Applying the Hierarchical Analytical Process to Enterprise Governance Goals for Value Creation

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The creation of value directly depends on Corporate Governance (CG) and Governance of IT (GIT) as these present the company as transparent, secure, and sustainable to shareholders and stakeholders, thereby establishing greater compliance with the rules, reducing risks, and generating a better competitive position. This work integrates the two governances through the prioritization of the criteria of benefits, risks, and resources to create value. Using the Analytic Hierarchy Process, an important research question is answered related to the priorities in CG and GIT goals that create highest value for the company. The analyses have been generated through a Decision Support System with specific software. The results show that the criteria of optimization of risks and resources are in dispute for the maximum importance in a framework of enterprise governance and long-term sustainability relative to the criterion of benefits generation. The decision alternatives found to have the highest priority were those related to system failures, customers loss, and operational and staff productivity.

Keywords: value creation, corporate governance, IT governance, decision-making support, analytic hierarchy process

INTRODUCTION

Creating value for the company to achieve a competitive differential by implementing strategies that currently require virtualized/digitized environments is of significant complexity as it requires a balanced integration between Corporate Governance (CG), Governance of IT (GIT), and everything that these two concepts require. In this work, these demands are related to requirements for the realization of benefits, optimization of risks, and optimization of resources; in turn, these requirements are broken down into 12 business goals, i.e., sub-criteria in the Analytic Hierarchy Process (AHP) terminology, and considered in accordance with COBIT® 2019 as follows: the value of investments perceived by shareholders and stakeholders; the portfolio of competitive products and services; financial transparency; customer-oriented service culture; fraud; customer losses; damage to assets; system failures; optimization of process costs; optimization of the functionality of business processes; operational and team productivity; and, finally, that people are qualified and motivated.

Therefore, creating value and achieving competitive advantage by implementing long-term strategies is complex for the company and require decisions that involve considering multiple criteria, which is why

this paper uses the AHP method (Saaty, 1980) to advance this research issue. This type of analytical and multi-criteria approach is robust in that it extends the limitations of human reasoning by relating all possible alternatives to each other to reach an optimized decision.

In accordance with this, the objective of this work is to determine through the AHP method the priorities in the CG and GIT goals that create the most value for companies.

The work is structured in four sections: in the first section, it is approached from the theoretical foundations, the creation of value, CG, and GIT; in the second, the research methodology and the application of the analytical process (AHP) in business decision making are presented followed by the analysis of results and prioritization of business criteria and goals for value creation. The paper ends with conclusions and future lines of research.

THEORETICAL REFERENTIAL

The theoretical foundation of this work focuses first on the concept and strategies of value creation followed by CG as a set of principles and norms that regulate and control the operation of the company and the GIT as an essential part of it.

Value Creation

A company develops and sustains some kind of competitive advantage (Porter, 1999) when it implements a strategy of creation that differentiates it from its competitors by meeting the needs of shareholders and stakeholders. In addition, it also needs to create value, which is related to strategy. In this sense, authors such as Ansoff and McDonnell (1993, p. 70) state that strategy becomes a set of decision rules, i.e., the orientation of how an organization progresses and develops advantages over its competitors using mainly the known five competitive forces.

The strategies can be of growth, stability, and reduction, all aimed at creating or generating value for shareholders and stakeholders (Wright, Kroll, & Parnell, 2000), where strong virtual communication and technological advances are currently established to drive companies toward digitalization (Solana-González & Castro-Fuentes, 2018). Therefore, creating value is related to a very significant technological approach based on strategic planning and, in the sense of Chandler (1962), defines it as the long-term company objectives established through actions and the application of the necessary resources to achieve them.

The strategy is connected to the Board of Directors, which acts as a bridge between the Board and the CG, but always in the end provides shareholder value (Assaf Neto, 2009). In other words, a company is considered to create value when it obtains yields above the opportunity cost of the total capital invested by adopting business strategies (value drivers), including Economic Value Added (EVA), Market Value Added (MVA), and Refined Economic Value Added (REVA) among others.

In this work, value creation is understood as that developed in the context of GIT and based on the criteria of benefits generation, the optimization of risks and resources (ISACA, 2018), and a management process structured to meet the mission, vision, organizational values, and capital of the company, which are connected internally. In this way, each of these main criteria for value creation contains sub-criteria that comprise the 12 enterprise governance goals examined in this paper.

In more detail, the benefits refer to the value of the investments perceived by the stakeholders, the company's product and service portfolio, its financial transparency, and the customer-oriented service culture.

Resources are aligned with reducing process costs, optimizing business process functionalities, improving operational and team productivity, and qualifying and motivating people.

