

Structural Equations Model of Perceived Occupational Risks Against COVID-19

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Abstract

The objective of this paper is to review the theoretical, conceptual and empirical frameworks around the perception of risk as a rational, deliberate, planned and systematic process of contingencies and threats. A documentary and retrospective study was carried out with a non-probabilistic selection of sources indexed in international repositories, considering the journal's impact factor and the author's citation index. A model was established based on the evaluative consensus of expert judges in the subjects, although the research design limited these findings to the study scenario, suggesting the extension of the work towards lines of research concerning normative, technological and strategic trust with respect to civil protection.

Keywords: Risks, contingencies, threats, perceptions, model.

Introduction

In the world up to the time of writing this document, more than 20 million have been infected, a million have become ill and half a million have died (WHO, 2022) [1]. In Mexico, the epidemic has caused the contagion of a million, the disease of 400 thousand and the death of 70 cases (PAHO, 2022) [2]. In the workplace, labor policies in response to the pandemic have generated sections dedicated to risk prevention. Previous accidents and illnesses add to the potential cases of contagion, illness and death from Covid-19. In this way, the theoretical, conceptual and empirical frameworks that explained the asymmetric relationships between decision makers and executors now pose a scenario of exacerbated differences that are reflected in the risks of contagion, disease and death. In other words, the probabilities of affecting these risks depending on the type of activity are now exacerbated. In this sense, the perception of risks is especially relevant as a determining variable of self-care; promotion and prevention of accidents and diseases, as well as the request for treatment and adherence to it. This is so because the theories of human capital now observe as intangible assets those who develop self-care and reduce the chances of contagion, disease and death to a minimum.

The objective of this work was to specify a model for the study of risk perception, considering the theoretical, conceptual and empirical frameworks, as well as the relationships established between the perceptual dimensions.

Are the random relations between the perceptual dimensions of the risks associated with contingencies and environmental threats homogeneous with respect to the differences between groups?

The random relationships between the factors reported in the literature as perceptual dimensions are homogeneous as long as the contingencies and threats of the environment are created and developed within the confidence intervals established in the state of the art. A section is included in which the sociocultural approach to human capital and its implications in a risk situation such as the pandemic are discussed. Next, the collective approach is reviewed to account for the differences between self-care models. The state of the question ends with a review of the psychometric approach to define the implications of self-care.

Risk perception theory

During the last 25 years the risks have been immeasurable, unpredictable and unsustainable, from the terrorist attacks registered in the United States to those that occurred in Europe, through the terrorist events registered in the Middle East [3]. The multidimensional nature of risks implies uncertainty before which cultures disagree between accepting or rejecting them [4]. Such a discrepancy defines two types of reaction: a priori and a posteriori [5]. The first implies a planning of prevention strategies, and the second a heuristic, improvised and immediate response, which simplifies the magnitude and impact of the risks [6].

The antecedent of the Sociocultural Approach is found in the functional normative classification [7]. In principle, there are two types of norms: what must be done and what is done, being three the determinants of the norms; 1) Perceived probability of receiving a formal sanction when the norm has been transgressed (deterrence), 2) Pressure exerted by the group with respect to said norm (influence) and 3) Degree of agreement that exists between the norm and our moral principles (legitimation).

A typology or structured and consistent set of categories that are derived from combining a set of criteria [8]. The typology is relevant based on three criteria (personal agreement, formal sanction and social disapproval). The differences between the norms (legitimate laws and prescriptions are complied with to a greater extent than illegitimate laws and convictions) using the informed and perceived compliance criterion [9]. The significant differences between the attitudes towards each type of norm, considering; a) Legitimate. Compatible with our personal principles; b) Coercive. Failure to comply with them implies sanctions applied by an authority with which you do not agree and c) Illegitimate. Failure to comply with them causes formal sanctions with which we do not agree and do not provoke disapproval from our reference group; d) Prescriptive. Compatible with our principles and expected to be disapproved by the reference group in case of non-compliance; e) Personal. Derived from our principles and their non-compliance does not cause any formal or informal sanction; f) Repeated. They cause a negative relationship with the reference group when they are not complied with, and a low probability of sanction is perceived as well as consistency with our principles; g) Null. They are not supported by authorities, our reference group or our principles.

