Journal of System Management (JSM)
Online ISSN: 2538-1571, Print ISSN: 2322-2301
**10(2), 2024, pp. 17-31**

Received: 20/09/2023
Accepted: 19/12/2023

**RESEARCH ARTICLE** **Open Access**

# Designing Casual Model to Eliminate Weak Points of Implementing Internal Controls in Educational Institutions Fuzzy Dimetal Technique

Mohsen Farahmand[1], Mohammad Mahmoodi[*2], Amir Reza Keyghobadi[3]

**Abstract**
Today, internal controls have grown so dramatically that we see its progress towards internal consulting in the company's risk management operations. The current research was carried out with the aim of designing a causal model to eliminate the weak points of implementing internal controls in educational institutions according to the Fuzzy Dimtel method. This research is of mixed type (qualitative-quantitative) in terms of nature and content. Information of this research is related to 15 experts in educational institutions (Azad University, higher education, non-profit institutions), which constitute the statistical sample. This research is descriptive in terms of data collection and analysis, practical in terms of purpose, and documentary in terms of method. In order to collect data, the tool of paired comparison questionnaire is used. The results of this research showed that the four main factors of risk components, operational risk, independence of the board of directors, and institutional ownership have an effect on the weak implementation of internal controls. Also, Dimtel's method showed that the factor of independence of the board of directors with an average influence of 18.740, the factor of institutional ownership with an average impact of 9.497 and the factor of risk components with an average impact of 8.742, are among the influential factors. On the other hand, operational risk factor with an influenced average of 14.975 is an influenced factor.

***Keywords:*** *Internal controls implementation weak point, Educational institutions, Fuzzy Dimtel method*

## Introduction

Today, function of internal controls is continuously improving and is moving from just issuing audit report in the form of shortage and weakness in organization internal controls as initial traditional role towards presenting managerial guidelines to company managers. Internal controls can help in controls assessment and provide a defensive line against risks which the organization encounters them (Bahiraie & Rahmanin, 2015). Indeed, although role of internal controls emphasizes internal control supervision and financial consideration, internal controls have significantly grown in recent years and we see their progress towards internal consultation in company risk management operations (Alzeban & Gwilliam, 2021). From viewpoint of the Institute of Internal Auditors (IIA), an activity is reliable and a consultation is independence and unbiassed that has been designed for increasing value and improvement of organization operations (Khatami et al., 2017). Internal controls help organization in achieving its goals through providing systematic and regular practice to assess and improve effectiveness of control risk

1. PhD student, Department of Accounting, Firoozkooh Branch, Islamic Azad University, Firoozkooh, Iran
2*. Associate Professor, Department of Accounting, Firoozkooh Branch, Islamic Azad University, Firoozkooh, Iran (Corresponding Author: mahmoodi_1978@yahoo.com)
3. Associate Professor, Department of Accounting, Central Tehran Branch, Islamic Azad University, Tehran, Iran

management and governance processes. Purpose of internal controls informs management in the field of existence of reasonable internal control system and its efficacy and effectiveness so that can protect organization against loss resulting from risk types (Jahanbani & Bagherpoor, 2017). According to Iran Audit Standard number 610, scope and purpose of internal control units include considering accounting and internal control systems, considering financial and operational reports, considering economic profit, efficacy and effectiveness of operations of economic unit including non-financial controls of aforementioned unit, considering adherence to ules, regulations and other requirements external and internal to organization and policies and instructions of management. In the past, internal controls were counted as considerable and supervisory function whose purpose was help in attaining confidence about reliability of accounting information and protecting company's properties. In recent years, role of internal controls has evolved and undergone two main changes (Bahiraie & Rahmanin, 2015). From one hand, subject of companies' governance disciplines, has been attended around the world recently and internal controls from new dimension as one of mechanisms designed for assurance of this case are considered to see whether interests of management and other stakeholders are in one direction (Spira & Page, 2017). From other hand, internal controls have developed their operation scope and beside consideration audit, they also manage risk and important operations like projects and technology (Jahanbani & Bagherpoor, 2017). Internal controls have important and critical role in managing and governing organization operations. Organizations with effective and efficient internal controls unit have better assessment for identifying dangers of business, processes and their business system, and use appropriate modifying efforts for improving environment of their business, continuously. Manager should be aware of performance of different parts of organization under their management so that can demand their various needs in the fields of implementation and information and assess different parts. Internal controls are from important elements of modern organizations which want to progress in today's competitive,environment, and having internal control units according to its multi-aspect functions, is a big help to organizations in achieving these goals (Yeganeh et al., 2013). Internal controls unit is from components of internal control and from main elements of controlling environment and organizational governance of business unit, and is responsible for continuous assessment of internal controls system efficacy and assurance of its correct implementation by related parts of organization. Furthermore, internal controls unit of effective management markets, is for assurance of consideration of established circular letters, regulations and instructions and consideration of related rules and requirements. Internal controls, is an independent assessment action whose purpose is helping governors, in organizing systematic relation between decision makers and different levels of performer of made decisions through assessing amount of effectiveness of instructions for methods and controls efficacy and reflection of results in the form of a structured report (Ekhlasmand et al., 2023). Although internal auditors like independent auditors don't have real and seeming independence, but, if they are under supervision of board of directors or CEO, will have more independence than other states (Dee et al., 2018). Studies of Price Water house Coopers (PWC) about big European companies show that 88% of studied companies have internal controls unit, and in most cases, audit committee has considered and approved scope of tasks and activities of internal audits (Rezaee et al., 2023). Internal auditors help audit committee in performing its responsibilities particularly in the field of considering and assessing internal controls, malversations and other internal investigations. Internal controls unit needs support of management and board of directors. Internal auditors should always have open relation with audit committee and

access it without any limitation. In companies without internal controls unit, audit committee should consider whether creation of internal controls unit is in favor of company or not (Fateh et al., 2023). Manager of internal controls should have at least one annual private meeting with committee and should be invited to attend in meetings of audit committee, if possible. Audit committee has increased independence of auditors through supervising work of internal controls. The stronger association between audit committee and internal controls unit, possibility of providing independence and thus maintaining neutrality and increasing effectiveness of internal auditors in internal control operations and reporting will be more (Shamshiri Yeganeh, 2021). According to mentioned matters, main purpose of this research is designing casual model to eliminate weak points of implementing internal controls in educational institutions.

