



## Analyzing the Relationship between Social and Professional Identity Characteristics of the Audit Committee and the Steering System on the Quality of Financial Reporting: A Legal Oriented Artificial Approach

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### ABSTRACT

The purpose of this study was to analyze the impact of the social and professional identity of the members of the audit committee and the characteristics of the governance system on the financial reporting quality. The modified Jones model was used to express the financial reporting quality. Given that part of the data was obtained through a questionnaire and another part by using financial statements. The research period was 2019 and the sample size was 79 companies listed in Tehran Stock Exchange. To test the research hypotheses, the method of decision making artificial intelligence method and MATLAB software were used. The results of the section of the governance system features indicate the effect of the dual role of the CEO and the ratio of institutional owners on the financial reporting quality. It can be stated that corporate governance mechanisms can reduce opportunistic behavior; they can improve the quality of information by reducing the cost of representation. Also, the results of the audit committee's benchmarks indicate the impact of the audit committee's social identity and the number of employees in internal accounting section on the financial reporting quality, which suggests that effective audit committees, as a determining factor in the financial reporting process, increase the credibility of audited financial statements. In this study, for the first time, the impact of audit committee social identity along with other characteristics of governance system on the quality of financial reporting was analyzed by artificial intelligence

### Keywords:

Legitimate Algorithm, Financial Reporting Quality – Characteristics of Governance System, Audit Committee's Social and Professional Expert Identity

## 1. Introduction

The quality of financial reporting, promoting transparency and publishing high quality report are possible through comprehensive disclosure. The quality of financial reports has always been and is a favorite of managers, shareholders, researchers and professional accountants. It is clear that lawmakers and investors are in favor of having high quality financial reporting, because the prevailing belief is that the quality of financial reporting directly affects capital markets [2]. On the other hand, the Audit Committee and the Governance System through the oversight of the financial reporting process including internal control system and application of accepted accounting principles as well as monitoring the independent audit performance, cause reduction in deliberate and inadvertent errors in accounting measurement and disclosure of important matters as well as fraud and illegal practices of management. Bédard and Gendron [7] also argue that the audit committee and the governance system increase information quality directly through monitoring financial reporting and indirectly by caring for and paying attention to internal controls and the independent auditor and, ultimately, improving the quality of information and strong controls can lead to increased investor trust and confidence in the quality of reporting and the efficiency of financial markets [19]. Due to the importance of the supervisory role of the company, the present study utilizes the characteristics of the social and professional identity of the Audit Committee and the Governance System to determine the quality of financial reporting.

## Theoretical foundations, literature and hypotheses

### Financial reporting quality

In general, the term "financial reporting" means the reporting of financial statements and other information disclosed by a business unit to third parties, such as shareholders, creditors, customers, governmental organizations and the general public. Undoubtedly the most important element of financial reporting is the usefulness of financial reporting. Financial reports must be relevant, reliable, and understandable. These are key elements of the financial reporting supply chain and the Audit Committee and internal auditors and the appropriate

governance system can greatly contribute to the quality of this report [11].

For the capital markets to survive, investors need to recognize the information of companies as being correct, complete, reliable and in a timely manner. They have to rely on information that others provide and this fact in many cases increases the risk of unreliable information. Shareholders can use the audited financial statements as one of the trusty instruments in order to know how to manage their funds and to ensure that managers are sound and efficient. Financial reporting as a major means of transmitting financial information to investors plays an important role in this regard [9]. Verrest [34] considers the quality of financial reporting as usefulness of accounting information and the reported amount of profit for enterprise stock users. In another definition, financial reporting quality is defined by the ability of financial statements to transmit information about the operations of a company and specifically to predict its expected cash flows to the investors; these are based on this view that accruals improve the information value of earnings by reducing the effect of unstable volatility on cash flows. Financial reporting quality is a standard that separates useful information from other information and enhances the usefulness of information. Also, the quality of financial reporting means that the financial statements are useful to investors, creditors, managers, and others related to the company [28].

There has been extensive research around the world on internal and external factors affecting the quality of financial reporting; in short, it can be said that three different perspectives on corporate characteristics and financial reporting quality are competing globally. First, some suggest that the firm's structural characteristics play an important role in preventing managers from manipulating accounting figures in comparison with other criteria, such as monitoring or performance variables. Second, others believe that supervisory mechanisms better control the opportunistic behavior of management in preparing financial statements. The latter view is held by those who believe that performance variables can stop conducting unethical accounting activities by managers that reduces the quality of financial reporting and these variables can do this better than other two approaches, namely structural and supervisory elements, [2]. By establishing an audit

committee and appropriate governance system, the quality of financial and accounting information improves and by providing and approving transparent financial information, the responsibility and accountability of the company management for adequate and appropriate disclosure and improved quality of financial reporting will be more under control. On the other hand, according to the theoretical concepts of financial reporting in Iran, one of the features of financial information is timely financial reporting, providing information to the users before deadline to enable them to make the right decisions; therefore, it is expected that the audit committee and the effective governance system perform their duties well and help improve timely financial information [16].

The role of audit committee and internal auditor on the quality of financial reporting

