

# **Valuation of the internal audit mechanisms in the department of Support for the Collective Bodies of the Local Government Organizations using Mathematical Programming**

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## **Abstract**

The importance of internal audit and its impact on the organizations' effectiveness raised public interest. This study focuses on the internal control mechanisms in the Local Government Organizations (LGO). Specifically, the level of implementation of internal corporate control mechanisms in the Decision Support Department (DSD) of the LGOs is explored. On the basis of data analysis and processing of the results of the study, in which 93 civil servants took part, it is evident that the degree of the added value of internal audit in public organizations depends on the degree of its independency. Also, findings suggest that it is inversely proportional to the degree of compliance with procedures of the DSD. The analysis is extended by incorporating mathematical programming techniques for subset variable selection in order to minimize error values. Decision variables of the proposed models indicate which of the variables will be included in the regression model, to increase adjusted  $R^2$ .

## **Keywords:**

Regression Analysis, Mathematical Programming, Statistical analysis, Quantitative Methods, Decision Support Department (DSD), Internal audit, Local Government Organizations (LGOs)

## **1. Introduction**

Reforms in some countries have opened up the audit of the public sector (Johnsen, 2019). In recent years, especially, internal audit became a major part of public sectors reforms in many developing countries, due to the fact that improves public services and contributes to sound governance (Asare, 2009; Aikins, 2011; Alzeban & Gwilliam, 2014). Hence, the impact and the added value that internal audit provides to organizations draw the attention of the public interest over the last years (Chang et al, 2019). Subsequently, the factors which affect effectiveness of internal audit also triggered the academic interest (Dellai & Omri, 2016; Rudhani et al., 2017; Oussii & Taktak, 2018).

The Institute of Internal Auditors defines internal audit as an advisory activity that is designed to add value and improve the organization's operations (IIA, 2008). Internal audit is also defined as a multi - dimensional consulting activity designed to add value, by evaluating and improving the effectiveness of risk management, control and governance processes (Goodwin, 2004; Erasmus & Coetzee, 2018; Vadasi et al, 2019). Similarly, the internal control system is an organized set of control procedures established by the management that aim to achieve effective

operation, strategic objectives and eliminate operational risks (Raiborn et al, 2017; Rae et al., 2017; Gramling et al., 2018). In this respect, D'Onza and Sarens (2018) emphasize the contribution of the internal control system to the achievement of the objectives of the economic unit.

However, the implementation of internal audit in public organizations is not an easy venture, as public organizations are characterized by certain peculiarities and core values of the public sector which differ from those of private sector (Onumah and Yao Krah, 2012; Elg et al., 2017). Similarly, Heffron (1989) also points out that during the implementation of strategic activities, public organizations face significant obstacles that define their structure and their objectives. In this context, the efficient implementation of a successful control mechanism is prevented by the ideological enhancement of the public sector, including bureaucracy (Groenewegen, 1990; Jain, 2017).

Compared to other public organizations, the phenomena of mismanagement and corruption are more pronounced in the Local Government Organizations (LGO). According to the Report of Ombudsman (2010), local public organizations are at the forefront of the number of complaints concerning various maladministration issues, such as failure to act lawfully, breach of the principle of legality, failure to comply with contractual obligations to the public, poor behavior and transparency of operations (Ladi, 2011).

Especially in Greece, corruption in public administration is a characteristic phenomenon stemming from a dysfunctional public sector (Zacharakis et al., 2017; Papapolychroniadis et al., 2017). Under these circumstances, the state mechanism is highly ineffective and negatively affects the financial and budgetary level. Also, in Greece, LGOs are governed by deficiencies that adversely affect the management of their financial resources and the effectiveness of their services. Therefore, it is necessary to organize adequate internal control procedures, in order to nurture reliability and transparency and to decrease mismanagement which will lead to waste of public wealth (Koutoupis et al, 2018; Pazarskis et al, 2019).

According to the aforementioned situation, it is clear, that the importance of internal control mechanisms is emerging in public administration and local governments, as it contributes to transparency, accountability and efficient use of public resources (Alzeban & Gwilliam, 2014). To ensure the effective functioning of public organizations, the present study aims to identify key variables that influence the role of internal audit in Greek public sector.