In essence, the sociocultural school raises four topics: i) Individualists. They emphasize individual autonomy, encourage free deeds and other forms of private ordering; ii) Hierarchical. They favor differences towards socially and politically authoritarian forms of tradition by protecting the roles and status of people; iii) Collectivists. They favor solidarity actions and social and public order and iiiii) Egalitarian. They favor collective actions to balance; health, status and power [10].

The Sociocultural School is complemented by an approach that originated in the United States and was developed in Latin America to be exported to Europe as a theoretical alternative to explain processes that are more collective than individual [11]. Its main principles are set out below.

Risk perception studies

In essence, community psychological studies combine paradigms (mainly the critical paradigm with the constructivist) based on the contingency of a problem [12]. That is, the conceptualization-method-intervention process is established ontologically and epistemologically only if the genealogy of the problem allows the concatenation of the paradigms in the intermediate part of the process [13]. Its emphasis on community processes ignores institutional processes [14]. Its intervening essence is derived from an approach in which it is proposed that communities do not have to be conceptualized and then prove said inferences, but rather they have to be involved with them, in the achievement of their demands and struggles, which implies the apprehension of strategies, observation and questioning that lead the researcher to become aware of community needs and through them to enrich the information collection and analysis techniques [15].

The researcher becomes an integral element of the object that he chose to study in such a way that he acquires knowledge with the community and builds it through a shared interpretation [16]. However, the context and more specifically, the situation of climate change does not allow its contemplation, be it individual, community, organizational or institutional [17]. From the Collective Approach, the socio-historical context includes needs that are represented in symbols, meanings and meanings transferred from the past to the present in frames of shared memories that, when signified, shape a structure of affections delimited to space generated and diffused from the interior. of the community.

Community needs are a set of group collective activities of an anticipatory nature, through which a community or group is sought to point out aspects of their common life as such, which they feel are unsatisfactory, unacceptable, problematic, disturbing, limiting or impossible, in such a way that they prevent reaching a different way of life that is perceived as better and to which one aspires [18]. They also suppose the consideration of the situation of lack and conflict in its relationship with the global situation in which the group or community lives, in its relationship with the society to which it belongs and based on an analysis of the causes and consequences of those needs [19]. This is how the community needs of minorities differ from the institutional needs of the middle classes [20]. Based on this differentiation, a conflict arises expressed in an unconscious and conscious Social Influence within the community entities in which an economic-political power is exercised to legitimize the domain of the institutions and the consequent delegitimization of the communities [21].

Both, legitimacy and delegitimacy, have been kept as memories in the people to represent themselves as different from other communities in the course of the history of the peoples [22]. And to solve the conflict, it is necessary to form a group identity and its innovation to solve the needs and its subsequent dissemination and transfer in subsequent generations [23]. That is, affectivity is a state of sensation with positive and negative stimuli [24]. Consequently, it is constructed, imagined, symbolized, fast, automatic, intuitive, non-verbalized, non-narrated and experiential in a process of simplification strategies to eliminate aspects of change. Therefore, affectivity determines judgments and decisions.

The main community strategy to face risks has been mainly Political Participation determined by Community Feelings [25]. Community Feelings are defined as needs raised, shared and resolved around a group [26]. This definition implies that the Feelings of Community solve needs such as intimacy, diversity, belonging and usefulness, being four indicators; I) Feelings of belonging to a stable and reliable group that is often the neighborhood where one lives; II) Feelings of similarity and interdependence with neighbors of a neighborhood; III) Know when you have a feeling of community and when that feeling is absent (diluted feelings of alienation, anomie, isolation and loneliness) and IV) Willingness to alter the permeability of the personal membrane to include others.

This construct can establish a direct affective process in the explanation of behavior favorable to community needs [27]. From three criteria; (1) residents of the neighborhood's founding antecedent generations, (2) residents of antecedent and subsequent generations, men and women, and (3) residents of antecedent and subsequent generations by age range, not necessarily the appearance of some indicators such as membership (safety emotional, belonging and identification, personal investment and shared symbol systems), influence, integration for the solution of needs and shared emotional connection, are determinants of the Sense of Community and underline the importance of a historical reconstruction of the community to understand said gap.