On the other hand, risks are related to CG goals that seek to avoid damage to assets, fraud, system failure, and customer loss.

Management aimed at creating value brings together several methodologies that identify, enhance, and develop value in the company; hence, economic value is the best measure of business success. However, rather than developing a short-term financial strategy, creating value is about developing long-term business sustainability, generating economic rewards in the form of cash-flow, EVA, and Return On Investment

(ROI) while ensuring that the structure of internal and external CG processes is well validated. This requires constant evaluation of GIT as the entire company is supported by information systems (Turban, Sharda, Aronson, & King, 2008). These connections between CG and GIT for the creation of value require a series of complex decisions that often involve the evaluation of multiple criteria such as those applied in project management (Jabbarzadeh, 2018). The research of Jabbarzadeh utilized the AHP method developed by Saaty (1980). The AHP method is a mathematical model for calculating priorities and has been applied to define the priorities in which a company should invest and where audits should be focused. Thus, this methodology is used to identify the business goals that company managers consider most relevant or that will have the greatest impact on value creation.

In this sense, GIT audits consider information systems and standards such as COBIT® 2019 (Control Objectives for Information and related Technology) (ISACA, 2018) to anticipate and mitigate risks using a performance audit approach (Drljača & Latinovií, 2016). In this way, this type of application is providing knowledge and answers to companies at an international level.

Corporate Governance

The importance of CG is reflected in various interdisciplinary research studies on the subject, including management, economic, financial, legal, and accounting aspects in both public and private organizations (Bebchuk & Weisbach, 2010). The role of CG is to protect the interests of shareholders and stakeholders; therefore its focus is on the Board of Directors (Adams, Hermalin, & Weisbach, 2010; Gaa, 2009; García-Torea, Fernández-Feijoo, & De La Cuesta, 2016; Lanis & Richardson, 2011; Ness, Miesing, & Kang, 2010); executives and their compensation (Hong, Li, & Minor, 2016; Lozano, Martínez, & Pindado, 2016); corporate control and ownership structure (Abdallah & Ismail, 2017; Ararat, Black, & Yurtoglu, 2017; Ducassy & Guyot, 2017); and corporate economic policies (Akbar, Poletti-Hughes, El-Faitouri, & Ali Shah, 2016; Briano-Turrent & Rodriguez-Ariza, 2016; Shawtari, Milad, Hafezali, Omar, & Omer, 2016; Villanueva-Villar, Rivo-López, & Lago-Peñas, 2016). It also ensures transparency and accountability (Christensen, Kent, Routledge, & Stewart, 2015; Mosunova, 2014) as well as compliance with rules and regulations by organizations (Griffith, 2016; McKay, Nitsch, & Peters, 2015; Spătăcean, 2015) with the aim of protecting their public interests.

The study of CG is not recent. Since Berle and Means (1932) and Coase (1937), it has been discussed how corporations can survive, considering that to grow they need to delegate power to agents for their management. Later, other research discussed property rights, that is, who owns the corporation, holds the capital, or develops the activities and products (Alchian & Demsetz, 1972; Demsetz, 1967).

Subsequently, the power of the agent over the principal is discussed, i.e., what the costs are of delegating to the agent the management of investors' capital for decision-making purposes, with the agents not acting in accordance with the interests of the principal (Jensen & Meckling, 1976). It is in this sense that CG arises to minimize the agency costs derived from the separation between ownership and control (La Porta, Shleifer, López-De-Silanes, & Vishny, 2000; La Porta, López-De-Silanes, & Shleifer, 1999; Morck, 2005; Shleifer & Vishny, 1986). Thereby, the objective of CG (Miglani, Ahmed, & Henry, 2015; Saltaji, 2013) is to reduce agency problems both in the private and public sectors (Dawson, Denford, Williams, Preston, & Desouza 2016), and to create value through the application of criteria oriented to the generation of benefits and optimization of risks and resources. In this way, by integrating these criteria with business goals, the company manages to present itself to society in a more sustainable way in the long term. It should also be noted that CG is supported by the GIT, also called Enterprise Governance of IT (EGIT) (Van Grembergen & De Haes, 2017; ISO/IEC 38500:2008).

Governance of IT

Van Grembergen and De Haes (2017) provide their own definition of GIT, noting that EGIT embodies the principles of CG while focusing on the management and use of IT to achieve corporate performance goals. The GIT is, therefore, an integral part of enterprise governance exercised by the Board, which oversees the definition and implementation of processes, structures, and relational mechanisms in the

organization that enable managers and IT staff to execute their responsibilities by aligning business and IT for value creation from IT-enabled business investments (De Haes & Van Grembergen, 2015).

