The importance of Risk Management Assessment: A proposal of an Index for Listed Companies

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Abstract

Objective – This study aims to construct an innovative index that integrates the most important qualitative elements of risk management for listed companies.

Design/methodology – This research is exploratory, since the subject has been rarely addressed in Mexico, so we will review the international literature on risk management and propose an instrument for measuring and monitoring risk management. The index proposed in this study is composed by five sub-indexes or dimensions, consisting of nineteen constructs that are expressed in one hundred items or statements, measured through a Likert scale and un-weighted.

Results – The integral risk management index proposed are related to five dimensions: architecture of risk, risk culture, risk guideline, risk assessment and business strategy. This framework constitutes a base for the implementation and conceptualization of the risk management, which harmonizes the regulations and methodologies of greater importance at the international level. Adherence to this framework complies with all international requirements and has the basis for an efficient administration in the 21st century. This study could be a reference for those responsible on the risk management decisions in Latin American listed firms.

Keywords Risk Management, Index, COSO, Mexico.

1. Introduction

The business world today is constantly changing with it being unpredictable, volatile, and seems to be more complex day by day. By their own nature, companies face a variety of risks. Historically, organizations have seen risk as a necessary malicious element that must be minimized or mitigated as much as possible. In recent years, the increase in regulatory requirements has further forced the companies to invest significant amounts of resources to evaluate risk and implement control systems with great scrutiny. The identification, management and control of risks have become indispensable for the success and longevity of companies.

According to the Code of Best Corporate Practices (CMPC) published in Mexico in 2010 and proposed by the Business Coordinating Council (CCE, 2010), a good corporate governance (CG) system must contain one of its eleven basic principles: the identification, administration, control and disclosure of the risks to which society is subject. Likewise, it highlights the function of internal and external audit as a way to control risk and suggests the presence of an intermediate body that prepares an analysis with the aforementioned characteristics in a continuous manner, so that it can be presented to the Board of Directors (BoD) for decision-making in this area.

The listed companies on the Mexican Stock Exchange must comply with CG practices that are essential for a risk management. The international law firm KMPG (2012), mentioned that this is a tool that promotes business management in a scheme of anticipation and risk management, in an environment of clarity and confidence for all stakeholders of a company. For this reason, regulators around the world look for companies to manage their operations in an appropriate CG framework that promotes

the identification and communication of high-impact events, and thus promote actions to reduce negative impacts and take advantage of business opportunities. The CG is more than a matter of regulatory compliance, it covers strategic, operational and management elements, through the integration and harmonization of the different actors of the organization, as well as its relationship with potential stakeholders, always with the intention to be a generator of sustainable value in the medium and long term.

Regarding to indexes, the literature that propose or design instruments in order to assess risk management is scarce. In 2017, COSO updated its Risk Management Framework published since 2004. That is why, in the context of these regulatory reforms, this research proposes the creation of a practical, sustainable and reliable index. As it is possible to observe, the risk management has become an indispensable tool in the day to day of the business and often its proper administration makes risk an incentive of competitive advantages and business strategies. Due to the above, the objective of this paper is to describe and explore methodologies, the literature and different index developed for risk management assessment for international contexts. This is performed in order to propose an index that evaluates the level of companies' success in managing their risk. Apart from that, this study also intends to propose a new conceptual framework for risk management applicable to Mexican listed companies, taking into account the institutional environment of this country. In this context, we are going to answer the following research questions: What is it and how integrated is the risk management? Which levels of the organization assess the risk? and What dimensions and elements should be part of the index for risk management assessment in Mexican listed companies? Even though for the purpose of this study, we focus the index for companies listed on the Mexican Stock Exchange (BMV), it does not exempt non-listed organizations in Mexico or other countries from the use of the proposed index, framework and methodology.

The current study represents a practical and theoretical contribution for risk management (RM), since up to now there is no instrument to assess the risk management. In Mexico, the RM research is scarce, and no studies have been focused on the relationship between RM and financial performance. For instance, some studies have studied the evolution of the main indicators of performance in the Mexican banking sector and the relation with the Mexican economic performance (Morales Gutierrez, Garcia Muñoz and Uribe 2013); there are also some studies related to the growth and impact of the financial sector in México (IMCO, 2012; Deloitte, 2018). There are only studies that analyze the stress-testing for credit portfolio in the Mexican banking system (Jimenéz Rosas y Benavides Perales 2016). For this reason, this paper contributes to extend the international literature about the importance of RM. Also the existing methodologies such as COSO and ISO, as well as the legislations are isolated, hence the proposed conceptual framework in this study aims to harmonize them. By following the proposed framework and evaluating the performance of the RA using the proposed index will lead to compliance towards most of outstanding guidelines in this subject thereby ensuring success in the RM.