One of the key responsibilities of the Company's Audit Committee is to review the major financial statement challenges and judgments made in preparing the financial statements, midterm reports and relevant official statements. Recent academic papers and recent corporate governance announcements have identified the critical role of audit committees in financial reporting [37]. Kalber and Fogarty [33] state that audit committee expertise enhances the quality of financial reporting. Goodwin [14] also advocates the subject that members of the audit committee should have financial expertise in addition to independence from management. Audit independence and knowledge play an important role in the audit committee and internal audit. An independent audit committee is effective in controlling and monitoring management and this increases the reliability of the financial statements and enhances the value of the company. As a result, the quality of accounting information improves and the value relationship of information increases. If members of the Audit Committee are truly independent, their effectiveness will be increased and the likelihood of discovering false reports, prepared by managers, will increase. Therefore, there is a positive and significant relationship between the independence of the audit committee and proper management [13]. In leading countries, corporate audit committee has become an important tool to monitor the reliability of the financial reporting process. The Audit Committee acts as a determining factor in the financial reporting process. Effective Audit Committees enhance the

validity of annual audited financial statements, and its members collaborate with the board of directors responsible for safeguarding the interests of shareholders, and assist the manager in performing his duties by contributing in monitoring the quality and desirability of financial statements, accounting, auditing and in the financial reporting process. Assign responsibility for self-help [37]. The result of using audit committee and efficient and regular internal audit in the company will greatly reduce the possibility of presentation false and distorted financial statements and improve the quality of the information provided and its effectiveness. One of the most important factors that diminishes the quality of financial reporting is the absence of an efficient audit committee and internal audit. The primary role of the corporate audit committee is to oversight the corporate financial reporting process. Although the Audit Committee provides the most effective protection of the public interest, previous reviews and studies of the Audit Committee show great variety in expertise and proficiency of audit committee members and also the lack of sufficient financial and accounting expertise and experience of many committee members. Recent amendments to the Corporate Audit Committee have targeted an increase in the number of managers with financial expertise as a prominent feature of the Audit Committee. If the audit committee performs well in its oversight of financial reporting, it can be expected that it contributes significantly to improving the quality and timeliness of financial reporting [16]. The research question is therefore presented as follows:

Do the characteristics of the audit committee and internal auditor affect the quality of financial reporting?

The Social Identity of the Audit Committee and the Quality of Financial Reporting

In this study, according to the research of Obermire (2016), the social identity of audit committee members are considered as independent variable in four dimensions (social identity of public sector accounting - social identity of executive management - social identity of financial management - social identity of investment management.

The Social Identity of Public Sector Accounting

Members of the Audit Committee with the social identity of Public Accounting have extensive experience in monitoring financial reporting. This is consistent with agency theory and the role of company

manager with emphasis on supervision; and the presence of individuals with such experience enhances the quality of financial reporting, therefore, the research question is presented as follows:

Is there any relationship between the presence of audit committees with identity of activity in public accounting and the quality of financial reporting?

The Social Identity of Executive Management

Audit Committee members with executive management identity have extensive experience in making operational and strategic decisions. These people, despite the financial and operational pressures of the company, can help management make decisions. Therefore, we expect these Audit Committee members to understand their corporate management role in a way that they recognize helping management identify and protect resources more important than management oversight. The research question is therefore defined as follows:

Is there any relationship between the presence of audit committee with executive management identity and the quality of financial reporting?

The Social Identity of Financial Management

People with new or previous experience in the role of financial management have complex impacts on the audit committee, which also affects their social identities on the audit board. Financial management professionals are also very aware of past officials and the poor quality results of financial reporting. As a result, the research question is formulated as follows:

Is there any relationship between audit committees with financial management identity and financial reporting quality?

The Social Identity of Investment Management

Audit Committee members with both banking and non-banking investment experience have a investment management social identity. In relation with their experience, they also devote considerable time to analyzing financial statements and assessing risks. This makes them better inspectors and affects the quality of financial reporting. Accordingly, the research question is presented as follows:

Is there a relationship between the existence of an audit committee with the identity of investment management and the quality of financial reporting?

The Role of Governance System Characteristics on the Quality of Financial Reporting

One of the factors shaping the problem of representation between managers and shareholders is

the lack of information transparency between them, and for this reason, shareholders cannot continuously control the actions and activities of managers. Adequate oversight and care must be taken to ensure proper disclosure and transparency of business information to the public and to stakeholders. Supervision and oversight in this area requires appropriate mechanisms, including proper design and implementation of a "corporate governance system" in companies and firms. One of the most important tasks that a corporate governance system can undertake is to ensure the quality of the financial reporting process. The competent legal authorities, with codifying laws and regulations, are always seeking to enhance the quality of financial reporting using methods such as obliging corporate executives to approve what they report, strengthening and developing the criteria of corporate governance system and enhancing the independence of auditors. Corporate governance system is the implementation of a set of internal and external control mechanisms of the company that determines how and by whom companies are managed, and what the appropriate process of responding and publishing company information to stakeholders should be. Therefore, corporate governance system is a process that results in higher quality financial reporting by the managers [10]. Al Sufy, F. J. [3] examined the impact of corporate governance on the financial information quality of companies listed in the financial market of Oman and concluded that providers and users of financial statements are fully aware of the concept of corporate governance and applying the appropriate governance system is effective on the quality of financial information and makes financial information more accurate and qualitative. The research question is therefore formulated as follows:

Do the characteristics of the governance system affect the quality of financial reporting?

Mousavi Shiri [24] examined the role of internal auditors' rotation on the quality of financial reporting. The data used in this study were extracted from the sources of corporates board reports, audited financial statements for the six-year period 2011-2016, as well as through interviews with senior executives of internal audit unit, 50 sample companies. The results showed that there is no significant relationship between the systematic rotation of auditors towards management position and also the rotation of internal

audit staff within the audit unit with the quality of financial reporting; and the oversight of the Audit Committee and the financial expertise of internal auditors are also unaffected.

Taghavi and Nazari [32] examined the moderating effect of corporate governance mechanisms on the relationship between cash holdings level and financial reporting quality, by selecting 149 companies listed on the Tehran Stock Exchange for a five-year period from March 2012 to the end of February 2016. The findings indicated that the different criteria defined by corporate governance (except board independence and management ownership) had a positive and significant effect on cash level and the duality of the role of CEO from the board of directors had a negative and significant effect on cash holding.

Parsa and Motevasel [26] investigated the effect of audit committee characteristics on the quality of financial reporting in companies listed on the Tehran Stock Exchange. The statistical sample of the study consists of 69 companies listed in Tehran Stock Exchange during 1836 to 1861. In this study, audit committee characteristics including financial expertise of the members, audit committee size, and audit committee members being non-executive and financial reporting quality were calculated by the modified Jones model (2008). The results show that only the financial expertise feature of audit committee members affect financial reporting quality.