It is worth differentiating and then complementing the concept of Participation with the concept of Protest Event, a public collective action (deliberately chosen, organized and strategically launched) by non-state actors with the express purpose of showing disagreement and (at the same time) make a political demand in relation to the protection and improvement of the environment [28]. Said Protest Event can be derived from an activism, but they are not necessarily the same unit of analysis as they differ in two aspects: The Environmental Protest Event arises from political, economic, social, collective, cultural and community interests. Finally, it is a subset of an activism when said interests are intercepted.

Consequently, Political Participation is defined as the collection of signatures, donation of money and protest demonstrations generated from a community need. To

exemplify this definition: The frequency of informative notes generated from the newspaper *El País* (chosen for being of national and municipal circulation in Spain, as well as meeting the journalistic requirements to validate its content), showed that the increase in protests has a parallel origin to the institutionalization of policies in the Spanish State [29].

From the Collective Approach, these investigations are complemented by studies of an approach that recently emerged from risk events in which terrorism in its various forms is its main subject of study [30]. The elements of this approach are presented below.

Modeling of risk perception

The Psychometric School of Risks, which has explained a more heuristic than algorithmic behavior. That is, more improvised than deliberate and planned, more emotional than rational. The taxonomic classification and psychometric measurement of risk perception, interdisciplinary research by complementing the psychometric measurement of risk perception with the econometric measurement of expected utility; alternative research by questioning the approaches on the affective factors that affect the perception of risks, and finally, the models of perception and communication of risks according to individualistic and collectivist cultures.

Studies on Risk Perception have been measured using two models that are based on affective and cognitive factors that predict intersubjective reaction [31]. The Descriptive Model of Risks, based on the affective factor, which implies the implicit representation of a reality built based on successes and errors of decision and automatic intuitions such as fear and anxiety [32]. The Normative Model of Expected Utility, which is based on the cognitive factor and includes explicit representations of control and decision-making judgments, probability calculations, formal logic and maximization of expected utility [33].

The structure of the "risks" concept implies a) Risks. Natural, technological, financial, social and organizational labour; b) Risk assessment. Diagnosis of probability around the magnitude and impact of the risks; c) Inter-subjective reaction towards risks. Diagnosis of perceptions, beliefs and attitudes towards risks; d) Communication of risks. Diffusion of the diagnosis of the evaluations and inter-subjective reactions towards the risks to intervene; prevent and/or manage risk situations; e) Risk acceptance. Diagnosis of high expectations of benefits and low intensity of risks; f) Risk management. Institutional intervention to control the magnitude and impact of risk situations in the communities.

This process has been diagnosed, explored, described and explained (1) socio-culturally, in which anthropologists and sociologists explore the social construction of risks in individualistic and collectivist cultures; (2) axiomatically, in

which basically physicists, chemists, biologists and economists describe the magnitude and impact of risks in organized systems, and (3) psychometrically, in which psychologists are essentially the ones who explain the intersubjective reaction; perception, beliefs and attitudes towards risks [34].

Thus, Risk Perception includes four dimensions; a) Involuntary exposure to risk; b) Perception of lack of internal control; c) Uncertainty about the consequences of exposure to risk and d) Skepticism towards the information generated by civil protection institutions [35]. In this sense, the perception towards normal and strange risk situations is explicitly represented from experiences and non-experienced information [36]. Therefore, it implies indication of danger, prevention, contingency, management and protection; expectation that determines an action, and quick-fix reaction.

The Risk Perception variable can be defined as a heuristic intersubjective reaction that responds immediately and simply to dangers and uncertainties and determines judgments, decisions and behaviors [37]. The perception of risks is the generalized reflection of an object or phenomenon of reality and that becomes consciously in it, although its particularity is that while it reflects the object or phenomenon, the threat that it represents for the individual is conscious. A member of a subsequent generation (child) directly, positively and significantly determines the risk perception of a family living in an unhealthy neighborhood.

The intersubjective reaction to terrorist attacks is ambiguous since the excess probability curves (EPC) describe the degree of experience and, consequent differences between experts and non-experts [38]. Using the CPE, it established the degree of uncertainty derived from the probability of occurrence and effects. This is how beliefs have been raised as disorienting and guiding human behavior.