Multiple regression analysis results indicate that the independence of internal control mechanisms and the characteristics of the municipality affect the value-added role of internal control mechanisms. Since the evaluation of the regression model is done based on the Least

Square method, all variables are included, and only the statistically significant variables are subsequently retained. With the use of a Mathematical Programming model for variable selection, the fit of specific indices of the regression model are improved.

The motivations for this study reflect a desire to extend our understanding of the specific role of internal control mechanisms in public organizations. Studies on internal audit in Greek public sector are limited in their number and in their context. This study therefore has the potential to contribute extensively to the existing literature by highlighting implications for internal audit in Greek public organizations, where quality of public administration is vital especially now during the post crisis period.

Furthermore, prior research published in this area uses mostly regression analysis. However, one of the problems of regression models is the fact that variables cannot be segregated to introduce to the model. To the best of our knowledge this paper provides several contributions as the selection of variables for the regression model is handled using a variable selection Mathematical Programming model that increase adjusted  $R^2$ .

The structure of the paper is as follows. In Section 2 the literature review is presented. In Section 3 the proposed model is analytically described and the results are presented in Section 4. The paper concludes in Section 5.

## **2. Literature review**

Given the particularities of the public sector, the application of internal audit to LGOs is of high research interest. Davies (2001) noted that internal audit is an important process within public organization as it provides a supportive basis for effective communication of all administrative levels and a correct allocation of available resources. Similarly, Baltaci and Yilmaz (2006) concluded that the added value of internal audit emerges through the efficient management of the budget, enhancing the efficiency of local governmental operations. Jorge and Costa (2009) revealed that the absence of internal audit in most Portuguese municipalities, results in low quality of financial information and lack of transparency. Bananuka et al. (2018) pointed out that internal audit significantly contributes to accountability of state-owned enterprises.

Furthermore, Monfardini and Von Maravic (2012) stated that the consolidation of internal audit is an essential element of local governments' reform. Badara (2013) pointed that the effectiveness of an internal control system is reflected in the economics of local government and depends on the quality of information and communication of internal auditors with the wider

audit environment. Pilcher (2014) concluded that internal auditors play a key role in ensuring good governance at local government level, particularly in terms of timely detection of fraud and corruption.

The process system of internal control in complex organizations is primarily connected to the special characteristics of the organization. A key requirement in the internal audit process is the reinforcement of the employees' participation in the decision-making processes. In this context the employees should participate in the decision-making process in their workplace. Furthermore, Sari et al (2018) showed that there is significant influence of organizational culture on internal control. The size and complexity of the organization may also affect the various forms of internal audit (Asare, 2009).

The role of internal control is often associated to employee's red flags and commitment (Zakaria et al, 2016). Furthermore, the weakness of the internal control mechanisms is contributed to factors such as poor staff supervision, improper documentation processes and illegal staff's malpractices (Asmah, 2019). Asare (2009) also pointed out that the failure of internal audit in many developing countries is due to the lack of cooperation between internal and external audit, the limited scope of the project and the inability to attract and retain competent internal audit staff. The internal auditors' cognitive and technical skills (Petridis et al., 2019) are also dominant factors, affecting the internal control implementation and effectiveness (Mahadeen et al., 2016). Ahmad et al. (2009) conclude that the internal auditors must be considered as colleagues and not as auditors. Unegbu and Kida (2011) demonstrated that the value added by internal control processes is affected by the lack of auditor training and auditor digital illiteracy. Gustavsonm and Sundstrom (2016) argue that independence, increased human resources, and educational skills are of vital importance for good auditing in public organizations.

Besides the organization's size and complexity, the different processes which are adopted at the management and operational level also affect the implementation of internal audit mechanisms. Sepsey (2011) noted that the added value of internal auditors in public organizations depends on the implied control processes and the consolidation of their role in the organizational chart and the operational processes. Gyüre (2012) also noted that the lack or insufficiency of internal audits and the fact that they are not integrated in the management procedures may lead in the deterioration of the economic situation and the unsuccessful management of local government assets in Hungary. Certainly, complex decision-making processes in the public sector demand special requirements in the application of control mechanisms and procedures (Boyne, 2001; Johnsen, 2015; Yigzaw et al., 2017).