## Research theoretical framework and background

Sarbanes–Oxley Act was the most important effort in the field of implementing revelation of reporting internal controls weak points. This act was approved in United States and because of huge financial scandals. This rule was propounded due to lack of any rule about necessity of management or audit for revealing effectiveness of internal controls (Burke et al., 2018). Although, before Sarbanes–Oxley Act, jut some limited companies assessed and reported effectiveness of internal controls, voluntarily goals (Behrouz et al., 2023). According to this act (section 302 and 404), managers and also independent auditors are required to provide report about efficacy of company internal controls in financial reporting, that means mangers of companies under coverage of this act have to reveal internal controls and its main weak points in annual reports (Ahmad et al., 2016). Also, they should confirm effectiveness and efficacy of internal controls. So, these requirements were in line with improving companies' performance, market risk decrease and supporting interests of stakeholders and other beneficiaries (Glaeser et al., 2017). It is one of the most fundamental factors and tools that managers have for implementing their policies and methods in direction of achieving their goals, is increasing wealth of stakeholders of internal controls (Du et al., 2018) that in recent years has been attended largely. Due to increase of importance of malversation and its evidence including financial corruption, money laundering and bribe on society economy and disability of auditors in discovering important malversations that have revealed recently and according to society demand and for preventing decrease of profession credit and protecting public interests, we need more practical and evident guidelines and more supervision to control this important issue (Mohammadi, 2019). In this regard, based on instruction of internal controls of propagators accepted in Tehran Stock Exchange and Iran Farabourse approved in 2012, board of directors of companies accepted in Tehran Stock Exchange and Iran Farabourse were required to make sure about establishment and use of appropriate internal controls and effectiveness to achieve company's goals and reveal its results in a report entitled *internal controls report* (Cheraghi et al., 2018). Designing and establishing internal control systems in economic units is counted one of the most important factors of effectiveness and efficacy, operation of promoting responsibility and clarity, considering regulations and helping in preventing malversation and financial exploitation (Pourheidari et al., 2018).

Shamshiri Yeganeh (2021) has performed research entitled factors in internal controls effectiveness in National Iranian Oil Company and subsidiary companies. Accordingly, five intra-organizational factors including internal auditors competence, number of individuals who are in internal controls unit, relation between internal auditors and independence auditors, amount of support by organization management for internal controls unit and amount of independence in internal controls unit, have

become 5 main hypotheses of this research and therefore, influence of five above factors as independent variable on effectiveness of internal controls as dependent variable has been tested. Research has been done by census method and among mangers and chairmen and all employees of accounting and audit units of Iranian Oil Company and information has been collected using questionnaire. Results show that in Iranian Oil Company and its subsidiary companies, independent variables, competence of internal auditors and amount of support by management of internal controls have direct influence on internal controls effectiveness and size of internal controls unit has reverse influence on internal controls effectiveness. Also, independent variables, relation between internal auditors and independent auditors and also amount of independence of internal controls unit has no influence on internal controls effectiveness. Mohammad Taghizadeh (2020), in research entitled *considering factors influential in effectiveness of internal controls*, has considered factors in internal controls effectiveness in companies accepted in Tehran Stock Exchange. Accordingly, existence of five characteristics of internal controls performance, relation between internal auditors and independent auditors, management support, independence of internal controls unit and role of audit committee in internal controls unit was considered through answers resulting from 161 questionnaire completed by internal auditors working in companies accepted in Tehran stock Exchange. Results show that relation between internal controls performance, senior manager support, internal controls unit independence, audit committee in internal controls units and internal controls effectiveness, is significant. In addition, results indicate that there's no significant relation between internal auditors and independent auditors with effectiveness of internal controls in companies accepted by Tehran Stock Exchange. Results also propounded role of internal controls committee as the most important factor.

Mohammad (2019) in his research entitled *Identifying factors influential in internal controls effectiveness in public systems of Iraqi Kurdistan Regional Government*, collected necessary information through distributing two questionnaires, first related to auditors and second specific to managers. Research findings showed that internal controls effectiveness is largely influenced by management support, then professional skill is in internal controls effectiveness. While, about other factors, *organizational independence*, negative correlation with internal controls effectiveness has been obtained.

Momenzadeh (2018) in research entitled *Considering role and effectiveness of internal controls in university,* through testing collected data by distributing questionnaire between managers and internal auditors of Tehran Universities of Medical Science, showed that from viewpoint of managers and internal auditors of university, the most important factors in internal controls performance effectiveness are: increasing awareness and skill of internal auditors through participating in professional competence training courses for supplying organizational position and independence of internal auditors, holding regular meetings between managers and internal auditors and tracing implementation of internal auditors' report supported by management.

In another research, Alzeban and Gwilliam (2021) have considered factors influential in effectiveness of internal controls in public section of Saudi Arabia. Accordingly, five factors including internal auditors' competence, size of internal controls unit, relation between internal auditors and independent auditors, amount of support by company management of internal controls unit and amount of independence of internal controls unit, have been tested as factors influential in effectiveness of internal controls effectiveness. Data was collected through questionnaires distributed among 203 managers and 231 internal auditors in 79 companies in public section of Saudi Arabia. Results showed that management support has

the most influence on internal controls effectiveness and then size of internal controls unit, employees' competence, internal controls independence and internal auditors' relation with independent auditors influence internal controls effectiveness.

Ahmad et. al (2019) report in their research that "shortage of number of internal auditors" was ranked as main barrier against internal controls in Malaysia public section by respondents. They found that management support is the second determinant factor with importance of internal controls after factor of audit employees' efficacy. They showed that through management's support, audit recommendations are used and internal controls are supplied in terms of employee's number and budget. They found that lack of competent employees in the field of knowledge, experience and training about internal controls, has had negative influence in role of internal controls, and training was suggested as an important requirement in improving work of internal controls.

