



Statistical Inference to the Internal Control
Variables of the Autonomous Decentralized
Municipal Governments: as an Optimization
Tool in the Improvement of Processes

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Statistical inference to the internal control variables of the Autonomous Decentralized Municipal Governments: as an optimization tool in the improvement of processes

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Abstract.

From the efficiency of internal control, continuous improvement is optimized in all municipal management, so the objective of this research is to evaluate the internal control system applied by the GADMS (Municipal Decentralized Autonomous Governments) to know if the internal audit departments apply Correctly, the policies and procedures established in the Regulations of the State Comptroller General's Office and if they are strictly enforced, the 221 Municipalities that exist in Ecuador will be taken into consideration. The methodology of this research is a mixed approach with a descriptive exploratory scope, to obtain information on the management of the internal audit units of the GADMS, multivariate statistics were used, where the effect of the selected components resulting from the research on the control variables, which result from the interviews with the directors of the areas: administrative and financial. As a result, the weight of each component analyzed and its impact on the variables that encompass units identified by experts in the area of government auditing can be evidenced.

Keywords: objectives; internal control; processes; GADM

INTRODUCTION

The Municipal Governments of Ecuador have as their main objective the improvement of the standard of living of the citizens of each canton, and the adequate application of internal control, applied by the directorates and the personnel of each Gad, provides security in the use of resources. From the General State Budget, in addition, efficient management and control contributes to the achievement of institutional objectives, both the internal administrative part and the external part, promoting improvements in the quality of life of citizens, supported by the Central Government.

To evaluate internal control in the 221 municipalities in Ecuador (National Institute of Statistics and Census, 2018), it must first be understood that the budget allocations that the central government approves to each Municipality are based on the Territorial Equity Model, the which seeks to consolidate a process for the allocation of public resources in a more transparent and fair manner, in accordance with article 193 of the (Organic Code of Territorial Organization, Autonomy and Decentralization, 2010), for the allocation and distribution of resources to each decentralized autonomous government. A territorial equity model should be applied in the provision of public goods and services

For Fabián Carrillo Vice Minister of Finance "What has gone through this year opens an interesting space for reflection and dialogue to reach a consensus, in the different actors of society, on a potential reform of the way in which the allocations of the Territorial Equity Model are distributed, who recognized that the system of distribution and transfers of resources to local governments is not fair, progressive or viable to manage" (Carrillo, 2020)

As principles we must understand that planning and control are two-way, you could not control something that has not been planned and vice versa. According to the internal control standards of the public sector, internal control is considered as a tool that encompasses the integral process carried out by the head, officials and servants of an entity, designed to face risks and to ensure that its management objectives are achieved (Mendoza Zamora, Garcia Ponce, Delgado Chavez, & Barreiro Cedeño, 2021).

Our constitution in its art. 227 of the Constitution of the Republic of Ecuador establishes that "Public administration constitutes a service to the community that is governed by the principles of effectiveness, efficiency, hierarchy, deconcentration, decentralization, coordination, participation, planning, transparency and evaluation." (Constitution of the Republic of Ecuador, 2008)

Internal control is the administrative responsibility of each State institution and of the legal entities of private law that have public resources according to article 9 of the (Organic Law of the Comptroller General of the State, 2015) and will have the purpose of creating the conditions For the exercise of control, it is a comprehensive process applied by the highest authority, management and staff of each entity, which provides

reasonable security for the achievement of institutional objectives and the protection of public resources (Gamboa Poveda, Puente Tituaña, & Vera, 2016).

