Safety culture maturity: relationship with occupational health and safety management practices and quality of work life

Maturidade da cultura de segurança: relação com as práticas de gestão de saúde e segurança ocupacional e qualidade de vida no trabalho

Madurez de la cultura de la seguridad: relación con las prácticas de gestión de la seguridad y salud ocupacional y la calidad de vida laboral

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Abstract: Occupational health and safety management and quality of work life practices play an important role in managing occupational risks in improving work environments and developing a culture of lasting safety. In this context, this article aims to analyze the maturity stage of safety culture and its relationship with occupational health and safety management practices and quality of work life. Data collection was carried out through a descriptive survey, applied through the "Google Forms" virtual platform. The sample consisted of 294 respondents from a company in the paper and cellulose segment, collected for accessibility and convenience. The Kaiser-Meyer Olkin and Bartlett tests were performed to verify the adequacy of the sample, the sphericity of the data, and the exploratory factor analysis confirmed the solution of the variables, in addition to a multiple linear regression analysis for each dimension. As a result, the research showed a positive relationship between the practices of GSSO and QVT with the maturity of safety culture. The safety culture dimension presented maturity stage Level 4 - Proactive continuous improvement, with an average value of 4.21 points.

PALAVRAS-CHAVE
Maturidade da cultura de segurança. Gestão de saúde e segurança ocupacional. Qualidade de vida no trabalho.

Resumo: As práticas de gestão de saúde e segurança ocupacional e qualidade vida no trabalho desempenham relevante papel de gerenciamento dos riscos ocupacionais na melhoria dos ambientes de trabalho e no desenvolvimento de uma cultura de segurança duradoura. Neste contexto, o presente artigo tem como objetivo analisar o estágio de maturidade da cultura de segurança e sua relação com as práticas de gestão de saúde e segurança ocupacional e qualidade de vida no trabalho. A coleta de dados foi realizada por meio de uma survey descritiva, aplicada por intermédio da plataforma virtual "Google Forms". A amostra foi composta por 294 respondentes de uma empresa do segmento de papel e celulose, coletada por acessibilidade e conveniência. Os testes de Kaiser-Meyer Olkin e Bartlett foram realizados para verificar a adequação da amostra, a esfericidade dos dados e a análise fatorial exploratória confirmou a solução das variáveis, além de uma análise de regressão linear múltipla para cada dimensão. Como resultados, a pesquisa evidenciou relação positiva entre as práticas de GSSO e QVT com a maturidade da cultura de segurança. A dimensão cultura de segurança apresentou o estágio de maturidade Nível 4 - Melhoria contínua proativa, com valor médio de 4,21 pontos.

PALABRAS CLAVE
Madurez de la cultura de seguridade. Gestión de seguridad y salud ocupacional. Calidad de vida en el trabajo.

Resumen: Las prácticas de gestión de la seguridad y la salud en el trabajo y de la calidad de vida en el trabajo desempeñan un papel importante en la gestión de los riesgos laborales para mejorar los entornos laborales y desarrollar una cultura de seguridad duradera. En este contexto, este artículo tiene como objetivo analizar la etapa de madurez de la cultura de seguridad y su relación con las prácticas de gestión de la seguridad y salud ocupacional y la calidad de vida en el trabajo. La recolección de datos se realizó a través de una encuesta descriptiva, aplicada a través de la plataforma virtual "Google Forms". La muestra estuvo compuesta por 294 encuestados de una empresa del segmento de papel y celulosa, recopilados por motivos de accesibilidad y conveniencia. Se realizaron las pruebas de Kaiser-Meyer Olkin y Bartlett para verificar la adecuación de la muestra, la esfericidad de los datos y el análisis factorial exploratorio confirmó la solución de las variables, además de un análisis de regresión lineal múltiple para cada dimensión. Como resultado, la investigación mostró una relación positiva entre las prácticas de GSSO y QVT con la madurez de la cultura de seguridad. La dimensión de cultura de seguridad presentó la etapa de madurez Nivel 4 - Mejora continua proactiva, con un valor promedio de 4.21 puntos.

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Introduction

In recent years, organizations have begun to recognize the importance of safety culture, which can offer efficient management of their operations and control of operational costs (Demir, Gul, & Guneri, 2018). According to Carvalho and Neves (2018), the recognition of the importance of Safety Culture [CS] by organizations is due to the adequacy of legislation, placing the burden to identify and properly manage the risks created by their activities on organizations.

For this reason the concept of safety culture has raised the interest of occupational health and safety professionals, since management techniques work better in organizations that have reached a certain level of maturity of safety culture (Ek *et al.*, 2007). In this sense, employees at all organizational levels, especially managers, need to know how to develop and implement quality safety culture and also know how to conduct day-to-day health and safety practices in all their responsibility areas (Meneghetti, 2010).