Mihret and Pisma (2018), in Ethiopia, using combined method of interview and questionnaire, identified organizational features that improve internal controls effectiveness. They found that internal controls quality largely influences effectiveness of internal controls, although organizational regulations and employer's features had weaker influences. They also found that lack of support from management has negative influence on performance of internal controls, because it causes creation of weak attitude by employer so that since internal controls aren't in senior management's agenda, considers it unimportant. They referred to this matter that lack of competent employees caused weakness of internal controls in public section of Ethiopia. This research suggests that internal controls employers without educational certificate be able to promote their skill through continuous professional training.

Bierly et. al (2016) in their research, expressed relation between sufficient number of employees and ability of internal control units in performing their duties. They found that internal controls units in Sudan face high shortage of employees and this causes disability in performing their duties.

## Factors influential in human resource development in Islamic Azad University

### Risk components

Continuous collapse of big companies that have presented incorrect image of company's existed risk, has demonstrated domain and profitability of information reveal (especially about risk) more than before. This status has encouraged regulators of financial and accounting rules to review status of revealing required information, ultimately, such status of information reveal about risk, has caused significant importance of companies. Company risk can be defined as possibility of negative effect in the future on company economic situations. Risk reveal should be created from a corporative risk management process. In current framework, risk management has become a fundamental part of internal organizations control and corporative governance and a main element of business domain. Focus of risk management has been on determining and decreasing risk and its purpose is adding maximum stable value to all activities of organization (Mehrani, 2016). Risk management process also produces risk information that can be accessed by public. Risky information reveal is considered as one important responsibility for managers, and creates this assurance that "stakeholders and other beneficiaries know about main risks and dimensions of company, well (Al-Twaijry et al., 2016). Risk report is valuable for investors. Risk reveal not only provides more information about risk characterizations of mentioned companies for investors but also can improve investors' investment decisions (Carson, 2019). From other hand, assessment of risk components, requires company to perform a dynamic and repetitive trend for identifying and assessing risks in relation to achieving goals and prevents its negative effect on company that includes various strategies of risk like risk acceptance, risk

transfer, risk division and risk prevention. Other component that is controlling activities, is efforts created through policies and practices making assurance that management's instructions are performed to decrease risks in achieving goals and controlling activities are performed in all layers of an organization. Therefore, risk reveal plays an important role in decreasing number of internal controls weak points in the future and in improving internal control power.

**Institutional ownership**

Since internal control system has close relation with corporative governance, therefore, weakness of internal controls often accompanies with weak corporative governance. In this condition, supervision control on management's opportunistic behavior will be difficult. Therefore, institutional investors as corporative governance mechanism, can play important role in many systems of corporative governance. and management's decisions (Center et al, 2020). Previous studies have shown that institutional investors with high stocks can benefit from higher level of supervision because they have motivations for improving corporative governance and influencing managers' behavior (Al-Twaijry et al., 2016). According to Chung, Fert and Kim (2002), institutional owners can control their manages' opportunistic behavior. Mitra and Karidi (2005) show reverse relation between institutional ownership and accrual management, such that institutional ownership plays important role in decreasing managers'. opportunistic reporting behavior. It seems that companies with higher institutional ownership, encounter higher accuracy and hence, it's less likely that they encounter serious problems in internal controls.

**Operational risk**

Due to increasing development and complexity of economic units, need to establishment of internal control has been seriously attended as an inseparable part of efficient management system. A good control should consider several risks which an organization encounters in different parts or operational phases and provide effective management mechanism for preventing risk emergence in environment. Furthermore, providing clear hierarchy for classification of risk factors can lead effective risk management (Naiker et al., 2019). Meol Broke believes that in operational risk, all risks that influence organization value are identified and assessed (Shamshiri Yeganeh et al., 2021). According to Banker and Sirohi (2005), operational risk can occur due to lack of efficacy of personnel and individuals, technology and work trend. In process of company comprehensive risk management, some techniques are used for operational risks management whose stages are: identifying operational risks, ranking identified risks and making appropriate decisions in encountering these risks. However, company comprehensive risk management process looks for techniques to decrease operational risks that ultimately causes increase of efficacy and decrease of internal controls weak points (Mohammad Taghizaderh, 2020).

**Board of directors' independence**

Representation theory provides framework to join corporative governance with internal controls. According to representation theory, corporative governance tries to decrease high expenses of representation through increase of voluntary reveal using supervisory systems like presence of independent managers in board of directors of company. Therefore, independent member of board of directors are there to act as a controlling mechanism and independent supervisory performance. Many studies have been done in United States for considering relation between characteristics of board of directors and weakness of internal controls (Spira et. al, 2017). They provide evidence on relation between board of directors' independence.and.internal controls weak points. In Egypt, Khalifeh et al. (2016) has reported partial relation between board of directors' independence and internal controls

weak points. According to Chen, Nachel and Maricity (2017), managing director's duality. influences relation between board of directors' independence. and revealing internal controls weak points in United States (Pourheidari et al., 2018). Therefore, company's board of directors and senior managers have important role in determining adaptation of internal controls.

## Research Questions

1. what factors are influential in eliminating internal controls weak points implementation in educational institutions?
2. How is causal model for eliminating internal controls weak points implementation in educational institutions?

## Research Population and Statistical Sample

Statistical population of this research is all professionals in educational institutions (Azad University, higher education, non-profit institutions) that based on fuzzy dimtel method, 15 individuals are sufficient for sample volume.

## Research Method

In terms of information collection and analysis, this research is descriptive and in terms of purpose is applied and in terms of method is documentary.

## Dimtel Fuzzy Method

Fuzzy set can encounter human's thinking and talk in decision-making. To confront ambiguities involved in decision-making process, verbal assessment can be effective. A verbal variable is variable that expresses values as phrases and sentences in a natural language. Verbal variables are used as variables whose values are not numbers but are lingual phrases and describe quantitative phrases effectively. Verbal phrase method is a natural and effective way for decision makers in expressing their assessment. In practice, verbal values can be shown by fuzzy numbers and usually triangular fuzzy numbers are used (Wang et al., 009).

