management accounting practices seems necessary [20]. Therefore, the hypotheses of the present study have been formulated as follows:

Hypothesis 1: There is a significant relationship between accounting system flexibility and management accounting system effectiveness.

Hypothesis 2: There is a significant relationship between the continuous evaluation of the accounting information system and the effectiveness of the management accounting system.

Hypothesis 3: There is a significant relationship between continuous investment of accounting information system and effectiveness of management accounting system.

Hypothesis 4: There is a significant relationship between the variability of the accounting information system and the effectiveness of the management accounting system.

The data envelopment analysis (DEA) of mathematical programming formulation is based on a technique that develops efficient frontiers with the efficiency related to each decision-making unit (DMU) in a DEA problem set on the concept of evaluating the performance of decision-making options based on the performance of outputs created through input consumption. The key DEA models are classified

into two categories of CCR and BCC, each can be assessed in two input-based and output-based methods [21]. However, these methods are different in terms of constant or variable returns to scale. In the CCR method, the constant return to scale is assumed, whereas the variable return to scale is considered in the BCC model. In this regard, the constant return to scale means that outputs will change as much as the inputs change. For instance, if inputs are doubled, the outputs will be doubled. However, variable return to scale means that outputs are not changed relative to inputs [22]. The assumption of constant return to scale is applicable when firms operate at an optimal scale. Nonetheless, different issues such as competitive effects and limitations lead to firms' failure to operate at an optimal scale. Using the assumption of constant return to scale will result in the impairment of the values calculated to technical efficiency when all firms do not operate at optimal scale.

In this study, the assumption of a variable return to scale was considered, which seems logical since commercial units do not usually operate at optimal scale [23]. Whether we consider the problem as an input or output depends on the implementation goal, which can be either maximizing output or minimizing input [22]. Given the fact that our goal was maximizing the output (increasing the level of risk disclosure), the BCC model of DEA with an output nature was selected to estimate the efficiency score of DMUs. The CCR model is the first data envelopment analysis model which takes its name from the initials of its creators (Charans, Cooper, Rhodes). In this model, to determine the highest efficiency ratio and to involve the number of inputs and outputs of other decision-making units in determining the optimal weights for the unit under study, the following basic model was proposed:

$$Max: \frac{\sum_{r=1}^{s} u_r y_{ro}}{\sum_{i=1}^{m} v_i x_{io}}$$

$$s.t.: \frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij}} \leq 1 ,$$

$$j = 1,2,\ldots,n , \qquad u_r \geq 0 \qquad v_i \geq 0$$

This model is named using the initials of its creators, Bunker, Charans, and Cooper. Unlike the CCR model, which assumes a constant return to scale ratio, the BCC model assumes a variable return to scale ratio. To scale, by calculating technical efficiency in terms of scale efficiency and management efficiency, a very detailed analysis is provided. To build input-oriented and output-oriented models in the main BCC model, the same principles of the CCR model are used in the model. Input-oriented efficiency increases with decreasing inputs, but in the output-oriented model, efficiency increases with increasing inputs. The BCC multiplicative model with the input-oriented form is as follows:

$$Min \sum_{i=1}^{m} v_i x_{io}$$

$$s.t.: \sum_{r=1}^{s} u_r y_{ro} = 1$$

$$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \leq 0 \qquad j = 1,2,\ldots,n \qquad v\_i \geq 0 \qquad u\_r \geq 0$$