Fakhari and Rezai Pate-Noi [12] analyzed the impact of the audit committee on the information environment of the company. Company information environment was measured by observable variables including company size, institutional ownership, company development opportunities, company life, bid-ask price range, number of shareholders of the company, earnings forecast error, stock turnover rate, Amihud illiquidity criterion and stock return fluctuation, as a comprehensive index, and the impact of the presence of audit committee on corporate information environment was tested for the period of 4 years before and after the approval of internal control guidelines in 2012, during the years 2008 to 2015. The results indicate that there is a positive and significant relationship between audit committee and company information environment. In other words, with the establishment of the audit committee in companies, their information environment has become more transparent and the index value has increased.

Nikbakht and Ahmad Khan Beigi [25] examined the impact of corporate governance on the quality of financial reporting: an integrated approach. According to the results of statistical tests, there is a significant relationship between corporate governance and financial reporting quality, so that the correlation between these two variables is 0.607 and their coefficient of determination is 0.368. Accordingly, corporate governance variables alone could predict 36.8% of the change in the quality of a company's financial reporting. The results showed that corporate governance has a positive and significant relationship with financial reporting quality and can predict changes in the quality of corporate financial reporting. These results are consistent with the results of research in emerging markets. Also among the impact of the examined dimensions of corporate governance on financial reporting quality, two dimensions of audit and ownership structure had significant effect on financial reporting quality.

Alavi et al. [4] examined the impact of audit committee activity on financial reporting. The results show that there is no significant difference between the rate of disclosure point difference and the number and proportion of post-test annual adjustments between the two experimental and control groups; in other words, the audit committee's activities did not yet improve the quality of financial reporting significantly in the two years following the establishment of these committees. Contrary to these findings, the results of the complementary tests based on the event study method show that the formation of audit committees for the companies in the experimental group, regardless of the control groups, has resulted in a decrease in the number of annual adjustments and an increase in the information disclosure point of the companies.

Zarei and Ghasemi [37] examined the effect of audit committee characteristics on the quality of financial reporting. In this study, we used earnings management variable to evaluate the quality of financial reporting. The results of the testing the research hypotheses show that there is no relationship between audit committee characteristics such as independence, expertise of members, experience of member as a manager and number of audit committee members with earnings management.

Bazrafshan et al. [6] in a study titled meta-analysis of audit committee independence and financial reporting quality, found that there was no significant

relationship between audit committee independence and earnings management and quality ratings, whereas there was a significant relationship between audit committee independence and quality of accruals, abnormal returns, and representation and fraud.

Yiwei Dou [36] examined the impact of financial reporting quality on the investment efficiency of US stock companies. The results show that selecting and applying existing equity enhances the quality of financial reporting due to its true fair value, which in turn enhances investment efficiency by reducing the problem of inappropriate selection by low-investment firms.

Ralf and Alfred [29] examined the impact of increased performance on financial reporting quality and audit quality. Their hypothesis was that increased public executive power improves the quality of financial reporting and the quality of auditing. In a model with a manager who could manage the earnings, a strategic auditor and an executive institution, they showed that audit performance has been completed in a poor performance regime, but it could replace a strong one. Although strong implementation always reduces profit management, the effects of different reinforcement tools are ambiguous. They showed that they can influence the quality of financial reporting and the quality of auditing depending on the production risk, characteristics of the accounting system, and the scope of the audit toward performance.

Al-Shaer [5] examined the relationship between audit committees and the quality of financial reporting in the UK. Their main purpose is to examine the quality of disclosure of information by focusing on the role of audit committees. In this regard, they used information from 350 English companies during 2007-2011. Their findings suggest that companies with a high quality audit committee have a higher quality of information disclosure and financial reporting. In addition, large corporations with major shareholders have a high volume of information disclosure, although the quality of the audit committee does not affect the volume of disclosure.

Kibiya [18] examined the relationship between the independence and expertise of audit committee members, ownership, and financial reporting quality. They used information from 101 non-financial companies listed on the Nigerian Stock Exchange for the period 2010-2014. Their findings, using multivariate regression, show that supervision

activities of audit committee affect the quality of financial reporting. In addition, the variables of members' expertise and independence as well as equity ownership have a significant effect on the quality of financial reporting.

Moses [23] examined the impact of the size of audit committees on the quality of financial reporting in Nigerian banks. He tested the hypotheses by using data from listed banks in the Nigerian Stock Exchange, using the modified Jones model as a measure of financial reporting quality. His findings show that the size of the audit committee has no significant effect on the quality of financial reporting.

Habib and Bhuiyan [15] examined the impact of the problem of the board of directors on the audit committee and the quality of financial reporting in companies listed on the New Zealand Stock Exchange. Their results show that the board of directors has a positive effect on the relationship between the audit committee and real earnings management, and this effect is more outstanding in the case of executive manager who have problem in reporting fraudulent reports.

Leong et al. [20] examined the relationship between audit committees and the quality of financial reporting in Singapore. They considered some of the committee's features, such as independence or expertise, and examined their effect on the financial reporting quality of companies listed on the Singapore Stock Exchange. Their main findings indicate that the quality of financial reporting would be improved if there were accounting, financial management or supervision expertise in the committee. Another point which is about the independence variable is that it has not had a significant impact on improving the quality of financial reporting since most of the audit committees are composed of independent members.

In a study, Wang et al. [35] investigated the relationship between the establishment of audit committees, information transparency, and earnings quality using the Simultaneous Equation Model. The results indicated that the establishment of audit committees was positively related to transparency of information and quality of earnings.

Kamarudin and Ismail [17] show that there is a negative relationship between some characteristics of the audit committee and the quality of fraudulent financial reporting. For example, the experience of

audit committee members has a negative relationship with fraudulent financial reporting.

