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Research Article

Confirmatory Factor Analysis of the Scale that Measures Biosecurity in the Face of the SDGs and COVID-19

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Abstract

The pandemic has been observed as a security phenomenon due to the dimensions it entails, although these dimensions have not been confirmed. The objective of this work was to compare the theoretical structure of security with empirical observations. A cross-sectional, correlational, psychometric, and confirmatory study was conducted with a sample of 100 students selected for their affiliation with institutions committed to implementing the SDGs. The results confirm four of the seven dimensions, and the extension of the model is recognized as an area of opportunity to confirm the remaining three dimensions. It is recommended to expand the number of items and the sample size to increase the total percentage of variance and align the empirical model with the theoretical model reported in the literature.

More Information

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Introduction

In the context of organizations and their relationship with an increasingly competitive environment, leaders have been pressured to establish control systems in which differences between employees are exacerbated. Given the lack of job skills, these are replaced by acts of loyalty to the company, which lead to violence against those considered to be responsible for poor performance or who are not seen as part of a work group. Thus, organizational violence is justified within collaborative teams, as is the case in Higher Education Institutions, where the phenomenon is exacerbated by the emergence of technologies, devices, and electronic networks. Educational issues are intertwined with the financing of vocational training [1]. In terms of budget, global vocational training is led by the United States with nearly $140 billion, followed by Japan, France, and Germany. Finally, Argentina and Mexico during the period from 1994 to 2007. Research investment shows little difference between Australia, Korea, China, the United States, France, and Japan. There are significant differences between funding from industry and public funding or other investment mechanisms in Canada, the United States, France, Germany, Korea, Japan, Mexico, the United Kingdom, and Sweden.

In the case of corporate financing, differences persist between countries, although they remain constant over the period from 1998 to 2007 in Germany, Argentina, Brazil, Canada, Korea, China, the United States, Spain, France, and Japan [2]. In the case of Mexico, increasing corporate financing is observed, which doubled during the analysis period. The use of available financing also remains constant, since from 1998 to 2007, higher education institutions and universities used a constant amount. This decreased only in the cases of Chile, Korea, Spain, and Japan, but increased in the cases of Brazil, Canada, and the United States. In the case of Mexico, a substantial increase is observed halfway through the period, which ends with a significant decrease.

Although funding has remained constant and resource utilization has increased and decreased in some cases, the differences in the number of researchers are substantial among the countries analyzed [3]. The US leads the group with nearly 1.4 million researchers, while China registered the same number in 2007, but its exponential increase denotes poor quality. Japan ranks third, followed by Germany with 600,000 and 200,000 researchers, respectively. In Latin America, Brazil, Mexico, Argentina, and Chile occupy ninth, tenth, eleventh, and twelfth places with nearly 100,000 researchers in all four countries. Although China and the US

had the same number of researchers until 2007, there is a gap of 200,000 between the two countries in terms of article production. Germany and Japan even match China's output. France, Canada, and Italy occupy intermediate positions, and Brazil is the Latin American country with the highest output. Regarding academic citations, the United States led the way between 1997 and 2008 compared to other countries, while Mexico ranked last. However, although the United States leads in each of the specified categories, it is significantly surpassed by Japan in terms of patents, and Latin American countries reached 50,000 patents between 1998 and 2007. The increase in scholarships explains Mexico's emergence in terms of patents and its lack of participation in other areas. From 2000 to 2009, the number of scholarships tripled in Mexico. Educational problems seem to be explained by the budget and research funding in Mexico compared to developed countries [4]. The differences between countries are not only financial but also organizational, since Japan, with $20 billion, exceeds the number of patents in the US, which invests $140 billion. Although the production of articles and the number of citations justify such an investment, in terms of technological innovations, Japan is a model of management for emerging countries in Latin America. Indeed, educational, scientific, and technological development appears to follow an organizational logic in which the professional training network and organizational training violence are factors that would explain the differences between countries that allocate similar investment amounts and the similarities between countries that support their production from different budgetary and financial amounts.