In this part, we elaborated on research findings after assessing the performance of banks active in the banking industry of Iran based on a quantitative criterion (i.e., DEA), applying the output-based BCC model with a variable return to scale in order to rank the banks. The following model was designed after

assessing the mechanisms of corporate governance in banks and extracting data related to risk disclosure in the text of financial reporting: Inputs included: major shareholder, board independence, the duality of CEO duties. Outputs included: positive risk disclosure words, negative risk disclosure words, capital adequacy ratio. In the present study, the variable assessed was risk disclosure. First, financial reportings were evaluated for the first level of critical discour analysis based on Norman Fairclough's model, followed by assessing the text in terms of disclosure of positive or negative risk words.
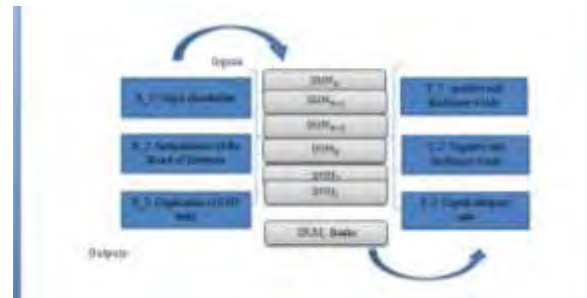
Fig. 1: Data Envelopment Analysis Model

3 Experimental Background

Daglini and Sutini [24] in a study examined the sustainability of accounting information systems based on a probabilistic approach. The research findings indicate that the surveyed companies include a sustainability strategy in their core strategy, but there is a significant relationship with the measurement and integration of sustainability results in the overall financial results of the company. The results also showed that there was no strong relationship between stakeholder participation and the design of a sustainable accounting information system. Therefore, this requires further research in this field in accordance with the view of researchers, which is a very important component for future research. Ghasemi et al. [25] in their research entitled the study of the effectiveness of management accounting systems in Iranian government organizations. Their study identified the relationship between technology and management performance with management accounting systems.

Their research findings show that it is possible to guide the managers of financial organizations to improve their performance through the management accounting system using new technologies and taking into account internal and environmental factors. Harris et al. [26] in a study examined management accounting and control for sustainability and strategy decisions. The results of their research showed that management accounting as a very real phenomenon in the situation, is limited to historical conditions that are specific to certain times and places. This means that the management accounting system can help managers to make strategic decisions and control the stability of the company. Murthy et al. [27] in their research examined the role of management accounting in ancient India. They explored the role of management accounting at the organizational level using ancient and economic society during the Morian period BC. The results of their research indicate that management accounting has a significant role in maintaining the values and norms of the organization to increase the wealth of shareholders in social maps. Kwarteng and Ave [28] in a study examined the impact of organizational culture on the accounting information system and the performance of companies in developed countries. The results of their research showed that there is a significant relationship between organizational culture and accounting information system and company performance. The results also show that there is a significant

relationship between the dimensions of mission, compatibility and coordination of organizational culture with the accounting information system and company performance. In addition, accounting information systems differ significantly in different parts of the industry. Lavia and Hiebl [29] in their research entitled Accounting Information System Courses: Accounting and Non-Accounting Perceptions of Students. The findings of this study show that the successful delivery of this course strengthens the positive perceptions of the accounting team and increases the benefits and positive perceptions of non-accountants. Ghaffari and Khozin [30] in a study investigated the effect of text based on conceptual drawings in learning management accounting using two groups of experimental (n = 24) and control (n = 24). Findings showed that the average score of students trained in accounting using a book based on conceptual drawings is higher than the scores of students studied than text-based books. Since conceptual drawings help to make meaningful learning of complex concepts, professors and students are suggested to use this method of learning and teaching more widely.

Tajwidi and Ahmadi [31] in their research investigated the effect of communication technology management communication mechanism on the performance of accounting information system in order to achieve a competitive advantage. The results show that under the effective guidance and control of IT management and by using this special mechanism, IT management capabilities are able to improve the performance of the accounting information system and thus achieve a competitive advantage. Amirbiki Langroudi et al. [32] were selected and studied from among university and professional professors to evaluate the management accounting model for sustainable development during 1397. Findings show that the sustainable management accounting model has a very high level of predictive power. Based on this, it can be concluded that with the development of a conventional management accounting information system based on a sustainable development approach, the economic consequences of "creating financial value for shareholders" will be replaced by "creating sustainable values" for all stakeholders. The enrichment of this research, in addition to the development of management accounting literature for sustainable development, also highlights the importance of the dimensions of the model categories for the use of stakeholders. Arab Mazar Yazdi et al. [33] in their research examined the effect of accounting information system flexibility on company performance with a dynamic capabilities approach based on an interview with financial managers and accounting experts of 50 companies listed on the Tehran Stock Exchange. Analysis of data by structural equation modeling shows that the flexibility of accounting information systems has improved accounting processes and thus has a significant impact on the company's financial performance. The findings of this study, in the form of informative guidelines, emphasize the importance and necessity of flexibility in accounting information systems and its performance effects in organizations.