Integrated with CG, which according to the OECD defines the creation of a structure that determines organizational objectives and monitors performance to ensure their achievement, the EGIT (Weill & Ross, 2005, p. 2–5), with a more technological emphasis, proposes a framework to associate CG with IT, thus characterizing GIT. Likewise, regarding IT-related decisions, the MIT authors (Weill & Ross, 2005, p. 11) establish five main types: 1) Decisions concerning IT principles; 2) IT architecture decisions; 3) IT infrastructure decisions; 4) decisions concerning business application needs; and 5) investment decisions and IT priorities.

The EGIT positions itself as the governance of IT that defines who is governed, what is governed, and, ultimately, how IT is governed in relation to CG and Agency Theory (Tiwana, Konsynski, & Venkatraman, 2014) as expanded by Alhuraibi (2017). In this sense, GIT is the specification of the framework of responsibilities to motivate desirable IT behavior; this is not decision-making, but it defines who decides and contributes to decisions.

Thus, GIT has evolved and has greatly influenced the COBIT® 2019 technology process assessment model, seeking to integrate competitive approaches such as Val IT (Framework for Business Technology Management), Risk IT (Framework for Management of IT Related Business Risks), and recently, CMMI (Capability Maturity Model Integration). However, COBIT® 2019 presents a greater potential for the achievement of value creation, which is guided by EGIT as a fundamental element for the support, sustainability, and growth of the company, considering 6 principles of the governance system until reaching 40 objectives of governance and management structured in 4 domains: 1) Align, Plan, and Organize (APO) the strategy and activities of IT; 2) Build, Acquire, and Implement (BAI) IT solutions and their integration into business processes; 3) Deliver, Service, and Support (DSS) for operational execution and IT services; and 4) Monitor, Evaluate, and Assess (MEA) IT compliance with performance objectives and external requirements. According to COBIT® 2019, to achieve these objectives, it is necessary for the company to consider the following as components of the GC system: organizational structures; principles, policies, and procedures; information; processes; services, infrastructure, and applications; culture, ethics, and behavior; and people, skills, and competencies.

In this way, governance is connected to technology through business strategy and goals. However, strategies affect and are affected by the criteria of benefits generation, risk, and resource optimization at a first hierarchical level, and then, at a second level, by the choice of goals (alternatives) that support and improve business competitiveness. This interaction between criteria and alternatives allows us to establish which strategic priorities and goals are decisive for the creation of value and the search for business excellence, an approach that is methodologically supported and systematized in this work through the application of the analytical process for multi-criteria decision-making.

METHODOLOGY

The Analytic Hierarchy Process (AHP) is a general theory about judgments and assessments that based on scales of reason allows us to combine the scientific and rational with the intangible to help synthesize human nature with our experiences captured through science (Moreno, 2002).

According to Saaty (1994), judgments and values vary from one individual to another, so a new science of judgments and priorities is needed to make it possible to achieve universality and objectivity in decision-making. For this reason, an approach is needed that contemplates hierarchies, networks, and scales of reason to analyze the relations between objectives and purposes. In this sense, AHP makes it possible to take a multi-criteria (multi-dimensional) problem to a problem on a scale of priorities (one-dimensional) in which global outputs are represented as alternatives.

As a decisional methodology, AHP can be implemented in a Decisional Support System (DSS) (Sprague & Watson, 1989, p. 20–22) although by the nature itself of DSS it requires a different technique from that used for the development of a traditional transaction processing system. The AHP method as a Multi-Criteria Decision-Making methodology (MCDM) has applications in many areas of scientific and

management knowledge, such as the selection of logistics providers, choice of technological solutions, location, and outsourcing problems (Bianchini, 2018).

The AHP method can be applied to solve problems that require assessment and measurement and is developed through six key stages (Saaty, 1980):

1. Define the problem and set clear objectives.
2. Break down a complex problem into a hierarchical structure of decision factors. At the top level of the hierarchy, the general objectives and criteria are divided into particular objectives or sub-criteria until the lowest level is reached where the alternatives are located.
3. Make comparisons between pairs of decision elements, forming comparison matrices based on establishing the relative importance between the factors at each hierarchical level.
4. Check the consistency properties of the matrices to ensure that the reasoning used by the decision-maker is consistent and coherent.
5. Estimate on the basis of the matrices the relative weights of the decision criteria to achieve the general objective.
6. Make an evaluation of the alternatives based on the weights of the decision factors.

Also, the way of grading or assigning relative importance among the factors is established according to the scale presented below.