The rest of this paper is structured as follow. The first section describes the theoretical and contextual framework in terms of risks at national and international level. The second section focuses on the methodology used in the analysis and analyzes the conformation of the index and its conceptual framework. The third section analyses results and the formal presentation of the proposed index, as well as the necessary elements for its implementation. Finally, we present the conclusions of the study, limitations and future lines of research on risk management.

2. Literature Review

2.1 Risk management

Looking at the business context, insurance industry is possibly the origin of risk management practices. During the 1950s as an effect of the insurance management

function in the US emerge important developments about RM and in the 1960s emerged the concept of contingency planning. In that time, companies could manage risk by reducing the possible hazard through insurance, however the high cost of this kind of products and the fact it wasn't enough to protect businesses, RM became a very popular method. In the US and Western Europe, the concept of RM created an important emphasis on the cost-benefit analysis during the 1970s. By the 1980s, the concept expanded and introduced the total cost of risk, risk financing and risk control. The application of this techniques and procedures developed due to project management, enterprises and financial institutions. From 1980s to the 1990s, risk management tools and theory combined to manage market risk, credit risk and operational risk for financial institutions (Sithipolvanichgul 2016).

The principles of risk management have moved away from its origins of trying to transfer risk to third parties, to take advantage of risk and opportunities by diminish the level of risk itself (Hopking 2012). RM is not just about avoiding negative results, because risk can comprise both negative and positive indeterminacy. During 1990s to 2000s, the concept of Enterprise Risk Management developed from a focus on managerial and corporate governance (Sithipolvanichgul 2016). The Chief Risk Officer (CRO) position was created during this period of time. Businesses were encouraged to develop their own risk management systems by financial scandals, such as Enron and WorldCom, and its fast evolution was as a result of the Sarbanes-Oxley Act of 2002 in the US. The 2008 financial crisis produced that more financial and non-financial companies took a holistic, strategic and process-oriented approach to Enterprise Risk Management that would handle the internal and external risks with the intention of increasing shareholder value.

The main differences between the RM into corporate governance theory and the traditional approach of risk management are: a "holistic" approach against a "silo" approach; view risk in the context of business strategy versus analyze risk as individual hazard; focus on risk optimization base on portfolio development in contrast to just focus on risk identification, assessment and mitigation; emphasis on critical risk and risk strategy in contrast to pay attention to discrete risk and risk limits. Risk governance integrates the structure, role and capacity of the organization, stakeholder involvement, collaborative decision-making, accountability and responsibility (Reen 2008) and provides the hierarchical structure, role and responsibility, policies and procedures.

With this basis, the RM could be defined as "the set of activities aimed at the detection, graduation, planning, organization, direction and control of the possible damages that the organization could suffer and its level of vulnerability with the objective to establish strategies that lead to maximize performance". Clarke and Varma (1999) affirm that RM constitutes a strategic business process and management requires assessing whether activities are consistent with strategic objectives, and how RM is linked to investment and growth decisions. The BoD needs to develop a vision of RM and a strategy based on the risk environment and the risk profile of the shareholders. For COSO (2017), it is a process carried out by the BoD of entity, management and other personnel, applied in a strategy environment, designed to identify potential events that may affect the entity and provide reasonable assurance regarding the achievement of the entity objectives.

Drew, Kelley and Kendrick (2005) identified five elements of corporate governance for strategic risk management: 1) culture, 2) leadership, 3) alignment 4) system, and 5) structure. With these elements came the CLASS acronym for the initials of each term. For example, the organizational culture is formed by leadership practices. The system supports the organizational structure and shapes the culture. The alignment ensures that each element is interrelated with others. The cited authors suggest that each element forming the CLASS must be reviewed by the BoD and management to build and reinforce the RM capabilities and CG practices.

Several studies have defined that the application of RM improves the performance of the company, like the study of Hoyt and Liebenberg (2011), who investigated the relationship between the adoption of RM and the performance of the company. They used the value of the company as a dependent variable with the Tobin Q measure. They found that companies may improve their capital return and capital efficiency and that the application of RM improves the value of the firm.

2.2 Risk Management Dimensions

Organizations must implement RM to improve the decision-making process, to efficiently gather the information and to strengthen its corporate governance. The results of different studies as Hoyt and Liebenberg (2011); Quon, Zaghal and Maingot (2012); Kose, De Masi y Paci (2016); Stulz (2015); Beltratti and Stulz (2012); Erkens, Hung and Matos (2012) have indicated that RM is a process through which it is possible to increase financial security and improve shareholder value and that RM also allows companies to grow economically and financially. This study presents a framework for the implementation of RM, as well as an index based on that framework. The proposed dimensions within the framework and the index have their theoretical basis in the following empirical evidence.