Nazaripour [15] in a study investigated the effect of information systems on the accounting compatibility of management. The results showed that the flexibility of information systems is a good incentive for management accounting compatibility. Also, according to the research results, no significant relationship was found between information systems integration and management accounting compatibility. Additional analysis performed showed that information system flexibility has a modulating effect on the relationship between information systems integrity and management accounting compatibility. The results also highlighted the importance of components such as shared knowledge, values , and interactions between stakeholders and information systems. Finally, the results showed that due to the ability of the system to provide relevant information continuously, the ability of management accounting compatibility can increase the effectiveness of managed accounting, which is consistent with management accounting theory. Hejazi and Asadi Vaeqan [34] in a study investigated the effect of perceived

environmental uncertainty on the relationship between management accounting system and performance of Iranian companies. The results of their research show that there is a significant relationship between management accounting system, perceived environmental uncertainty and corporate performance. Rahnamaye Roodpashti et al. [16] in his research to evaluate the impact of management accounting information system based on decision support and business intelligence in decision making of managers of economic units using a questionnaire and collecting the opinions of financial managers of companies listed on the Tehran Stock Exchange in 2010 they paid.

Their results showed that the components of management accounting information system based on decision support and business intelligence in the form of communication and inference based systems, warning and reporting systems, effective analysis and decision making tools are not significantly related to decision variables. Conceptual model of research is as Fig. 2.
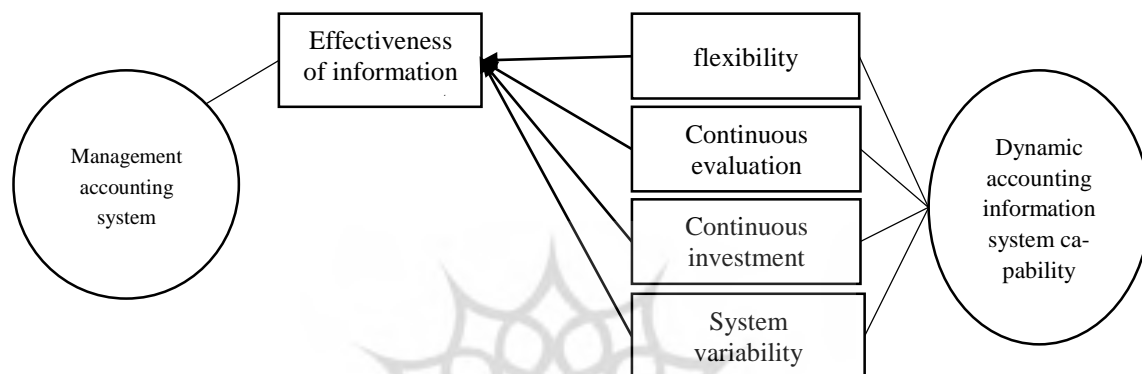

Fig. 2: Conceptual Framework of Research

3 Research Methodology

The present research is an applied research in terms of purpose and a library research in terms of data collection. In terms of classification of research according to the method, it is a descriptive and survey type of research. And Thematic background of the research in the field of main factors of management information system Management and effectiveness of accounting information system Identification and elements related to decision making in economic units and collection of analysis and analysis of statistical data include; Questionnaires were designed and surveyed of managers and users in the field of accounting information systems management of economic units. The paradigm governing information systems studies in recent years has focused more on user evaluation by scrolling through the impact of a particular information system and then drawing conclusions through structural equation modeling. In this regard, in the present study, the semi-structured interview method in the data collection stage and the structural equation modeling method with the partial least squares approach in the inference stage were used.