A more refined understanding of safety culture by organizations main leaders, according to Corrigan *et al.* (2018), requires the identification and analysis of the level of cultural security maturity and the main policies and procedures needed to condition a more lasting security culture. The author also emphasizes that it is necessary to pay attention to operational, political, and environmental changes, both natural and man-made threats, which can directly impact safety culture in organizations.

Thus, it is important to point out that the transformations introduced in recent years on the work processes, significantly modified the relationship between people, the production processes, and the work environment, which led many organizations, consciously or not, to maximize the use of organizational resources to provide a healthy, safe, and productive work environment (Araújo, Santos, & Mafra, 2006).

Adequate work environments require greater responsibility from organizations, from the intelligent use of policies and practices aimed at stimulating employees to feel motivated to produce, to satisfying their desires and needs in favorable environments (Khoo, Hussin, & Abdullah, 2018). Thus, Coutinho, Maximiano and Limongi-França (2010) point out the need for precautions related to safety culture through actions and programs based on Occupational Health and Safety Management [GSSO] and Quality of Work Life [QWL], since these are intended to harmonize the employee to his/her work position (Dejours, 2012).

According to Reiman and Rollenhagen (2014), aspects related to organization's occupational health and safety management practices [SGSST] and employees quality of work life [QWL] can influence the maturity level of safety culture, as in an environment where there is culture of safety, people's attitudes and behavior regarding health and safety develop and last.

In this context, Gonçalves Filho, Andrade and Marinho (2013) show that the success in verifying the level of safety culture in industrial organizations requires the predisposition to undertake a good study of their reality. Calori, Gutierrez and Guidi (2015) state research on safety culture occurs in small numbers in the country, suggesting that new research should be developed to better understand safety culture in various services. Lima and Lima (2018) point out the application of methodological studies in the areas of health and safety management at work, workers' quality of life, is essential, presenting ample opportunities for research. Therefore, this article aims to analyze the maturity stage of safety culture and its relationship with occupational health and safety management practices and quality of work life. Araújo (2005) mentions the need for greater organizations efforts to develop strategic plans, convert them into action plans and implement them so that it can fully integrate health and safety practices into safety culture at all hierarchical levels and working methods.

The document is structured as follows: the second section grounds the theory for addressed subject, the third, presents the research methods, the fourth, discusses the results found in the study and, lastly, final considerations and recommendations for future work.

Theoretical foundation

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This chapter presents the theoretical contributions of this research, presenting safety culture, management of occupational health and safety, and the quality of work life.

Safety Culture

The concept of "safety culture" appears in 1988, in the first technical report carried out by the International Nuclear Safety Advisory Group [INSAG], with an approach of organizational factors in the accident analysis, where the result of the analysis on the 1986 Chernobyl nuclear power plant accident's origins is presented (International Atomic Energy Agency [IAEA], 1991). The concept of safety culture was elaborated as: "the set of characteristics and attitudes of organizations and individuals, which ensures the safety of a nuclear plant, due to its importance, will have the highest priority" (INSAG, 1988, p.84).

As Pidgeon (1991) and Turner *et al.* (1989) safety culture expresses a specific set of norms, beliefs, roles, attitudes, and values within an organization, with the aim of reducing the exposure of employees, customers, suppliers and the general public to conditions considered dangerous or that cause disease. In this context, where there is a safety culture, employees' attitudes regarding safety manifest and last.

According to Cooper (2000) safety culture is determined as a consequence of the dynamic interactions between three aspects: 1) basic assumptions and values; 2) collective practices; and 3) organization structure. According to the author, the dynamic interactions between these aspects can vary in intensity and time.

The International Labor Organization [ILO] (2004) establishes that a country's safety culture is the respect for the right to safety in the workplace and governments, employers, and workers should actively participate in the defense of this right and the principle prevention should be agreed as the highest priority.

For Richter and Koch (2004) safety culture is formed by people and their social relations inside and outside organizations and must be understood in a specific context that can change depending on

material conditions and developed social relations. Silva and Lima (2004) add that safety culture is a set of beliefs, values, and norms shared by members of an organization that constitute the basic assumptions for safety at work.

Reason (2016) defines safety culture as a set of shared values and beliefs that interact with organizational structures and control systems to produce behavioral standards.

To better understand safety culture in organizations, Gonçalves (2011) expresses the need to evaluate and measure safety culture through factors that define it and/or through maturity models.

Security Maturity

The conception of maturity models within the area of safety teaching has been used to improve safety culture in several "high risk" organizations. These models were developed to allow organizations to understand their own safety culture maturity level by assessing the level of compliance with various key elements of safety culture in various stages (typically 5) that represent different levels of maturity (Foster & Hoult, 2013).

Bessant, Caffyn and Gallagher (2001) developed a 5-stage model to measure the maturity curve, classifying skills, allowing organizations to identify their position in relation to others, plan and develop plans to increase their skills through continuous improvement.

