

Factors that influence the success of Information Technology Governance in Universities

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Abstract

IT Governance (ITG) allows Information Technology to be an efficiently managed and used strategic resource within universities and other organizations. However, despite its importance, this is not being accomplished due to a series of factors that inhibit the fulfillment of its purpose. Therefore, this article analyzes the influence of 13 factors on the success of ITG in a university context; 8 are taken from contexts outside of universities, and 5 are taken from theories of the studies of administration and human behavior. The heads of IT from 45 Ecuadorian universities participated in this empirical study. The results showed that all the proposed factors have a positive influence on the success of ITG. 1 of them have a very strong influence, 10 have a strong influence, 2 a moderate influence.

Keywords: IT Governance; Success; Factor; University; ISO/IEC 38500

Introduction

The use of information technology (IT) has a positive impact on the performance of organizations. It is a key strategic asset and it is essential for organizations to be competitive; however, in many cases, the use of IT has evolved, specialized, and expanded in various services and processes. On many occasions, this growth has not been aligned with business objectives, so the necessary value is not provided. An alternative for IT to be used and managed efficiently is IT governance (ITG). ITG is the system through which the current and future use of IT (its mission) is directed and controlled in order to ensure that it adds value to the company, keeps risks under control [1], and achieves the strategic objectives of the organization [2].

Despite the importance of ITG in organizations, many times it does not achieve

its purpose. The success of ITG is determined by the degree that the entire organization adopts clear and transparent structures, processes, and standards. Constant monitoring allows having a pulse on what is going on in the organization [1]. Thus, we have the questions: What causes this? What makes ITG successful? These questions have motivated the development of studies that identify factors that affect ITG's success, such as can be seen in [3] and [1].

Like all organizations, universities must be competitive and offer quality services in all aspects: teaching, research, innovation, management, and university extension. This can only be achieved through the efficient use of IT since IT is necessary for a university's operations and the achievement of its strategic plans. Because of this, having effective ITG is a requirement for success. However, a

comprehensive review of the literature in journals indexed in Scopus and Web of Science (WoS) on factors influencing ITG success using the string ((FACTOR * OR "CRITICAL SUCCESS FACTORS" OR CFS *) AND ("IT GOVERNANCE" OR "INFORMATION TECHNOLOGY GOVERNANCE" OR ITG) AND SUCCESS) shows that no studies have been carried out in a university environment. This is corroborated in the work carried out by [4].

Studies show that there are factors that affect the success of the ITG in business organizations such as the commitment of senior management [5], [6], the support of financial and human resources [6], [7], and the integration of IT and business perspectives [8], [9]. Universities have different characteristics than those organizations since their mission is to train professionals and researchers. Because of the research and university extension programs they administer, they have markedly different governance, organization, and process structures. As a result, this question arises: Are these factors valid in a university environment? Additionally, there are factors such as ethical behavior in management, referring to ethics, morals, and the values that managers have in the management of an organization. These have not been considered in the literature nor in the business environment. Not taking them into account could affect the image, efficiency, effectiveness, and reputation of ITG and the organization. Thus, the following question arises: what other factors affect the success of ITG in a university environment?

To answer the previous questions, in this paper 13 factors that influence the success of ITG are proposed. 8 of them have been taken from contexts other than universities. After analysis and justification, they have been extrapolated to a university context. Additionally, 5 have been proposed based on theories from studies of administration and human behavior. To verify the validity of these factors, IT managers from Ecuadorian universities were consulted to get their perspectives.

This work is organized into 6 sections. In section 2, 13 factors are proposed and justified for the success of ITG in a university context. Section 3 describes the research methodology used to validate the proposed factors, which

includes the strategy applied for the collection of information and analysis of results. The results of the study and its discussion are presented in sections 4 and 5, respectively. Finally, the conclusions follow in section 6.

1. New factors that influence the success of ITG in universities

1.1 IT Governance Success

There are few definitions for establishing what defines ITG success. It must be based on a methodological and organizational structure that guarantees the adequate use of Information Communication Technologies (ICTs) aimed at achieving business objectives [3]. Successfully implementing ITG requires having a careful and comprehensive procedural design with a holistic vision [10]. Also, having a clearly defined and transparent set of IT structures, processes, and standards that are adopted throughout the organization, together with constant monitoring, allows understanding the way the organization functions [1].