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On the other hand, the Comptroller General of the State (CGE) issues the technical standards for the management of resources, which will be executed by the areas requesting these resources and will have its highest authority as responsible. Therefore, internal control would allow the processes to be carried out with a reasonable degree of security in meeting the objectives of each institution. (Office of the Comptroller General of the State, 2009)

In Ecuador, the new authorities of the Municipal GADs are elected for a period of 4 years, and the elected mayors make up their technical and political work team, this team receives the information from the different departmental directorates of the municipality that includes the Financial Directors, Accountants, Director of Revenue, Treasurer, and other Headquarters (AME & GIZ., 2019). The study shows the weaknesses of internal control. None of those named has the responsibility for internal control. The general comptroller's office of the Ecuadorian state according to article 212 of the (Constitution of the Republic of Ecuador, 2008) has the function of directing the administrative control system that is made up of internal and external audits and the internal control of public and private entities. that have public resources. The regulations in Ecuador (Organic Law of the State Comptroller General, 2017) indicate that internal auditors are appointed by the highest authority of the State Comptroller General, a designation that is temporary or freely removable, that is, the Comptroller decides their stability. and the weather. The designated auditor is technically and administratively controlled by the State Comptroller General, maintaining coordination of the annual planning of special examinations to be carried out, it does not carry out prior or subsequent control.

Methodology

For the statistical diagnosis of internal control in municipal GADs, multivariate statistics are proposed, to be able to show the effects of multiple variables, knowing the joint behavior of more random variables. For the selection of the municipalities (7 selected), the technical conglomerate analysis (cluster) is applied that focuses on the units of analysis, and that allows grouping and classifying the municipalities into homogeneous groups with similar characteristics and the most similar to each other. Although different from the other groups, this assignment in the selection of municipalities obeys, for example: territorial extension in relation to assigned budgets, or the number of inhabitants per territorial extension, which allows the classification to be hierarchical based on research needs.

This helps to improve the sampling by having to compare municipalities with the same levels of budget commitment. The municipalities analyzed were: El Empalme, Balzar, Santa Elena, La Libertad, El Carmen, Puerto López, Jama, Quilina, Chillanes. Municipalities with high budgets are excluded from the selection, because the advantage over the others would skew the information.

For the analysis of the defined procedure, the instrument represented in table # 1 was created, which contains thirty-four items that include variables listed below:

1. Context: through the following items and associated indicators we try to assess whether the mission, vision and objectives are aligned with the national objectives in the context of public administration. (1-10);
2. Design: objectives we set by Decentralized Autonomous Governments of Ecuador, they are declared in terms of those competences that it is expected to acquire, and they have been planned in such a way that they are reviewable, evaluable and that they affect practice. (11-16);
3. Design of indicators in the municipalities: management indicators, we will evaluate if management indicators are designed by the municipalities, and if there is a department that does the timely monitoring of them: in consideration of the diversity of conditions, interests, motivations, achieving the fulfillment of objectives. (17-21);
4. Design of indicators: application of indicators, we propose whether the contents of the management indicators used in the entities. (22-26);
5. Design of indicators: risks, determine the existing risks in an organization and the possible consequences, through the application of various techniques so as not to omit any significant

event. (27-34)

Once the places where the study is carried out have been defined, such as the financial, planning, and administrative areas, since they are involved in the integral process of internal control, in order to face the risks and provide reasonable assurance regarding the mission and objectives of the institutions. It was determined which population is subject to it, the generalization of the results was sought; sampling units, their scope and time were used for this purpose. A quantitative value was chosen in which a scale ranging from one to three is taken into account - high, medium, low.

TABLE No. 1
Questionnaire to diagnose the performance of the internal control.

N°	PREGUNTAS	VALOR
1	Has the Autonomous Municipal Government defined the mission and vision of the entity?	
2	Does the planning system include the formulation, execution, control, monitoring and evaluation of the institutional multi-year plan and annual operating plans, which consider the institutional function, mission and vision as a basis and are consistent with government plans and SENPLADES guidelines? ?	
3	The entity has an annual operating plan that contains: objectives, indicators, goals, programs, projects and activities that will be promoted in the annual period.	
4	The POA was formulated in accordance with the processes and policies established by the National Planning System (SNP), the Norms of the National Public Investment System (SNIP) and the guidelines of the budget system.	
5	Was the POA formulated based on a detailed analysis of the internal situation and the environment	
6	An internal control system has been established to ensure compliance with institutional objectives, goals, programs, projects and activities.	
7	Permanent monitoring and evaluation of the POA and Pluriannual Plans is carried out.	
8	Within the analysis of the situation and the environment for the design of the POA, the results achieved and the deviations to the previous programming were considered.	
9	In the POA, emerging needs have been identified to satisfy the present and future demands of internal and external users and the available resources, within a quality framework.	
10	The products of the formulation, fulfillment, monitoring and evaluation of the multi-year plan and PÓA were disseminated to all the entity's personnel and the community in general.	
11	The organizational structure allows the management levels to meet the objectives of the GAD	
12	Institutional objectives are relevant and are linked to the needs of the internal and external client.	
13	The objectives clearly show the incidence of GAD management.	