A fuzzy set $\tilde{A}$ is a subset of phrase X that is a set of ordered pairs and is shown by membership function $M_{\tilde{A}}(x)$, $M_{\tilde{A}}(x): X \rightarrow [0,1]$. Value of $M_{\tilde{A}}(x)$ function for fuzzy set $\tilde{A}$, is called membership value of X in $\tilde{A}$, that shows a degree that x is an element of fuzzy set $\tilde{A}$. It is assumed that $M_{\tilde{A}}(x): X \in [0,1]$ that $M_{\tilde{A}}(x) = 1$ indicates that x belongs to $\tilde{A}$ while $M_{\tilde{A}}(x) = 0$ indicates that x doesn't belong to fussy set $\tilde{A}$.

$$\tilde{A} = \{x, \mu_{\tilde{A}}(x)\}, \qquad x \in X \quad (1)$$

That $M_{\tilde{A}}(x)$ is membership function and X = {x} is a set of elements of x.

A triangular fuzzy number $\tilde{N}$ can be defined as a triad (l, m, r) and membership function can be defined as $M_{\tilde{N}}(x)$:

$$\mu_N(x) = f(x) = \begin{cases} 0, & x < l \\ (x-l)/(m-l), & l \le x < m \\ (r-x)/(r-m), & m \le x < r \\ 0, & x \ge r \end{cases} \quad (2)$$

That m, l and r are real numbers and l < m <r. According to characteristics of fuzzy triangular numbers and propounded development principle. Operational rules of two triangular fuzzy numbers, $\tilde{A} = (a_1, a_2, a_3)$ and $\tilde{B} = (b_1, b_2, b_3)$ are as following:

summation of two fuzzy numbers $\oplus$: $(a_1, a_2, a_3) \oplus (b_1, b_2, b_3) = (a_1 + b_1, a_2 + b_2, a_3 + b_3)$

substraction of two fuzzy numbers $\ominus$: $(a_1, a_2, a_3) \ominus (b_1, b_2, b_3) = (a_1 - b_1, a_2 - b_2, a_3 - b_3)$

multiplication of two fuzzy numbers $\otimes$: $(a_1, a_2, a_3) \otimes (b_1, b_2, b_3) \cong (a_1 b_1, a_2 b_2, a_3 b_3)$

multiplication of any real number by one fuzzy number: $k \otimes (a_1, a_2, a_3) = (ka_1, ka_2, ka_3)$

division of two fuzzy number $\oslash$: $(a_1, a_2, a_3) \oslash (b_1, b_2, b_3) \cong (a_1/b_1, a_2/b_2, a_3/b_3)$

To confront problems of group decision making in a fuzzy environment, one collective fuzzy method is required. Human's judgement with fuzzy verbal variables, are fuzzy numbers, that is a defuzzification method for transforming definite elements to required scores. CFCS defuzzification method (transforming fuzzy numbers into crisp score) is based on determining left and right scored by fuzzy minimum and fuzzy maximum, and total determined score according to a weighted average with regard to membership functions. This provides a more appropriate definite value compared to other methods. To implement DEMATEL method scientifically, for group decision making in fuzzy environment, process has been shown as following:

Stage 1: Designing fuzzy verbal scale: to confront ambiguities of human's assessment, verbal variable of "influence" with five verbal terms like {no, very low, ow, high, very high} is used that are expressed in fuzzy triangular positive numbers (rij, mij, lij) as is shown in the Table 1 [42].

Table 1.
*Fuzzy numbers*

| **Verbal options** | **Definite numbers** | **Triangular fuzzy numbers** |
|---|---|---|
| Very high influence | 4 | (0.75, 1, 1) |
| High influence | 3 | (0.5, 0.75, 1) |
| Medium influence | 2 | (0.25, 0.5, 0.75) |
| Low influence | 1 | (0.0, 0.25, 0.5) |
| Without influence | 0 | (, 0, 0.25) |

Stage 2: Fuzzy calculation of direct influence matrix: based on experts' opinions, fuzzy direct influence matrix $\widetilde{D}$ can be obtained with verbal scales from natural language and relation between elements through following formula:

$$\widetilde{D} = [\widetilde{d}_{ij}]_{n\times n} \quad \text{that} \quad \widetilde{d}_{ij} = (d_{ij}^{l}, d_{ij}^{m}, d_{ij}^{r}) \qquad (3)$$

So, matrix D has been achieved through direct relations, and paired comparison show its cause-and-effect relation. Assume that *n* is variable existed under influence of this system; direct influences matrix *D* is shown in the following matrix:

$$\begin{bmatrix} 0 & d_{12} & \cdots & d_{1n} \\ d_{21} & 0 & \cdots & d_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ d_{n1} & d_{n2} & \cdots & 0 \end{bmatrix}$$

Stage 3: Normalizing fuzzy direct influence matrix: based on fuzzy direct influence matrix $\widetilde{D}$, normalized fuzzy direct influence matrix $\widetilde{N}$ can be obtained through following formula:

$$\widetilde{N} = \widetilde{D}/_{u} \qquad (4)$$

That

$$u = \max_{i,j}\left\{\max_{i}\sum_{j=1}^{n} d_{ij}, \max_{j}\sum_{i=1}^{n} d_{ij}\right\} \quad , i,j \in \{1,2,\dots,n \qquad (5)$$
$$\widetilde{N} = [\tilde{e}_{ij}]_{n\times n}, \tilde{e}_{ij} = (e_{ij}^{l}, e_{ij}^{m}, e_{ij}^{r})$$

Stage 4: obtaining fuzzy total influence matrix: when normalized fuzzy direct influence matrix $\widetilde{N} = (N_1, N_m, N_r)$ is obtained, that Nl=[elij]n*n and Nm=[emij]n*n and Nr=[erij]n*n, fuzzy total influence matrix $\widetilde{T}$ is obtained through following equation. I is a unit matrix:

$$\widetilde{T} = [\tilde{t}_{ij}]_{n\times n}, \lesssim \tilde{t}_{ij} = (t_{ij}^{l}, t_{ij}^{m}, t_{ij}^{r}) \qquad (6)$$

Stage 5: Defuzzification to definite values: using CFCS method that was shown in equations, fuzzy total influence matrix $\tilde{T} = [\,]n * n$ with definite values is transformed into defuzzied total influences matrix T = [] n * n.

$$x = [\tilde{t}_{ij}]_{n\times n} \quad \text{that} \quad \tilde{t}_{ij} = (t_{ij}^{l}, t_{ij}^{m}, t_{ij}^{r}) \qquad (7)$$