For their part, motives have essentially been defined as a factor that drives, reinforces or encourages action. That is, they are the reasons that people have to carry out a certain

behavior in the face of an unpredictable event [39]. Motivation can be extrinsic as the expected benefits of conserving resources and intrinsic motivation as the satisfaction that divides in four; I) Frugality. Need for efficiency in the prudent use of resources and risk avoidance; II) Participation. Behavior oriented to social change based on a strategy; III) Altruism. Financing and promotion of limited risk behavior and IV) Competition. Skills for conserving resources and reasons for developing these skills. These topics allow to define the motives as the reasons to carry out an action.

The six exposed variables are related in such a way that they explain more a heuristic behavior (improvised, emotional and inconsistent) than an algorithmic one (deliberate, planned and systematic). Said behavior is determined by variables of a more effective than rational order and it is the three approaches that have used these variables to theorize risk events in which terrorist events have an indirect impact on human behavior [40]. Said impact is more mediated (the effects of the uncertainty of the event are transmitted) than moderate (the variables interact in such a way that the situation of the event does not affect human behavior). In this sense, it is pertinent to ask three questions:

In summary, the sociocultural, collective and psychometric approaches highlight three dimensions related to the incommensurability, unpredictability and unsustainability of risks. If culturally, collectively and psychologically risk events are incommensurable, then they will be unpredictable for cultures, groups and individuals, being unsustainable in the short, medium and long term in terms of tolerance, resistance or coping of groups, groups and individuals in the face of these events that occur as contingent threats.

Method

Participants. A documentary and retrospective study was carried out with a non-probabilistic selection of sources indexed to international repositories, considering the impact factor of the journal and the prestige of the author, as well as the period from 2019 to 2022 (see Table 1).

Table 1. Sample Descriptive.

	A	B.	C
Academy	11	10	7
Copernicus	10	8	6
Dialnet	8	7	4
Ebsco	7	6	3
latindex	7	5	2
Publindex	6	4	1
Redalyc	5	3	1
Scielo	4	2	1
Scopus	3	1	0
WoS	2	0	0
Zenodo	1	0	0
Zotero	1	0	0

Note: Prepared with study data. A = Findings reported on the prevalence of the immeasurable dimension of risks, B = Results alluding to the hegemony of the unpredictable dimension of risks, C = Findings related to the prevalence of the unsustainable dimension of risks.

Instruments: The Carreon Risk Assessment Inventory (2019) was used, which includes questions related to incommensurable dimensions (What is the impact of contingencies and threats according to the literature published from 2019 to 2022?), unpredictable (When will these impact contingencies or threats according to the literature published from 2019 to 2022?) and unsustainable (What is the degree of tolerance for these contingencies and threats as reported by the literature published from 2019 to 2022?).

Procedure: The Delphi technique was used for the evaluation of the selected literature. In three rounds of feedback, expert judges rated the content and established consensus based on the risk assessment inventory. In the first round, the ratings of the judges were collected in order to be able to compare them in a second round and adjust the ratings according to the evaluative trend. In the second round, qualification criteria were established following the

instrument used with the purpose of establishing the categories of analysis related to the three dimensions; incommensurability, unpredictability, and unsustainability. In the third phase, the ratings were weighted to be able to estimate the parameters of normality, contingency and proportion in the unveiling of the decision structure in the face of contingencies and threats collected in the literature, evaluated by judges and quantified.

Qualitative data analysis software version 3.0 was used considering the statistics of mean, standard deviation, bias, asymmetry, kurtosis, chi square and probability ratio to observe the structure of decisions in the face of contingencies and threats considered as risks.

Regarding the equations, the present work used several for the estimation of the normal distribution, contingency, proportion and probability.