14	The objectives are open to modifications depending on the development of their fulfillment.	
15	The objectives promote the integration of tics in the different processes of municipal management activities.	
16	The multi-year objectives are monitored in accordance with the annual objectives of the GAD.	
17	Does the entity have an updated and approved process to evaluate the knowledge and skills competencies of the institution's servants and servants?	
18	Management indicators have been carried out for the internal evaluation of the institutional objectives.	
19	The design of the indicators foresees the different levels of competence of the servers	
20	Have you designed objectives based on general and specific objectives based on strategic planning and action plans?	
21	The design of the indicators considers the internal structure, values, policies, objectives and strategies?	
22	The management indicators identify the internal and external factors of the entity.	
23	The effectiveness of the management indicators used is periodically evaluated.	
24	The elaborated management indicators are shared with all levels of the entity and approved.	
25	The management indicators are made considering external factors: economic, environmental, environmental, technological, political and social.	
26	The management indicators are carried out considering internal factors: infrastructure, personnel, technology.	
27	The administrative risk assessment is carried out in order to prevent consequences in the management.	
28	Has the highest authority established the necessary mechanisms to identify, analyze and treat the risks to which the entity is exposed in order to achieve its objectives? (Eg risk map)	
29	Managers develop plans, response methods and change monitoring, as well as a program that provides the necessary resources to define actions to mitigate risks.	
30	There is adequate planning for the management of risks, which produce the eventuality of the occurrence and the negative effect, to alert the entity regarding its adaptation to changes in the entity	
31	The managers develop plans, response methods and change monitoring, as well as a program that provides the necessary resources to define actions to mitigate the risks of the entity.	
32	Sufficient information is obtained about risk situations to estimate their probability of their occurrence or of unwanted events.	
33	Complex programs or activities, cash management, high staff turnover and growth, the establishment of new services, redesigned information systems, rapid growth, and new technology, among others, are considered high potential risk factors.	
34	Risks are determined by considering valuation techniques and data from observed past events, which can provide an objective basis in comparison with estimates.	

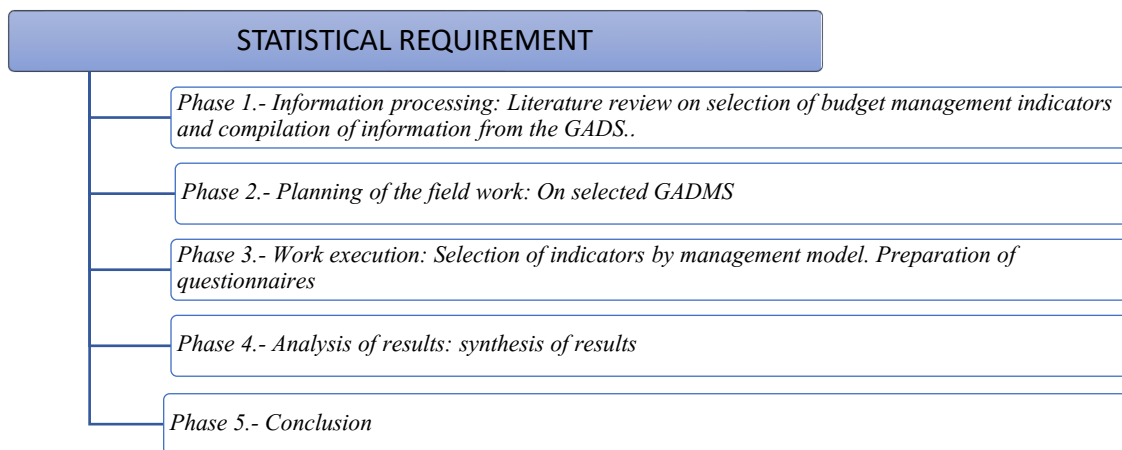
The hierarchical cluster analysis procedure makes it possible to agglomerate the elements of internal control. In this way, the elements are grouped into conglomerates according to the deficiencies found in the different areas of an entity (Vega de la Cruz & Gonzalez Reyes, Statistical diagnosis of internal control in a hospital institution, 2017).