a) Structure

An effective RM model must have an adequate structure to understand and communicate potential risks. Based on Lai (2011), an adequate RM program in organizations is very important to handle the challenges in their operations. RM practices within the firm provide a structure that combines risk with management in a framework that facilitates the identification of uncertainties (Hoyt and Liebenberg, 2011). The RM structure establishes policies, processes, competencies, reporting, technology, and a set of rules for risk management. Standard and Poor's argument that the evaluation of the organizational structures of RM allows the company to manage their risks, establish a common terminology and expectations about which risks should be taken and which ones should be avoided (Pagach, 2010).

b) Government

An adequate CG aligned with the RM ensures a management system to develop internal control procedures that are crucial to avoid loss, protect safety and improve profitability (Drennan, 2004). The main goal of the RM mechanism is linked to the creation of economic value such as cost reductions (Ramly and Rashid, 2010). In a few words, the CG applied in the RM allows to the organization to survive in the market. An integrated government incorporates an infrastructure that allows everyone to improve transparency and understand their responsibility (Lai and Azizan 2011). In the same line, Lai (2014) argued that the RM program within a company may only be successful if all personnel know the nature of the relevant risk. Therefore, all risk information must be disseminated in an appropriate manner. Based on Beasley et al. (2005), the adequate communication channel within the company allows all members to understand their roles and responsibilities in relation to risk.

c) Process

The proper RM process helps the company to identify the risks that it is willing to accept or must avoid and then successfully quantify and measure the identified risk. It allows the company to integrate business strategies to achieve the desired objectives. According to Demidenko and McNutt (2010), the appropriate RM process improves decision-making and analyzes alternative responses to problems, helps the company to reduce operational losses and errors, identify and capture opportunities and improve capital allocation.

2.3 Risk Assessment: The International Context

The previous literature has focused on assessing the risk in quantitative aspects, leaving aside the qualitative evaluation to the expert point of view of the directors. The risk assessment tools currently used generally consist of the value at risk

(VaR) developed by JP Morgan, risk adjusted return (RORAC), capital asset price model (CAPM), weighted cost of capital (WACC), measures of standard deviation, variance, covariance or correlation coefficient, coefficient of variation, Beta, sensitivity analysis, correlation matrices, bow-tie diagrams, decision theory and decision trees, stochastic linear programming, stochastic processes, net present value (NPV), time series analysis, simulations, elaboration of proformas and also the use of financial ratios for the analysis. Since most of the mentioned tools have a quantitative approach, therefore it is necessary to develop tools that cover the qualitative aspect. For example, the design and application of weighted questionnaires and maturity models for risk management (Gramlich and Bianco, 2012). The maturity model of RM was originally proposed by HVR consulting service in 1999, which refers to four levels of capacity: innocent, novice, normalized and natural. It was then developed by Hilson (1997) who used it to establish a generic framework for the analysis of the level of maturity. Hopkinson (2013) adapts the model proposed by Hilson (1997) for the qualitative assessment of maturity in risk management. In the same line, Monda and Giorgino (2013), published an article which described the development of a qualitative maturity model, developed through the Delphi method, obtaining as a result of a weighted questionnaire.

COSO 2017 has been very popular for the proactivity of their tools in the implementation of RM practices based on internal control practices. COSO decided to update one of the most applied risk management frameworks in the world, due to continuously changing complexity of doing business and the emergence of new risks at a faster pace than it has been seen in the past. Moreover, transparency issues and new technology are straining strategic planning processes and operational capabilities. The COSO framework introduces a new structure composed of five dimensions and twenty principles aligned to the business cycle. These principles cover processes from governance to day-to-day activities. The COSO represents a clear way to integrate RM practices in enterprises with strategy-setting and performance management practices to help realize benefits related to value, and offers guidance on how to better integrate RM, embedding it throughout an organization's culture capabilities and practices, and fostering better decision-making (PWC 2017).

For instance ISO 31000 (2009) divides the RM framework into three blocks: risk architecture, risk strategy and risk protocol (The Public Risk Management Association, 2010). It defines risks as financial, infrastructure, market and reputation, as these can be presented as internal and even external factors. Regarding the risk assessment process, the steps to follow are: identification, analysis and evaluation. Kaplan (2014) recently made a strong criticism of current regulations and risk management frameworks used. In agreement with this author, the risks are only defined in three dimensions: foreseeable, strategic and external. In addition, it defines three essential elements that must be considered within any framework, which refer to: 1) process to identify, evaluate and prioritize the risk; 2) frequency of the meetings on risk management, defined by the speed and evolution of the risks, and 3) the definition of the tools to assess the risk, taking into account the importance of the availability of information, expert knowledge and relevance.