Using the stages of organizational culture created by Westrum (1993), Hudson (2003) presented a maturity model for safety culture. Two stages, reactive and proactive, were added by the author to the three existing stages, expanding to five stages, in addition to changing the name of the bureaucratic stage to calculative. In Hudson's (2003) model, safety culture progresses from an initial stage, pathological, to the ideal final stage, constructive.

A team at the University of Queensland developed the Minerals Industry Risk Management (MIRM) maturity table, based on the Hudson (2003) model and a similar approach used by Bayside Aluminum, a BHP Billiton site in Richards

Bay, South Africa. The MIRM model is described as a ladder with five stages (Vulnerable; Reactive; Compliant; Proactive; Resilient). The terms used are slightly different than those used by Hudson (2003), although the implied maturity levels are similar (Kecojevic *et al.*, 2008).

Security Maturity Models can be applied across many organizations and can identify differences and then help resolve any behavioral and cultural issues with the aim of improving security culture maturity over time. However sensible, this approach effectiveness can be limited by differences in organizations security culture, especially in the early stages of culture development, which may require different techniques from those with stronger cultures (Kaassis & Badri, 2018).

In order to achieve the desired conditions of safety culture, it becomes necessary to understand how organizations identify safety culture maturity stage. To this end, methodologies can be adopted in order to allow the definition of specific levels that clearly guarantee the assessment of maturity stages, comprehensive enough to provide a correct perspective of the real situation of the organizational (Freitas *et al.*, 2018).

According to Kaassis and Badri (2018), for the development of the maturity model process to be successful, a necessary characteristic is the interrelation between the model and good management practices, moving from a more basic level to a higher level gradually, to reach the best practicable maturity stage.

With regard to management practices, Leão (2014) mentions that good planning and analysis of occupational health and safety management practices, favors the identification of specific needs and expansion of safety culture standards. Santos and Martins (2016) show that programs and actions related to quality of work life can be used as a safety culture strategy.

Occupational Health and Safety Management

Emerged in England during the Industrial Revolution, which comprised the mid-nineteenth century, the term occupational health and safety followed the expression occupational medicine as a result of an accelerated and inhumane production context that consumed the workforce in extreme, raising the need to intervene in the existing conditions (Mendes & Dias, 1991).

Mezomo (1995) defines occupational health and safety management as the planning, organization, control, coordination and evaluation of resources and methods, by which medical and health precautions are pursued, through the provision of services to individual clients, organizations and communities.

More than a simple improvement in terms of risk management, a GSSO system represents a philosophical and operational challenge for organizations, insofar as it presupposes a structured approach to the identification, assessment and control of risks arising from their activity and an effort that must result in continuous improvement in performance (Veloso Neto, 2007).

According to the Occupational Health and Safety Assessment Series [OHSAS] (2007), a GSSO system is a set of interrelated elements used to create, establish, and execute policies and objectives at various levels in organizations. Cerqueira (2010) adds that the term GSSO refers to conditions and factors that affect, or could affect, the safety and health of collaborators and other workers (including temporary workers and outsourced personnel), visitors or any other person on the work site.

For the British Standards Institution [BSI] (2014) GSSO was created to provide better working conditions for employees in the organization, identifying hazards and defining controls to manage them, reducing accidents, costs and downtime, motivating employees with better conditions work environment, demonstrating compliance to customers and suppliers.

With the same purpose, the International Labor Organization [ILO] (2015) considers the management of occupational health and safety in a broader way, conceptualizing it as a science. In this sense, GSSO is intended to help organizations control health and safety risks at work (OHSAS, 2007). With a different approach from the

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International Labor Organization, İnan, Gül and Yılmaz (2017) understand GSSO in a more functional way, considering the environment and operational activities, as the most appropriate place to minimize the level of occupational accidents to the desired stage.

Regardless of a more comprehensive or functional concept, Mendes (2017) present the constant need to establish more effective processes in organizations, the implementation or maintenance of a GSSO system adjusted to the incessant search for better levels of performance with minimal overhead and costs. In this scenario, Bayram, Üngan and Ardiç (2017) express that an occupational health and safety management system is directly related to accidents and health costs, safety area performance, and employee satisfaction.

Quality of Work Life

According to Nascimento and Pessoa (2007) "the term Quality of Work Life [QWL] was initially presented at the end of the 1960s to emphasize the deficiency of quality of life at the workplace" (p.3). The concept aroused interest between the 60s and 70s, until it became a concept used in different events; such as health and safety, education, the economy, politics, and services.

From the 1960s and 1970s onwards, aspects of workers' health and well-being received a new boost from the QWL movements, expanding studies to identify better ways of developing work activities. "In Brazil, only from the 1980s onwards, some studies were carried out which were still strongly influenced by foreign models" (Rodrigues, 2009, p.3).