For this paper, violence consists of the differentiation between two or more actors regarding a relationship of power and influence that configures a system of personal and organizational insecurity or security. Thus, violence on digital networks is based on prejudice, depersonalization, benevolence, harassment, subjugation, objectification, stigma, and bullying through technology or devices in digital information and communication protocols [5]. Consequently, in the organizational sphere, violence on digital networks is part of an asymmetric professional development process in which the differences between leaders and employees overlap with the climate of relationships between employees, generating a subsystem of violence in which employees close to leaders are the beneficiaries of the vicious circle of differentiation. The theoretical frameworks that explain organizational formative violence are: 1) theory of reasoned action, 2) theory of planned behavior, 3) theory of spontaneous processing, and 4) theory of knowledge networks.

The theory of reasoned action argues that attitudes mediate the effect of beliefs on intentions and behaviors. An increase in beliefs increases dispositions toward specific, deliberate decisions and actions. This is a process that goes from the general, in terms of beliefs, to the specific, in terms of intentions and actions. However, the predictive power of general beliefs is limited by the specificity and unidimensionality of attitudes. Since attitudes transmit the effect of beliefs, they delimit their indicators in dispositions likely to be carried out [6].

The theory of planned behavior warns that the effect of beliefs on behavior is mediated by attitudes and perceptions of control. In a contingent situation or event, the perception of control increases its predictive power for intentions and behaviors if and only if it interacts with specific dispositions. To the extent that the perception of control decreases, its relationship with attitudes makes it predictable to have a minimal effect on decisions. Necessarily, the deliberate and planned process of decision-making and strategy implementation requires a perception of control consistent with the dispositions towards the object [7].

Spontaneous processing theory posits attitudes as a consequence of the activation of experiences with the attitudinal object. Attitudes are associated with object evaluations. A negative evaluation increases disposition and, consequently, the spontaneity of behavior [8].

A network is a set of central and peripheral nodes around which symmetrical or asymmetrical interaction relationships are established. In the first case, central nodes distance themselves from peripheral nodes. The information gap between nodes is explained by the discontinuous transfer of knowledge. In the second case, the differences between central and peripheral nodes are minimized, facilitating the exchange of information [9].

The theory of knowledge networks proposes that universities and companies are nodes of information exchange that become productive relationships through their exchanges of knowledge, development of interdisciplinary projects, and training flows [10].

Professional training network theory explains collaborative relationships oriented toward balancing demands and resources in contexts of scarcity, uncertainty, insecurity, and risk. The theory anticipates the emergence of factors such as trust, commitment, and satisfaction, which in turn determine innovation and, ultimately, organizational happiness. Professional training networks are information and communication systems related to the development of educational competencies derived from institutional and organizational synergies. They involve information technology systems from which it is possible to construct an academic or professional identity, provided that the nodes form a consensus and share responsibilities around scientific and technological production [11].

Professional training networks, the relationships between institutions and organizations, are exposed to problems inherent to collaborative relationships. Thus, the work environment is the determining factor in agreements, conventions, and/or consensuses oriented toward

organizational development—industrial, scientific, and technological-as—as well as the innovations of collaborative groups. That is why they are instruments for managing knowledge and innovations that allow us to overcome the discrepancy between industrial growth and sustainable development [12].

The theory of organizational formative violence posits that the differences between production systems that invest similar amounts of money in their processes are a result of the organizational climate: asymmetrical, violent, and conflictual relationships. In this sense, organizations approach an imbalance between demands and resources, but it is inequity and discretion that allow for the adjustment of task relationships to the diffuse objectives of companies [13].