TABLE 1
DEFINITION SCALE OF WEIGHTS IN AHP

Value	Definition	Interpretation
1	Equal importance	Factor i has the same importance as factor j.
3	Moderate importance	Factor i is moderately more important than factor j.
5	Strong importance	Factor i is significantly more important than factor j.
7	Very strong importance	Factor i is strongly more important than factor j.
9	Extreme importance	Factor i is extremely important than factor j.
2,4,6,8	Intermediate values between the previous ones when it is necessary to qualify.	

Source: Saaty (1980)

The judgment reflects which of the two factors is more important and with what intensity, using the 1–9 scale. Table 2 shows how, for the most important factor in the comparison, a scale value is always used and for the least important one, the inverse of that unit. If the factor i in the row is less important than the factor j in the column of the matrix, then we enter the reciprocal value at the corresponding position in the matrix. The positions of the diagonal will always be 1 because a factor is equally important as itself.

Table 2 shows the ratings assigned on a comparison matrix following the AHP method.

TABLE 2
AHP PAIRWISE COMPARISON MATRIX

P	A_i	A_j	A_k
A_i	1	a_{ij}	$1/a_{ik}$
A_j	$1/a_{ij}$	1	a_{jk}
A_k	a_{ik}	$1/a_{jk}$	1

Source: Elaborated by the authors

Among the advantages of the AHP method are the multi-criteria assessment, the use of linguistic variables, and the need for in-depth analysis to establish value judgements among the various decision factors. This leads to a better understanding of the problem addressed because the decision-maker generally acts within a limit of psychological judgment on seven points of difference with two points of variability. However, for complex problems or problems with multiple alternatives, it may require an excessive effort of the computer system and a high number of comparisons between pairs.

According to Hogue (1987), a Decision Support System (DSS) is an interactive system that provides the user with easy access to decision models and data to support semi-structured or unstructured decision-making activities. The AHP method in its integration into an applied DSS converges completely with this definition because the user when building his model increases the connections between criteria and alternatives that generate a new strategic decision scenario.

This definition can be extended to the construction of AHP-derived models such as Fuzzy AHP (FAHP) models, which integrate elements of fuzzy logic when establishing comparisons between pairs and determining weights as in the FAHP model proposed by Cobo, Vanti, and Rocha (2014). A generalization of the classical AHP model is the Analytic Network Process (ANP), which allows more complex relationships between decision elements and, thus, the modeling complex problems. Saaty has been very productive in this methodology since the 1980s, including current research on evaluation and optimization in industrial companies and plans to apply it also to government environments (Gu, Saaty, & Wei, 2018). It should also be noted that multi-criteria methods are very robust although they also undergo continuous questioning and comparative validation, and this is a very positive point (Ishijaza & Siraj, 2018).