Walton (1973) declares that the expression "Quality of Life" was used to describe certain environmental and human values, which are neglected by industrial societies, to the detriment of technological advance, productivity and economic growth. For the author, QWL can be analyzed according to the level of satisfaction of employees and the factors that interfere with their well-being at work.

Researches about organizational behavior, health incentives, work anomalies and total quality programs were dedicated to the analysis of quality of work life. "Concepts on the topic Quality of Work Life - QWL are observed, with related approaches: degree of satisfaction with the company; general environmental conditions and health promotion" (Limongi-França,1996, p.9). In this sense, "QWL can be analyzed based on three approaches: Quality Systems, Human Potential, and Health and Safety at Work" (Limongi-França, 1996, p.16).

According to Limongi-França (2007) there is a set of QWL criteria, which must be used by organizations that are dedicated to employees human potential, health, and occupational safety (p.174). Table 1 presents the organizational indicators for QWL management.

Table 1
Relevant categories of QVT

Criterion	Focus
Organizational	- Image, training and development, processes and technology, decision-making committees, absence of bureaucracy and personal routines;
Biological	- Internal accident prevention week, ergonomic risk control – PPRA, medical outpatient clinic, labor gymnastics, meals, health, commission – CIPA;
Psychological	- Recruitment and selection, performance evaluation, camaraderie, career, salary, personal life;
Social	- Commercial agreements, free time, leisure, children, basic food basket, private pension, course financing.

Source: Limongi-França (2007, p.174).

Gonçalves and Vilarta (2004) state that quality of life encompasses several areas of people's daily lives, such as: health, education, transportation, housing, and work, demonstrating how people live, feel, and understand their day by day. Quality of life emerges as a growing movement these days, with the main objective being to find employees in good physical and mental health, stimulated and with a lot of energy to respond to the daily routine.

Marras (2011) announces organizations focus on competitiveness, higher production at lower cost, while employees seek better environments to carry out their activities and minimize stress due to

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the incessant pursuit of results. The author states that employees are increasingly aware of the desire to "live qualitatively". In this sense, a person's quality of work life is as essential as their personal life. Satisfaction and contentment are essential to maintain a more balanced life. An imbalance in either of these aspects can affect the other, creating dissatisfaction (Stephen & Dhanapal, 2012).

Widely debated by several authors, the issue of quality of work life has been portrayed in several researches due to its relevance. Originating from numerous studies in the first half of the 20th century, QWL was segmented into two precepts: productivity demand and worker satisfaction (Trentin *et al.*, 2016). From this perspective, organizations have invested in automation, computerization, and adequacy of facilities and equipment, with a view to better harmone work environments and people's satisfaction (Campos, 2016).

Quality of work life, when well understood and implemented, can provide many gains for both organization and employees. QWL becomes viable when organizational actions are sustained, directed towards the individual, the team, the work environment and the organization itself (Boas *et al.*, 2018).

Research methodology

This is a quantitative research because it uses indicators as a form to analyze dimensions, by capturing data that indicate the functioning of organizations (Lindfelt *et al.*, 2018).

The questionnaire consisted of a set of 03 dimensions, 16 sub-dimensions and 95 assertions, with a focus on analyzing safety culture maturity stage, occupational health and safety management, and quality of work life. The safety culture dimension is composed by the sub-dimensions: management commitment, communication, employee participation, training and information, motivation, observation of safety procedures, learning organization, and organizational change and transition management; the occupational health and safety management dimension, by the

components: crisis management, standards and legislation, integration of actions, and adding value; and the dimension of quality of work life, by the components: physical domain, psychological domain, social domain, and environmental domain.

Each of the questions was formulated based on Rodrigues (2011), Oliveira (2014) and WHOQOL - World Health Organization Quality of Life (1996), who involved in their research the development of instruments to measure safety culture, management of occupational health and safety and quality of work life, respectively.

The multi-stage theoretical maturity model proposed by Bessant, Caffyn, and Gallagher (2001) was adopted to measure the maturity curve of safety culture dimensions, occupational health, and safety management and quality of work life. The criteria to establish maturity stage proposed by Bessant, Caffyn and, Gallagher (2001) are described in Table 2.

The multi-stage model by Bessant, Caffyn and Gallagher (2001) seeks to offer a theoretical framework for the development of organizational processes, thus allowing an understanding of the maturational phases through which organizations possibly pass.

To obtain the data, a cross-sectional survey was carried out using a structured questionnaire available for filling out via the WEB, through the website specialized in data collection Google forms. The sample consisted of 294 respondents, belonging to a pulp and paper industry, located in southern Brazil, being used for accessibility and convenience. Then the data were tabulated in a Microsoft Excel® spreadsheet and imported into the SPSS® Statistical Software (Statistical Package for the Social Sciences) version 22.