Non-experimental research cannot manipulate or control study variables. The researcher limits himself to observing the phenomena as they occur in the environment, to later describe and analyze these events. (Montaño, 2021) The researcher fulfills the role of observer. For this reason, this type of research is applied since the information provided by the municipalities established in the sample has not been manipulated; The approach was mixed, the qualitative phase of this research was carried out by collecting data related to the evaluation of internal control in the selected departments that went through an audit process in the years 2015-2019 through the application of interviews, maintaining an order and continuity of a structured scheme.

The quantitative phase consisted of gathering information related to the study variables through the application of surveys, based on an internal control evaluation questionnaire. Figure No.1 shows the process carried out in this investigation.

Figura No.1

Statistical requirements of the investigation



Prepared by Authors

The number of Municipalities in Ecuador is 221 that are grouped into 24 provincial governments, all with the same purpose, to improve the social and economic development of their community, but with different budgetary allocations and dispersed population growth, according to the (Organic Code of Territorial Organization, Autonomy and Decentralization, 2010) in article 192.- Total amount to be transferred.- The decentralized

autonomous governments will participate in twenty-one percent (21%) of permanent income and ten percent (10%) of non-permanent of the general budget of the State.

By virtue of constitutional powers, the total amount to be transferred will be distributed among the decentralized autonomous governments in the following proportion: twenty-seven percent (27%) for the provincial councils; sixty-seven percent (67%) for municipalities and metropolitan districts; and six percent (6%) for the parochial boards

- The total of these resources will be distributed according to the size and density of the population; unsatisfied basic needs hierarchical and considered in relation to the resident population in the territory of each of the decentralized autonomous governments; logos in the improvement of living standards; fiscal and administrative effort; and fulfillment of goals of the National Plan of Development and development plan of the decentralized autonomous government
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Identification of the Sample Frame:

The sampling frame takes into account the different levels of participation in investment, competition or budget execution, and based on this, the application of the surveys was programmed:

1. Number of municipalities (Decentralized Autonomous Governments (N = 221).
2. Addresses and headquarters (N = 2431).
3. Municipal coordinators / advisor (N = 1105).

Determination of sample size.

The sample will be constructed according to its structural relevance within the population and due to its statistical significance, it will be of the probabilistic type and will be estimated by applying the simple random sampling method without replacement. The sample must be representative in such a way as to provide reliable information to make the inferences and analysis of the research.

The data on the components of the sampling frame were delineated by the Functional Organic (organization chart).

Regarding the directions and headquarters, it is considered by the size of the departments by the number of employees to:

- a. Financial direction = 96
- b. Human talent management = 56
- c. Address / head of property registry = 32
- d. Direction / head of fixed assets = 48
- e. Directorate / Head of Public Procurement = 24
- f. Directorate / head of communication = 40
- g. Directorate / Head of Community Development = 32

Where the population size is 328 middle management officials, To determine the size of the sample, the methodology set out in the research work of (Vega de la Cruz, Pérez Pravia, & Tapia Claro) is used in the exposed context, Formula 1 expresses the calculation of the sample size by using simple random sampling where n_m is the sample size; p is the probability with which the phenomenon occurs; $q = (1 - p)$ is equivalent to the probability that the phenomenon does not occur; N is the size of the population; e is the probability of error for the confidence level; and finally, K is the critical value corresponding to the chosen confidence level.

$$n_m = \frac{K^2 pqN}{e^2(N-1) + K^2 pq}$$

Formula 1

Meanwhile, the sample size is calculated through the use of sampling

$$n_e = n \frac{n_m}{N}$$

stratified, in which case each stratum is determined by means of formula 2:

Formula 2

Where n_e is the size of the stratum to be analyzed, and n the population size of the stratum.