Stage 6: Determining threshold value
Threshold value is calculated through defuzzification matrix.

$$x = [\tilde{t}_{ij}]_{n\times n}\alpha = \left(\sum_{I=1}^{N} \sum_{I=1}^{N} \mathrm{I[TIJ]}\right)/\mathrm{N} \qquad (8)$$

Stage 7: Results analysis: in this stage, total of rows (given influence) and total of columns (received influence) is expressed separately as vector $d = (d_1, \dots, d_i, \dots, d_n)'$ with factor j = (1, 2, …, n) and vector $r = (r_1, \dots, r_i, \dots, r_n)'$ with factor I (i=1, 2, …, n) using following equations. Then, when $i, j \in \{1, 2, \dots, n\}$ and i=j, horizontal axis vector $(d + r)$ is formed with vector R that shows total important influence of each criterion. Similarly, vertical axis vector $(d - r)$ is formed with deduction of vector D from vector R, that may separate criteria into one group and one influenced group. Overall,

when value of $d_i - r_j$ is higher, criterion belongs to cause group. In contrast, if value of $d_i - r_j$ is lower, criterion belongs to influenced group. Therefore, diagram of cause and influence can be obtained by drawing data collections of $(d_i - r_i)|(d_i + r_i)$ {i = 1, 2, …, n}:

$$T = [t_{ij}]_{n\times n'} \quad i,j \in \{1,2,\dots,n\} \tag{9}$$

$$d = \left[\sum_{j=1}^{n} t_{ij}\right]_{n\times 1} = [t_i]_{n\times 1} = [d_j]_{n\times 1} \tag{10}$$

$$r = \left[\sum_{i=1}^{n} t_{ij}\right]'_{1\times n} = [t_j]_{n\times 1} = [r_j]_{n\times 1} \tag{11}$$

That vector $d = (d_1, \dots, d_i, \dots, d_n)'$ is total of rows and vector $r = (r_1, \dots, r_i, \dots, r_n)'$ is total of columns based on total influence matrix $T = [t_{ij}]_{n\times n}$.

## Results of Data Investigation

Information investigation is a multi-stage process within which after collecting data and calculating value of variables intended for research questions, resulted information has been tested and questions will be answered based on finding obtained from results.

**Question 1: what factors are influential in eliminating internal controls weak points implementation in educational institutions?**

According to theoretical principles of this research, four main factors have been identified to eliminate weak points of internal controls in educational institution that are as following

1. Risk components
2. Institutional ownership
3. Operational risk
4. Board of directors' independence

To consider cause-and-effect relations between main factors influential in eliminating weak points of internal controls in educational institutions, dimtel method is used. First, questionnaire of paired comparisons was distributed among 15 professionals of research and then in next stage, dimtel method is applied on information.

**Question 2: How is causal model for eliminating internal controls weak points implementation in educational institutions?**

In this part, we want to determine cause-and-effect relations between factors influential in eliminating internal controls implementation weak points in educational institutions; so, in the following, findings in each of stages of fuzzy dimtel is provided.

Stage 1: Designing fuzzy verbal scale: to confront ambiguities of human's assessment, verbal variable of "influence" with five verbal terms like {no, very low, ow, high, very high} is used that are expressed in fuzzy triangular positive numbers (rij, mij, lij).

Table 2.
*Fuzzy Verbal Scales*

| Verbal options | Definite numbers | Triangular fuzzy numbers |
|---|---|---|
| Very high influence | 4 | (0.75, 1, 1) |
| High influence | 3 | (0.5, 0.75, 1) |
| Medium influence | 2 | (0.25, 0.5, 0.75) |
| Low influence | 1 | (0.0, 0.25, 0.5) |
| Without influence | 0 | (, 0, 0.25) |

Stage 2: Fuzzy calculation of direct influence matrix: based on experts' opinions, fuzzy direct influence matrix $\widetilde{D}$ can be obtained with verbal scales from natural language and relation between elements mentioned in Table 2, through following formula:

$$\widetilde{D} = [\widetilde{d}_{ij}]_{n\times n} \quad \text{that} \quad \widetilde{d}_{ij} = (d_{ij}^{l}, d_{ij}^{m}, d_{ij}^{r})$$

In the following Table, direct influence fuzzy matrix resulted from experts' opinion, is presented.

Table 3.
*Direct influence fuzzy matrix for four main factors*

| Matrix D | Risk components | | | Operational risk | | | Board of directors' independence | | | Institutional ownership | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Risk components** | 0.00 | 0.00 | 0.25 | 0.23 | 0.28 | 0.73 | 0.00 | 0.03 | 0.28 | 0.00 | 0.22 | 0.47 |
| **Operational risk** | 0.03 | 0.20 | 0.48 | 0.00 | 0.00 | 0.25 | 0.03 | 0.05 | 0.33 | 0.00 | 0.05 | 0.30 |
| **Board of directors' independence** | 0.72 | 0.97 | 1.00 | 0.70 | 0.93 | 0.98 | 0.00 | 0.00 | 0.25 | 0.68 | 0.93 | 0.97 |
| **Institutional ownership** | 0.07 | 0.23 | 0.55 | 0.27 | 0.28 | 0.77 | 0.03 | 0.03 | 0.32 | 0.00 | 0.00 | 0.25 |

Stage 3: Normalizing fuzzy direct influence matrix: based on fuzzy direct influence matrix $\widetilde{D}$, normalized fuzzy direct influence matrix $\widetilde{N}$ can be obtained through following formula:

$$\widetilde{N} = [\tilde{e}_{ij}]_{n\times n};\ \tilde{e}_{ij} = (e_{ij}^{l};\ e_{ij}^{m};\ e_{ij}^{r})$$

Normalized state of direct influence fuzzy matrix resulted from experts' opinions for four main factors is presented in Table 4.