Organizational formative violence, unlike PFR, is indicated by asymmetrical and inequitable relationships between members of the knowledge network. In this way, management is replaced by dogmas; freedoms are displaced by discretion; opportunities give way to impositions; capabilities are reduced to their minimum expression in the face of kinship; and co-responsibilities are inhibited by attributions of blame [14]. Organizational formative violence is the result of the interrelationship between relative and simple majorities and minorities that, when innovating, increase or decrease their participation in the construction of an organizational climate. Thus, professional training networks are power groups that, by centralizing their decisions, generate formative dissent and thus the discussion for consensus or the use of violence as a persuasive or dissuasive instrument for knowledge management and technological innovation [15].

Organizational formative violence warns of the emergence of an organizational climate that materializes in discourses of power in which differences, conflicts, and disagreements are symptoms of discretionary management or indicate consensual management, but are related to the influence of the majority over minorities. It anticipates the emergence of conflicts that would explain the increase in creativity rather than trust, personal initiatives and efforts rather than trust and group commitment, and pragmatism rather than satisfaction, aimed at innovation but also toward conformity [16].

Studies of organizational violence have focused on the deliberate, planned, systematic, and improvised process of professional training focused on formative violence, such as mobbing, bullying, stalking, and trolling in the electronic networks where an organization's employees interact. Organizational studies show that the work environment is a key factor in explaining collaborative relationships between employees and managers [17]. In this sense, workplace violence has been identified as a factor adjacent to vocational training, as it involves interpersonal and task-related conflicts that inhibit productivity and competitiveness. Within the framework of the relationship environment and workplace violence, this study is part of the discussion about sexism as an inhibiting factor in productive relationships [18].

Although educational institutions and for-profit organizations pursue common goals, the discrepancy between responsible professional training and productivity unrelated to sustainability is prevalent in the disagreements and conflicts between academic and business actors [19].

However, corporate funding, which drives the specialization of knowledge and technological innovation, incentivizes scientific production toward the optimization of natural resources and thereby disseminates a labor identity that runs counter to the values of equity, altruism, or biosphereism. These are asymmetrical relationships in which verticalism, sexism, and ostracism are indicators of an organizational power structure that controls the management, production, quality, and innovation of knowledge [20].

In the educational organizational sphere, professional training is the process through which the skills that will enable students to enter the workforce are developed. In this sense, collaboration agreements between universities and companies are aimed at adapting students' skills and knowledge to the requirements of the local and global markets. This requires symmetrical relationships between participants, since trust, cooperation, commitment, satisfaction, and ease are indicators of entrepreneurial training [21].

In contrast, when asymmetric relationships prevail among network members, distrust, selfishness, dissatisfaction, and stress emerge as limiting paradigms for task-related and collaborative relationships. Teachers' analysis of meanings surrounding the knowledge network reveals a work environment of asymmetric relationships. The lack of professional entrepreneurship is a factor to consider in evaluating the effectiveness of the internship program [22].

Theoretical frameworks that explain the behavior of knowledge networks through information and communication technologies have established evaluative principles, beliefs about information, and normative principles of Internet and electronic device socialization as determining factors. The relationship between these variables and technological behavior has been established based on the assumption that attitudes, perceptions, and intentions mediate the impact of values, beliefs, and norms on the use of a technological device [23].

Innovation is an effect of the exchange of information between research and technology projects and strategic knowledge planning. In this sense, a knowledge network involves the collaborative participation of specialists and technologists around a productive-technological activity. Therefore, the configuration of a network is carried out based on the collaborative organizational structure between universities and industrial sectors [18].

In terms of organizational networks, two types of knowledge converge: codified and tacit. The first refers to productive relationships in which the communication of procedures, recruitment, and training is responsible for implementing the organization's mission and vision among human resources [24]. The second type of knowledge is articulated through the exchange of procedures not written in a manual, but transferred by more experienced personnel to recruits. These are beliefs and values surrounding the execution of tasks, the use of technical equipment, and production-distribution procedures [12].

Both knowledge networks symbolize the construction of an organizational-labor-technical culture around which trust is fundamental. The absence of trust means that the formation of a network cannot be achieved since collaborative learning requires a distribution of responsibilities, where those who do not follow the work dynamics or organizational climate are excluded [20].