Schmidt & Wilkins [30] examined the impact of audit quality and financial expertise of the audit committee on the timely presentation of financial reporting after a time interval and for representation of financial statements. The results indicated that companies with specialist audit committee have more timely disclosures and the lack of expertise of audit committee members results in a 38% reduction in timely financial statements.

Abdukadir [1] in a study entitled audit committee characteristics and quality of financial reports, found that audit committee independence and expertise had a significant relationship with improving the quality of financial reports. The audit committee is five to four meetings per year and its size is 5 members. The results also showed that 70% of sample companies employ people other than four senior auditors.

The following hypotheses have been formulated with respect to the theoretical foundations and the purpose of this study:

- 1) The governance system criteria affect the quality of financial reporting with an artificial intelligence rule-based approach.
- 2) The audit committee and internal auditor's criteria affect the quality of financial reporting with an artificial intelligence rule-based approach.

## Research Method

### Statistical Population and Sample

The statistical population of this research is the companies listed in Tehran Stock Exchange in 2019. Information about social identity of audit committee is extracted through questionnaire and information about other variables of governance system and audit committee is extracted from Rahavard Novin software.

### Research variables

The research variables are as follows

Figure 1: Research variables

Operational definition	Primary independent variables
The number of members of the board of directors	Board size
If the CEO is the Chairman or Vice President of the Board of Directors, number 1, otherwise zero is considered.	Dual Role of the CEO
Number of Non-Executive Board Members to Total Board Members	Ratio of Non-Executive Directors
As defined in paragraph 27 of Article 1 of the Securities Market Act, banks, corporations and any person holding more than 5% of the issued shares is considered as the criterion for calculating the institutional shareholder.	The percentage of institutional owners
The <i>Herfindahl-Hirschman Index</i>	The focus of ownership
Number of Audit Committee Members of the company	Number of Audit Committee Members
The number of non-executive members of the Audit Committee divided by the total number of members	Independence of the Audit Committee
Number of Audit Committee members with financial expertise divided by total members	Audit Committee expertise
Number of members of Internal Audit Unit	Number of staff of Internal Audit Unit
The number of years that Audit Committee members have investing experience.	The Social Identity of Investment Management
The number of years that Audit Committee members have financial management experience.	Social Identity of Financial Management
The number of years that Audit Committee members have the experience of executive management.	Social Identity of Executive Management
The number of years that members of the Audit Committee have experience in accounting in public sector	The Social Identity of Public Sector Accounting
Financial reporting quality (modified Jones model)	<b>dependent variable</b>
Cart Rule-Based Artificial Intelligence Algorithm	<b>Research Method</b>
2019	<b>Research period</b>

## Findings

### Descriptive statistics of research

The descriptive statistics of the independent and dependent variables of the study are described in Figure.

Figure 2 shows that the average proportion of non-executive directors is greater than 0.5. Therefore, it can be stated that most sample firms have more non-executive directors than the executive director in the board structure. The percentage of institutional owners in the sample surveyed is more than 50%, indicating that more sample companies are among the group of firms with higher institutional owners and based on the results of the descriptive statistics of the board size, it can be concluded that all the samples studied have 5-member board members and for the greater confidence during the period 2011 to 2017, all the Board members of 213 companies active in the seven-year period were also examined, which confirms the same result as among the 1491 companies listed on Tehran Stock Exchange, only 48 observations have 7-member board of directors and the rest of the companies have 5-

member board, so this variable is omitted from the final results of the study and it can be stated that other number of board members as an indicator of governance system in accounting research cannot be a suitable variable due to the sameness of the numbers of members. Regarding the financial expertise of the members of the Audit Committee, given the mean and median value, it can be stated that the sample examined has more expert members in the composition of the Audit Committee. Given that the mean and median of the independence of the Audit Committee is greater than 0.65, it can therefore be argued that independent members of the Audit Committee are more than independent members. Given the mean of social identity criteria of the Audit Committee for investment management experience, financial management experience, executive management experience, and public sector accounting experience, it can therefore be argued that most members of the audit committee have accounting experience, particularly in the public sector.

Figure 2: Descriptive statistics

SD	min	max	median	mean	variable
0/19	0/2	1	0/60	0/62	The ratio of non-executive directors
19/24	1827	98/05	75	70/24	Percentage of institutional owners
0/19	0/01	0/75	0/31	0/32	Concentration of ownership
0/47	0	1	0	0/33	Dual role of CEO
0	5	5	5	5	Board size
0/45	3	5	3	3/11	Number of Audit Committee Members
0/24	0	1	0/67	0/75	Financial expertise of Audit Committee members
0/19	0	1	0/67	0/72	Independence of Audit Committee
2/20	1	11	1	2/33	Number of staff of Internal Audit Unit
2/73	0	15	5	4/99	Investment Management Experience
2/15	0	12	5	4/80	Financial Management Experience
2/69	0	10	4	3/76	Executive Management Experience
2/80	0	12	5	5/13	Public Sector Accounting Experience
0/05	-0/19	-0/02	-0/07	-0/08	Financial Reporting Quality

### Decision Tree

Cart decision tree is similar to the C5 tree, but it uses Gini index instead of entropy. The Gini index relation is defined as follows.

$$(1) \quad I_{gini} = 1 - \sum_j p(c_j)^2$$

In which  $p(C_j)$  shows the proportion of absolute data to class C. This algorithm first calculates the Gini index for all the properties of the initial data using the relation (1). Then, the information gain of each of the attributes is obtained from the following relation.



$$Gain(A) = I_{gini} - I_{res_{gini}}(A) \tag{2}$$

$$I_{res_{gini}}(A) = \sum_j \left( p(a) \times \left( 1 - \sum_j p(c_j | a)^2 \right) \right) \tag{3}$$

These relationships mean that the error of the hypothesis h on the learning data is less than the error h' but the error h on the whole data is greater than h' and this is called over-learning. Figure (1) illustrates that as the tree size (number of nodes) increases, the accuracy of the learning data increases but the accuracy of the test data decreases; therefore, there is a need for methods to stop tree growth from one point and prevent the phenomenon of over-learning.