As an information processing method, the one proposed by (Vega de la Cruz, Pérez Pravia, & Tapia Claro) is followed, where they recommend making inferences through univariate, bivariate and multivariate statistics. The purpose is to simultaneously validate a set of variables in order to measure the correct use of internal control indicators in the municipalities.

Figure No.2

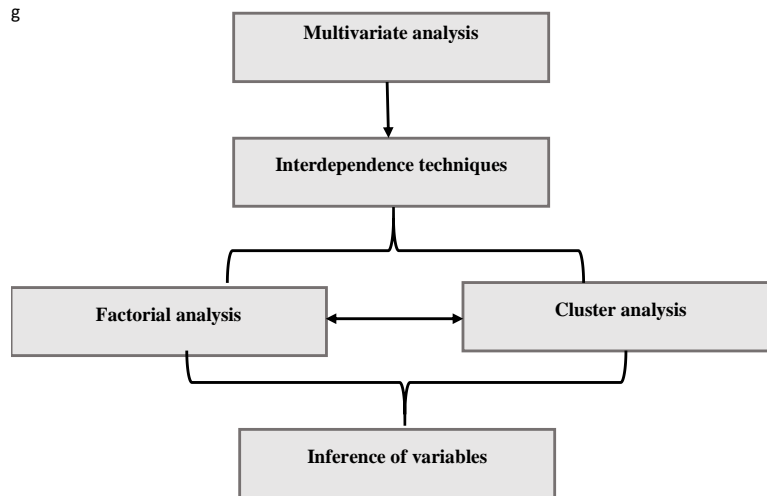


FIGURE No. 2

Multivariate method for explanation of variables to the GADM in Ecuador

The sampling by strata is presented in table No. 2, the size of the sample was determined starting from the departments or addresses of each municipality by means of a simple random sampling on the number of officials in (addresses and headquarters), which were indicated in 328 for the 7 selected municipalities. The selected municipalities have similar characteristics in terms of territorial extension and budget allocation. Simple or random random sampling is the most common way to obtain a representative sample with random selection of the elements, with the assurance that each of the individuals in the population has the same possibility of being chosen with the use of a table. of random numbers. (Cortés, Mur, & Iglesias, 2020).

Estimated error for the selection of the sample is 5%, in a context in which there was a probability of success of 50% (for municipalities with similar characteristics). Similarly, the probability of failure was taken into account, since there was no information on these events; consequently, a critical value of 1.96 was recommended, for 95% confidence. What determined that 178 surveys were carried out.

TABLE No. 2
Questionnaire to diagnose the performance of the internal control

#	CALCULATION OF THE NUMBER OF STRATUS IN THE GADM				
	Addresses	Description Special Exam	No. of officials	% representation of officials	Sample size
1	In the Financial Department and other related units.	To the process of determination, collection, control and registration of the values for urban and rural property taxes, rates and special contributions.	96	29.3%	52
		To the process of registration, control and payment of accounts payable; and third party funds			
		To the process of determination, collection, control and registration of the values for taxes on urban and rural properties, rates and special contributions			
		To the process of registration, control and payment of accounts payable; and third party funds .			
		To the payments and obligations generated by concept of fines, interests and glosses			
2	In the management of the human talent and other related units	At the entrance of servers and servants; and, to the technical administration of human talent .	56	17.1%	30
3	In Property Registrar	To the process of collecting property registry values	32	9.8%	17
4	In the direction of Bodega	To the use, maintenance, mobilization and control of vehicles and machinery (long-lasting goods)	48	14.6%	26
5	In the direction of public purchases	To the acquisitions of goods and services made through the process of very small amounts	24	7.3%	13
6	In the direction of communication	To advertising and propaganda expenses	40	12.2%	22
7	In the direction of community development	Compliance with the provisions issued in relation to people with special abilities	32	9.8%	17
Total			328	100%	178