In this study, the independent variable (dynamic capability of accounting information system) and the dependent variable (effectiveness of management accounting system) were measured by semi-structured interview method. The questions in the structured part of this interview are taken from the research questionnaire of Jacks et al. [35]. In this regard, in this study, the companies listed on the Tehran Stock Exchange that had the following conditions were selected for the statistical population and studied by adopting a census method.

1- The financial unit of the company is located within the city of Tehran;

2- The financial year of the company should end on March 20, 2017;

3. At least one year has passed since the implementation of the latest significant changes in the organization's accounting information systems.

4- They are not part of intermediation companies, holding companies.

In order to conduct interviews with financial managers or accounting experts of the companies under study, 156 companies were referred to the head office or factory within six weeks. References led to interviews with 98 companies, of which 12 were rejected due to insufficient or inaccurate data, bringing the number of correct observations to 86 companies. Regarding the adequacy of the sample size in the structural equation modeling method, it should be said that in order to obtain valid and generalizable results, according to Chin et al. [14], the sample size should be estimated at a ratio of at least 10 items per parameter. Messner [37] also proposed five items per parameter; Therefore, according to the structural model of this study, the minimum number of required observations is 30, so the existing observations (86 cases) are statistically sufficient. Table 1 shows the information about the research variables.

Table 1: Characteristics of Research Model Variables

No.	Variable Name	Variable Symbol	Variable Role	Variable Kind	Structure
1	Dynamic accounting information system capability	AIS	Independent	Perceptual	Reflective
1-1	Continuous evaluation	CE			
1-2	flexibility	flexibility			
1-3	Continuous investment	CI			
1-4	System variability	SV			
2	Management accounting system	MAS	Dependent	Perceptual	Reflective
2-1	Effectiveness of information management	EIM			

In this section, we describe the multiplier CCR model. Suppose $DMU_j (j = 1, \ldots, n)$ is a set of homogeneous DMUs that consume m inputs, $x_{ij}(i = 1, \ldots, m)$, to produce s outputs, $y_{rj}(r = 1, \ldots, s)$. If DMU_o is the unit under evaluation, its efficiency is measured using the following model, known as the multiplier CCR model [4].

$$\theta_o^* = max \sum_{r=1}^{s} u_r y_{ro}$$

$$s.t: \sum_{i=1}^{m} v_i x_{io} = 1 \qquad\qquad (1)$$

$$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \leq 0 \qquad j = 1, \ldots, n$$

$$u_r, v_i \geq 0 \qquad r = 1, \ldots, s \qquad i = 1, \ldots, m$$

Where u_r and v_i indicate the relative importance of the output and input vectors, respectively.

Definition DMU_o is efficient if and only if $\theta_o^* = 1.$

4 Research Findings

Table 2 provides demographic information about the interviewees. About 60% of respondents held the position of CFO or Chief Accountant. Also, the level of education of half of the interviewees was master's or doctoral. It is noteworthy that this group of people had better participation in terms of accepting the interview and the quality of response. Two-thirds of the interviews were conducted at the companies' headquarters located in the center of Tehran and the rest at the factory located within a 25-kilometer radius of Tehran.

Table 2: Demographic Information of the Respondents

Variable	Group	Frequency	Percent	Variable	Group	Frequency	Percent
Gender	Man	69	80	Responsibility Title	financial manager	18	21
	Woman	17	20		Head of Accounting	47	55
Age (year)	Below 30	9	10		accountant	15	17
	31 to 40	61	71		Others	6	7
	41 to 50	14	17	Activity Experience (year)	1 to 5	62	72
	51 to 60	2	2		6 to 10	13	15
Education	Below Bachelor Degree	47	54		11 to 15	8	9
	Master	35	41		Central Office	67	78
	Ph. D	4	5		Factory	19	22

4.1 Model Analysis and Testing of Hypotheses

To test the hypotheses by structural equation modeling, version 3 of Smart PLS statistical software was used. When the volume of observations is small or does not have a normal distribution, it is preferable to use the partial least squares approach and software such as Smart PLS [38].