The formula for establishing the normal distribution is:

$$y = \frac{e^{-(x-\mu)^2 / (2\sigma^2)}}{\sigma\sqrt{2\pi}}$$

where

$e \approx 2.718$

$\pi \approx 3.14$

$\mu = \text{population mean}$

$\sigma = \text{population standard deviation}$

The equation for the contingent distribution was:

$$X^2 = \sum_{i=1}^k \frac{(O_i - E_i)^2}{E_i}$$

$O_i = \text{observed frequency counts in each category}$

$E_i = \text{expected frequency counts in each category}$

$k = \text{number of categories}$

The equation to determine the odds ratio was:

		Outcome	
		Yes	No
Predictor	Yes	A	B
	No	C	D

$OR = \frac{(A \cdot D)}{(B \cdot C)}$

The equation to estimate the confidence interval is:

$$95\% CI = OR \pm 1.96 * \sqrt{\frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{1}{d}}$$

Results

Table 2 shows the values for each finding concerning the three dimensions of risk perception; incommensurability, unpredictability and unsustainability considering the three qualifying rounds of the judges.

Table 2. Descriptive of the Risk Assessment Inventory.

E	M	SD	S	A		C1			C2			C3	
R1					χ^2	df	p	χ^2	Df	P	χ^2	df	P
e1	0.78	0.14	0.15	0.13				14.23	14	<.05			
e2	0.73	0.15	0.18	0.12							15.23	14	<.05
e3	0.72	0.12	0.10	0.11	12.34	12	<.05						
e4	0.71	0.10	0.11	0.10				14.37	13	<.05			
e5	0.75	0.17	0.19	0.19									
e6	0.76	0.15	0.18	0.17	11.09	15	<.05						
e7	0.70	0.16	0.13	0.16									
e8	0.72	0.19	0.12	0.14									
e9	0.71	0.14	0.14	0.13	18.61	10	<.05						
e10	0.74	0.13	0.10	0.10									
R2													
e11	0.77	0.10	0.11	0.13									
e12	0.70	0.13	0.10	0.14	10.15	11	<.05						
e13	0.75	0.16	0.19	0.18				14.39	18	<.05			
e14	0.73	0.13	0.16	0.10	11.07	19	<.05						
e15	0.79	0.12	0.15	0.18	16.21	17	<.05						
e16	0.72	0.11	0.13	0.10				15.48	16	<.05			
e17	0.71	0.17	0.16	0.16				12.04	15	<.05			
e18	0.77	0.16	0.19	0.15	17.60	14	<.05						
e19	0.70	0.14	0.10	0.14							13.25	13	<.05
e20	0.75	0.15	0.13	0.13									
R3													
e21	0.77	0.12	0.14	0.11									
e22	0.78	0.11	0.15	0.10				16.58	10	<.05			
e23	0.79	0.14	0.13	0.14	17.61	13	<.05						
e24	0.78	0.15	0.17	0.19	19.54	12	<.05						
e25	0.70	0.18	0.10	0.18				10.35	16	<.05			
e26	0.73	0.19	0.18	0.10				19.21	14	<.05			
e27	0.74	0.13	0.16	0.11	16.78	13	<.05						
e28	0.75	0.12	0.15	0.17							15.26	15	<.05
e29	0.70	0.15	0.13	0.16	15.61	10	<.05						
e30	0.71	0.10	0.12	0.11	10.84	11	<.05						

Note: Prepared with the study data, R = Delphi Round, e = Extracts of findings published in the literature, M = Mean, SD = Standard Deviation, S = Bias, A = Asymmetry, C1 = Category of Incommensurability, C2 = Category of Unpredictability, C3 = Category of Unsustainability, X2 = Chi Square, df = Degrees of Freedom, p = Level of significance.

It is possible to notice that the consensus was reached in the third category of unsustainability, but the greatest dissent in the first category of incommensurability. In other words, the panel of experts seem to agree that the risk events reported in the published literature from 2015 to 2019 are unsustainable for collectives, groups and individuals, but

their measurement is possible, although the study design did not seek to know how it could be estimated.

Once the structure of the contingent relationships between the categories was established, the structure of the probability proportions concerning decision-making in the face of contingent and threatening events for collectives, groups and individuals was established (see Table 3).

Table 3. Structure of probability proportions before risk events.

PT	C1	C2	C3
C1	PA	0.33 (0.28 0.47)	0.66 (0.41 0.83)
C2		P.M	0.10 (0.07 0.49)
C3			PI

Note: Prepared with the study data, CI = Category of Incommensurability, C2 = Category of Unpredictability, C3 = Category of Unsustainability; PI = Intercultural Policy, PM = Multicultural Policy, PA = A cultural Policy.