In this sense, knowledge networks require three conditions to survive: horizontal power, redistributed among network members, and the burden of responsibility, oriented toward everyone of them. The solution to problems after the formation of the network lies within the network itself. Therefore, decisions are made through induction rather than selection [13].

An essential factor in the network is the translators, who possess skills and knowledge regarding the needs of operational staff and the requirements of administrative staff regarding strategic planning goals. If we consider the different languages between the growth needs of a company and basic research, translators are essential since their transdisciplinary training and theoretical-applied experience are a link between business owners, administrators, and staff [22].

Self-efficacy is a perception and/or belief motivated by deliberate or discursive trials of personal or impersonal success and error. Since self-efficacy refers to failure, but primarily to success, even despite those failed trials that incite achievement, the perception and belief in self-efficacy are based on the attainment of expected goals rather than on competitiveness, recognition, or vicarious learning. If self-efficacy is a system of perceptions and beliefs focused on success, then the group to which the self-efficacious agent belongs or wants to belong is related to success. Because groups are diverse, self-efficacy varies according to this diversity. A competitive group attributes success to one of its members when they have surpassed previous achievements, which were, of course, established by the group. In this sense, the concept of self-sufficiency seems reliably adjusted to the influence of a group on the objectives, system, and achievements of an individual [25].

If self-efficacy is a system of perceptions that incentivize achievement by defining effective capabilities, self-sufficiency would also be a system of perceptions and beliefs, but unlike self-efficacy, these would be oriented toward the execution of a procedure or technology. The factors that drive self-efficacy would be identical in the case of self-sufficiency. If competitiveness, recognition, and vicarious learning drive self-efficacy, then self-efficacy would also have that drive [26].

Attitudinal psychological studies have focused on their conceptualization, formation, activation, accessibility, structure, function, prediction, change, inoculation, identity, and ambivalence. Attitudes have been defined based on affective and rational dimensions. Both dimensions are the result of experiences and expectations. This implies their structure: unidimensional or multidimensional, shaped by exogenous and endogenous factors. That is, when attitudes activate decisions and behaviors, they cause a peripheral, emotional, spontaneous, heuristic, and ambivalent process. In contrast, when attitudes transmit the effects of values and beliefs on intentions and actions, they are endogenous mediators of a central, rational, deliberate, planned, and systematic process [27].

Psychological studies have demonstrated significant differences between attitudes toward people and attitudes toward objects. The former refers to stereotypes or attributes, and the latter refers to evaluations or dispositions. In both, ambivalence is an indicator of change when beliefs and evaluations interact, forming negative and positive dispositions toward the object. Conflicts arise within the components formed by beliefs toward the object. Resistance to persuasion is a consequence of attitudinal ambivalence. If the environment threatens the formation and function of attitudes, it will adapt the individual to contingencies. Thus, attitudes have two essential functions: egoistic and utilitarian [28].

Attitudinal change refers to emotions and affects that result from individual actions and for which people feel responsible. It also involves the social influence that teaching groups exert on students. Or, the reception of persuasive messages oriented toward central reasoning, or persuasive messages directed toward peripheral emotionality. In general, the attitudinal system is sensitive to object instability and to cognitive variations that affect the individual's consistency, stability, predictability, competence, or morality [29].

Consistent attitude change is related to its multidimensional structure resulting from majority pressure. The diversity of dimensions implies a consistent construction of attitudinal change. That is, attitudes assume a function of internalized responses to constant situations framed by the mass media [30].

Attitudinal change is related to the deterrent principle of inoculation. Before the onslaught of persuasive messages, the perception of threat, risk, and uncertainty is induced. In general, overexposure to persuasive messages induces high elaboration and thus persuasion. The massive emission of persuasive messages, the motivation, and the resulting

management skills can lead to helplessness. That is, faced with a wave of information, people reduce their perception of control and tend to believe that events are immeasurable, unpredictable, and uncontrollable. Or, individuals form an identity that consists of identifying with an administrative group in reference to a teaching group. In the process of helplessness, the individual constructs a change in attitude and reinforces their helplessness. In the identity process, it is the group that influences the person's attitudinal change. Helplessness is a process of self-validation or self-fulfilling prophecy. In contrast, identity is a convergent validation of group norms [31].