In order to evaluate the measurement model (external model), the reliability and validity of structures and indicators are evaluated. Cronbach's alpha and composite reliability for each of the model structures were greater than 0.7. Also, all indicators had the necessary reliability. In order to evaluate the validity of the reflective structures of the model, convergent validity and differential validity were used. The average criterion of variance extracted to evaluate the convergent validity of all model reflective structures is more than 0.5. Also, for differential evaluation using Fornell-Larker criterion, the mean root extracted for each structure was higher than the highest correlation of each structure with other latent structures and thus the differential validity of the measurement models was confirmed.

4.2 Fitting of Measurement Models

In the fitting of the measurement model, the reliability criterion is also used, which is examined in three ways: factor loading, Cronbach's alpha and combined reliability. The value of the criterion for the suitability of the factor load coefficients is 0.4. Because the higher this value is in relation to a particular structure, the more that index plays a role in explaining that structure [39]. According to

Table 3, all factor load coefficients are greater than 0.4, which indicates the appropriateness of the measurement models used in this study.

Table 3: Factor Load of each of the Latent Research Variables

Structures	Symbol	Sub-Structures	Factor load
Dynamic accounting information system capability	AIS	CE Flexibility CI SV	0.843 0.905 0.876 0.912
Effectiveness of Management Accounting Information System	MAS	EIM	0.951

Cronbach's alpha coefficients and combined reliability, if higher than 0.7, indicate appropriate model reliability. Since the numerical reliability coefficient is between zero and one, zero indicates the lack of reliability and a reliability indicates one hundred percent. Therefore, the closer the reliability and Cronbach's alpha to the number one, the better [39]. According to Table 4, the relevant values for all structures are higher than 0.7, which indicates the appropriate reliability of the research measurement models.

Table 4: Cronbach's Alpha Coefficients and Combined Reliability of Latent Variables

Hidden variables	Symbol	Cronbach's alpha coefficients	Combined reliability coefficient
Dynamic accounting information system capability	AIS	0.824	0.968
Effectiveness of Management Accounting Information System	MAS	0.813	0.943

4.3 Structural Model Fit

Unlike the research measurement models, the structural model section does not deal with explicit variables, but only the hidden variables of the research along with the relationships between them. The first criterion for examining the fit of a structural model in a study is the R^2 coefficients related to the endogenous (dependent) variables of the model. R^2 is a measure that indicates the effect of an exogenous variable on an endogenous variable and three values are 0.19; 0.33 and 0.67 are considered as the criterion values for weak, medium and strong R^2 values.

Table 5: Results of the 2R Criterion of the Endogenous Variable

Endogenous variable	Symbol	R^2
Dynamic accounting information system capability	AIS	0.510
Management accounting information system	MAS	0.526

This means that this index examines the overall predictive ability of the model; That is, whether the tested model has been successful in predicting endogenous latent variables or not [38]. According to Table 5, the value of R^2 has been calculated for the endogenous variable of the research, which according to the values of the criterion, can confirm the appropriateness of the structural model of the research. It should be noted that this coefficient is not calculated for exogenous variables. The second criterion for examining the fit of the structural model of the research is the value of Q^2 of the endogenous variables of the model. This criterion determines the predictive power of the model [39]. Each of the three values of 0.02, 0.15 and 0.35 for this criterion have been introduced as expressing

weak, medium and strong predictive power for the respective structure, respectively. According to Table 6, the value of Q^2 of the endogenous variable is more than 0.15, which indicates the strong predictive power of the model and confirms the proper fit of the structural model of the research.