2.4 Regulatory Framework in Mexico on Risk Management

In Mexico one of the main stock market regulations is the Market Value Law, where expressed in its article 2, part XII, that risks are part of the relevant information of every company. In article 28, part V, it is established that within the functions of the board of directors, the main risks to which the company is exposed should be monitored and identified based on the information provided by the committees, the CEO, and representatives of internal and external audit. Similarly, the Article 306, Fr. I, said that the BoD determines and apply the system of risk man-

agement and issue operational standards, prudential and self - regulatory applicable to the company.

Another regulation in Mexico applied to financial institutions is Basel III (2011). One of its most important pillars corresponds to risk management and it mentions as complementary requirements for the monitoring of standards in terms of good governance and risk management. The banks manage risk by business unit: risk capital, credit, liquidity, market and operational risk. However, a comprehensive approach is required for a complete perspective on the degree of risk faced and the risk appetite that an organization establishes before any activity, not only in order to comply with regulations such as Basel III and other regulations issued by the companies or national regulatory bodies, but also for making decisions that allow the conscious growth of the business.

In Mexico there is no other relevant regulation in terms of risk management and the guidelines to be followed are the frameworks proposed by international bodies such as COSO and ISO. Although there are guidelines and laws for the transparency of risk information, as a basis for the confidence of shareholders and the market in general, there are no specific principles for risk management, but a variety of broad recommendations for their management. As it can be seen, there does not exist in the current literature, an index for evaluating risk management, as well as a conceptual framework that integrates the features of all the above additional methodologies that provide empirical evidence of the power of the RM to generate value.

3. Research Method

3.1 Construction of the Integral Index to Assess Risk Management

This research is exploratory in nature, since the subject has been rarely addressed in Mexico, so we will review the international literature on risk management and propose an instrument for measuring and monitoring risk management. For this, our instrument is based on the methodology proposed by Spector (1992), which integrates the following aspects:

1) Delimitation of index objects. Evaluate the level of success with which the risk is managed in companies listed on the Mexican Stock Exchange, based on an internationally accepted framework.
2) Elaboration and theoretical selection of the variables. The most representative variables for the development of the index are: 1) Risk architecture: roles and responsibilities, internal control, communication structure, reporting structure, structure of corporate governance. 2) Risk culture: attitude-appetite, philosophy, risk taking and environmental guidance. 3) Risk guideline: policies and procedures, tools and methodologies. 4) Risk Assessment: identification, interaction, assessment, prioritize. And 5) business strategy: mission, vision, strategic objectives. These were selected based on the dimensions expressed in the theoretical framework, as well as the different methodologies.
3) Empirical selection of the variables. In the results of the research, the validity of the proposed index is demonstrated with empirical evidence.
4) Configuration of the measuring instrument. In the results of the research the instrument is presented, as well as the explanation of its measurement.

3.2 Conceptual Framework for Risk Management Index

For the construction of a new conceptual framework for the implementation of RM, the content analysis of the literature presented in the theoretical framework was applied as a study methodology. The purpose is to facilitate analysis of the most representative international approaches on RM that correspond to those proposed by COSO, ISO and Kaplan (2014), as these meet the requirements of international regulations as OECD, SOX, Basel III and other securities trading laws for the disclosure of risks as presented in Table 1.

Table 1
Current Tools to Measure and Evaluate Business Risk

Dimension/ Author	COSO (2017)	ISO 31000	Kaplan (2014)
Classification of risks	Internal and external Inherent and residual Dynamic and static Strategic, operation, report, compliance	Internal and external Financial, infra-structure, market, reputation	Predictable, strategic, external
Elements that make up risk management	Internal environment Definition of objectives. Identification of the event. Risk assessment. Response to risk. Activity con-trol. Information and com-munication. Monitoring.	Architecture of risk. Risk strategy. Protocols of risk.	Identify, evaluate and prioritize. Joint consistency (speed and evolution). Tools for risk.
Risk assess-ment process	Identify the risk. Develop evaluation criteria. Evaluate. Evaluate interactions. Prioritize and prioritize. Response to risk	Establish the con-text Identify the risk Analyze the risk. Evaluate the risk. Treatment of risk.	Analyze the contingent variables. Mix of the business risk management. Intervening variables. Organization-al Effectiveness.
Limitations or critical points.	Judgment of the members involved, cancellation of management, collusion, fraud, poor cost-benefit ratio, breakdowns by human factor.		

Source: Own elaboration based on COSO (2017), ISO 31000 (2009) and Kaplan (2014).

4. Result and Discussion

4.1 Framework for Comprehensive Risk Management

Following the comparative analysis of the methodologies with greater international recognition for risk management and theoretical content, we propose a framework that integrates most outstanding characteristics.