Note that the existing definitions of ITG success are disparate. Some are oriented to implementation, and others to compliance with standards. That is, there is no agreed-upon definition. All of them, in one way or another, either directly or indirectly define the adequate use of IT. Therefore, in working towards the goal of finding a definition for ITG success, the following is considered:

- Success comes from the Latin *exit* which means "end" and refers to achieving good results or achieving what is desired.
- ITG is defined as the system by which the current and future use of IT is directed and controlled to support an organization and contribute to the achievement of its plans [2]. That is, for the ISO, the purpose of ITG is focused on proper organization and the achievement of objectives.
- ITG is effective if it generates benefits for the business and increases value for stakeholders, such as a better reputation, trust, product leadership, time to market, and reduced costs [11]. That is, for the IT Governance Institute (ITGI), the purpose of ITG is to generate business benefits and increase value for stakeholders.

Therefore, considering the previous definitions, it is possible to define it this way:

An ITG is successful if IT governance supports the organization in achieving its plans, generates business benefits, and increases value for stakeholders.

This definition is valid for all contexts, including universities since the purpose of ITG is the same in any organization.

1.2 Factors that influence the success of ITG

For [12], critical success factors (CSF) are characteristics, conditions, or variables that are critical to achieving the mission and the success of the organization. For organizations, success involves achieving their mission. This concept can be customized for the systems of an organization, where each one of them contributes to achieve success. This is particularly valid for ITG. Therefore, in this paper the following definition is used: *The CSFs for ITG are the characteristics, conditions, or variables that are critical to achieve success.*

An exhaustive search on CSFs for ITG, as indicated in the introduction, shows that there are no studies specific to the university environment. However, there are studies about organizations in general, from which 8 CSFs are extracted (see Table 1). These are: comprehensible regulations (F1), adequate regulations (F2), persuasive communication (F3), senior management engagement (F4), financial and human resource support (F5), integration of business and IT perspectives (F6), IT business orientation (F7), and IT value chain understanding (F8). These factors that have been experimentally corroborated should also be valid in a specific context, such as a university.

On the other hand, seventy theories from the fields of administration and human behavior were reviewed, to understand their relationship with the success of ITG. This allowed the identification of the following theories: Organizational Culture, Organizational Learning, and Stakeholder, Contingency, and Organizational Information Processing. Five new factors were identified based on this analysis, which are described below.

- **Organizational Culture (F9):** This is the way things are done in organizations. It describes the beliefs, expectations, experiences, and values (personal and cultural) that are shared by the members of an organization. This creates norms that powerfully shape the behavior of individuals and groups in the organization. Also, they control interactions, both internal and external [13], [14]. This factor is based on the theory of Organizational Culture that describes organizations as having their own culture. Organizations use communication to develop unique, shared patterns of behavior, traditions, and norms that all members adhere to. "Culture is not something that the organization has, but something that the organization is" [15].

- **Organizational Learning (F10):** This is defined as the process of improving actions within an organization, through better knowledge and understanding [16]. It is the ability of organizations to create, organize, and process information in order to generate new knowledge. In turn, this allows them to develop new capabilities, design new products and services, increase their existing offers, and improve processes [17]. On the other hand, the Organizational Learning Theory maintains that organizations have the ability to process, acquire, interpret, distribute, and store information that helps them improve performance in the future. That is, people as well as organizations can learn [18]. The core of this theory is that the organization's learning activities are the organization's source of value creation [19].

- **Ethical behavior in the management of an organization (F11):** This refers to the ethical actions of managers in the management of an organization. It involves respecting ethical principles and established norms; specifically, it refers to how managers treat the needs of involved parties, based on morals and values. This is supported by the Stakeholder Theory, which is a theory of organizational management and business ethics that emphasizes morals and values in the management of an organization [20].

- **IT adaptability (F12):** This refers to the ability and willingness to act effectively and agilely when facing changes caused by IT. This factor is supported by Contingency

Theory, which states that there is no single “right” way to run an organization; rather, it emphasizes that there should be no absolutes in organizations. Everything depends on environmental conditions, since there is a functional relationship between these conditions and the appropriate administrative techniques for achieving organizational objectives [21]. Today's organizations must face increasingly more uncertain, changing, and challenging environments from various economic, technological, social, political, and environmental points of view, among others [22].