Independence is the cornerstone of internal audit (Al-Akra et al., 2016). Christopher et al (2009) revealed that the independence of internal auditors is jeopardized by the approval of the internal audit budget by the chief financial officer and by in-house cooperation. In the same context Alktani and Ghareeb (2014) investigate independence of internal audit as key factor for internal audit quality in public organizations. Drogalas et al. (2015) pointed that the main factors influencing the effectiveness of internal audit are independence, responsibilities of the internal audit group and management support. Similarly, Tackie et al. (2016) and Asiedu and Deffor (2017) found that independence of internal audit has statistically significant positive relationship with internal audit effectiveness. Alqudah et al (2019) revealed that external auditors' cooperation, top management empowerment, and internal auditors' independence are key factors that positively and significantly affect the internal auditors' effectiveness.

The majority of the papers published measuring internal audit's efficiency in organizations, employ linear regression. As discussed in the previous paragraphs, on the shortcomings of linear regression is that all variables are included in the analysis and in order to improve fit indices, many combinations of the regression model should be analyzed. There are mathematical programming techniques to reduce the computational effort of this procedure. Similar approaches have been proposed in the selection of variables to be included in Neural Network formulations (Abdelaziz et al., 2014). In the same context, Miyashiro et al. (2015a) proposed a mixed integer second order cone programming formulation for the minimization of AIC/BIC values, improving these indices in comparison to the stepwise regression. Except for the AIC/BIC measures, Mallows'  $C_p$  measure is improved in the linear regression model using a Mixed Quadratic Integer Programming model (Miyashiro et al. (2015a). Besides the problem of variable selection in the linear regression model, mathematical programming models have been proposed on the ranking of forecasting techniques (Emrouznejad et al., 2016).

As mentioned above, there are several factors affecting internal control mechanisms that can be subdivided in the following major categories: characteristics of the Municipality, department Employees, organizational procedures, interaction of departments and independence of internal control mechanisms.

### **3. Methodology**

#### **3.1 Research design**

The purpose of this paper is to explore the level of implementation of internal control mechanisms in the DSD and especially to examine the internal control mechanisms in LGOs.

Initially, responses were sought on the variables contributing to the existence and implementation of internal control mechanisms. The expected results of the survey include the investigation of the existence and implementation of internal control mechanisms in all municipalities of any size.

A quantitative approach methodology was selected for this study. The survey approach is chosen because it provides direct evidence concerning respondents' perceptions. The research tool which was selected was a closed – ended questionnaire. The questionnaire is based on the relevant literature review, discussions with two knowledgeable internal auditors and questions used by other researchers.

The target population of the survey was 325 Municipalities, from all geographical regions-areas. In total, 93 questionnaires were collected.

### **Variables' selection**

The variables used in the analysis were derived from the previous literature review.

The variable “Internal Control Mechanisms” forms our dependent variable.

The independent variable “Municipality characteristics” is measured by factors regarding the procedures ‘complexity, the number of the different departments, the employees participation in the decision-making process and the applied information system.

The independent variable regarding “Department Employees” is defined by the number of the staff, their education, their skills and their working experience.

The independent variable “Organizational Procedures in the Municipality” is measured by the degree of implementation of information systems in the municipality, the documentation and the release of information to the public.

The independent variable “Interaction of Internal Audit Mechanisms and DSD” encloses the collaboration degree of the staff, the recognition of the role and the contribution of internal mechanisms by the different departments of the municipality and the relationship between the DSD and the management.

Finally, the independent variable “Independence of Internal Control Mechanisms” is defined by the degree of staff objectivity and the access degree to files and information.