Table 4.
*Normalized state of fuzzy direct influence matrix for four main factors*

| Matrix N | Risk components | | | Operational risk | | | Board of directors' independence | | | Institutional ownership | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Risk components** | 0.00 | 0.00 | 0.12 | 0.11 | 0.13 | 0.35 | 0.00 | 0.02 | 0.13 | 0.00 | 0.10 | 0.22 |
| **Operational risk** | 0.02 | 0.10 | 0.23 | 0.00 | 0.00 | 0.12 | 0.02 | 0.02 | 0.16 | 0.00 | 0.02 | 0.14 |
| **Board of directors' independence** | 0.34 | 0.46 | 0.48 | 0.33 | 0.44 | 0.47 | 0.00 | 0.00 | 0.12 | 0.33 | 0.44 | 0.46 |
| **Institutional ownership** | 0.03 | 0.11 | 0.26 | 0.13 | 0.13 | 0.37 | 0.02 | 0.02 | 0.15 | 0.00 | 0.00 | 0.12 |

Stage 4: Obtaining fuzzy total influence matrix: when normalized fuzzy direct influence matrix $\widetilde{N}$ is obtained, fuzzy total influence matrix $\widetilde{\mathrm{T}}$ is obtained through following equation; I is a unit matrix:

$$\tilde{T} = N * (I - N)^{-1}$$

Fuzzy total influence matrix resulted from fuzzy direct influence for four main factors is presented in the following Table.

Table 5.
*Fuzzy total influence matrix for four main factors*

| Matrix T | Risk components | | | Operational risk | | | Board of directors' independence | | | Institutional ownership | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Risk components** | 0.00 | 0.04 | 2.09 | 0.11 | 0.17 | 2.68 | 0.00 | 0.02 | 1.28 | 0.00 | 0.12 | 1.88 |
| **Operational risk** | 0.02 | 0.12 | 1.90 | 0.01 | 0.03 | 2.14 | 0.02 | 0.03 | 1.13 | 0.01 | 0.05 | 1.58 |
| **Board of directors' independence** | 0.36 | 0.59 | 3.92 | 0.42 | 0.61 | 4.63 | 0.01 | 0.03 | 2.15 | 0.33 | 0.53 | 3.38 |
| **Institutional ownership** | 0.04 | 0.14 | 2.37 | 0.14 | 0.17 | 2.89 | 0.02 | 0.02 | 1.39 | 0.01 | 0.03 | 1.93 |

Stage 5: Defuzzification to definite values: using CFCS method, fuzzy total influence matrix with definite values is transformed into defuzzied total influences matrix. Matrix defuzzied into definite values resulted from fuzzy total influence matrix and by using following formula for four main factors, is presented in the following Table.

$$T^D = \frac{T_l + 2T_m + T_r}{4}$$

Table 6.
*Defuzzied matrix (definite numbers) for four main factors*

| | Risk components | Operational risk | Board of directors' independence | Institutional ownership |
|---|---|---|---|---|
| Risk components | 2.167 | 3.127 | 1.324 | 2.124 |
| Operational risk | 2.151 | 2.215 | 1.196 | 1.678 |
| Board of directors' independence | 5.464 | 6.269 | 2.225 | 4.782 |
| Institutional ownership | 2.695 | 3.364 | 1.448 | 1.989 |

Stage 6: Calculating value of threshold
Total: 44.2198
Threshold value: 2.763

According to obtained threshold value, in relations between defuzzification Table, relation between factors whose value is under threshold, isn't considered.

Table 7.
*Pure defuzzied matrix (pure definite numbers) for four main factors*

| | **Risk components** | **Operational risk** | **Board of directors' independence** | **Institutional ownership** |
|---|---|---|---|---|
| Risk components | 0 | 1 | 0 | 0 |
| Operational risk | 0 | 0 | 0 | 0 |
| Board of directors' independence | 1 | 1 | 0 | 1 |
| Institutional ownership | 0 | 1 | 0 | 0 |

According to above Table, factor of board of directors' independence influences all other factors purely but doesn't receive pure influence and from one hand, operational risk receives pure influence from all factors but isn't influenced purely.

Stage 7: Determining amount of importance and effectiveness and influence between dimensions

Following Table presents amount of effectiveness (D) and influence (R), amount of relation with other factors (D-R) and amount of importance of factor (D+R) among dimensions for four main actors.

Table 8.
*Importance and influence of dimensions (definite numbers) for four main factors*

| | **D** | **R** | **D-R** | **D+R** |
|---|---|---|---|---|
| Risk components | 8.742 | 12.478 | -3.736 | 21.221 |
| Operational risk | 4.241 | 14.975 | -7.734 | 22.216 |
| Board of directors' independence | 18.740 | 6.194 | 12.546 | 24.933 |
| Institutional ownership | 9.497 | 10.573 | -1.076 | 20.070 |

According to above Table, amount of influence of board of directors' independence is 18.74 and has the highest influence amount between factors. Also, it is influenced by amount of 6.194 that is the lowest amount among factors. Factor of board of directors' independence has the highest amount for relation between all factors and ultimately importance amount of this factor is 24.933 that has the first rank in importance and influence, and it can be told that is one of the most important factors in this research. So, to

eliminate weak points of internal controls implementation in educational institutions, four main factors *risk components*, *operational risk*, *board of directors' independence* and *institutional ownership* should be controlled. Until this point, research came to this conclusion that if independence of board of directors is managed, according to influence of this factor, other factors can be managed too, and thereby, weak points of internal controls implementation can be eliminated with very low expense and time. According to performed analyses about effectiveness and influence between factors of this research, as is shown in figure 1, a general model has been provided for relation between factors...

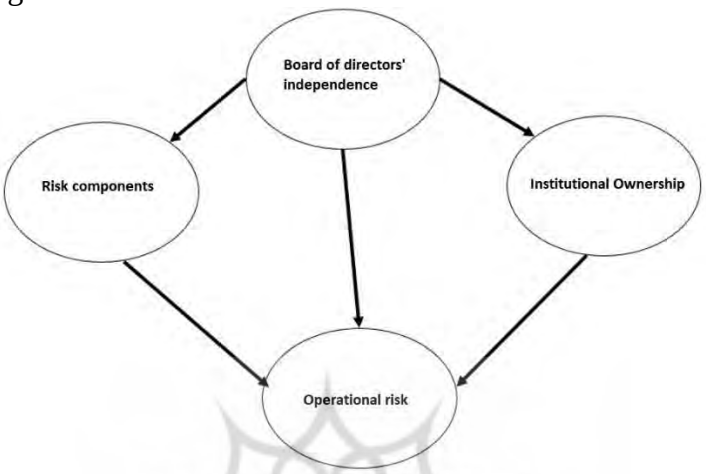


Figure 1. Model resulted from data analysis.