With regard to the statistical technique used for data treatment and analysis, descriptive research was used, indicated for the detailing of specific situations, in which it is developed and structured to measure the characteristics of occurrences found in a scientific study (Hair Jr. *et al.*, 2009). The Cronbach's Alpha reliability test was performed. According to Hair Jr. *et al.* (2009) this indicator measures the reliability in a variance of 0 to 1, with

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values from 0.60 to 0.70 considered the lower limit of acceptability. We also applied multiple linear regressions. This multivariate analysis technique is used to explain or predict the occurrence of a given event as a function of a set of predictive dimensions (Fávero *et al.*, 2009).

Table 2
Maturity levels established by continuous improvement

Maturity Levels	Description
Level 1 - Prior interest in continuous improvement	- There is no formal structure for improvement in the organization, problems are solved haphazardly, always aiming at a short-term benefit. In addition, there are no human resource awareness strategies, such as training, development, and recognition;
Level 2 - Continuous structured improvement	- There is a formal committee to build a system to develop continuous improvement in the organization, with the participation of employees in activities, even though these are not integrated into day-to-day operations. Employees are provided with basic training and the recognition system is introduced;
Level 3 - Continuous improvement directed towards the goal	- There is a formal use of strategic objectives and continuous improvement activities are part of general management activities;
Level 4 - Proactive continuous improvement	- There is a tendency to develop autonomously, with individuals and teams managing and directing their own processes. At this level, continuous improvement responsibilities are devolved to the problem-solving unit;
Level 5 - Full capacity for continuous improvement	- Approximation of the organizational learning model with the identification and systematic problems solution and sharing of learning.

Source: based on Bessant, Caffyn and Gallagher (2001).

Based on the research instrument and the theoretical framework, three hypotheses were created (Table 3), which enable explanations and tests of ideas related to the proposed phenomena, in addition to guiding the researchers in conducting the study.

Table 3
Research hypotheses

Hypotheses
H_1: Occupational health and safety management practices have a positive relationship with maturity of safety culture;
H_2: Quality of work life practices are positively related to maturity of safety culture;
H_3: Occupational health and safety management practices are positively related to quality of work life practices.

Source: research data (2020).

In order for the hypotheses to be tested, occupational health and safety management and quality of life at work dimensions will be compared with safety culture. After describing the methodological procedures used for the research development, applicability of statistical techniques, analysis of the results found is presented.

Search results

In this chapter the research results are presented and analyzed. With the aim of characterizing the sample, demographic aspects were investigated, characteristics shown in Table 4.

Table 4
Distribution of respondents by gender, education, and function

Gender	Male			Female	
	209	71.1		85	28.9
Schooling	n°	%	**Function**	n°	%
Postgraduate	8	2.7	Manager	25	8.5
Graduate	51	17.4	Administrative	40	13.6
High school	201	68.4	Maintainer	43	14.6
Elementary school	34	11.6	Operator	175	59.5
-	-	-	Technician	11	3.7
Total	**294**	**100**	**Total**	**294**	**100**

Source: research data (2020).

Among research participants, 28.9% are female and 71.1% are male. It is noteworthy that most of the research participants attended high school, representing 68.4% of the sample, while the number of respondents with higher education

represents 17.4% and only 2.7% have specialization as training. Regarding the distribution of respondents by function, 59.5% occupy operational functions, 14.6% maintenance, and only 8.5% in managing function. In Table 3, it is possible to see the average length of permanence in the organization, the function held, and the average age by area of activity.

Table 5
Distribution of respondents by area of activity in terms of time at the company, permanence in position, and age

Occupation area			Time in Company	Permanence in position	Age
	nº	%	Mean	Mean	Mean
Administrative	46	15.7	2.7	3.8	31.4
Forestry	16	5.4	4.4	2.8	29.9
Logistics	44	14.9	3.3	2.5	29.9
Maintenance	46	15.7	8.6	6.4	34.3
Production	142	48.3	6.2	4.3	32.3
Total	**294**	**100**	**5.9**	**4.2**	**32.0**

Source: research data (2020).

Table 5 demonstrates the longest period of permanence in the organization is found in maintenance area with more than 8 years. It is possible to verify that respondents remain 4.2 years on average in their function and are an average of 32 years old.

The Shapiro-Wilk test was used to verify the normality of the data,. After the test, it was found that the data were not normal, with a p-value of 0.000 for the safety culture dimension, a p-value of 0.007 for the health and safety management dimension, and a p-value of 0.001 for the quality of work life dimension. According to Öztuna, Elhan, and Tüccar (2006), the Shapiro-Wilk test is the best normality adherence test, efficient for different distributions and sample sizes.