- Quality information for decision-making (F13): This refers to the extent to which information is accurate and timely for decision-making. The Organizational Information Processing Theory identifies three important concepts that support this factor. They are information processing needs, information processing capacity, and the interrelationship between the two for optimal performance. Organizations need quality information to face environmental uncertainty and improve their decision-making [23].

Table 1: Factors that influence ITG success in a university context

ID	Factor	Description	Support
F1	Comprehensive regulations	This refers to the fact that the internal regulations defined by ITG are clear, simple, and consistent, and, therefore, understandable for the entire organization [1].	[3], [6], [7], [9], [24], [25]
F2	Adequate regulations	Regulations should be defined in such a way that ITG is designed to support the efficient direction and control of IT in an organization. It includes three important characteristics for ITG: 1) It should offer a balance between regulations and freedom of choice in order to achieve better acceptance and adoption by the organization. 2) It must be detailed enough so that people understand and apply it. And 3) It must only incorporate the minimum necessary control and direction structures, processes, and relational mechanisms while leaving out excessively complex and bureaucratic approaches [1].	[1], [3]
F3	Persuasive communication	This refers to the fact that the IT administration has the ability to establish ITG throughout the organization. To do this, the ITG must be communicated to all its members, since an adequate understanding of the components and the interaction between them is required to achieve its success [1].	[1], [3], [5], [6], [7], [26], [27], [28].
F4	Senior management engagement	Senior management should promote ITG through direction, communication, resource allocation, and guidance. In addition, the commitment of senior management not only refers to high-level executives but also to operational management. They have to be involved to achieve the introduction and continuous application of ITG within the organization [1].	[1], [3], [5], [6], [7], [27] [28].
F5	Financial and human	This is the extent to which a business's backers provide sufficient financial and human resources	[1], [3], [6], [7], [29]

	resource support	to define, affirm, maintain, and further develop ITG [6].	
F6	Integration of business and IT perspectives	This considers the needs and requirements of IT and the business, as well as incorporates and directs both perspectives in strategic alignment. That is, it makes sure that IT policy is strategically aligned to the needs and requirements of the business [3].	[3], [7], [9], [8], [30],
F7	IT business orientation	The IT organization and its employees must have the skills and attitudes necessary to adequately support the business function and act as business enablers [28].	[1], [3], [25], [27], [28]
F8	IT value chain understanding	This refers to the extent to which the IT value generation process is understood in the organization, in the value creation of IT products and services offered [1].	[6], [28]
F9	Organizational Culture	This is the way things are done in organizations. It describes how beliefs, expectations, experiences, and values are shared by the members of an organization. In turn, this produces norms that powerfully shape the behavior of individuals and groups in the organization. This controls interactions, both internal and external [13] [14].	Organizational Culture Theory
F10	Organizational learning	This is the capacity that organizations have to create new knowledge by improving their products and services [17]. It is done by creating and organizing information. The organization's learning activities are the source of value creation [19].	Organizational Learning Theory
F11	Ethical behavior in the management of an organization	This refers to how those in charge of the management of the organization deal with the needs of stakeholders in accordance with ethics, values, and principles. Morals and values must necessarily be present in the management of an organization [20].	Stakeholder Theory
F12	IT adaptability	This refers to the continuous adaptation of organizations to new situations caused by the use of new IT. Today's organizations must face increasingly more uncertain, changing, and challenging environments from various economic, technological, social, political, and environmental points of view, among others [22].	Contingency Theory
F13	Quality information for decision making	Information must be accurate and timely for decision making. Organizations need quality information to face environmental uncertainty and improve their decision-making [23].	Organizational Information Processing Theory

1.3 *The factors' influence on the success of ITG in a university context*

In this section, the influence of the 8 identified factors and 5 proposed factors in the success of ITG in a university context is established and explained.

Influence of Comprehensible regulations (F1)

According to [25], regulations must be simple to be successful. [1] states that one of the main factors for successful ITG is understandable regulations. Based on the results obtained in this research where empirical evidence was collected from 15 organizations, and when analyzing the cases of this study, it is found that regulations must be specific and adapted to each organization. Additionally, they must be pragmatic and meaningful. Universities are organizations that are regulated by specific laws that govern each country. There are rules, statutes, and other factors that establish a university's mission, vision, and organizational structures. There are also regulations that govern areas like technology, therefore, ITG at a university is not exempt from requiring understandable regulations for its success. Thus, the following hypothesis is proposed:

Hypothesis H1: Comprehensible regulations (F1) positively influence the success of ITG.