Data Collection Instrument

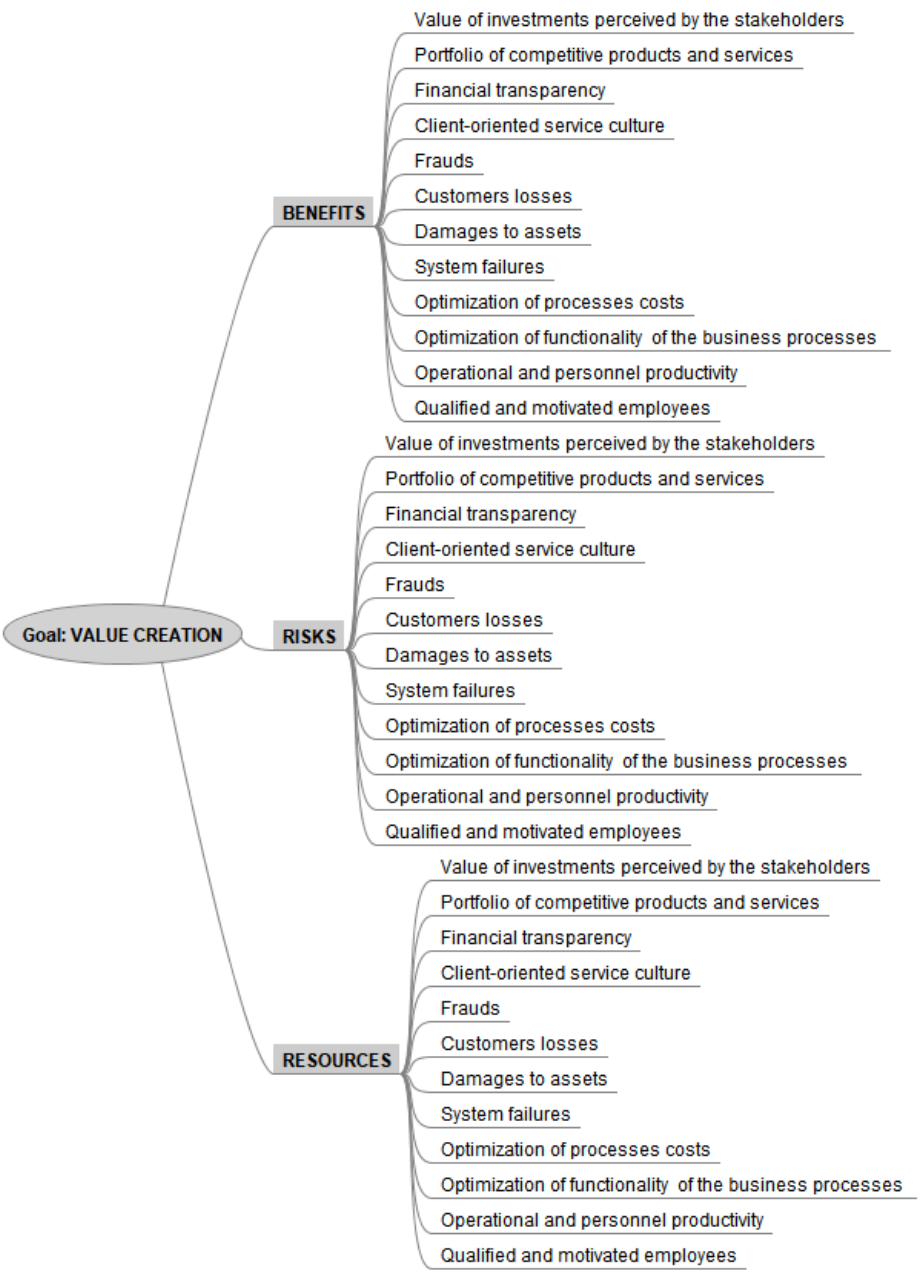
The data collection instrument was designed using a structured questionnaire developed in Google Drive on which various adjustments and validations were made so that it could be completed by the interviewee following a logical hierarchical organization. The questionnaire was used to ask the decision-maker to establish the importance of the different criteria and alternatives. For this purpose, a series of pairwise comparison questions were made using the Saaty scale (ranging 1–9) shown in Table 1.

In this way, questions were used first to define the options at a higher level in the hierarchy between benefits, resources, and risks, and then to lower a hierarchical level where the alternatives were crossed. The following business goals were considered as alternatives:

- Value of investments received by the stakeholders
- Portfolio of competitive products and services
- Financial transparency
- Client-oriented service culture
- Frauds
- Customers losses
- Damages to assets
- System failure
- Optimization of processes cost
- Optimization of the functionality of the business processes
- Operational and personnel productivity
- Qualified and motivated employees

Figure 1 shows in a hierarchical way these value creation alternatives represented by the free software (GPL) *FreeMind*.

FIGURE 1
HIERARCHY TO CREATE VALUE



Source: Elaborated by the authors

The whole hierarchy converges toward the main objective of value creation without losing coherence between criteria and alternatives. The benefits, risks, and resources matrices were also used, which provide greater objectivity of the research, including data related to the valuations established by the decision-maker.

The three matrices formulated were validated by the AHP expert together with the respondent after applying the data collection instrument. Subsequently, work was done on the data analysis instrument as detailed below.

Two profiles of actors must necessarily be involved in the data collection process: the expert in the decision-making methodology and the decision-maker in the company. The first has the methodological knowledge while the latter has the reasoning and deep knowledge of his or her organization and the implications of the different criteria to be evaluated. The AHP expert must guide the decision-maker in the process of collecting data and assessments, discovering possible logical inconsistencies on the part of the decision-maker, and proposing alternative solutions.

Data Analysis Instrument

The data analysis instrument was applied through the AHP approach and the *Expert Choice* tool developed by Saaty. The time-based implementation was used to structure his method.

In the analyses, it was studied:

- The priorities
- The peer-to-peer structures
- The inconsistencies of the comparisons, having to stay within the limits suggested by the AHP method
- The sensitivity graphs relating to Performance, Dynamics, Gradient, Head-to-head, and 2D, integrating different types of graphs to perform comparative analyses
- Other types of graphics such as circular/sectors, radar, bars etc.

Research Implementation Context

The context of this research is structured with consideration of the hierarchy for creating value over the criteria of benefits, risks, resources, and their respective alternatives, including the business goals stated in the COBIT® 2019 governance framework represented in Figure 1.