The social influence of the teaching or administrative group refers to majority norms and minority principles oriented toward attitudinal change. The majority influence fosters individual conformity, while minority principles foster conflict and attitudinal change. Recently, the minority style has emerged as the most permanent factor of social influence and attitudinal change. That is, the construction of majority consensus appears to have a short-lived effect, while the construction of dissent appears to offer constant change [32].

Studies of attitudes toward behavior have focused on their ambivalence. People try to balance favorable and unfavorable information regarding that dispositional object by maintaining ambivalent attitudes. In other words, attitudinal objects are part of the environment in which people find themselves and their need to order, predict, and control it. Therefore, although the attitudinal object is consistent with their perceptions, values , and beliefs, people must contrast said objects with the behaviors associated with them [33].

Education is a system of knowledge networks that configure a teaching-learning cycle. At the beginning of the educational cycle, knowledge networks are merely a blueprint. Production strategies are guided by an emerging paradigm rather than a dominant one. This involves the plausibility of theories because knowledge is barely supported by ideologies. The second stage of the educational cycle is peer review, which consists of adjusting projects to the policy of the administrative group. Subsequently, in the third stage, the dissemination of knowledge in institutional academic spaces is observed [34].

Studies on knowledge networks warn that group formation and project planning are as important as trust and identity within an organization, institution, or university. Group formation originates in the social psychological processes of categorization, comparison, representation, and social identity, around which conflict and change are the foundations of knowledge networks [35].

Conflict precedes change. It involves asymmetrical relationships between members of one group and members of another group, considered unrelated to the group's common interests. Conflict emerges when differences between groups are evident. Conflict arises when one of the students violates the practice rules, affecting knowledge transfer. Since teacher-researchers are responsible for managing and training students to integrate them into the mission and vision of organizations, they must ensure compliance with the rules and sanction those who violate the rules of collaboration [36].

Another type of conflict, related to innovation, is defined as the influence of a persistent minority on its actions to persuade or dissuade an administrative group. It lies within the organization or university and is a conflict in which the students involved perceive greater use of their capabilities and resources. Consequently, they demand greater management and training to achieve objectives focused on administrative-technological innovation [37].

On the other hand, change is a consequence of conflict. It is a process in which conversion precedes the persuasion that triggered a conflict and a central or peripheral attitude of need for cognition. Attitudinal change surrounding the questioning of beliefs refers to a deterrent process in which information can be rationalized or emotional. In the first case, the need for cognition can foster dissonance in which the information does not match expectations. In the second case, information fosters emotions that increase expectations toward the informational-attitudinal object [38].

In this sense, change is also synonymous with conversion, in which attitudes toward an object foster a modification of the individual's behavior toward the group [39]. In the case of knowledge networks, conflict and change are essential processes to understand the barriers and facilities of knowledge transfer between symmetrical and asymmetrical groups around the information of an object, process, institution or organization [40].

Individuals establish categories, comparisons, identities, and representations about themselves in relation to group members and in reference to other individuals belonging to other groups [41]. By establishing parameters of comparison, conflicts within an academic group can be transferred to conflicts between organizational groups. This is the first step in delimiting identity or group membership [42].

Intra- and intergroup categorization consists of a set of perceptions about the resources, skills, and abilities within a group in relation to another group. If perception is the biased ordering of objects, groups and their individuals bias their assessments when evaluating their actions and those of others. This is the case of attribution bias, whereby individual perceptions attribute achievements to their own abilities and attribute their failures to the abilities of others [43].