Influence of Adequate regulations (F2)

The factor of having adequate regulations had not been considered in ITG despite being considered in other research areas until [3] and [1] proposed it as a construct and demonstrated its positive influence on the success of ITG. This is strongly supported by empirical evidence from 13 organizations and suggests it should be included in future research in this field. This influence is also valid in a university context since successful ITG requires that processes must be defined and regulated. This is mandatory in any university organization. It is also essential that these regulations are simple, traceable, and should provide guidelines for daily work within the university. Thus, the following is proposed:

Hypothesis H2: Adequate regulations (F2) positively influence the success of ITG.

Influence of Persuasive communication (F3)

The relationship of this construct to the success of ITG is supported by empirical evidence from 10 established organizations [1]. This relationship must be established at the university level since IT administrators at universities must inevitably have the necessary persuasion to establish ITG throughout the organization. Without this factor, it would hardly be possible to have successful ITG, given that the lack of persuasive communication would be an inhibitor to ITG implementation [6] [7]. Thus, the following is proposed:

Hypothesis H3: Persuasive communication (F3) positively influences the success of ITG.

Influence of Senior management engagement (F4)

Senior management commitment is considered an important factor for ITG success [28]. In [1] its influence in 15 organizations is evidenced. For ITG to be successful at universities, there is no doubt that top management must promote ITG activities; if managers do not support it, it is difficult to try to introduce it at the university. It would also become a tiring process for those interested in adopting it. So, the following is proposed:

Hypothesis H4: Senior management engagement (F4) positively influences the success of ITG.

Influence of Financial and human resources support (F5)

In the research carried out by [3], it is established that the inadequate allocation of financial resources affects the success of ITG. This relates to the fact that the ITG is closely linked to the financial and human resources required to increase the competitive advantage of organizations [31]. Therefore, to achieve successful governance, managers should allocate both financial and human resources for the IT area. Likewise, in a university context, an adequate allocation of resources will be required, for which the following is proposed:

Hypothesis H5: Financial and human resources support (F5) positively influences the success of ITG.

Influence of Integration of business and IT perspectives (F6)

In a study carried out by [3], it was established that the integration of business and IT perspectives is a determining factor that contributes to the success of ITG in an organization. This is due to the significant interdependence between business processes and technology [25]. This link continues to grow in significance and also occurs in universities, where all their activities are closely linked to IT. Thus, the following is proposed:

Hypothesis H6: The integration of business and IT perspectives (F6) positively influences the success of ITG.

Influence of IT business orientation (F7)

IT's business orientation is a construct that influences ITG's success and is evidenced by results achieved in eight organizations. This means it is more than just a support tool, it is a facilitator of business [1]. Gartner's research director estimated that by 2021, 40% of IT areas will be more versatile and focused on business aspects [32]. This has been happening in universities for decades. Also, the internet has allowed for a reduction of costs and lead to technological advances that permit a stronger orientation between IT and business objectives. These implementations have become widespread and diversified, so the following is proposed:

Hypothesis H7: IT business orientation (F7) positively influences the success of ITG.

Influence of IT value chain understanding (F8)

In the investigations carried out in [3] [1], it is clear that knowing the IT value chain is important for the success of the ITG. This implies awareness of IT processes and how they add value to the organization in order to best manage it. In a university context, this factor is also valid, since not including it implies having IT processes that do not support the organization achieving its plans. On the contrary, that does not generate benefits for the business or increase value for stakeholders, which does not emphasize the success of ITG. The following is stated:

Hypothesis H8: IT value chain understanding (F8) positively influences the success of ITG.

Influence of Organizational Culture (F9)

According to the results obtained in the research of [33], Organizational Culture plays a very important role in ITG in organizations, since it affects the operation of the entity throughout its processes, structures, and relational mechanisms. In turn, the culture depends on having values and norms that IT employees identify with, which fosters positive behaviors and greater productivity. In this context, the Organizational Culture positively influences the success of ITG, which is why it has taken on great importance within organizations. Universities are no different, as the promotion of values and norms creates a culture that leads to improved behaviors and increased productivity of IT staff. Therefore, the following is proposed:

Hypothesis H9: Organizational Culture (F9) positively influences the success of ITG.