The reliability of the dimensions was assessed using the Cronbach's Alpha test (Table 6). Cronbach's alpha is a useful statistic for investigating the internal consistency of the questionnaire scale. According to Hair Jr. *et al.* (2009) this indicator measures the reliability in a variance of 0 to 1, with values from 0.600 to 0.700 considered the lower limit of acceptability. In this research, values were considered reliable in data with coefficients α ≥ 0.700.

Table 6
Reliability Analysis

Dimension	Subdimension	*Cronbach's alpha*	Nº Assertions
Safety Culture	Management Commitment	0.792	06
	Communication	0.720	05
	Employee Participation	0.839	06
	Training / Information	0.800	05
	Motivation	0.788	04
	Safety Procedures Observation	0.860	07
	Learning Organization	0.745	03
	Organizational Change and Transition Management	0.796	04
Occupational Health and Safety Management	Crisis Management	0.756	06
	Standards and Legislation	0.831	07
	Integration of actions	0.898	09
	Adding value	0.807	07
Quality of work life	Physical domain	0.735	07
	Psychological domain	0.748	06
	Social domain	0.700	03
	Environmental domain	0.733	08
Total nº Assertions			**95**

Source: research data (2020).

Through the Kaiser-Meyer-Olkin – Measure of Sampling Adequacy [KMO] test, which determines sample adequacy with regard to the degree of partial correlation, ranging from 0 to 1, it can be seen that KMO close to 1 indicates it is very suitable for use of the Factor Analysis technique [FA]. In contrast, values close to 0 reflect a weak correlation between dimensions. It should be noted that for the correct use of the factorial analysis, the KMO must be at least 0.6 (Fávero *et al.*, 2009; Hair Jr. *et al.*, 2009). Therefore, the KMO test showed reasonable explanatory power (0.927), as highlighted in Table 7. In turn, the Bartlett's sphericity test showed a p-value of 0.000, indicating that there is a correlation between dimensions, so it is advisable to use the FA. It is clear that for the p-value to be significant, it must be below 0.05 (Fávero *et al.*, 2009; Hair Jr. *et al.*, 2009).

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Table 7
KMO and Barllett's dimensions tests 1 to 3

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Sampling Appropriateness Measure.		.927
Bartlett's Sphericity Test	Approx. Chi-square	2874.40
	Df.	120
	Sig.	.000

Source: research data (2020).

A factorial analysis was carried out in order to verify whether all the indicators fit a given factor and also to verify whether all of them had adequate factorial loads. Hair Jr. *et al.* (2009) mention that factor analysis is used to analyze the interrelationships between a large number of dimensions and explain these dimensions in terms of common factors, with the objective of reducing the number of dimensions to be considered in the study. Eight components were loaded on safety culture, four components on occupational health and safety management, and four components on quality of life at work. Exploratory factor analysis (EFA) produced, for each dimension, a factor loading greater than 0.71 for each factor. Comrey and Lee (1992) suggest that factor loadings greater than 0.71 are excellent, greater than 0.63 are very good, greater than 0.55 are good, greater than 0.45 are fair, and greater than 0.32 are poor. Factorial analysis of records confirmed the three dimensions used in the research. The 16 joint components in this study contributed to 67.37% of total variance.

In order to assess the level of maturity of safety culture, occupational health and safety management and quality of life at work, based on the multi-stage maturity model proposed by Bessant, Caffyn, and Gallagher (2001), a descriptive analysis of the sample.

In order to define the maturity of each dimension, the mean value obtained in the subdimensions was applied. The mean value was used because the dimensions are measuring distinct aspects. Thus, total maturity corresponds to the level attained by the whole, and not by its specific parts. According to Vasconcellos (2010, p.199) the understanding of the whole is externalized beyond

the existence of the parts and "the relationships are what give cohesion to the whole system, giving it a character of totality or globality" (p.199). Figure 1 shows the consolidated maturity levels of the three dimensions present in the research.

Figure 1
Consolidated Maturity Level of the CS, GSSO and QVT Dimensions

Source: research data (2020).

In Figure 1 is verified, in a consolidated form, that the average value obtained for the safety culture dimension presents a higher stage of maturity. With an average value of 4.21 points inside the maturity curve, the component was classified as Level 4 - Proactive continuous improvement. The dimensions Quality of Work Life and Occupational Health and Safety Management were classified within the maturity curve as Level 3 - Continuous Improvement Directed towards the Goal with an average value of 3.73 points and 3.44 points respectively.

The average maturity of all dimensions was compared using the Kruskal-Wallis non-parametric statistical test for comparing two or more samples, because the data did not follow a normal distribution, violating one of the assumptions for carrying out parametric statistical tests (Siegel & Castellan, 2008). The descriptive analysis of dimensions and sub-dimensions by area of activity is shown in Table 8.