Following categorization and comparison, identity lies beneath. These are decisions about belonging based on biased attributional judgments. If a student perceives greater opportunities for personal growth in a group to which he

or she does not belong, he or she will decide to change or convert his or her ideas to those of the favored group. In this sense, the knowledge network would be the one most favored by individual judgments and attributions. At this point in the group formation process, two types of reference are constructed: the teaching group and the administrative group [44].

The administrative group constructs its identity based on the capabilities of the teaching group. In other words, the formation of a knowledge network is based not only on the perceptions of the capabilities of the group members but also on the perceptions of the incapacity of the teaching group [45].

To the extent that an administrative group biases its value judgments, it transfers its conflicts to the teaching group. Perceptual bias transforms into attributional bias and ends up as selective bias. By focusing on the teaching group, the individual in the administrative group constructs a network of representations around which the capabilities, resources, and limits of the administrative group are interpreted about the teaching group [46].

The representation of teaching group competencies involves an evaluation of their behaviors by the individual and their teaching group. It involves a set of emotions and cognitions surrounding the causes of the teaching group's actions compared to the actions of the administrative group. That is, individuals only want to observe actions that contradict the administrative group and try to minimize their effects on other people's decisions [47].

To the extent that individuals have contact with the teaching group, their emotions and cognitions regarding the teaching group's actions increase. Precisely from these experiences, it is possible to infer attitudinal processes that explain the exclusion of the teaching group due to the attribution of different resources and capabilities to them compared to the administrative group [48].

Underlying this exclusion process is the emotive-cognitive-behavioral consistency that explains the differences between groups. If the administrative group excludes members of the teaching group, then it has demonstrated a high level of consistency that threatens the consistency of the administrative group. Therefore, individuals belonging to an administrative group tend to see significant differences concerning the teaching group and its members. The consistency of the administrative group is biased when compared to the teaching group, since a biased idea can only be a prejudice rather than an argument [49].

In the realm of knowledge networks, the consistency of the administrative group and the teaching group is incompatible. For a knowledge network to function, an administrative group is required that can connect its knowledge with a teaching group that is inconsistent in its emotions, cognitions, and actions. For this reason, the transfer of knowledge from the administrative group would justify the synergy of the groups by correcting the inconsistency of the teaching group. This process can also be observed if the administrative group is inconsistent and the teaching group is consistent [50].

However, individuals who perceive emotional-cognitive-behavioral inconsistency regarding knowledge production in their administrative group end up migrating to the teaching group because it will allow them greater personal growth. This migration process is emotional-cognitive since emotions surrounding the teaching group produce aversion to the administrative group, and affinity and adhesion to the teaching group [51].

Translators, those with the knowledge, skills, and abilities to manage synergies between the administrative and teaching groups, tend to seek data that corroborates their knowledge management. However, inaccessibility to the teaching group impedes knowledge management, the formation of synergies, and knowledge transfer. If individuals have restricted access to a teaching group, they may blend in with the administrative group and fall into the assumption of natural compatibility of knowledge between both the teaching and administrative groups. The consequence of this compatibility will be the inhibition of the knowledge network and its development into corruption, simulation, or nepotism surrounding the production and transfer of knowledge. In other words, an increase in inaccessibility to the teaching group increases the likelihood of failure of organizational, scientific, and technological programs between the administrative and teaching groups [52].

Translators, as knowledge managers, mediate the relationships between faculty and students. When the organizational climate between the administrative group and the teaching group becomes more ambiguous and adversarial than transparent and loyal, and those involved in knowledge networks manipulate information to pursue their interests, translators must persuade both groups of the unsustainability of their relationship. It is not enough to diagnose group differences; it is also essential to reduce risks and uncertainty by enhancing the benefits of each link and node in the knowledge network [53].

However, affective-behavioral consistency between both groups implies creativity, which introduces both groups into an innovative dynamic. This is a flexible organizational climate in which ideas surrounding knowledge production and transfer are enhanced. Given that knowledge networks are diverse, heterogeneity is required in each link or node for knowledge production and transfer. To the extent that the organizational climate is soft, it increases trust and identity within both groups [23].