Influence of Organizational Learning (F10)

Universities, like other organizations, must have the ability to adapt in response to environmental challenges. This allows them to achieve a competitive advantage, which is one of the objectives of successful ITG. This is due to the fact that the main role of information technologies is considered to be the creation of competitive advantages for organizations [34], [35], [36]. Organizational Learning is a critical factor in the ability of organizations and, specifically, of universities to create value. The creation or discovery of cutting-edge knowledge done by universities creates this value. The speed of changes in society has led organizations to learn to adapt quickly to changes in order to survive; therefore, the following is proposed:

Hypothesis H10: Organizational Learning (F10) positively influences the success of ITG.

Influence of Ethical behavior in the management of an organization (F11)

This factor is decisive for organizations, since it shows how an organization is handling ethical issues [37]. The actions of managers are critical determinants in shaping the corporate image and public perception of organizations [38]. The study carried out by [39] establishes a positive link between ethical behavior and the success of organizations.

Since ITG's objective is to support the organization in the achievement of its plans, ethical behavior should be an important factor in ITG's success. This is also valid for universities, where ethics is a deeply rooted principle in all its activities, so the following is proposed:

Hypothesis H11: Ethical behavior in the management of an organization (F11) positively influences the success of ITG.

Influence of IT adaptability (F12)

Today's organizations must face increasingly uncertain, changing, and challenging environments. And these factors are shaped by different points of view: economic, technological, social, political, and environmental, among others [22]. New technologies are constantly appearing, and all organizations (especially universities) depend on technology to function and achieve their objectives. This creates a special need for information technologies: the need for continuous adaptability to new situations. Additionally, Contingency Theory states that the survival of organizations lies in their ability to adapt to changes [40]. Globalization and new technologies have disrupted the

organizational environment, so it is essential that universities have the ability to adapt to new IT, therefore, the following is proposed:

Hypothesis H12: IT adaptability (F12) positively influences the success of ITG.

Influence of Quality information for decision making (F13)

At present, Currently, universities, like any organization that seeks to be competitive in order to achieve success, make strategic decisions based on the needs of the global market. For these decisions to be correct, organizations need up-to-date, reliable, complete, and, above all, quality information. Quality information improves effective decision-making [41], which is why it is considered a factor for success. Thus, the following is proposed:

Hypothesis H13: Quality information for decision making (F13) positively influences the success of ITG.

Therefore, the proposed conceptual model is shown in Figure 1 and aims to determine new factors and their positive or negative influence on ITG in a university context.

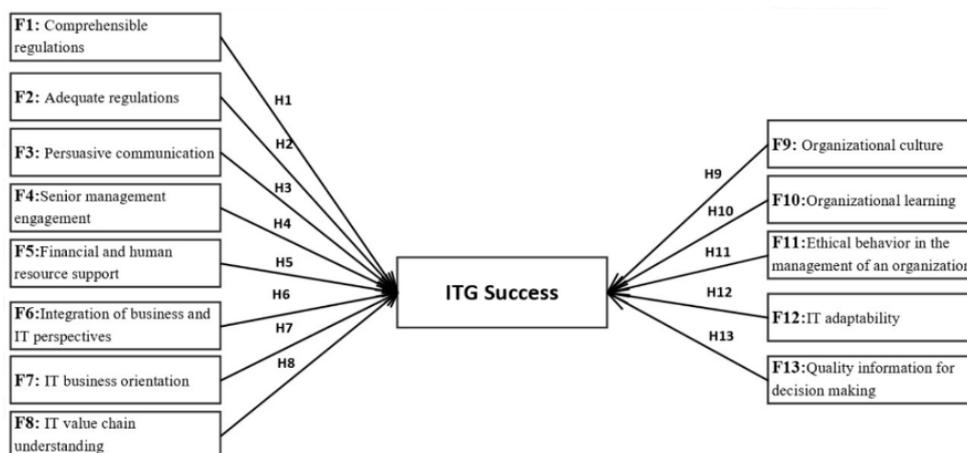


Fig. 1. Conceptual model: factors that influence ITG success

2. Methodology

A descriptive, correlational, explanatory, and multivariate, cross-sectional study was carried out, based on the design and application of a survey that allowed determining the influence of the 13 factors identified as key to the success of ITG in a university context, as well

as evaluating the degree of importance of each of them.