Table 8
Descriptive evaluation of the dimensions and sub-dimensions by area of activity

Dimension	Subdimension	Administrative		Forestry		Logistics		Maintenance		Production		Chi-square	p-value
		Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation		
Safety Culture	Management Commitment	4.26	0.646	3.97	0.782	4.12	0.686	3.93	0.783	4.23	0.601	6.874	0.143
	Communication	3.91	0.649	3.68	0.816	3.94	0.790	3.89	0.769	3.97	0.778	2.692	0.611
	Employee Participation	4.19	0.700	3.94	0.943	4.08	0.815	3.80	0.821	4.21	0.720	9.776	0.044
	Training / Information	4.43	0.549	4.06	0.802	4.28	0.760	4.17	0.649	4.32	0.687	6.195	0.185
	Motivation	4.29	0.745	4.25	0.837	4.27	0.775	4.23	0.656	4.39	0.653	3.010	0.556
	Observation of Safety Procedures	4.37	0.637	4.17	0.778	4.35	0.695	4.12	0.700	4.29	0.685	4.771	0.312
	Learning Organization	4.65	0.421	4.06	0.880	4.45	0.771	4.42	0.735	4.52	0.665	6.627	0.157
	Organizational Change and Transition Management	4.38	0.711	4.05	0.862	4.34	0.715	4.11	0.714	4.37	0.672	8.481	0.075
Occupational Health and Safety Management	Crisis Management	3.57	0.761	3.63	0.739	3.49	0.809	3.56	0.680	3.62	0.662	1.158	0.885
	Standards and Legislation	2.99	0.620	3.18	0.389	3.04	0.551	3.09	0.464	3.05	0.546	1.598	0.809
	Actions Integration	4.10	0.900	3.72	0.718	3.95	0.789	3.83	0.827	4.04	0.765	6.235	0.182
	Adding value	4.08	0.832	3.85	0.859	3.95	0.788	3.95	0.798	4.04	0.711	2.047	0.727
Quality of work life	Physical domain	4.13	0.422	3.89	0.714	4.05	0.525	4.22	0.495	4.10	0.548	4.566	0.335
	Psychological domain	4.03	0.483	3.84	0.900	3.95	0.624	4.04	0.513	4.07	0.566	2.870	0.580
	Social domain	4.23	0.583	4.04	0.749	4.08	0.601	4.24	0.639	4.11	0.663	2.403	0.662
	Environmental domain	3.84	0.464	3.58	0.605	3.70	0.542	3.63	0.468	3.69	0.502	5.791	0.215
Number of respondents		**46**		**16**		**44**		**46**		**142**			

Source: research data (2020).

In Table 8 it can be seen the maturity stage of the sub-dimensions ranges from 2.99 points to 4.65 points. The highest maturity stage of 4.49 is for "organization of learning" in the safety culture dimension, while the lowest maturity score of 2.99 is for "compliance with legal standards" in the health management dimension and occupational security, both related to the administrative area.

It was verified the existence of alternation between variables, through the average maturity values of the dimensions. The results of the Kruskal-Wallis test referring to the safety culture dimension showed there is no difference between the average maturity values of the subdimensions, showing a p-value greater than 0.05, with the exception of the subdimension "employee participation" ($X^2 = 9.776$; p<0.05), which showed a significant difference between the average maturity of maintenance and production areas (p-value of 0.026) with the level of significance adjusted between the comparisons made. The difference in average maturity between maintenance and production areas is mainly due to the non-contribution of maintenance area

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managers regarding the performance of internal occupational health and safety audits in partnership with employees. The average maturity value assigned by maintenance employees was 3.30 points, while production area obtained an average of 4.10 points. Regarding occupational health and safety management dimensions and quality of work life, the results of the Kruskal-Wallis test showed there is no difference between the average maturity values of the subdimensions.

To identify the existence, or not, of a relationship between researched variables, a multiple linear regression analysis was performed for each variable, considering safety culture as the dependent variable and occupational health and safety management and quality of work life as independent variables.

Regression analysis involving only one explanatory dimension is called simple regression, while analysis involving two or more explanatory dimensions is called multiple regression. Multiple linear regression is a data analysis technique widely used to analyze a dependent (quantitative) variable related to two or more independent (quantitative) variables. The objective is to predict changes in the dependent variable in response to changes in independent variables (Hair Jr. *et al.*, 2009).

The hypotheses of relationship between variables and their respective results are shown in Tables 9.

Table 9
Multiple Linear Regression Analysis

Hypothesis	β	*p-value*	Situation
H_1: Occupational health and safety management practices have a positive relationship with safety culture maturity;	0.322	0.000	Non-rejected hypothesis
H_2: Quality of work life practices are positively related to safety culture maturity;	0.407	0.000	Non-rejected hypothesis
H_3: Occupational health and safety management practices are positively related to quality of work life practices.	0.402	0.000	Non-rejected hypothesis

Adjusted $R^2 = 0.371$; $p < 0.05$.
Source: research data (2020).