Trust and identity are the result of a type of persuasive information known as belief, and the organizational environment in which beliefs are disseminated is known as attitude toward the knowledge network, its members, and

processes. An increase in information related to the network increases certainty, production, and transfer of knowledge. In contrast, a decrease in information inhibits group relationships. Consequently, collaborative and innovative relationships impact productivity; however, stress such as burnout, depersonalization, or frustration can emerge as a result of increased production demands [22]. However, part of the professional development process is only explained because organizations contain underlying barriers that inhibit development [54]. In this sense, ambivalence and organizational violence are external to professional development. Therefore, knowledge management involves training networks that innovate in adverse and contingent situations, but also underlie the conflicts and asymmetries inherent in the organizational climate.

Thus, professional development is influenced by conflicts arising from the degree of organizational discretion. As this intensifies, inequity materializes in monopolistic habitus, but reducing it to its minimum expression generates consensus among senior management. Discretion is the discursive heritage of senior management; persuasion or deterrence are products of monopolistic or consensual fields. In other words, discretion as an antecedent of monopolistic habitus anticipates formative violence, as it suppresses innovation and generates conformity and obedience, verticalism, sexism, and ostracism [55].

However, more recent research has shown that the socialization of information in knowledge networks disseminates its effects on perceptions of utility and risk, as well as on attitudes linked to anxiety and network addiction, the main determinants of behavior. Thus, technological behavior is determined by the processing of information within a knowledge network. This effect, when mediated by collaborative decisions, increases the predictive power of beliefs about task and interpersonal relationships in an organization [10].

Collaborative intentions, for their part, involve attitudes of trust, perceived capabilities, and informational beliefs that, when interrelated, determine decision-making favorable or unfavorable to a knowledge group. However, the process of knowledge construction would not be feasible without the formation of attitudes of trust, in which collaborative groups disseminate information that will be categorized into learning tools or motivational tools aimed at achieving objectives and goals [24].

In parallel, perceived capabilities complement the formation of information categories, as they involve skills and knowledge related to the construction of a professional training network. However, some studies suggest that professional training and network construction are different processes, as they involve selfish values that contradict altruistic values. These are a series of group norms around which individuals are professionally trained or are emotionally guided when forging an identity. However, it is the socialization of information that will determine the behavior of an individual in a collaborative group [21].

As a review, the state of knowledge has explained the organizational performance of collaborative groups and networks in situations of scarcity, uncertainty, insecurity, and risk [56]. Individuals and groups develop climates of trust, enhance their work commitment, and approach life satisfaction, but they also implement creative management and innovative processes in response to contingencies.

The model proposed by the state of knowledge, by assuming that knowledge socialization consists of general beliefs about information, assumes general effects on each of the mediating factors in its relationship with behavior [57]. Consequently, the specification of the dimensions of behavior could indicate the existence of other intermediate factors with respect to socialization. These are eight indicators of technological behavior that explain the formation of a collaborative group based on information processing.

In the case of trust, technological behavior is indicated by collaborative relationships in which benefits are not based on costs, but rather derived from interdependence when carrying out a specific task. That is, professional training involving the intensive use of technologies arises from symmetrical relationships that a group establishes to distribute skills and disseminate knowledge. These are committed relationships because, if a member does not develop work competencies, they will be excluded from a group that has established a culture of high-quality production. In this sense, collaboration is the result of shared goals, while individualism is an effect of the goal system that rewards personal effort [53].

In the case of cooperation, unlike simple normative collaboration, technological behavior presupposes specialized skills and knowledge to achieve goals. This is why groups are forced to establish cooperative relationships, since the group itself must exchange information, process strategies, or implement techniques that require ongoing support among its members [52].

However, another indicator of technological behavior is empathy among its members, since intensive work and the achievement of objectives or goals require affective and emotional relationships to reduce personal conflicts due to a lack of communication [51].