2.1 Data collection

To carry out the research, the study population is the 59 institutions of higher education in Ecuador. To determine the sample, a type of intentional sampling was carried out, where

the survey was sent to all the universities, of which 45 participated. Both public and private universities were consulted, and responses were received from managers, heads of systems, heads of projects, and heads of support for IT departments. The survey was carried out with a Google Form, which can be found at <https://forms.gle/EFCUNuawxh69jgDRA>. It consists of 32 questions distributed in five sections, of which only the first two correspond to the present study: General Data (Section 1) and the Perception of the Relationship between Factors and the success of ITG (Section 2). The questions in Section 1 were multiple-choice, while the questions in Section 2 were evaluated according to the Likert scale of 5 values, in relation to the factor-success influence on ITG: 1-None, 2-Low, 3-Medium, 4-High, and 5-Very High. Also, 3 questions determining the level of familiarity with ITG were included to determine the quality of the responses. As with section 2, this was evaluated using the Likert scale.

A pilot test of the survey was carried out to ensure its validity, detect errors in the wording of the questions and determine unexpected values of the variables analyzed. After the adjustment, based on the suggestions, the survey was applied.

2.2 Data analysis

In the present paper, a qualitative and quantitative statistical analysis is set out. The analysis of consistency and data validation process allowed for obtaining valid and reliable results. The software used is SPSS; the statistical methods used are the following:

- a) Descriptive statistics, prepared to characterize the information of the respondents.
- b) Reliability and validity test, using Cronbach's alpha, to determine the reliability of the internal consistency of the survey.
- c) Structural Equations Model, to contrast the models that propose causal relationships between variables, measurement error effects, and structural coefficients [42]. This method

identifies whether or not there is an influence of the factors identified on the success of ITG.

The structural equation model was created using the SPSS AMOS program, with which the impact of each factor will be determined; for this, the Maximum Likelihood (MV) method was used. The statistics that will serve to validate the proposed model are the following:

- p: probability associated with the chi-square statistic
- GFI: suggested test statistic pointing to the variability explained by the model
- CFI: incremental adjustment measure
- NFI: evaluates the decrease of the chi-square statistic of the model with respect to the null model.
- NNFI: considers the degrees of freedom of the proposed model, as long as their relationship is weak with the sample size.
- ECVI: represents the correlation between the model variables.
- RMSEA: can be interpreted as the mean approximation error per degree of freedom.

To determine whether or not there is an influence of the factors on the success of ITG in a university context, the Spearman correlation coefficient is also used. It measures a linear association using the ranks and order numbers of each group of subjects and compares those ranges. The Spearman correlation coefficient can score from -1.0 to +1.0 and is interpreted as follows: values close to +1.0 indicate that there is a strong association between the classifications, that is, as a rank increases, the other also increases. Values close to -1.0 indicate that there is a strong negative association between the classifications, that is, as one rank increases, the other decreases. When the value is 0.0, there is no correlation [43].

3. Results

3.1 Descriptive Statistics

Of the 45 higher education institutions that participated, representing 76% of all Ecuadorian universities, 60% were public universities, while 40% were private.

Likewise, of the total of those surveyed, 74% hold management positions in IT, and 26% positions in the technical and IT support area (see Table 2).

Table 2: Distribution profile of those surveyed

Surveyed Profile	Percent
IT Coordinator	11%
IT Director	36%
IT Administrator	22%
IT Manager	5%
IT Technician	26%
Total	100%

Next, an evaluation was carried out on the level of knowledge of ITG, considering experience, knowledge of ISO 38500, and the knowledge of ITG areas, with the Likert scale. It was done using intervals, where the values of 1.00-1.79, 1.80-2.59, 2.60-3.39, 3.40-4.19, and 4.20-5.00 correspond, respectively, to the levels of none, low, medium, high, and very high. The results obtained (see Table 3) show that the experience and knowledge of ITG areas are high, and the level of knowledge about ISO/IEC 38500 is medium. Therefore, on average, the level of knowledge about ITG is high, and, therefore, it could be said that the quality of the responses is acceptable.