### **Model**

Initially, the data collected via questionnaires were analyzed with the use of descriptive statistics. Reliability analysis has been evaluated using Cronbach's alpha, which measures the consistency with which respondents answer questions within a scale. To explore whether the dependent variable ("Internal Control Mechanisms") is associated with the five independent variables, multiple regression analysis was conducted. The regression model is formulated as follows (1):

$$ICM = b_0 + b_1 \cdot MC + b_2 \cdot DE + b_3 \cdot OPM + b_4 \cdot IIAM + b_5 \cdot IICM \quad (1)$$

In the formulated regression model (1), the variables are the following:

*Dependent*

*ICM*: Internal Control Mechanisms

*Independent*

*MC*: Characteristics of Municipality

*DE*: Department Employees

*OPM*: Organizational Procedures in the Municipality

*IIAM*: Interaction of Internal Audit Mechanisms and DSD

*IICM*: Independence of Internal Control Mechanisms

### 3.2 Mathematical programming models

One of the shortfalls of regression models is the fact that all variables should be included in the initial model. Therefore, the procedure of achieving the best fit would be to introduce the dependent along with combinations of independent variables (assuming that the variables that are introduced to the model are statistically significant). To reduce the number of variables to be introduced in the regression model, mathematical programming techniques are employed for variable selection and subset variable selection.



### 3.2.1. Variable subset technique

A similar technique to the previous context mathematical programming technique is applied for subset variable selection. This technique, proposed by Park et al (2017), is specifically applied to multiple regression framework. The adoption of this technique is applied as a means of minimizing error measures, among which Mean Absolute Error (MAE) and improvement of adjusted  $R^2$ .

The technique proposes two methods according to the number of variables and the number of observations. In this work the thin case ( $m < n$ ) is applied where  $m$  is the number of independent (explanatory) variables and  $n$  the number of observations.

Due to the existence of discontinuous functions (absolute function), the Discontinuous Non – Linear Programming (DNLP) model applied in this instance is presented in (4).

$\min u$

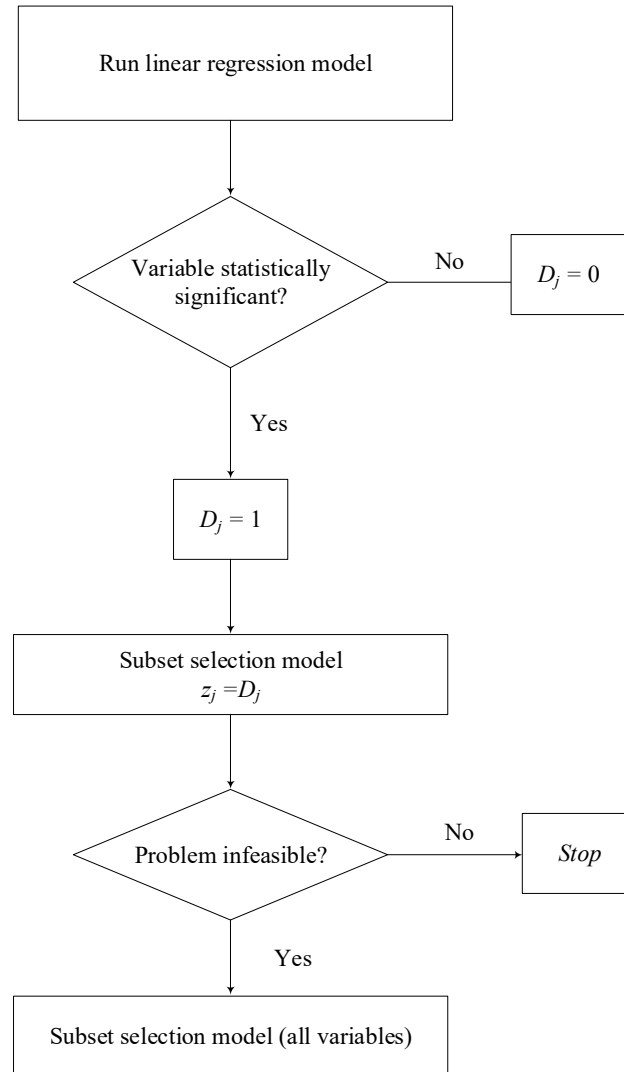
*s.t.*

$$\begin{aligned} \sum_i |t_i| &= (n - 1) \cdot u - u \cdot \sum_j z_j \\ t_i &= \sum_j a_{ij} \cdot x_j + y - b_i, i = 1, \dots, n \\ -M \cdot z_j &\leq x_j \leq M \cdot z_j, j = 1, \dots, m \\ v_j &\leq u, j = 1, \dots, m \\ u - M \cdot (1 - z_j) &\leq v_j \leq M \cdot z_j, \quad j = 1, \dots, m \\ v_j &\geq 0, z_i \in \{0,1\} \end{aligned} \tag{4}$$

In (4),  $t_i$  is the error term of the  $i^{\text{th}}$  observation,  $x_j$  is the coefficient of the  $j^{\text{th}}$  independent variable,  $z_j$  is a binary variable for the inclusion (1) of independent variable  $x_j$  or not (0).