Figure 1
Elements of Risk Management

Source: Own elaboration based on COSO (2017), ISO 31000 (2009), Kaplan (2014)

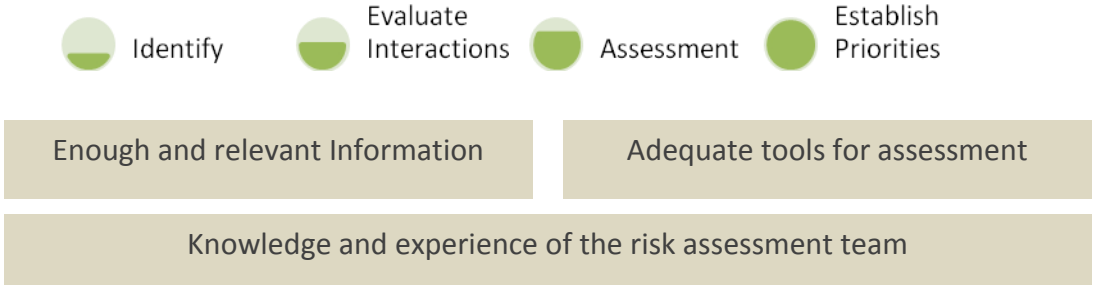
Figure 1 describes the elements or dimensions that make up risk management. This research has shown that the four pillars that govern risk management are: risk architecture, risk culture, risk assessment and risk guideline. All of these pillars are in continuous interaction and therefore, their effects are similar to those of a system, where they become interdependent and interrelated variables; which means that the change in one will produce a significant change in the others. As it is possible to observe, these four elements must be included within the business strategy. A risk management that is not aligned within the framework of action of the business strategy itself, will not make sense for the performance of the organization.

Risk architecture refers to the determination of roles and responsibilities, internal control, communication structure, reporting structure and corporate governance structure. Meanwhile risk culture is comprised of the attitude and appetite for risk, philosophy, environmental directive and a concept that we will introduce called as risk thinking. The risk guideline is integrated by the policies and procedures, tools and methodologies. The risk evaluation is composed by identification, interaction analysis and stablish priorities.

Source: Own elaboration based on COSO (2017), ISO 31000 (2009), Kaplan (2014).

Figure 2
Taxonomy of Risk

Figure 2 shows the taxonomy of the risks proposed for our instrument. Basically, risk is of external and internal in nature. As for external risks, they are divided into economic, political, socio-cultural and environmental. Internal risks for instance consist of: operating, financial, market, technological and infrastructure. It should be noted three relevant premises in this integrating framework, the first is that each of the internal risks may have the characteristic of being foreseeable or being strategic, according to its nature. The second is, as shown in figure 2, external risks have an impact between themselves and likewise affect the internal risks of the organization, which in turn give impact to each other. Due to this, the third premise and of great relevance is that it is considered within this framework that all risks are dynamic and therefore, should be studied and administered with the knowledge of this intrinsic nature.



Source: Own elaboration based on COSO (2017), ISO 31000 (2009), Kaplan (2014)

Figure 3
Risk Assessment Process

Figure 3 refers to the risk assessment process. Despite the numerous steps and their order in other methodologies, for the purpose of our proposed instrument, the risk management process consists of only four essential steps and must be based on 2 pillars and a main basis. The process begins with the identification of the risk that occurs in the organization, in order to make way for the analysis of the interactions of the risks, to determine the way in which each of the risks impacts others and at what level. Once this analysis process was made, risk should be evaluated individually and collectively determining the speed, probability, vulnerability, repetitiveness, among other features. As a final step, based on the analysis carried out in the three previous steps of the process, the risks are prioritized according to the level of necessary monitoring and the permeability or influence capacity. On the aforementioned pillars in which this process is subordinated, it is essential to have sufficient and relevant information, as well as with the appropriate evaluation tools. Regarding the basis of this process and considered as a core part, is to have a team of specialists with extensive knowledge in the risk management department. At this point it should be emphasized that this does not depend on a broad knowledge in econometrics or statistics, as to date is considered necessary, but rather a more qualitative knowledge and focused on the sensitivity of organizational environments.

4.2 Risk Management Index

An internal consistency analysis was carried out. If there are several elements that respond to the study variables, it is possible to calculate the variance of each variable and the total variance. The most usual formula for this measure is the Cronbach Alpha Coefficient. If there is no internal consistency, the coefficient will be equal to zero, while if the variables that make up the index perfectly explain the variance of the indicator, the coefficient will be worth one. In line with the studies carried out by Lai and Samad (2011), the concern regarding the reliability in the construction of the index has been considered, calculating the measures of reliability and internal consistency through Cronbach's alpha coefficient (Cronbach, 1951), to evaluate the internal consistency of the index, which refers to the degree to which the elements of an index measure the same construct. In this sense, the Cronbach's alpha is an individual correlation coefficient that estimates the average of the total correlation of the coefficients of the elements that make up the index. If Cronbach's alpha is greater than 0.80, the results suggest that all items are reliable and internally consistent. In this sense, the five sub-indices or dimensions that make up the global AR index, as well as the constructs, obtain an alpha of Cronbach equal to or greater than 0.799. Similarly, the alpha obtained from the total of the test is 0.989. The foregoing suggests that our AR index is reliable and consistent.