Table 3: Level of ITG knowledge of survey respondents

ITG Knowledge	Average	Minimum	Maximum
ITG Experience	3.83	3	5
ISO 38500 Knowledge	3.02	1	5
ITG Knowledge	4.14	3	5
Average	3.66		

3.2 Reliability and Validity Test

The result of applying Cronbach's alpha is shown in Figure 2, where the value obtained based on that established by [46] is excellent since it is greater than 0.9. Therefore, the conclusion is that the survey has excellent reliability and internal consistency, and thus the results will be reliable when applying the subsequent statistical methods.

Alfa de Cronbach	N de elementos
.929	13

Fig. 2. Results of the application of Cronbach's alpha

3.3 Structural Equations Model

The Structural Equations Model has been designed (see Figure 3), where the oval represents the latent variable (ITGS), the

rectangles represent the observed variables (Fn), and the circles represent the variables corresponding to the errors in the model.

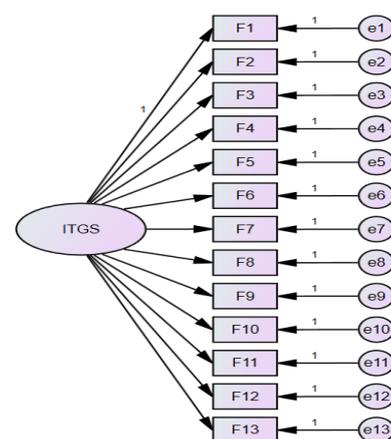


Fig. 3. Structural equations model

To determine the relevance of the structural equations model, the maximum likelihood method was applied. The most important statistics are shown in Table 4. The determination is that the obtained results are acceptable, which indicates that the proposed model is relevant.

Table 4. Adjustment measures for the Maximum Likelihood Method

Goodness-of-fit measure	Acceptable values	Obtained acceptability values	Interpretation
p	≥ 0.05	0.058	Acceptable
GFI	≥ 0.90	0.871	Moderately Acceptable
CFI	≥ 0.90	0.935	Acceptable
NFI	≥ 0.90	0.912	Acceptable
NNFI	≥ 0.90	0.926	Acceptable
ECVI	≥ 0.65	0.81	Acceptable
RMSEA	≤ 0.05	0.050	Acceptable
SRMR	≤ 0.05	0.047	Acceptable

From the analysis of the offending estimates (Table 5), it is observed that the errors are not significant since the estimate does not

correspond to a critical proportion greater than 1.96, nor is the p-value is greater than 0.05. Therefore, all parameters (Fn) can be used.

Table 5. Analysis of Offending Estimates

	Estimate	S.E.	C.R.	p
ITGS	0.414	0.125	3.308	***
e1	0.343	0.068	5.074	***
e2	0.241	0.047	5.098	***
e3	0.370	0.071	5.208	***
e4	0.261	0.052	5.055	***
e5	0.216	0.046	4.753	***
e6	0.366	0.071	5.129	***
e7	0.245	0.048	5.052	***
e8	0.375	0.070	5.328	***
e9	0.297	0.059	5.047	***
e10	0.248	0.049	5.017	***
e11	0.377	0.074	5.117	***
e12	0.271	0.055	4.971	***
e13	0.672	0.124	5.401	***

*** $p < 0.05$

From the results shown in Table 6, it can be seen that all the Spearman correlation coefficients are significant given that the

calculated p-value (0.001) is lower than the significance level of the investigation (0.05). Also, from the results of the correlation of

each factor, it can be affirmed that all the hypotheses raised in section 2.3 are true since the correlation measures are positive. Factors F5, F10, and F12 have the greatest ITGS

correlation with scores greater than 0.75; those with the lowest influence are F8 and F13, which have a score of less than 0.587.

Table 6. Result of the Spearman Correlation Coefficient according to expert opinion

Factors	ITGS (correlation)	
F1	0.739	
F2	0.730	
F3	0.677	
F4	0.746	
F5	0.821	
F6	0.717	
F7	0.747	N=45
F8	0.586	p=0.001
F9	0.749	
F10	0.759	
F11	0.722	
F12	0.773	
F13	0.497	

4. Discussion

On defining the success of ITG in a university context

In the direction of finding a definition for the success of ITG in universities, an exhaustive review of the literature was carried out in journals indexed in Scopus and WoS. No definition of it could be found, so the search was broadened to other areas and also to Google Scholar, obtaining only 4 definitions and these are disparate. As regards defining the concept of success, it refers to achieving good results or achieving the desired purpose. The purpose of ITG given in ISO/IEC 38500, which establishes supporting the organization to achieve its objectives, and at the IT Governance Institute, which sets out to generate business benefits and increase value for stakeholders were also considered. Therefore, a definition of ITG's success in a

university context is proposed, which is also valid for any other context:

ITG is successful if IT governance supports the organization in achieving its plans, generates benefits for the business, and increases value for stakeholders.