### 3.2.2. Selection algorithm

Since mathematical programming techniques can only provide a choice of variables on purely fitting indices, the following algorithm is employed to select variables which are only statistically significant. Firstly, the linear regression model is employed, stating whether a variable is statistically significant (based on the statistical significance level set 1%, 5% or 10%). If a variable is statistically significant, then corresponding variable receives a value of 1 in the binary variable  $D_j$ .



**Figure 1:** Proposed algorithm for variable selection.

Subset variable selection model is solved with the additional constraint  $z_j = D_j$ . Therefore, if a variable is statistically significant, it would be included in the new linear regression formulation. If the new model is feasible, then the variables that are selected are the ones to be

included in the regression model. If the model is infeasible then the subset selection model is solved for all variables.

## 4. Results

### 4.1 Demographics

Table 1 provides the descriptive statistics of the final sample.

**Table1:** Demographics of respondents

<b>Demographics</b>	<b>Frequency</b>	<b>(%)</b>
<b>age</b>		
31 – 40 years	6	6,4
41 – 50 years	51	54,9
> 50 years	36	38,7
<b>Total</b>	<b>93</b>	<b>100</b>
<b>sex</b>		
Male	30	32,2
Female	63	67,8
<b>Total</b>	<b>93</b>	<b>100</b>
<b>Education of respondents</b>		
Secondary education	45	48,4
Technological Institute Degree	9	9,7
Bachelor's Degree	36	38,7
Master's Degree	3	3,2
<b>Total</b>	<b>93</b>	<b>100</b>
<b>Work experience</b>		
<2 years	3	3,3
3-10 years	15	16,1
11-20 years	39	41,9
>21 years	36	38,7
<b>Total</b>	<b>93</b>	<b>100</b>

The majority of the respondents (54.8%) belonged to the age group 41 – 50 years, while the second largest group (38.7%) was the age group >50. 67.7 % of the participants is women and 32.3% is men. As far as education is concerned, most participants were high school graduates (48.4%), while the second largest group is university graduates (38.7 %). Regarding the experience, 41.9% of the participants have been working in a Municipality for 11 – 20 years,

while the second largest group (38.7%) consists of individuals who have been working in a certain position for over 21 years.

The analysis indicates the contribution of the internal audit mechanisms in the municipalities. These findings are consistent with Davies (2001), Baltaci and Yilmaz (2006), Jorge and Costa (2009) pinpointed that the internal audit mechanisms are extremely important in public organizations.

Next, the survey examines views concerning the “Characteristics of the Municipality”. The results reveal the existence of a uniformed handbook of procedures. The findings also indicate that municipalities have – on a small scale – updated information systems in order to inform citizens and, as a result, the development of e-Government is hindered. Finally, the results reveal that municipalities provide their employees – on a medium scale – with the possibility to participate in the decision-making process concerning work issues.

The participants were then asked regarding the “Department Employees”. The results reveal that there is a division of functions, proficiency and competence of the staff. These findings differ from other researchers who noted that there are ambiguities in the job descriptions and a lack of regulation mainly in the supply and economic departments of the Municipalities. A possible explanation for this difference is that, in DSD, the functions can be more clearly defined in comparison with other departments of the municipality, since every employee is responsible for the secretarial support of a committee and maintains certain procedures.

Concerning the degree of legality and transparency of information provided by the DSD, the findings indicate that effective procedures are in place regarding the documentation and the release of information to the public

The results also reveal that the degree of “Interaction of internal audit mechanisms and the DSD” is high. The results indicate that the DSD provides the information requested by the internal audit mechanisms to a great extent.