?? is calculated from relation (2), where ?? is the amount of irregularity remaining in the categories due to the use of the feature A which is obtainable with the help of the sum of the probabilities of each of the divisions. Then the feature F which has the most gain is selected as the root of the splitting feature.

In relation (3), a is the subcategory created by selecting the Ath feature as the splitting feature.

Overlearning and avoidance techniques

Suppose there is a hypothesis called h (here we mean the decision tree). Hypothesis error h on learning data is displayed as error<sub>train</sub>(h) and error on all data is displayed as error<sub>D</sub>(h). The hypothesis h overlearned the learning data, if there is another hypothesis (tree) such as h' and the following conditions are in place.

$$error_{train}(h) < error_{train}(h') \quad \text{and} \quad error_D(h) > error_D(h') \tag{4}$$

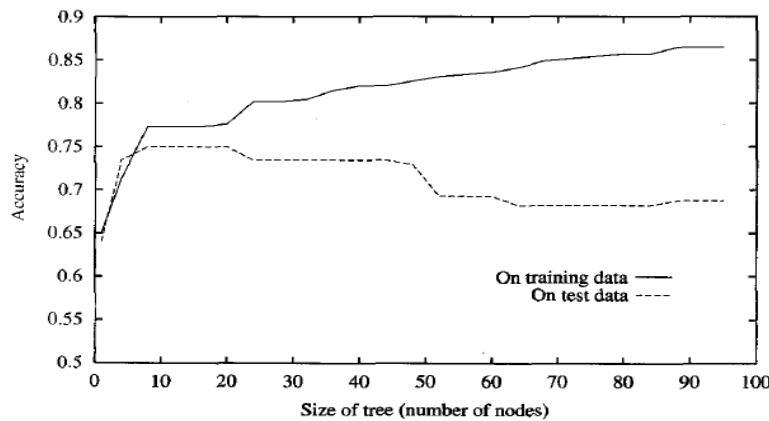


Figure 1: The concept of over-learning in the decision tree

Methods for overcoming the decision tree over-learning have been proposed, which are called pruning, and are divided into two categories:

A number of methods prevent the tree from growing before it is fully grown. Setting a benchmark for when to stop growing is one of the challenges of such methods. Stopping the tree before the tree is full is called pre-pruning. In the second set of approaches of facing over-learning, the tree is first allowed to grow fully and then pruning happens. These methods are called post-pruning. In practice it is shown that the first method is very fast but the efficiency of the second method is higher. The training data is then

applied to the Cart decision tree algorithm and the Cart decision tree uses this data to make an estimation tree. In the learning phase of the tree, the tree is initially allowed to grow completely and then pruning beings using validation data to deal with the over-learning phenomenon. After training the Cart tree, the tree structure will be stored in the computer memory. It is now applied to evaluate the test data which were not yet observed by the tree, and the test error is calculated.

Data division using a 10-fold cross-validation method Before the data is entered into the decision tree model, we need to divide it into two classes of training and

test data. For this purpose, a 10-fold cross-validation method is used. In this method, the data set (company set) is divided into 10 equal parts randomly, so that for the thesis data which is about 80 samples in total there are about 8 samples in each segment which are selected randomly from the companies. The 10 pair sets  $\{x_i, [y_i]\}$   $(i = 1) \wedge 10$  are extracted randomly, in which  $X_i$  is the independent variables and  $Y_i$  is the  $i$ th sample dependent variables. In the first run, the first part of the 10 sections is used to test

the remaining 9 parts for the training data. For example, in Figure 2: For the first run the 10th piece is used as test data and the 1st piece is used as training data. In the second run, the 9th piece was used as the evaluation data of the 1st to 8th and 10th pieces as training data. In other performances, another part of 10 parts is used for testing, and the remaining 9 parts for training. The algorithm is executed the same way 10 times. Figure 2 shows the data division in 10 replications.

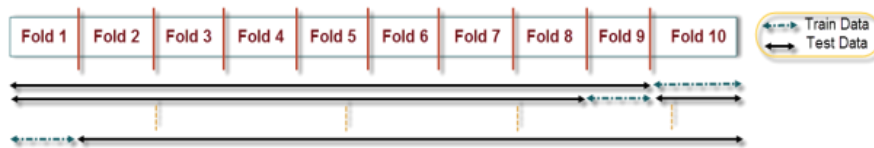


Figure 2: Steps for selecting two training and test data sets with 10-fold cross-validation

At each replication, a prediction error rate for the training data and a prediction error rate for the test data are calculated. Finally, the average error rates obtained are assigned as the error rates of the training data and test data, and are shown in the tables of results. The reason for using this method is that one of the criteria used to evaluate a classifier / regressor is the error rate which has different types. Generally, it is not possible to have a proper judgement on the algorithms abilities with the comparison of calculated error on training data. The error rate on training data is usually lower than the error rate on data not seen in the learning process. With this argument, learning error cannot be used to compare two algorithms. This is because for more complex models, classifiers that usually have more parameters have more complex boundaries. This complex boundary reduces the error on training data compared to simpler models; therefore, in addition to the training data set, a set of data is required for the test. In the case of decision trees due to the phenomenon of over-fitting, in addition to the two training and test data sets, another set of data called the validation data set is required which is selected from the training data set (over-fitting or over-learning is one of the biggest problems in the learning process and one way to prevent it is using validation data). Therefore, each dataset is divided into three independent subsets of training data, validation data, and test data. The training data is used for model learning and the validation data for the prevention of overlearning. The test data is used to calculate the

algorithm error rate (model prediction error) on data that has not been observed so far. Of course, one algorithm implementation is not sufficient for the evaluation to be appropriate. Usually, algorithms tend to approximate their estimated error rates to the actual error rates (real-world errors), this action is possible by repeatedly performing the learning and evaluation process; therefore, when a dataset is provided, a part of it is set aside for final evaluation and the rest is used for training and validating, and again the three sets are changed and the model is reevaluated. This process is performed by 10-fold cross-validation. Thirteen independent variables from 10 different industries for 79 companies were collected in 2017. The names of these industries and companies are shown in Figure 3 and Figure 4.