Own elaboration

Results and Discusión

The study of correlation between the variables takes as a reference the structure of the data by studying the correlations between the variables, in such a way, this procedure summarizes the data to a reduced number in the 5 components described in the research methodology

Factor Analysis and Principal Component Analysis (PCA) are closely related and are a multivariate data reduction analysis technique. Some authors consider the second as a stage of the first and others consider them as different techniques. (University of Alicante, 2021). The instrument used in the research initially had 32 basic questions that collected the 5 dimensions detailed in the methodology. This made it possible to correct elaboration errors, eliminating 15 questions that did not contribute significantly to the research.

As a result of the factorial analysis (Table 3), the Kaiser-Meyer-Olkin (KMO) measure of sample adequacy is obtained that greater than 0.699, which is equivalent to the minimum recommended value; a result that suggests the relevance of the factor analysis.

(University of Alicante, 2021) The KMO test (Kaiser, Meyer and Olkin) relates the correlation coefficients, r_{jh} , observed between the variables X_j and X_h , and a_{jh} are the partial correlation coefficients between the variables X_j and X_h . The closer to 1 the value obtained from the KMO test has, it implies that the relationship between the variables is high. If $KMO \geq 0.9$, the test is very good; notable for $KMO \geq 0.8$; median for $KMO \geq 0.7$; low for $KMO \geq 0.6$; and very low for $KMO < 0.5$.

Bartlett's sphericity test:

If Sig. (P-value) < 0.05 we accept H_0 (null hypothesis) > factor analysis can be applied.

If Sig. (P-value) > 0.05 we reject H_0 > factor analysis cannot be applied.

Table No. 3
KMO and Bartlett test.

Kaiser-Meyer-Olkin measure of sampling adequacy		,699
Bartlett's test of sphericity	Approx. Chi squared	1303,330
	gl	120
	Sig.	,000

Meanwhile, by studying the communalities 1 of the extraction, it is evident that the variable corresponding to the evaluation of indicators is the worst explained: the model is only capable of reproducing 76.0% of its original variability. In this case, validity was analyzed from the internal or construct point of view; According to the above, in table No.4, this is called the component matrix, since the principal components method was used as the extraction method.

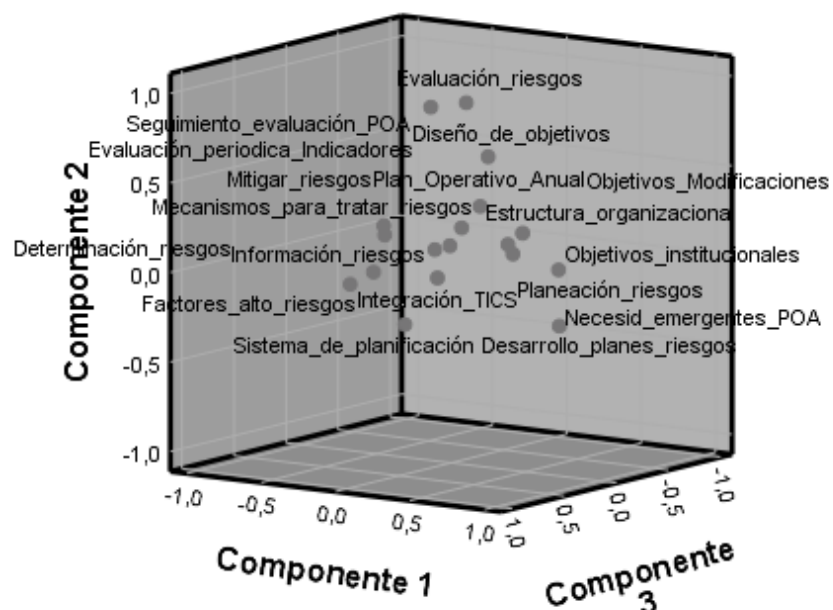
The total variance explained by the first three components is 71.40% of the total variance explained. The matrix of components informs us of the relationship between the variables, grouping them and, therefore, reducing the amount of data with which the investigation began.