Table 2
Cronbach's Alpha By Sub-Index, Construct And General Index

Sub-indexes (Dimensions)	Constructions	Number of elements	Alfa Cronbach
Risk architecture *α = 0.905*	RyR	6	0.799
	CI	15	0.922
	EC	5	0.868
	ER	5	0.885
	ECG	8	0.826
Culture of risk *α = 0.896*	AA	5	0.888
	F	5	0.779
	RT	7	0.744
	GIVES	5	0.875
Risk guideline *α = 0.948*	PP	7	0.917
	H	5	0.970
	M	3	0.957

Risk evaluation $\alpha = 0.903$	ID	3	0.971
	IN	5	0.883
	AND	10	0.975
	P	3	0.950
Business strategy $\alpha = 0.807$	M	1	0.807
	V	1	0.807
	OE	2	0.807
		101	**0.989**

Source: Own elaboration

The index that is proposed is an unweighted index, since no literature was found that allowed giving more weight to one of the variables over another. However, the weight will be given by the number of items that make up a group of the variables. Table 3 shows the dimensions and scales to measure and evaluate the risk.

Table 3
Weighting Scales to Manage Risk

Dimensions		**MIN**	**MAX**	**%**	**% op.**	***% def***
Risk architecture	RyR	6	30	6%		
	CI	15	75	15%		
	EC	5	25	5%		
	ER	5	25	5%		
	ECG	8	40	8%	39%	*8%*
Culture of risk	AA	5	25	5%		
	F	5	25	5%		
	RT	7	35	7%		
	GIVES	5	25	5%	22%	*4%*
Risk guideline	PP	7	35	7%		
	H	5	25	5%		
	M	3	15	3%	15%	*3%*
Risk evaluation	ID	3	15	3%		
	IN	5	25	5%		
	AND	10	50	10%		
	P	3	15	3%	21%	*4%*
Business strategy	M	1	5	1%		
	V	1	5	1%		
	OE	2	10	2%	4%	*1%*
		101	**505**	**100%**	**100%**	***20%***

Source: Own elaboration (***RyR*** *: Roles and responsibilities,* ***CI*** *: Internal control,* ***EC*** *: Communication structure,* ***ER*** *: Report structure,* ***ECG*** *: CG /* ***AA structure*** *: Attitude-Appetite,* ***F*** *: Philosophy,* ***RT*** *: Risk Thinking,* ***DA*** *: Environmental Directive /* ***PP*** *: Policies and procedures,* ***H*** *: Tools,* ***M*** *: Methodology /* ***ID*** *: Identification,* ***IN*** *: Interactions,* ***E*** *: Evaluate,* ***P*** *: Prioritize /* ***M*** *: Mission,* ***V*** *: Vision,* ***SO*** *: Strategic objectives)*

In this way, the maximum level for purposes of the index and that denotes the optimal conditions of risk management is represented by a value of 100%, on the contrary the lower end corresponds to 20% representing the minimum possible to be obtained and therefore the poor level of success in managing risk. In the same way, this proposal will allow analyzing each element to identify, which one that negatively affects the risk management and to be able to implement preventive and corrective measures. The index of each of the variables may take a value between 1 and 5. Following the methodology of the Likert scales, where 1 refers to a totally disagree and 5 totally agree. Each subscript is obtained in the following way:

$$\boldsymbol{SIx} = \frac{\sum_{i=1}^{n} n1, n2, \ldots nx}{\alpha SIx} * 100$$

Where:
SIx = Value of the evaluated sub-index.
N1, n2, … nx = The value of the different variables that make up the measured sub-index
αSIx = Maximum possible total value of elements that make up the sub-index

The Risk Management Index (RMi) is operationally defined as follows:

$$RMi = \sum_{i=1}^{n} (SIx)(P_{SIx})$$

Where:
RMi = Overall value of the risk management index
SIx = Value of the sub-index obtained under the aforementioned formula
P Six = Proportion that the subscript represents with respect to the other elements of the index as indicated in the% op column of table 1

Table 4 shows the integral risk management index proposed in this study, which was obtained from the existing international literature review in this field. Each one of the dimensions and elements is detailed as well as the scale for its measurement in the following Table 4.