Finally, the responses show that there is a great degree of independence of the internal audit mechanisms in the municipalities. These findings are consistent with Asare (2009) and Drogalas et al. (2015), who conclude that the internal audit mechanisms require independency and objectivity in order to work properly in an organization.

## **4.2 Research hypotheses results**

This section examines the relationship between the dependent variable “Internal Control Mechanisms” and the other independent variables “Characteristics of Municipality”,

“Department Employees”, “Organizational procedures in the Municipality”, “Interaction of Internal Audit Mechanisms and DSD”, “Independence of Internal Control Mechanisms”.

For each respondent and for every dimension of internal control mechanism in DSD, a total score was calculated based on the sum of the values of the answers to the questions that make up each dimension. Descriptive statistics and reliability indicators of variants of the multiple linear regression model presented in Table 2.

Regarding reliability, the assessment of the measures was conducted with the use of Cronbach’s Alpha. As a general rule, a coefficient greater than or equal to 0.6 is considered acceptable and a good indication of construct reliability. Cronbach’s Alpha for the dependent variable is 0.92 and for the independent variables MC, DE, OPM, IIAM is (0.70), (0.64), (0.76), (0.77), respectively. These results show that all of these measures are reliable. Based on the data in Table 3, it is noted that only the overall score for "Independence of Internal Control Mechanisms" has a low confidence index (Cronbach's <0.60).

**Table 2:** Reliability analysis results

<b>Variables</b>	<b>Average Term</b>	<b>Standard deviation</b>	<b>Cronbach’s a</b>
<b><i>Dependent</i></b>			
Overall Score for "Internal Control Mechanisms" Independent (IC)	9.9	3.1	0.92
<b><i>Independent</i></b>			
Overall Score for "Characteristics of Municipality" (MC)	8.5	2.6	0.70
Overall Score for the "Department Employees" (DE)	10.0	2.3	0.74
Overall Score for "Organizational procedures in the Municipality" (OPM)	21.7	2.9	0.76
Overall Score for "Interaction of Internal Audit Mechanisms and DSD" (IIAM)	12.7	1.9	0.77
Overall Score for "Independence of Internal Control Mechanisms" (IICM)	11.3	1.8	0.78

Coefficients of the Multiple Linear Regression model are presented in Table 3.

**Table 3:** The regression analysis full model

<b>Terms of the Model</b>	<b>Coefficients</b>	<b>Coordinator prices</b>	<b>Standard error</b>	<b>P</b>	<b>Individual Correlation Factor</b>
Constant	b0	0.171	2.219	0.939	

<b>MC</b>	<b>b1</b>	<b>0.297</b>	<b>0.122</b>	<b>0.017</b>	<b>0.181</b>
DE	b2	0.161	0.130	0.221	0.092
<b>OPM</b>	<b>b3</b>	<b>-0.206</b>	<b>0.101</b>	<b>0.044</b>	<b>-0.152</b>
IAM	b4	0.073	0.158	0.644	0.035
<b>IICM</b>	<b>b5</b>	<b>0.816</b>	<b>0.150</b>	<b>&lt;0.001</b>	<b>0.405</b>
<hr/>					
Adjustment Indices	$R^2=0.516$	$R^2\text{-adj} = 0.488$	Typical Error = 2.17	ANOVA	
				$P<0.001$	

Based on the data in Table 3, the model of the multiple linear regression is statistically significant (ANOVA  $p < 0.001$ ) and the data adaptation is moderate to satisfactory ( $R^2 > 0.50$ ).

The analysis revealed that the characteristics of the municipality, the organizational procedures in the municipality and the degree of perceived independence of internal audit defines the "Internal Control Mechanisms" score.

More specifically, the MC variable is consistent with the theory, as studies have shown that the existence of a detailed manual of procedures in each section, combined with upgraded information systems (Leavitt, 2009) and active participation of employees, have a positive effect on good functioning and efficiency and reduce the lack of indifference, resignation and mismanagement of the department. With respect to the IICM variable, the findings confirm existing literature as respondents realize that it is essential for internal auditors to be objective in the execution of their work and to have access to all files and information (Asare, 2009; Drogalas et al., 2015 Asiedu and Deffor, 2017).