Figure 3: Name of the industries surveyed

Name of the industry	#
Automotive and parts manufacturing	1
Cement, lime and plaster	2
basic metals	3
Ceramic and tile	4
Rubber & Plastic	5
Electric machines	6
equipment and machinery	7
chemical products	8
Food and beverage except sugar	9
Pharmaceutical materials and products	10

Figure 4: the name of surveyed companies

Company name	#	Company name	#	Company name	#	Company name	#
Salemin	61	Saadi Tiles	41	Surud Cement	21	Saipa Azin	1
Pegah Azarbajejan	62	Behsaram	42	Isfahan Cement	22	Iran khordro Diesel	2
Shahd Iran	63	Iran Yasa	43	Soofian Cement	23	Parskhodro	3
Mahram	64	Iran Tire	44	Gharb Cement	24	Saze Pooyesh	4
Noosh Mazandaran	65	Sahand Tires	45	Fars No Cement	25	Tractor Casting	5
Abooreyhan Pharmaceutical Co.	66	Sanati Barrez	46	Ghaen Cement	26	Iran Radiators	6
Daroopakshh Factories	67	Plasscocar Saipa	47	Neyriz White Cement	27	Iran Casting Industries	7
Osveh Pharmaceutical co.	68	Iran Transfo	48	Kalsimin	28	Zamyad	8
Alborz Pharmaceutical Co.	69	Shahid Ghandi	49	Iran Aluminum	29	Saipa	9
Amin Pharmaceutical co.	70	Niroo Trans	50	Bahonar Copper	30	Khodro Shargh Electric	10
Pars Pharmaceutical co.	71	Agricultural Services	51	Kashan Amirkabir Steel	31	(Lent Tormoz) Brake Pads	11
Daroopakshh Materials	72	Absal	52	Khorasan Steel	32	Niroo Mohareke	12
Zagros Pharmed Pars	73	Shazand Petrochemical co.	53	Khoozestan Steel	33	Tractor Motorsazan	13
Razak Pharmaceutical co.	74	Abadan Petrochemical co	54	Sanaati Sepahan	34	Mehrkam Pars	14
Shimi Daroopakshh	75	Karin Iran	55	Iran National Copper Industry	35	Iran Khodro	15
Injectable Products	76	Piazar Kesht O Sanaat	56	Navard Aluminum	36	Darab Cement	16
Kosar Pharmaceutical co.	77	Kalber Diary	57	Navard Steel Parts	37	Oroomiyeh Cement	17
Daru Eksir	78	Behnoosh	58	Isfahan Mobarake Steel	38	Tehran Cement	18
Iran Daru	79	Pak Diary	59	Taksaram Tiles	39	Khash Cement	19
		Pars Minoos	60	Sina Tiles	40	Khazar Cement	20

Figure 3 shows the frequency chart of the continuous variable of financial reporting quality in 25 quarters for all companies

The importance of independent variables for explaining the quality of financial reporting

After training the Cart decision tree with the training data, important variables to predict the quality of financial reporting are shown in Fig. (4); the name of the variables x1 through x13 are shown in Figure 4.

This significance is obtained based on the Gini index in division of the training data in the Cart decision tree. As can be seen, the important variables for predicting the quality of financial reporting are: 1- Investment management experience, 2- Number of internal audit staff, 3- Financial management experience, 4- Executive management experience, 5- Public sector accounting experience, 6- Percentage of institutional owners and 7- Dual role of CEOs.

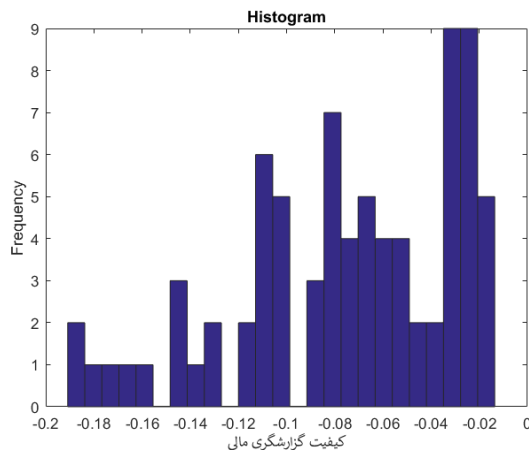


Figure 3: Frequency chart of financial reporting quality in 25 quarts

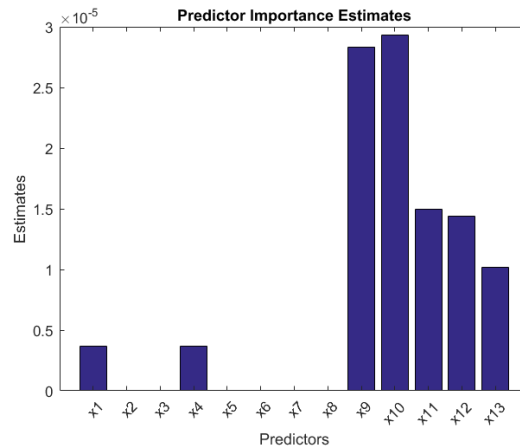


Figure 4: The importance of independent variables in predicting the quality of financial reporting

Figure 5: Symbol of the independent variables in the Cart decision tree

Independent Variables	#
Dual role of the CEO	x1
Number of board of directors	x2
Proportion of non-executive directors	x3
Proportion of institutional owners	x4
Concentraton of ownership	x5
Number of members in audit committee	x6
Financial expertise of members in audit committee	x7
Independence of audit committee	x8
Number of employees in internal audit unit	X9
Experience of investment management	X10
Experience of financial management	X11
Experience of executive management	X12
Experience of accounting in public sector	X13

Prediction Evaluation Criteria of Financial Reporting Quality.