## Discussion and Conclusion

According to research findings, board of directors' independence factor with effectiveness average of 18.740, institutional ownership factor with effectiveness average of 9.497 and risk components with effectiveness average of 8.742 are the most influential factors. From one hand, operational risk with influence average of 14.975 is counted as influenced factor. In other words, independence of board of directors is influential in three other factors and institutional ownership and risk component factors influence operational risk and operational risk factor doesn't. influence. any factor. spira et al. (2017) reported a relationship between board independence and internal control weaknesses. Also, Chen, Nichol and Maristiti (2017) showed that CEO duality affects the relationship between board independence and disclosure of internal control weaknesses in the United States, which is consistent with the results of this study.

Mohammad Taghizadeh et al. (2020) showed that operational risk management follows techniques to reduce operational risks, which ultimately increases efficiency and reduces internal control weaknesses, which is consistent with the results of this study.

Altvari et al (2016) showed that companies with higher institutional ownership face more scrutiny and are less likely to have serious problems in internal control, which reduces internal control weaknesses and is consistent with the results of this study. Also, Karson (2019) showed that the components of corporate risk oblige them to perform a dynamic and iterative process for identifying and assessing risks in relation to achieving objectives and take steps to eliminate internal control weaknesses, which is consistent with the results of this study.Good role of corporative governance in company management cannot be underestimated, so, it is important to attend that corporative governance is related to internal controls and dangers. Presence of independent members in structure of board of directors, as one of the mechanisms of corporative governance, has significant role in decreasing company

internal controls weak points. If members of board directors are dependent to company management, haggling power of these members in presenting opinions, opposed to other members, will decrease and has bad effect on supervisory role implementation by them. Therefore, it is expected that independent and bigger board of directors have better supervision on company and internal controls be more effective. So, results show that independence of board of directors has important role in eliminating weak points of internal controls. From theoretical point of view, representation of uncommitted members' presence in structure of board of directors of companies, helps decreasing conflict of interest of managers and beneficiaries and causes decrease in information asymmetry between internal and external elements of company, therefore, current research emphasizes role which is expected that corporative governance has in decrease of opportunistic behaviors of management and weakness of internal control. Results of current research are compatible with results of research performed by Khalif and Samaha (2016). Undoubtedly, beside appropriate governance and ethical methods of business, internal control is key of survival for educational institutions. Previous studies show that educational institution with internal control weakness, unethical work methods and lack of social responsibility, will have weak performance and financial structure and their reputation will be damaged. Since risk is in any business activity, dimensions and complexity of risks will be more than past, so, identifying factors which create risk (that is identifying risks resulting from management decision of educational institutions and organizations for company output and input) is a necessary task for company. In this content, reveal related to risk, includes an extensive collection of information related to risk and will be from important decisions made by management. Report of information related to risk provides a lot of information about potential danger factors and their effect in operational situations of companies for investors, so, it plays important role in decreasing asymmetry of information between managers and investors. Furthermore, this report propounds information risk related to company potential danger factors and responses to this risk that reflects managers' ability in confronting uncertainties and fluctuations. Risk assessment and respond to risk is from fundamental steps in risk management that determines foundations of controlling company's risks. Companies can achieve maximum profit while decrease company's risk, if only assess risk carefully and perform appropriate efforts to confront risks. Revealing information related to risk includes a lot of information about activities related to risk assessment and control and is from key points of internal control quality. It's obvious that risk components report has positive effects on internal control quality. So, according to results of statistical analysis of collected information, revealing risk components causes elimination of internal controls weak points. According to signaling theory, companies that tend to present their ability in managing risk based on representation theory of risk components reveal, can achieve many results including decrease of internal controls weak points. In this regard, results show importance and effectiveness of risk components in increasing internal controls quality dominant on financial reporting. Results of current research, in some ways, is compatible with study performed by Spira et al. (2017). Institutional owners as one other mechanisms of corporative governance will have positive effect on corporative governance quality because institutional investors tend to invest in companies with good corporative governance structure. So, companies with higher institutional ownership more likely have better internal controls than financial report process and there is lower possibility that get into trouble in revealing internal controls weak points. Briefly, institutional ownership combination can influence internal control decisions. Results of current research are compatible with study of Barker et. al

(2018). Risk-taking is an inseparable element of company strategy and motivation for achieving goals and a part of decision making in organization. Operational risk is risk of loss resulted from inefficient internal processes, individuals and systems or external events that can disturb business operations. Operational risk can refer to both a company performance risk and strategies used by management in implementing company's policies. Therefore, operational risk management is a framework that can identify the most critical operational dangers in time and inform all individuals in all level of management with having enough information for performing necessary efforts. If operational risk management isn't performed appropriately, will cause disaster and ultimately lead to fall of company. Therefore, establishment of an operational risk management system can influence internal control system in the best manner. In this line, it is suggested that educational institutions have the most concentration on board of directors' independence because controlling and managing this factor causes control and management of the other factors as it is influential in all other factors and thereby, causes elimination of internal controls weak points with very low expense and time. Current study and presenting causal model of this research has been done for educational institutions and, so, generalization of obtained results to other sections should be performed cautiously.

## References


Ahmad, H., Othman, R., & Jusoff, K. (2019). The effectiveness of internal audit in Malaysian public sector. Journal of Modern Accounting and Auditing, 5(9), 53–62. 10.22108/ https://doi.org/.2019.112553.1301

Al-Twaijry, A., Brierley, J., & Gwilliam, D. (2016). The development of internal audit in Saudi Arabia: An institutional theory perspective. Critical Perspectives on Accounting, 14(5), 507–531. https://doi.org/ 10.22108/NMRJ.2021.124800.2225

Alzeban, A., Gwilliam D. (2021). Factors affecting the internal audit effectiveness: A survey of the Saudi public sector. Journal of international accounting auditing and taxation. 23, 74-86. https://doi.org/ 10.22108/FAR.2019.112553.1301

Bahiraei, Afsaneh and Rahmani, Ali (2015). Internal Audit and assessing effectiveness of soft controls. The third international conference on applied research in management and accounting, Tehran, Shahid Beheshti University. 10.22059/ACCTGREV.2018.246549.1007759.[In Persian]

Behrouz, M., Forghani, M. A., & Kazemi, M. (2023). Prioritizing the Implementation Barriers of Prison Entrepreneurship Program from Employees' Perspective (Case Study: Central Department of Kerman Prisons and Kerman Prison). Journal of System Management, 9(4), 27-40. 10.30495/JSM.2023.1980011.1773.[In Persian].