On the other hand, the context of research refers to the environment/setting in which the respondent analyzed the priorities for creating value. The decision-maker acted in the context of a Brazilian Financial Institution as a professional in the financial and accounting management area. In this regard, it should be noted that the complex economic situation that followed the fall of Lehman Brothers in 2008 to the current crisis resulting from the COVID-19 pandemic is affecting the financial system and even generating doubts about the future viability of some of its institutions. In this context, the development of CG frameworks takes on special relevance to guarantee the sustainability and growth of these institutions in the medium and long term.

In the development of the research, the DSS *Expert Choice* was used, which allowed the registration of all data and the application of the AHP method. The different comparison matrices generated are presented below.

The main comparison matrix between the benefits, risks, and resources criteria and their respective Inconsistency Ratio (IR) is shown in Table 3. The values indicated in blue color represent the inverse of the relative importance between the two criteria compared.

TABLE 3
MAIN MATRIX OF COMPARISON CRITERIA

Goal: CREATE VALUE	Benefits	Risks	Resources
Benefits		3.0	3.0
Risks			1.0
Resources			
Inconsistency Ratio = 0.5 (<0.1)			

Source: Data research

This is the first level of the hierarchical tree for which the crosses between criteria are determined from a business value creation approach but within a CG framework. In this context, considering the situation of worsening economic and market indicators in the medium term, and in view of the need to optimize resources and reduce risks that compromise the sustainability of the business in accordance with his experience, the decision-maker established that the risks and resources criteria should take on a moderately higher importance than the benefits generation criterion.

In the benefits matrix shown in Table 4, the analysis and prioritization of enterprise governance goals is focused under the consideration of this criterion, comparing all the alternatives. The validation adjustment is also shown at the bottom of the table, with the level of inconsistency below 0.1, i.e., it is at an appropriate level; otherwise, the expert will have to revise the estimations.

TABLE 4
BENEFITS MATRIX

BENEFITS criteria	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**B8**	**B9**	**B10**	**B11**	**B12**
B1 - Value of investments perceived by the stakeholders		1.7	2.0	3.0	2.1	1.0	2.1	4.0	1.0	2.8	5.0	3.0
B2 - Portfolio of competitive products and services			1.4	1.1	1.0	1.3	1.0	1.0	1.0	1.3	1.1	1.4
B3 - Financial transparency				1.1	1.1	1.6	1.1	1.1	1.2	1.0	1.2	1.1
B4 - Client-oriented service culture					1.1	6.0	1.0	3.0	3.0	1.3	1.0	1.0
B5 - Frauds						1.6	1.1	1.4	1.2	1.0	1.2	1.3
B6 - Customers losses							1.5	5.0	1.0	1.8	1.0	2.0
B7 - Damages to assets								1.4	1.2	1.2	1.1	1.6
B8 - System failures									2.0	1.8	2.0	2.0
B9 - Optimization of processes costs										1.5	1.0	1.0
B10 - Optimization of functionality of the business processes											1.5	1.2
B11 - Operational and personnel productivity												3.0
B12 - Qualified and motivated employees												
IR = 0.08 (<0.1)												

Source: Data research

Table 5 analyzes and compares the importance of enterprise governance goals from a risk perspective. The validation adjustment, as in the previous case, indicates a level of inconsistency lower than 0.1 as shown in the lower part of the table.

TABLE 5
RISKS MATRIX

RISKS criteria	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12
R1 - Value of investments perceived by the stakeholders		1.3	1.2	1.4	1.4	2.3	1.7	2.3	1.7	1.4	1.6	1.0
R2 - Portfolio of competitive products and services			1.2	1.2	1.2	2.0	1.5	2.0	1.5	1.2	1.4	1.1
R3 - Financial transparency				1.2	1.2	2.3	1.7	2.1	1.7	1.2	1.6	1.0
R4 - Client-oriented service culture					1.2	2.1	1.7	2.1	1.7	1.2	1.6	1.0
R5 - Frauds						2.1	1.6	2.1	1.7	1.2	1.6	1.0
R6 - Customers losses							5.0	2.0	1.0	2.0	3.0	5.0
R7 - Damages to assets								5.0	3.0	1.6	3.0	3.0
R8 - System failures									1.0	2.0	1.0	3.0
R9 - Optimization of processes costs										1.7	1.0	3.0
R10 - Optimization of functionality of the business processes											1.6	1.0
R11 - Operational and personnel productivity												3.0
R12 - Qualified and motivated employees												
IR = 0.09 (<0.1)												

Source: Data research

Finally, an analysis of the resource's criterion was carried out according to the AHP method in the matrix in Table 6, comparing all the alternatives with each other, with a view to optimizing the company's resources for the creation of value.