On the factors that influence the success of ITG in a university context

13 new factors have been identified that positively influence the success of ITG, 8 of them adapted from a non-university context, and 5 obtained from the theories: Organizational Culture, Organizational Learning, Stakeholder, Contingency, and Organizational Information Processing.

The identified factors were tested in 76% of the universities in Ecuador, confirming that all of them have a positive influence. Partitioning the interval [-1.0, 1.00] of values for the Spearman correlation as ([-1,0): negative influence; 0: neutral influence; (0,1.00]:

positive influence), it is observed that all the proposed factors positively influence the success of ITG. Using a continuous Likert scale for positive influence ((0,0.2] very mild;(0.2,0.4]: mild; (0.4,0.6): moderate; (0.6, 0,8]: strong; [0.8,1.00) very strong) the correlation coefficients found from the Spearman coefficient (see Table 6) can be interpreted that 1 of the 13 of the factors present a very strong positive influence, 10 present a strong positive influence, and the other 2 present a moderate influence.

The factors with a very strong is financial and human resource support (F5), and the factors with strong influence are the following: comprehensible regulations (F1), adequate regulations (F2), persuasive communication (F3), senior management engagement (F4), integration of business and IT perspectives (F6), IT business orientation (F7), Organizational Culture (F9), Organizational Learning (F10), ethical behavior in the management of an organization (F11) and IT adaptability (F12). All of these present a Spearman correlation greater than 0.67 and are critical to achieve the success of ITG. For example, universities must have the ability to adapt to changes, in particular, to new information technologies (F12). If they don't adapt, they will not be competitive and thus fail to achieve their objectives. It should be noted that the factor that has the greatest influence is F5. This result reflects that the allocation of resources is very critical, without it, it is not possible to guarantee the achievement of plans, generate benefits for the business, and increase value for stakeholders. On the other hand, the factors with moderate influence are IT value chain understanding (F8), this could be due to the fact that within Ecuadorian universities it has not yet been possible to adequately establish and integrate processes in such a way that they generate added value to services, but their importance is known. And the influence of Quality information for decision making (F13) could be explained since most Ecuadorian universities are in a phase of process and service automation. That is, decision-making is carried out, in general, with empirical information.

Study limitations

The validation of the proposed factors was carried out using the survey technique and is limited to only universities in Ecuador and the perception of those responsible for IT areas.

5. Conclusions

In this article, a definition of ITG's success has been proposed for a university context. 13 critical success factors were identified, 8 of which are taken from a non-university context, and 5 are extracted from theories of administration and human behavior. In addition, an exhaustive literature review was carried out in journals indexed in Scopus and WoS on factors that influence the success of ITG in universities. No studies were found in this regard, so this work is the first to contribute to this topic.

The definitions of ITG success are disparate and lack consensus. As a result, the following definition has been proposed: ITG is successful if ITG supports the organization in achieving its plans, generates benefits for the business, and increases value for stakeholders. This definition is based on the concept of success and the purpose of ITG given in ISO/IEC 38500 and by the ITGI.

Regarding the factors that influence the success of ITG in a university context, an empirical study of 76% of the universities in Ecuador shows that all the proposed factors have a positive influence on the success of ITG. 1 of them show a very strong (influence financial and human resource support (F5)), 10 show a strong influence (comprehensible regulations (F1), adequate regulations (F2), persuasive communication (F3), senior management engagement (F4), integration of business and IT perspectives (F6), IT business orientation (F7), Organizational Culture (F9), Organizational Learning (F10), ethical behavior in the management of an organization (F11) and IT adaptability (F12)). Meanwhile, the factors IT value chain understanding (F8) and the factor quality information for decision making (F13) shows a moderate influence.

Future Works

In the direction of this study, the following challenges are posed: establish practices to deal with factors, identify the influence of factors in ITG areas (strategic alignment, risk management, value delivery, resource management, performance measurement), and establish the relationship between the factors and ITG principles given in ISO 38500.

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