Likelihood ratios relationships reveal three risk policies; a cultural policy focused on the measurement and anticipation of risks, multicultural policy focused on anticipating risks while conserving resources, and intercultural policy only focused on conserving the environment.

With the purpose of observing the axes and trajectories of the relations between the categories and the extracts qualified by the expert judges in the matter, a model of structural equations was made (see Figure 1).

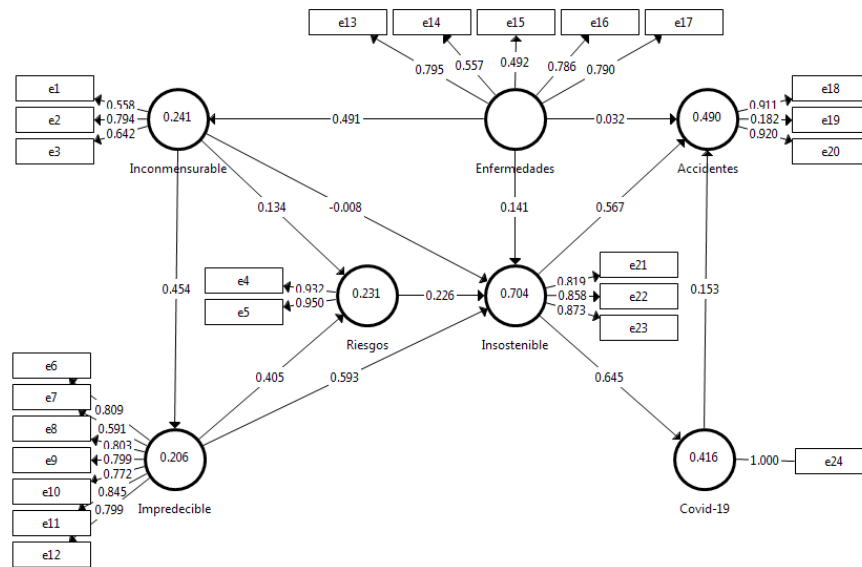


Figure 1. Structural equation model.

Source: Prepared with study data

The structural equation model warns that the perception of risks considered unsustainable determines occupational accidents and exposure to Covid-19. In turn, this unsustainability is determined by the perception of risks considered unpredictable. In short, risks assumed to be unpredictable and unsustainable anticipate risks of contagion from Covid-19 and occupational accidents.

The fit values ($\chi^2 = 700.98$; $p > 1.68$; $NFI = 0.56$; $SRMR = 0.17$) suggest the non-rejection of the null hypothesis that notes significant differences between the theoretical relationship structure with respect to the observed relationship structure.

Discussion

The contribution of this work to the state of the question lies in the establishment of a probability ratio structure for the study of the perception of risk events, mainly contingencies and threats to communities, groups and individuals, but the research design limited the results to the informative sample and panel of experts who evaluated the reported and published findings from 2015 to 2022.

In relation to cultural studies, this paper highlights the emergence of intercultural policies as a result of risk perceptions as indicators of objectives, tasks and environmental conservation goals. This is so because differences between cultures are recognized, but similarities

in terms of coping, handling and communication of contingent and threatening events.

Regarding collective studies, this study highlights the gestation of multicultural policies in which the differences between groups, for example, migratory flows and native communities are reduced to their minimum expression in the face of contingencies and threats from the environment.

Regarding psychometric studies, this research warns that the conservation of the environment is focused on the conservation of resources that, being understood as common goods, generates a perception of risk that precedes the conservation of resources.

Lines of research concerning risk management and communication policies are suggested, such as the case of a cultural policies focused on the measurement and prediction of contingencies and threats, multicultural policies focused on the anticipation of risks and conservation of the environment and intercultural policies delimited to the conservation of resources.

Conclusion

The objective of the present work was to specify a model for the study of the perception of risk events alluding to the environment and the resources that, due to their contingent situation of scarcity, shortage, insalubrity and famine, threaten communities, groups and people, although the design of the research suggests lines related to the study of

the differences and similarities of these entities and based on three risk management and communication policies such as a cultural, multicultural and intercultural.

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