TABLE 6
RESOURCES MATRIX

RESOURCES criteria	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
S1 - Value of investments perceived by the stakeholders		1.2	1.2	1.0	1.5	1.5	1.0	1.4	1.4	1.7	1.3	1.6
S2 - Portfolio of competitive products and services			1.2	1.7	1.5	1.5	1.0	2.3	2.2	2.0	2.0	1.2
S3 - Financial transparency				1.5	2.2	2.2	1.4	1.8	2.0	2.6	1.8	2.2
S4 - Client-oriented service culture					1.1	1.1	3.0	1.0	1.0	3.0	1.0	2.0
S5 - Frauds						1.1	1.3	1.1	1.1	1.3	1.1	1.2
S6 - Customers losses							1.1	1.1	1.0	1.3	1.1	1.3
S7 - Damages to assets								3.0	3.0	2.0	3.0	2.0
S8 - System failures									1.0	3.0	1.0	3.0
S9 - Optimization of processes costs										3.0	1.0	1.0

S10 - Optimization of functionality of the business processes	3.0	3.0
S11 - Operational and personnel productivity	2.0	
S12 - Qualified and motivated employees		
IR = 0.09 (<0.1)		

Source: Data research

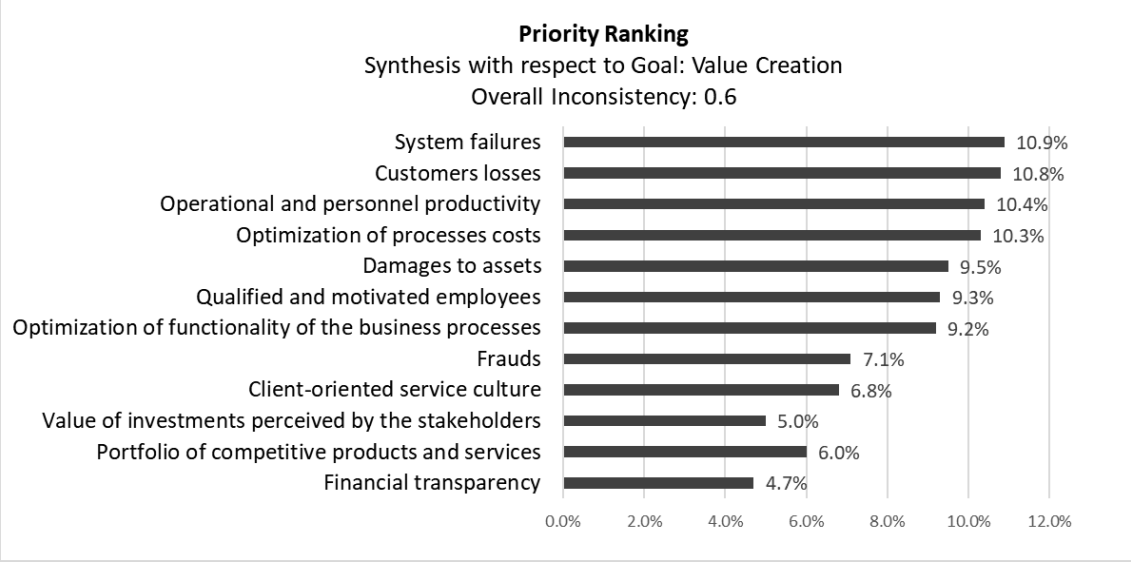
From this multi-criteria methodological approach based on the data collection and analysis instruments, and in the context of the application case indicated, the analysis of results and findings is presented below.

ANALYSIS OF RESULTS

The results of the research are presented in graphic form to synthesize the different priorities. The findings found for value creation are consistent with COBIT® 2019 as maintained by ISACA (2018) and the priorities in the CG goals correspond first to System Failure followed by Customers loss and Operational and equipment productivity as indicated in Figure 2.

This systematic process of reasoning has been carried out in accordance with the AHP methodology based on matrices of two-to-two ratings at each hierarchical level of the decision tree. First, the relative importance weights between the criteria of benefits, risks, and resources in relation to value creation have been generated. In this way, according to the expert's judgement and in accordance with the analytical process followed, and as seen in Figure 3, the aspects that should be prioritized are those relating to the optimization of resources and risks. Once the ratings on the main criteria have been established, the hierarchical levels of the decision tree have been lowered until the ratings for each of the alternatives analyzed have been obtained. Figure 2 shows the global ranking of priorities for the business goals analyzed.