**Table 6:** The Results of Q^2 in Predicting Model

Total	SSE	SSO	$Q^2 = 1 - \frac{S}{SSO}$
Dynamic accounting information system capability	51	312	0.843
Management accounting information system	71	453	0.912

4.4 Overall Model Fit

After examining the fit of the measurement models and the structural model, the general model of the structural equations of the research should be examined using the good fit criterion (GOF). The general model includes both the measurement and structural model parts, and by confirming its fit, the fit check in a complete model is completed. To examine the fit of the overall model, the GOF criterion is used as follows [39]:

Where $\overline{Communalities}$: indicates the common mean of latent variables[1] and $\overline{R^2}$ shows the mean values of the coefficient of determination of endogenous variables

$$GOF = \sqrt{\overline{communalities} \times \overline{R^2}}$$

of the model. The three values of 0.01, 0.25 and 0.36 are considered as weak, medium and strong values for GOF for GOFF, respectively. Note that the value obtained for the research model is 0.487, so a very good fit of the overall research model is confirmed.

Hypothesis Test Results: After examining the fit of the measurement models and the structural model and having a suitable fit of the general model and according to Fig. 3 and Fig. 4, the test results of the research hypotheses are examined, the results of which are presented in Table 7:
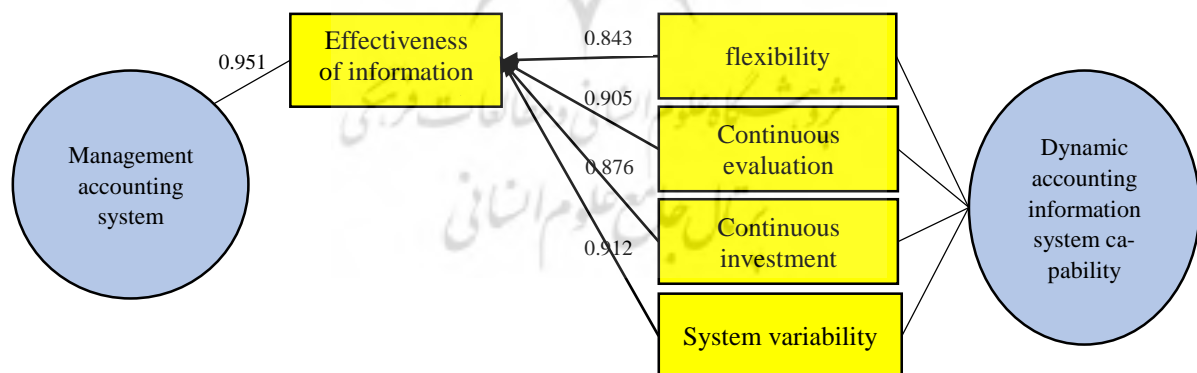
Fig. 3: Research Model with Standardized Path Coefficient

As can be seen in the table above, the path coefficient between the flexibility of the accounting information system and the effectiveness of the positive management accounting system (0.843) and its t-statistic (6.712) is greater than 1.96, which indicates a significant positive relationship between

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[1] The fit indices of this approach are related to examining the adequacy of the model in predicting dependent variables. In fact, these indicators show to what extent for the measurement model the indicators are able to predict their underlying structure and for the structural model, to what extent and with what quality are the external variables able to predict the internal variables of the model.

flexibility. Accounting information system and the effectiveness of the management accounting system. Accordingly, the first hypothesis of the research is accepted. Also, the path coefficient between continuous evaluation of the accounting information system and the effectiveness of the positive management accounting system (0.905) and its t-statistic (9.352) was greater than 1.96, which indicates a significant positive relationship between them.
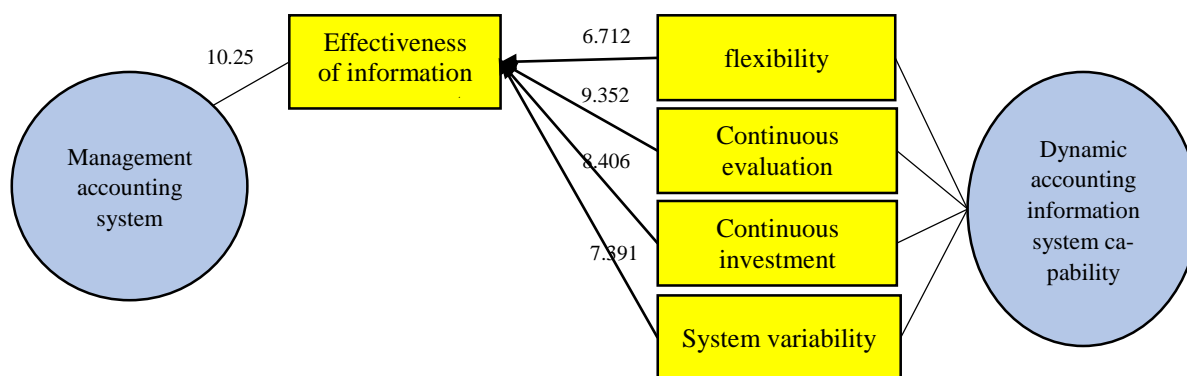