Table No. 4
Relevant Results of the factor analysis

KMO	0,699		Componentes						
	Inicial	Extracción	1	2	3	4	5	6	7
Planning system	1,000	0,851	0,901	-0,065	0,089	-0,058	0,103	0,155	0,006
Operative plan	1,000	0,815	0,891	0,043	-0,059	-0,027	0,025	0,039	0,257
POA tracking	1,000	0,862	0,592	0,086	-0,192	-0,281	-0,322	0,118	0,429
POA needs	1,000	0,769	0,076	0,802	0,120	-0,090	0,038	0,182	0,251
The objectives	1,000	0,808	-0,235	0,766	0,146	-0,029	0,294	-0,073	-0,076
Goal development	1,000	0,767	-0,240	-0,602	-0,107	0,596	-0,103	-0,079	0,068
Tics integration	1,000	0,793	0,279	0,574	0,422	0,145	0,394	-0,027	-0,141
Goal design	1,000	0,775	-0,009	-0,046	-0,854	0,114	-0,020	-0,076	0,126
Indicator evaluation	1,000	0,760	0,102	-0,272	-0,846	-0,075	-0,086	-0,022	-0,028
Risk assessment	1,000	0,867	0,097	0,232	0,203	-0,750	0,354	-0,078	0,101
They develop plans	1,000	0,830	0,003	0,318	0,366	0,642	0,320	0,206	-0,006
Risk planning	1,000	0,782	-0,021	-0,254	-0,044	0,141	-0,886	0,009	0,038
Monitoring changes	1,000	0,761	0,086	0,130	-0,013	0,141	-0,047	0,862	0,241
Risk information	1,000	0,848	0,360	-0,001	0,441	-0,145	-0,015	0,582	-0,382
High risk factors	1,000	0,808	0,218	-0,437	0,380	0,095	0,273	0,453	0,296
Data evaluation techniques	1,000	0,874	-0,321	-0,048	0,089	0,043	0,034	-0,185	-0,837

Extraction method: component analysis

Graphic No. 1
Rotated space components



Own elaboration
Source: self made

From the factor analysis (Matrix of rotated components) we can conclude that the variables they are grouped into three large groups, (see figure No.1):

1. Component 1: the association of the variables development of plans, risk information, planning systems, monitoring of the POA, risk assessment are related to the determination of valuation techniques
2. Component 2: the association between risk planning, integration of Tics High risk factors, the institutional objectives are related to the annual operating plan.
3. Component 3: Risk control, change monitoring, development of objectives, POA needs are related to the design of objectives.

Conclusion

In internal control, there is no evaluation of planning, risk information, planning systems, monitoring of the POA, in order to know the status of the processes.

When evaluating internal control, information can be obtained that allows us to carry out annual planning and therefore annual purchasing planning, the planning variable is deficient.

Risk control is an input for strategic planning integrating internal control, there is no evidence of improvements to the processes. In addition, there is no evidence of evaluations of indicators or monitoring of them.

Despite the existence of information systems in planning for the management of Municipal GADs, there are no regulations that allow an internal auditor to evaluate the prior or continuous control, for the improvement of processes. The generation of information from the processes is constant, but the process of information or data analysis systems is not evident.

The audits fulfill their function of being sanctioning, and through reports they leave the observations and recommendations to the highest authority and their managers, but it is observed that the errors are not rectified in their entirety, nor is the progress of the recommendations monitored in approved reports.

It is necessary that the strategic planning, the fulfillment of objectives and the follow-up of recommendations through internal control, change its structure and its control methodology. The non-existence of institutional internal control affects the results found. A strategic planning model updating regulations and identifying new processes, data analysis, measurement of indicators and results aligned with institutional objectives, will allow the GADs to improve their efficiency and effectiveness of their processes.

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