Brierley, J., El-Nafabi, H., & Gwilliam, D. (2016). The problems of establishing internal audit in the Sudanese public sector. International of Journal Auditing, 5(1), 73–87. https://doi.org/ 10.30495/JDAA.2223.699870

Burke, J., Hoitash, R., Hoitash, U., 2018. The use and characteristics of component auditors: Implications for US audits. Available at SSRN 3240212. 10.22108. https://doi.org/2020.119476.1529

Carson, E., 2019. Industry specialization by global audit firm network. The Accounting Rev. 84 (2), 355–382. 10.22108/FAR. https://doi.org/2020.119476.1529

Center for Audit Quality (CAQ), 2020. Comment letter in response to PCAOB request for public comment: Improving the transparency of audits: proposed amendments to PCAOB auditing standards and Form 2, PCAOB Rulemaking Docket Matter No. 29. https://pcaobus.org/Rulemaking/docket029/035b_caq.pdf.https://doi.org/10.30495/JDAA.2023.702089

Cheraghi, Jamila and Nazaripour, Mohammad, (2011). Importance and effectiveness of internal auditing in manufacturer companies, case study of Kermanshah province, management international conference. 10.22108/JAS.2022.129099.2125.[In Persian].

Dee, C.C., Gunny, K., Lulseged, A., 2018. External audit work and audit quality (August 30, 2018). Abstract available at SSRN: https://ssrn.com/ abstract=3241793. 20.1001.1. https://doi.org/23223405.1391.4.1.6.2

Ekhlasmand, S. S., Fattahi, M., & Salavati, S. (2023). Identifying the Components and

Indicators of Social Marketing in Small and Medium Businesses with a Resistance Economy Approach. Journal of System Management, 9(4), 1-12. 10.30495/JSM.2023.1979182.1766. [In Persian].

Fateh, M., Mohammadi, M., & Mousavi Moheb, S. M. (2023). Design a competency model for salespeople in food distribution industry of Iran. Journal of System Management, 9(4), 41-54. 10.30495/JSM.2023.1980096.1774.[In Persian].

Glaeser, S., Guay, W.R., 2017. Identification and generalizability in accounting research: A discussion of Christensen, Floyd, Liu, and Maffett (2017). J. Accounting Econ. 64 (2–3), 305–312. https://doi.org/ 10.30495.2022.698391

Jahanbani, Mustafa and Baqarpour and Shani, Mohammad (2012). Risk-based internal audit as a modern tool in the service of risk management, Iranian Society of Certified Accountants, Certified Accountant Quarterly, No. 9, pp. 11-92. 10.30495/FAAR.2022.697086. [In Persian].

Khatami Firouzabadi, M., Valizadeh, M., & Sajjadi, K. (2017). Make Decision for Selection Enterprise Resource Planning by Defines Key Performance Indicators (KPIs) and Analytic Network Process (ANP). Journal of System Management, 3(3), 1-16. 10.22108/FAR https://doi.org/.2020.119476.1529

Mehrani, Sasan (2012). Internal Audit, Iran Certified Accountant Association, Accountant Magazine, No. 141, pp 68-79. (DOI): 10.30495/JDAA.2022.693173.[In Persian].

Mihret, D., & Yismaw, A. (2018). Internal audit effectiveness: An Ethiopian public sector case study. Former audit partners on the audit committee and internal control deficiencies. The Accounting Rev. 84 (2), 559–587. 10.22108/NMRJ https://doi.org/.2022.133308.2486

Mohammad, Akram (2012). Identifying factors influential in internal audit effectiveness in government systems of Kurdistan Region of Iraq. MSc thesis in accounting, Imam Khomeini International University. 10.30495/JDAA.2023.699870.[In Persian].

Mohammad Taghizadeh, Samaneh (2020). Considering factors influential in effectiveness of internal auditing. MSc thesis in accounting. Valiasr University of Rafsanjan. 10.22108/NMRJ.2022.131270.2577.[In Persian].

Momenzadeh, Marzieh (2011). Considering role and effectiveness of internal audit in university. MSc thesis in accounting, Al-Zahra University. 10.22108/NMRJ.2022.131270.2577.[In Persian].

Pourheidari, Omid and Rezaie, Omid (2018). Considering factors influential in internal audit value added in companies accepted in Tehran Stock Exchange. Accounting and Auditing Research Quarterly. No. 14. 10.22034/IAAR.2012.104688.[In Persian].

Rezaee, G., & Karimi, F. (2023). An Investigation of Institutional Quality Conditions and the Export of Intermediate Goods by Developing Countries. Journal of System Management (JSM), 9, 4. 10.30495/JSM.2023.1978563.1767.[In Persian].

Shamshiri Yeganeh, Somayeh (2021). Factors influential in effectiveness of internal audit in Iranian Oil Company and subsidiary companies. MSc thesis in accounting. Islamic Azad University, Central Tehran Branch. 10.22108/FAR.2019.112553.1301.[In Persian].

Spira, L.F.,&Page, M.(2017).”Risk.management: the relevention of internal control and the changing rol of. internal audit.. “Accounting, Auditind, and Accountability journal. 16,640-661. https://doi.org/10.30495/.2023.702289

Yeganeh and Maqsoodi (2015). Relation of audit quality and renewal of financial statements resulted from interest management and cash flow management in Tehran Stock Exchange, Financial accounting scientific research quarterly, eight year/ no. 92, spring 2016, pp 103–131. 10.22034/JCLC.2022.340911.1688.[In Persian].