The 10-fold cross-validation method is used for implementation and evaluation. After dividing the observations into two sets of training and test data using 10-fold cross validation method, three evaluation criteria were used to evaluate the models, namely mean absolute error, mean squared error, and symmetric mean absolute percentage error, which is obtained using the following relationships.

$$MSE = \frac{1}{n} \sum_{i=1}^n (y_i - d_i)^2 \tag{5}$$

$$MAE = \frac{1}{n} \sum_{i=1}^n |y_i - d_i| \tag{6}$$

$$SMAPE = \frac{1}{n} \frac{\sum_{i=1}^n |d_i - y_i|}{\sum_{i=1}^n (d_i + y_i)} \tag{7}$$

In the above equations  $Y_i$  and  $D_i$  are the real dependent variable and the dependent variable predicted by the algorithms for the  $i$ th company-year, and  $n$  represent the number of company-years (in the learning or evaluation phase) and  $\bar{y}$  and  $\bar{d}$  are the

mean of the real and predicted dependent variable, respectively. The training data and the test divided by the 10-fold cross-validation method were given to the Cart. The decision tree model is shown in figure (5). As it can be seen, this tree has a depth of 6 and is understandable and usable for humans. It should be

noted that extracting such a tree and determining the significance of the independent variables of the problem could not be done by an expert, and therefore the Cart algorithm, which is a very powerful data mining tool, was used in this study

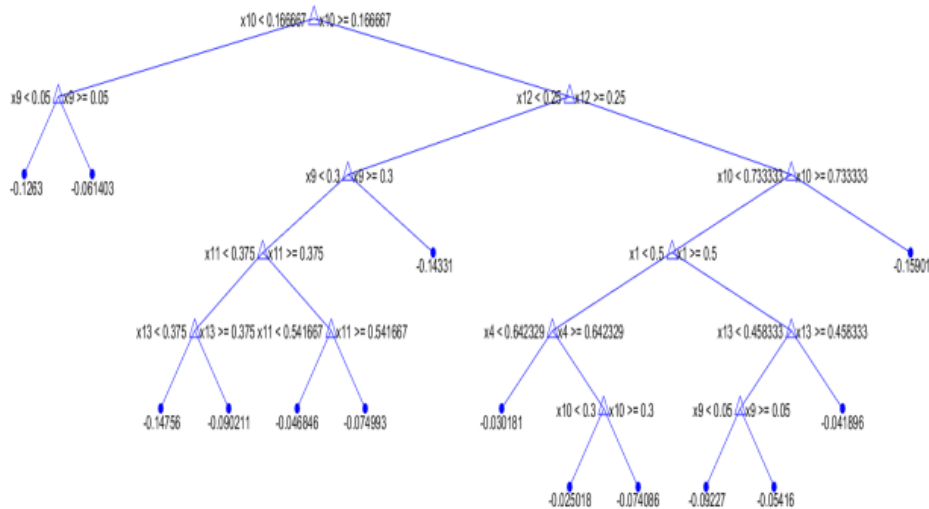


Figure 5: Cart decision tree for explaining the quality of financial reporting

For better understanding of this decision tree, the rules which are extracted from it are given as follows. As the shape and rules say, 14 laws can be used to determine the quality of financial reporting. These 14 rules are of the rules which are under the leaves meaning that they are at the end of rules 4, 5, 9, 11, 16-20, 23-27.

**Decision tree for regression**

- 1 if  $x_{10} < 0.166667$  then node 2 elseif  $x_{10} \geq 0.166667$  then node 3 else -0.0752833
- 2 if  $x_9 < 0.05$  then node 4 elseif  $x_9 \geq 0.05$  then node 5 else -0.100339
- 3 if  $x_{12} < 0.25$  then node 6 elseif  $x_{12} \geq 0.25$  then node 7 else -0.069411
- 4 fit = -0.126296
- 5 fit = -0.0614028
- 6 if  $x_9 < 0.3$  then node 8 elseif  $x_9 \geq 0.3$  then node 9 else -0.0877672
- 7 if  $x_{10} < 0.733333$  then node 10 elseif  $x_{10} \geq 0.733333$  then node 11 else -0.0568514

- 8 if  $x_{11} < 0.375$  then node 12 elseif  $x_{11} \geq 0.375$  then node 13 else -0.0805232
- 9 fit = -0.143305
- 10 if  $x_1 < 0.5$  then node 14 elseif  $x_1 \geq 0.5$  then node 15 else -0.0540903
- 11 fit = -0.159013
- 12 if  $x_{13} < 0.375$  then node 16 elseif  $x_{13} \geq 0.375$  then node 17 else -0.107415
- 13 if  $x_{11} < 0.541667$  then node 18 elseif  $x_{11} \geq 0.541667$  then node 19 else -0.0598369
- 14 if  $x_4 < 0.642329$  then node 20 elseif  $x_4 \geq 0.642329$  then node 21 else -0.046239
- 15 if  $x_{13} < 0.458333$  then node 22 elseif  $x_{13} \geq 0.458333$  then node 23 else -0.0669889
- 16 fit = -0.14756
- 17 fit = -0.0902105
- 18 fit = -0.0468457
- 19 fit = -0.0749933
- 20 fit = -0.0301812
- 21 if  $x_{10} < 0.3$  then node 24 elseif  $x_{10} \geq 0.3$  then node 25 else -0.0565619
- 22 if  $x_9 < 0.05$  then node 26 elseif  $x_9 \geq 0.05$  then node 27 else -0.0770261

- 23 fit = -0.0418958
- 24 fit = -0.0250185
- 25 fit = -0.0740861
- 26 fit = -0.0922703
- 27 fit = -0.0541599

After executing the learning process of decision tree model, in order to verify how successfully the model has passed the learning process, first the same training data which were previously given to the algorithms to learn its model parameters, is given to the model with the learned parameters as an evaluation sample; the difference in this case is that the models explain the value of the dependent variable, then the mean of 10 error criteria of the 10-fold cross validation method are calculated which are reported in Figure (6). The closer these errors are to zero, the better the models learn. The SMAPE error, if multiplied by 100, indicates the percentage of symmetric mean absolute error. This error, according to its definition, is a number between 0% and 200%. As shown in the figure, the Cart algorithm has a SMAPE value of 13.9%, and considering the range of this error, it is

acceptable. Also, by observing the MAE with a mean of 0.021 for 10 performances with different training data, it can be said that the Cart decision tree can predict and recognize the importance of independent variables to influence the quality of financial reporting with low error.