Also, based on the data in Table 3, we observe that as more processes in the DSD of the LGO (OPM variable) are respected; the importance of the internal control mechanisms is reduced. Although this initially seems to be contradictory, as internal control mechanisms and, by extension, internal control is comprised of procedures, it is logical to provide less control when the procedures and no errors are detected. Failure to comply with lawful procedures in Local Governments allows for the appearance of maladministration.

### 4.3 Algorithm results

The first step of the algorithm is to select the variables that are statistically significant. In Table 4, we can see that MC, OPM, and IICM are initially selected. Therefore,  $D_{j=MC} = 1$ ,  $D_{j=OPM} = 1$  and  $D_{j=IICM} = 1$ .

Subsequently, subset selection model is solved only for variables MC, OPM, and IICM. Results indicate that only the MC and OPM variables should be included in the model.

**Table 4:** The regression analysis restricted model

<b>Terms of the Model</b>	<b>Coefficients</b>	<b>Coordinator prices</b>	<b>Standard error</b>	<b>P</b>
Constant	b0	0.819	2.088	0.696
<b>MC</b>	<b>b1</b>	<b>0.356</b>	<b>0.108</b>	<b>0.001</b>
<b>OPM</b>	<b>b2</b>	<b>-0.164</b>	<b>0.079</b>	<b>0.042</b>
<b>IICM</b>	<b>b3</b>	<b>0.859</b>	<b>0.144</b>	<b>&lt;0.001</b>
<b>Adjustment Indices</b>	$R^2=0.508$	$R^2\text{-adj} = 0.491$	<b>Typical Error = 2.15</b>	ANOVA $P<0.001$

In Table 4, estimation of restricted model is presented. Restricted model contains only statistically significant variables, which are MC, OPM and IICM. Regression coefficients' values for MC, OPM and IICM variables are very close to the corresponding ones in full model as presented in Table 3.

This is a sign that coefficients are consistent. In addition, there is a small gain in fit, as restricted model's adjusted  $R^2$  is larger by 0.3% than full model's corresponding index. Also, the typical error is reduced from 2.17 to 2.15. Therefore, application of algorithm results is a better fit of regression model to the observed data. The proposed algorithm can significantly reduce the computational effort in large scale regression models and improve fit indices.

## 5. Conclusions

The importance of internal controls is of continuing interest to academics, firms, auditors, and regulators (Maijoor, 2000; Lawson et al, 2017). Internal audit helps organizations reach their objectives by using a systematical scientific approach for estimation of the efficiency of the risk management, the internal control system and management processes (Danescu, 2015; Abdolmohammadi et al., 2017 Khalid et al., 2017).

The public sector is plagued by poor governance, corruption and a bad state of affairs in administration (Shan et al., 2017; Mocetti and Orlando, 2019). Therefore, the implementation of internal audit in the public sector is of paramount importance in order to meet the demanding responsibilities and improve governance processes of local government organizations (Noraini et al., 2018).

Results of the study indicated that the crucial factors that affect internal control mechanisms in the Local Government Organizations. Overall, the results of this study indicate that “the characteristics of the municipality”, “the organizational procedures in the municipality” and the degree of perceived “independence of internal audit” affect the role of internal audit

mechanisms. The proposed methodology extends the current literature by introducing an algorithm for the reduction of the combinations of the linear regression models that will eventually be evaluated. Once the initial linear regression model is evaluated, then the statistically significant variables are selected. Then, the variable selection model is formulated only for the statistically significant variables. Results indicate better fit indices with the application of the model.

There are a number of limitations of our study which should be borne in mind when interpreting our findings. The most important limitation is that the results of this paper are based exclusively on the beliefs of the employees and not necessarily on the actions of the municipalities. In this framework, the objectivity of the answers is not given. Similarly, the possibility of sampling bias could limit the generalizability of our results. Moreover, the size of the sample is an equally important limitation.

Overcoming each of these limitations provides opportunities for further research. As suggestions for future studies, it is recommended to expand this study to other countries. Future research could also explore the perceptions of other governance parties such as management and external auditors of public organizations. Further, future research may also investigate some of the issues in more depth. Finally, other independent variables could be modeled.



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