It is observed that all variables had a positive relationship with the β values. According to Hair Jr. *et al.* (2016), which range from -1.0 to +1.0, values close to +1.0 indicate a very strong positive relationship between two variables, and values close to -1.0 indicate a negative or low relationship. Near zero indicate weak relationships. In Table 9, the relationship between variables and the β values, that is, the relationship between safety culture maturity and the practices of occupational health and safety management and quality of work life, showed more representative values close to + 1. Table 9 shows all the values that tested the causal relation between variables are within the parameters proposed by Hair Jr. *et al.* (2009), confirming the hypotheses proposed in this research.

With different results from this research, regarding dissatisfaction with practices contentment with financial resources, leisure, physical environment and acquisition of information, Silva (2008) states quality of work life negatively influences safety culture maturity. On the other hand, the author mentions results obtained with practices needed for medical treatment, locomotion ability, work ability and meaning of life, demonstrated quality of work life positively interferes on safety culture.

According to the results obtained in the research by Oliveira *et al.* (2015), practices of quality of work life are essential for people to become involved and committed to safety culture in organizations. Veiga, Cantorani and Vargas (2016) state people's behavior towards culture is an immediate reflection of the everyday practices established by the organization.

The results of this study corroborate those of Mukai (2013), who concluded a consolidated occupational health and safety management system goes beyond the operational aspects of the organization, covering policies, practices, management, and commitment of top management, directly influencing safety culture. The author reports that occupational health and safety management must be considered as a performance factor and must be incorporated into

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the strategic business management. In organizations where health and safety management is considered sustainable, employees are aware of how they should act and develop their activities in a safe and healthy way, thus guaranteeing general well-being and a constituted safety culture (Acto, 2017; DuPont, 2015).

Freitas *et al.* (2016) show in their research the need to develop ways to train and communicate actions of occupational health and safety management and quality of work life to create a favorable safety culture in all hierarchical levels of the organization. Practices must become an essential value to the organization, serving as foundation to develop a strong safety culture.

From this perspective, Santos and Martins (2016) mention that programs and actions related to the quality of work life can be used as safety culture strategy, and Lima and Lima (2018) ensure investments made in management of occupational health and safety contribute to expanding safety culture, improving efficiency and results expected by the organization and the well-being of employees.

Purcidonio *et al.* (2018) reports that good safety and well-being practices contribute to routine activities and to safety culture. The authors also concluded good occupational hygiene practices intensify the evolution of safety culture in organizational environments.

Final considerations

The existence of a set of occupational health and safety management practices and quality of work life enables people to feel encouraged and motivated to carry out their tasks, satisfying their desires and needs while meeting organizational goals, in particular safety culture. This study aimed to analyze the maturity stage of safety culture and its relationship with occupational health and safety management practices and quality of work life.

The result of testing hypothesis H_1 with regard to occupational health and safety management, presented the GSSO practices in the confirmatory test as a positive relation to safety culture maturity.

H_2 hypothesis test conclusion, which corresponds to quality of work life, evidenced QWL practices in the confirmatory test as a positive relationship with safety culture maturity. Testing hypothesis H_3 showed a positive relationship between GSSO and QWL practices (Table 9).

Based on the data collected for this research, the safety culture dimension shows the highest maturity stage within maturity curve, Level 4 - Proactive continuous improvement, with an average value of 4.21 points. The occupational health and safety management dimensions and quality of work life were classified within the maturity curve as Level 3 - Continuous Improvement Directed towards the Goal, with an average of 3.73 and 3.44 points respectively.

Management practices for occupational health and safety and quality of work life are essential for a successful and lasting safety culture. Among the main practices of occupational health and safety management evidenced in this research, it can be highlighted: establishment of policies and guidelines by senior management; defined roles and attributions; compliance with legal standards of occupational health and safety; occupational health and safety integrated into operational procedures. With regard to practices of quality of work life, the following can be highlighted: accessible means of transportation; accessibility to health services; physical and mental capacity to perform activities; adequate daily activity load; appropriate interpersonal relationship; leisure opportunities.

This study contributed at a managerial level to a greater understanding of GSSO and QWL practices from the model used in this research and its relationship with Safety Culture. The instrument used in this research makes it possible to establish a diagnosis of the maturity stage of organizations, identifying strong points and points that demonstrate fragility in the implementation or execution of improvements in GSSO and QWL practices. This study provides a method for evaluating the organization in relation to the competition (benchmarking), enabling the understanding of the best market practices.

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As a recommendation for new works, we suggest a new application of this study in different market segments. It is also suggested the application of a longitudinal study to verify the phenomenon, using a timeline as a way to obtain information that can attest to the gradual increase or not of the maturity stage of practices.

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