But what we need to worry about is the phenomenon of over-fitting. For this reason, to examine the generality of the models presented, the error rates of MAE, MSE, and SMAPE for explaining the dependent variable of financial reporting quality for companies in 2017, the tests of the companies that were set aside by the 10-fold validation method in each replication and the algorithms have not yet seen them, have been obtained. For each error criterion, 10 errors each reported by the 10-fold validation method, are acquired and the mean of these errors is shown in figure . Similar to the previous one, it is concluded that the obtained models are general, that is, they perform well for companies that have never seen them, and that the problem of over-fitting did not occur, as the difference between the error criteria of the training and evaluation data is negligible.

**Figure 6: The errors mean for evaluation of training rate of decision tree model**

Fold	MSE Train	SMAPE Train	MAE Train
1	0/00072	0/44	0/0212
2	000/70	0/133	0/0208
3	0/00061	0/131	0/0196
4	0/00068	0/139	0/0204
5	0/00075	0/141	0/215
6	0/00071	0/137	0/0210
7	0/00077	0/145	0/0217
8	0/00037	0/143	0/0210
9	0/00071	0/135	0/0208
10	0/00072	0/142	0/0212
AVG	0/00071	0/139	0/021

**Figure 7: Mean of errors for estimating the power of decision tree model explanations**

Fold	MSE Test	SMAPE Test	MAE Test
1	0/00059	0/102	0/0183
2	0/00079	0/216	0/0220
3	0/00170	0/128	0/0350
4	0/00096	0/137	0/0256
5	0/00042	0/122	0/0156
6	0/00067	0/163	0/0202
7	0/00022	0/087	0/0138
8	0/00055	0/109	0/0203
9	0/00069	0/185	0/0221
10	0/00065	0/112	0/0181
AVG	0/00072	0/145	0/0211

## **Discussion and Conclusion**

The purpose of this study was to investigate the impact of social and professional identity characteristics of audit committee and internal accounting members and governance system features on the quality of financial reporting. For this, the financial information of 79 companies in 2017 was used. The results of the governance system features indicate the impact of the dual role of the CEO and the proportion of institutional owners on the quality of financial reporting, which can be argued that the corporate governance mechanisms can reduce opportunistic behavior, which can improve the quality of information while reducing agency costs. One of the most important tasks that a corporate governance system can undertake is ensuring the quality of the financial reporting process. Al Sufy et al. [3] stated that applying a corporate governance system affects the quality of financial information and makes the information more accurate and high quality. Chang, J. Ch & Sun, h. L [8] found in a study that after financial scandals, investors were more aware that the dual role of a CEO may jeopardize the trustee's role of board of directors in overseeing financial reporting. In addition, they argued that dual role of the CEO could potentially increase the risk of the CEO being the ultimate decision maker in financial reporting. The results of the research of Moeinuddin and Dehghan [22] indicate that there is a significant relationship between the percentage of ownership of institutional investors and the final score of corporate disclosure and its components. Nikbakht and Ahmad Khan Beigi [25] and Mehrani et al. [21] also found a direct relationship between institutional ownership and financial reporting quality. The results of audit committee criteria indicate the impact of audit committee social identity and the number of internal audit staff on financial reporting quality. It can be said that effective audit committees increase the validity of audited financial statements as a determining factor in the financial reporting process. Members of this committee cooperate with the board of directors who is responsible for safeguarding the interests of shareholders, and monitor the quality and desirability of financial statements, accounting, auditing, internal control, and the reporting process [27]. As stated in the theoretical foundations, the experience of the members of the audit committee in the area of public sector accounting, investment, financial management and

executive management has a significant impact on increasing the efficiency of the audit committee. Ralph and Alfred [29], Al-Shaer et al. [5] Kibiya, et al. [18]; Habib and Bhuiyan [15]; Sun et al [31]; Parsa and Motevasel [26]; Fotouhi [13] and Heidari [16] pointed out the relationship between audit committee characteristics and the quality of financial reporting. Mousavi Shiri [2245]; Alavi et al. [4] and Zarei and Qasemi [37] state that audit committee oversight and the financial expertise of internal auditors also have no impact on the quality of financial reporting. According to the results of the study, it seems that the role of corporate governance system and social identity of the audit committee and internal auditor in Tehran Stock Exchange is effective on enhancing the quality of corporate financial reporting; therefore, the audit committee has a positive impact on the performance of the accounting and internal audit units as well as the financial reporting quality of each entity if it is established to function properly in the entities, so the formation of this committee should be considered important.

It is recommended that shareholders and general assemblies of corporations seek to appoint non-executive directors for their board to enhance the quality of financial reporting in addition to enhancing the independence of the board of directors.

Users of financial reports should also be aware that having supervisory mechanisms provides sufficient assurance of information quality and reduction of information asymmetry.

The Securities and Stock Exchange Organization should implement a coherent system for evaluating the quality of corporate governance system, and oblige companies to a greater extent to implement effective and efficient corporate governance system.

In addition, by expanding the theoretical studies and literature of the corporate governance system, stock exchange activists, corporate board members, shareholders, audit firms, researchers, ... become more familiar with corporate governance issues so that they can, appropriately play a role in the corporate governance system and therefore enhance the quality of corporate financial reporting.

It should be noted that the social identity of the audit committee and their past experience play an important role in the efficiency of the audit committee's duty, so we recommend this to companies decision makers.

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