Fig. 4: Research model with t-values

Therefore, the second hypothesis of the research is accepted. On the other hand, according to the third hypothesis, according to the result of the coefficient of continuous investment path of the accounting information system and the effectiveness of the management accounting system; It is positive (0.876) and its t-statistic is (406.8), it can be said that the third hypothesis is confirmed. In the fourth hypothesis, the path coefficient of variability of the accounting information system is positive (0.912) and its t-statistic (7.391), which according to the level above 1.96, the fourth hypothesis is accepted.

4.5 Financial Evaluation Using Data Envelopment Analysis

In the final stage, that the main criteria are established, we employed the selected criteria to rank the 85 companies listed on the Tehran Stock Exchange. The well-known CCR method is applied. The obtained results are described in Table 8. The name has been stated as their abbreviations to protect the anonymity of the company. The analysis are done based on three scenarios. Due to simplicity, only the top five companies in each scenarios are showed. In scenario 1, all the selected criteria are taken into account to make the general evaluation. The company SK has been recognized as the best by considering all criteria.

In scenario 2, only the Developmental measurement are taken into account. We can see that again the company SK has been recognized as the best in this scenario. Table 8 indicates that in addition to the SK, the company SD has also acceptable performance in scenarios 1 and 2. In scenario 3, only the reflective measurement are taken into account. We can see that the company SHS has been recognized as the best in this scenario. Tables 8 indicates that the company SFN has acceptable performance in scenarios 1 and 3.

Table 7: Results of the Research Hypothesis Test

Path	Abbreviation	Path Coefficient	t Statistics	Hypothesis test result
Accounting information system flexibility → Effectiveness of management accounting system	Flexibility → EIM	0.843	6.712	Accept
Continuous evaluation of accounting information system → Effectiveness of management accounting system	CE → EIM	0.905	9.352	Accept
Continuous investment of accounting information system → Effectiveness of management accounting system	CI → EIM	0.876	8.406	Accept
System Information Accounting System Variability → Effectiveness of management accounting system	SV → EIM	0.912	7.391	Accept