FIGURE 2
PRIORITIES OF ENTERPRISE GOVERNANCE GOALS FOR VALUE CREATION

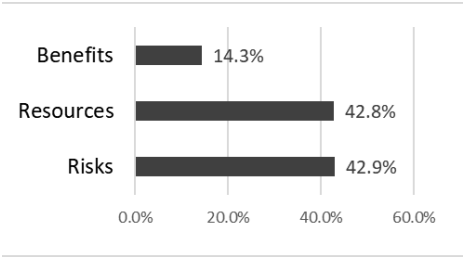


Source: Elaborated by the authors, adapted from *Expert Choice*

Thus, the research has found that value creation is intrinsically related to Systems failure and Customers loss, and by qualitatively analyzing this finding, the researchers validated the results with a risk approach as the focus is on governance and not immediacy in business profitability but sustainability and long-term growth. Likewise, value creation is closely linked to productivity; hence, it is essential to prioritize the company's operations and human resource management so that the organization gains in competitiveness.

The graph in Figure 3 illustrates that in this governance context, risks and resources are competing for top priority while benefits are positioned secondarily.

FIGURE 3
RANKING OF BUSINESS CRITERIA FOR VALUE CREATION



Source: Elaborated by the authors, adapted from *Expert Choice*

This synthesized way of visualizing priorities makes it possible for decision-makers to perfect their differential by generating greater advantage over their competitors as each of the business goals that are considered when implementing a strategy can be evaluated as a whole and look at the investments required to achieve a higher level of return on value creation, considering both types of governance. When choosing to implement a strategy, the implications of each of the possible options should be assessed with respect to the assessed goals. Bearing in mind that each criterion has a relative weight, a combined score is obtained for each alternative, finally choosing the one with the highest score. Another option could be the generation of an ideal point formed by the best values in each criterion and then selecting the alternative closest to that ideal point that is normally unattainable; i.e., this is the same as the approach proposed by the methodology TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) (Hwang & Yoon, 1981).

CONCLUSIONS

Creating business value that is reflected in shareholders and society requires making the right decisions, which are currently complex and multidimensional; therefore, it is highly recommended to optimize the decision-making process using multi-criteria methods. In this sense, not simplifying complex decisions and seeking the most appropriate prioritization of all decision alternatives provides greater security, transparency, and compliance as required for good CG.

In this work, the Hierarchical Analytical Process (Saaty, 1980) was used as a robust multi-criteria method to find the best alternatives for value creation. This method is applicable to decision-making processes in which both business and technological variables are involved, thus improving decision-making as well as CG and GIT as institutions increasingly act in highly competitive environments and are subject to intense digital transformation.

The effective use of DSS to implement the AHP method has been shown to be effective because it streamlines and systematizes the decision-making process, providing important benefits to Board members and senior management. Therefore, obtaining a ranking in the decision alternatives on the IT enterprise governance goals is of great importance and characterizes companies that have a high degree of maturity; such companies often become benchmarks for their sector.

This research has prioritized in an applied manner the principles supported by CG and GIT to create value according to the criteria of generation of benefits, optimization of risks and resources for which 12 business goals were considered in accordance with the COBIT® 2019 governance framework.

Based on the review of the literature on value creation, CG and GIT, as well as methodologically through the characterization of DSS and the AHP method, it has been possible to provide a rigorous response to an important research question and validate this approach in an applied manner. Thus, it has been possible to achieve the objective of defining the priorities in CG and GIT that create the most value for the institutions. The contributions of the work make recommendations of a strategic nature on the alternatives to be taken for the creation of value, considering jointly the criteria of benefits, risks, and resources.

The research showed that the criteria of risks and resources (with 42.9% and 42.8%) dispute the importance/top priority for value creation, whereas benefits (with 14.3%) are positioned secondarily. Likewise, considering in a convergent way the three criteria, it was confirmed that the business goals to reach this objective in a framework of enterprise governance and long-term sustainability should be focused on minimizing system failures (10.9%), reducing customers loss (10.8%), and optimizing operational and human resources productivity (10.4%).

From the point of view of resources, it is also important to reduce process costs (10.3%) and to achieve the most appropriate motivation and qualification of staff (9.3%) by increasing their digital skills and competences. From the risk perspective, it is worth highlighting the importance of avoiding damage to the organization's assets, such as loss of data or damage to physical assets due to vulnerabilities, impact of cyber-attacks, etc. (9.5%). Finally, from the benefits perspective, it is necessary to optimize the functionality of business processes (9.2%), which implies investing in the most appropriate IT solutions and services.

The findings of this work to support business decision-making improve competitiveness and create value, and also contribute to the academic community because the research raises a methodological process that can be followed for application in other studies; moreover, this system can be implemented in other business sectors and companies.

For future work, it is suggested that the hierarchical structure for creating value in the CG framework be adapted and applied to the context of public management under COBIT® 2019 and its future updates.

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