Table 4
Integral Risk Management Index

Architecture of risk (5,39)		
Roles and responsibilities	There is a statement that establishes the risk responsibilities of each member of the organization.	1 2 3 4 5
	The Board of Directors has reservations about strategic matters in Risk Management.	1 2 3 4 5
	Management responsibilities are attributed to an appropriate management committee.	1 2 3 4 5
	The responsibility to implement improvements has been defined.	1 2 3 4 5
	The responsibility to develop strategies related to risk is defined.	1 2 3 4 5
	The responsibility for the audit and controls is defined.	1 2 3 4 5
Internal control	There are agreements established to audit the efficiency and effectiveness of controls.	1 2 3 4 5
	The Board of Directors ensures that risk management is within all processes of the organization.	1 2 3 4 5
	Efficient controls are applied.	1 2 3 4 5
	The organization demonstrates a commitment to integrity and ethical values.	1 2 3 4 5
	The board of directors demonstrates independence to administer and execute the development of internal control	1 2 3 4 5
	The administration is properly structured and has reporting lines to meet its objectives.	1 2 3 4 5
	The organization demonstrates the commitment to attract, develop and retain competent personnel aligned with the objectives.	1 2 3 4 5
	The staff is responsible for their internal control focused on the functional objectives.	1 2 3 4 5
	The organizational objectives are clear enough to identify the relative risks and evaluate them.	1 2 3 4 5
	The organization identifies and evaluates changes that may impact internal control.	1 2 3 4 5
	Internal control activities are developed and selected.	1 2 3 4 5
	The organization obtains and generates relevant and quality information.	1 2 3 4 5
	The organization communicates its internal control policies abroad.	1 2 3 4 5

	Select, develop and carry out evaluations during and after the internal control.	1 2 3 4 5
	Evaluates and communicates deficiencies in time.	1 2 3 4 5
Communication structure	There are measures to ensure the availability of competent advice on risks and controls.	1 2 3 4 5
	There is direct and constant communication with the audit committee by all the members of the organization.	1 2 3 4 5
	The identified risks are communicated at all levels of the organization.	1 2 3 4 5
	The risk strategy is communicated to all the members involved.	1 2 3 4 5
	Members of any level are allowed to comment on the strategies and risks identified.	1 2 3 4 5
Report structure	There are agreements established for the mandatory notification of risks.	1 2 3 4 5
	The business units report to the risk management, audit and disclosure committee.	1 2 3 4 5
	The disclosure committee reports to the audit committee.	1 2 3 4 5
	The risk management committee reports to both the audit committee and the board of directors.	1 2 3 4 5
	The audit committee reports to the board of directors.	1 2 3 4 5
CG structure	There is a solid Board of Directors.	1 2 3 4 5
	There is an audit committee.	1 2 3 4 5
	There is a disclosure committee.	1 2 3 4 5
	The business units are aligned to the board of directors.	1 2 3 4 5
	There is a risk management committee.	1 2 3 4 5
	The board of directors establishes the structure for risk management.	1 2 3 4 5
	The CEO is aligned with the decisions of the CA regarding risk management.	1 2 3 4 5
	The shareholders do not influence the decision making on risks.	1 2 3 4 5
Risk culture (4.22)		
Attitude- appetite	The organization has defined the nature and level of acceptable risks.	1 2 3 4 5
	Strategies and policies are formulated based on attitude and appetite for risk.	1 2 3 4 5
	An evaluation is made to each of the members of the organization to know their risk profile.	1 2 3 4 5
	The organization has a proactive and provisional attitude in risk management.	1 2 3 4 5
	Risk attitudes or profiles that are not aligned with the company's general strategy are avoided.	1 2 3 4 5
Philosophy	There is a conscious culture about risks within the organization.	1 2 3 4 5
	Actions are on hand to improve the level of maturity in risk management.	1 2 3 4 5
	The organization has a culture of continuous learning.	1 2 3 4 5
	Transparent management of activities is promoted for the revelation of relevant problems.	1 2 3 4 5
	The "design thinking" is promoted for strategic innovation in terms of risks within the organization.	1 2 3 4 5
Risk Thinking	It seeks to improve consumer confidence and satisfaction.	1 2 3 4 5
	We strive to ensure the consistency and quality of products and services.	1 2 3 4 5
	It has established one proactive culture of prevention and improvement.	1 2 3 4 5
	The members of the organization are exhorted to identify what risks and opportunities exist in the company.	1 2 3 4 5
	There is a continuous risk assessment process.	1 2 3 4 5
	A process of continuous improvement is carried out.	1 2 3 4 5
	Members are considered an integral part of the organization.	1 2 3 4 5