Table 8: Financial Evaluations

	scenarios 1	scenario 2	scenarios 3
SK	0.654	0.677	0.787
SD	0.697	0.586	0.782
SFN	0.566	0.568	0.679
SG	0.557	0.565	0.672
JD	0.485	0.564	0.678
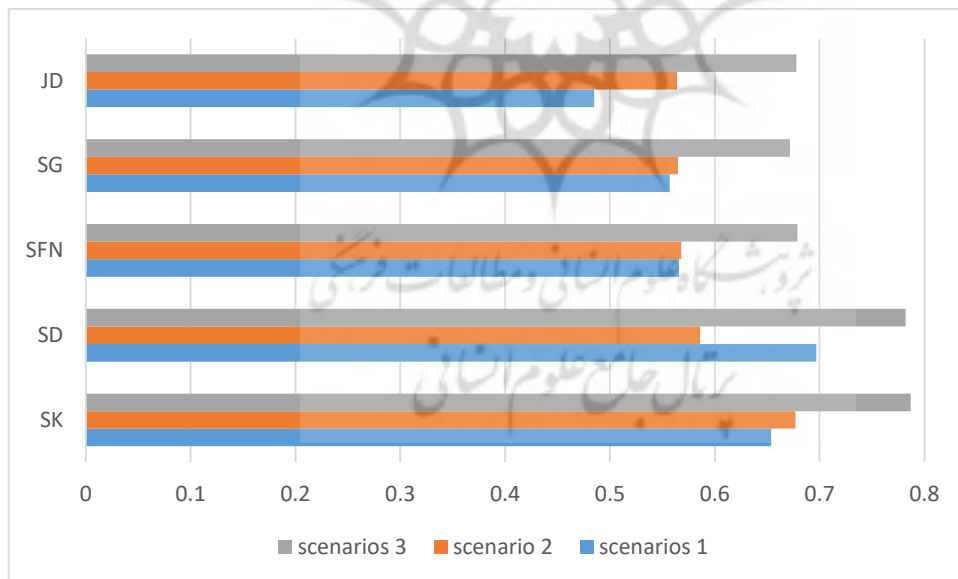
Fig. 5: Level of efficiency

5 Conclusions

Adaptability is an important feature and capability in the field of management accounting, because it can play a decisive role in adapting the system to the environment and the effectiveness of management

accounting. The flexibility of information systems and shared knowledge was on the ability of management accounting to accept new requirements. From the point of view of contingency and appropriateness theory, adaptation to the environment is important, because the inability to adapt to the environment has negative effects on performance and can cause management accounting stagnation and irrelevant information. Although the role of management accounting in an organization is to provide key and useful information to management, but there is evidence that if not compatible with the environment, this type of accounting will not only have a positive but also a negative impact on the performance of the organization. Some features of the accounting information system can play a more constructive role in the change process. For example, in organizations that use better quality information systems, due to lower measurement costs, more advanced measurement systems such as activity-based costing can easily be used. Also, the quality and accessibility of data have a significant impact on the development of new management accounting systems. The role of information systems seems to be undeniable both in supporting and preventing change.

Companies today also face issues related to business sustainability as a result of globalization, size, technological advancement, intensified market competition, and management change [40,41]. Therefore, in order to continue the activity and remain stable in the field of competition, company managers try to improve their management performance by using the management accounting system obtained through financial and non-financial information, because the management accounting information system is based on the existence of accounting information systems. The financial and non-financial sector also pays attention. The diminishing factors such as the relevance and different attitudes of different companies and industries to modern management accounting practices have intensified the interest in changing management accounting and innovation. The source of change in management accounting is theories such as contingency theory, institutional theory, social constructivism theory, and actor network theory. Focusing on change itself is not considered as a goal for this research, but instead tries to pay attention to the ability to make changes (adaptability) as an important capacity. In this study, the term dynamic adaptability, which has a meaning beyond the traditional view of change, is used, which is consistent with the theory of proportionality, meaning that it seeks to achieve a specific goal. Therefore, the result obtained from the research hypothesis indicates the relationship between the dynamic capability of the accounting information system and the management accounting system. The present result can be argued that the dynamic capability of accounting information systems is considered as an important feature and capability in the field of management accounting, because it can play a decisive role in adapting the system to the environment and the effectiveness of management accounting.

From the point of view of contingency and appropriateness theory, adaptation to the environment is important, because the inability to adapt to the environment has negative effects on performance and can cause management accounting stagnation and irrelevant information. Therefore, this research is consistent with the researches done by [42,43,44,45]. The results of this study can help management accounting researchers in understanding how to play the role of information systems in the development and strengthening of management accounting practices over a wide period of time and strengthen the further convergence of financial accounting and management accounting. Therefore, it is recommended to the managers of the organizations to pay much attention to the employees while serving to hold training courses in the field of information systems, which can empower them and reduce possible future problems. They should also try to establish a close relationship between financial and non-financial accounting information systems and management accounting systems in order to make practical and optimal decisions.

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