Risk Management Assessment

Environmental guideline	The economic conditions of the country foster a culture of risk taking.	1 2 3 4 5
	The country's cultural characteristics promote risk-taking as a common activity.	1 2 3 4 5
	Cases of success are observable within the country thanks to risk taking.	1 2 3 4 5
	The environment is stable and predictable in more than 50% of cases.	1 2 3 4 5
	It is easy to respond to environmental changes in general.	1 2 3 4 5
Risk guideline (3.15)		
Politics and procedures	There is a risk management policy that describes risk appetite, culture and philosophy.	1 2 3 4 5
	There is an established risk management action plan that includes the use of key indicators.	1 2 3 4 5
	Procedures that include risk as part of business decision making.	1 2 3 4 5
	There are incident reporting procedures to identify the risk trend.	1 2 3 4 5
	There is a procedure to monitor and review the performance of risk management.	1 2 3 4 5
	Risk communication is interdepartmental.	1 2 3 4 5
	The internal control procedures are duly identified and carried out periodically.	1 2 3 4 5
Tools	Questionnaires and checklists are carried out to collect information about risks in the company.	1 2 3 4 5
	Workshops are carried out.	1 2 3 4 5
	Brainstorming is used to locate opportunities and actions to respond to risk.	1 2 3 4 5
	Flowcharts and dependency analysis are performed.	1 2 3 4 5
	The SWOT and PESTLE analysis (political, economic, social, technological, legal, environmental analysis) are applied to the organization.	1 2 3 4 5
Methodologies	An adequate and up-to-date risk management framework is in place and followed.	1 2 3 4 5
	The CANVAS model is used to create value proposals for the company	1 2 3 4 5
	Qualitative and quantitative risk assessment methods are carried out	1 2 3 4 5
Risk assessment (4.21)		
ID	The risks are categorized and classified.	1 2 3 4 5
	Previous incidents that produced effects in the organization are analyzed.	1 2 3 4 5
	Benchmarking processes are carried out within the industry in which the organization operates.	1 2 3 4 5
Interactions	Each of the risks is comprehensively understood individually.	1 2 3 4 5
	The relationships between each of the risks are known.	1 2 3 4 5
	"What-if" or scenario evaluations are carried out.	1 2 3 4 5
	Sensitivity analyzes are carried out.	1 2 3 4 5
	The level of correlation between the different types of risks is known.	1 2 3 4 5
Evaluate	The events leading up to describe achieving risk.	1 2 3 4 5
	The risk is described and analyzed in case it had effects within the organization.	1 2 3 4 5
	The magnitude of each of the risks is known.	1 2 3 4 5
	Time scales of the potential impact are made.	1 2 3 4 5
	The probability of occurrence of each of the risks is known.	1 2 3 4 5
	Potential losses are determined, and the financial impact of the risk is anticipated.	1 2 3 4 5
	The speed of the company's environmental change is analyzed.	1 2 3 4 5
	The level of vulnerability is estimated.	1 2 3 4 5

	The speed and evolution of the risks are determined.	1	2	3	4	5
	The confidence levels of the existing controls are measured continuously.	1	2	3	4	5
Prioritize	Impact is analyzed vs probability of occurrence	1	2	3	4	5
	Impact vs. vulnerability analysis of the company's risk is analyzed	1	2	3	4	5
	It aligns the attention in risk taking with the business strategy	1	2	3	4	5
Business strategy (3,4)						
Mission	Business continuity plans are set	1	2	3	4	5
View	The vision of the company is rethought according to the changes in the environment	1	2	3	4	5
Strategic objectives	The objectives are validated by proven assumptions	1	2	3	4	5
	The management of risks is integrated with the strategy and business plans	1	2	3	4	5

Source: Own elaboration

5. Conclusions and Limitations

The Index for RM was proposed which is composed of five sub-indexes or dimensions, consisting of nineteen constructs that are expressed in one hundred items or statements, measured through a Likert scale and unweighted. The analysis of Cronbach's Alpha presents a value of 0.989 for the whole index, which shows that it is internally consistent and reliable, and that the variables used for its elaboration are closely related to the RM.

Likewise, a framework was proposed for the implementation and conceptualization of the RM, which harmonizes the regulations and methodologies of greater importance at the international level. Adherence to this framework complies with all international requirements and has the basis for an efficient administration in the 21st century.

To ensure the success of the RM in addition to the alignment to the proposed framework, six fallacies must be eliminated in the executives in charge of risk management: thinking that the risk is managed by only predicting extreme events, being convinced that studying the past helps the risk management, opposing to the recommendations and new ideas, assuming that the risk can be measured by the standard deviation, not appreciating that it is not mathematically equivalent psychological, and avoiding redundancy in corporate governance.

The limitations of our study are related to the level of subjectivity that can occur when using the proposed index as a self-assessment, since the Likert scale used could lead to the evaluators not being honest when answering it or granting an inappropriate level of agreement. The second limitation is that the index is not weighted, since all the constructs that compose it have the same level of importance, since in the current literature no empirical evidence was found to give more weight to any element.

This study represents an incentive for other researchers interested in RM. Likewise it is the initial part of a research that continues to be carried out to estimate the relationships between the value obtained in our index and the creation of value.

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