Regarding solidarity, Unlike collaboration or cooperation, it involves professional training based on the dynamics of collaborative teams within the knowledge network. While collaboration and cooperation are determined by social values, solidarity goes beyond the normative or evaluative principles that unite groups. It involves an awareness of scarcity and uncertainty that allows for anticipating shortages by sharing resources [50].

Consequently, the propensity for the future is the result of supportive behaviors that anticipate risk scenarios. Indeed, collaborative groups are motivated by prevention and coping strategies in the face of situations unfavorable to groups with whom they share objectives and goals [49].

Finally, the quintessential indicator of technological behavior is entrepreneurship or a dissident spirit. Indeed, the use of technology, and even more so the formation of collaborative networks, would be meaningless if only short- or medium-term gains were pursued. Professional training consists of anticipating scenarios of scarcity, risk, and uncertainty, for which knowledge groups form networks that are essentially entrepreneurial, dissidents of impending situations or expected catastrophes [19].

Social violence was indicated by hostile sexism, in which male gender identity inhibits the development of female gender identity. Gender identity appears to be a condition upon which benevolent discourses are formed, confining the function of female identity to the care and attention of the work group or team. The specification of relationships suggests that organizational formative violence is indicated by eight factors related to prejudice, depersonalization, benevolence, harassment, subjugation, objectification, stigma, and bullying that shape a climate of relationships and tasks in which discourses emerge that diminish the merits of individuals and exalt differences between groups [58].

The theories and findings reviewed in the literature, explaining the phenomenon of formative violence in different contexts, settings, and scenarios, will explain the institutional and academic situation prevailing in public universities regarding violence perpetrated on electronic networks and even anticipate scenarios of conflict between actors (Table 1).

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This paper falls within the discipline of management, an area of institutional studies, but includes concepts related to organizational psychology, such as entrepreneurship, the sociology of work in the case of human capital, and labor economics in the case of knowledge networks.

Therefore, the objective of this paper is to review studies on security in electronic networks in order to compare the theoretical framework with the observations of this study.

Are there significant differences between the theoretical framework of security and the observations of this study?

This paper suggests a propensity for violence in social and digital networks, contrary to the state of the art, in which security is multidimensional, compared to the reduction of dimensions in the Intranet.

Methods

Design: A cross-sectional, confirmatory, psychometric, and correlational study was conducted with a sample of 100

Table 1: Comparison of the dimensions of security around the SDGs and COVID.

Security Dimension	Sustainable Development Goals (SDGs)	Impact of COVID-19
Health Security	SDG 3: Good Health and Well-being. Promotes universal access to health and well-being.	The pandemic overwhelmed global health systems, highlighting inequalities in access to medical care and protective equipment.
Food Security	SDG 2: Zero Hunger. Ensure food security and sustainable agriculture.	The pandemic disrupted food supply chains, increasing food insecurity and malnutrition in some regions.
Economic Security	SDG 8: Decent Work and Economic Growth. Promote decent employment and inclusive economic growth.	COVID-19 caused global recessions, increased unemployment, business closures, and exacerbated economic inequality.
Social Security	SDG 10: Reduced Inequalities. Reduce inequality within and among countries.	The pandemic worsened pre-existing inequalities, disproportionately affecting vulnerable groups such as women, migrants, and informal workers.
Environmental Security	SDG 13: Climate Action. Combat climate change and its impacts.	The temporary reduction in emissions during the pandemic showed the positive impact of reducing human activity, although it was only temporary.
Educational Security	SDG 4: Quality Education. Ensure inclusive, equitable, and quality education.	COVID-19 led to the closure of schools and universities, severely affecting access to education, especially in developing countries.
Housing Security	SDG 11: Sustainable Cities and Communities. Ensure access to safe and affordable housing.	The pandemic underscored the importance of adequate housing, with many facing difficulties due to overcrowding and inadequate living conditions during lockdowns.
Water and Sanitation Security	SDG 6: Clean Water and Sanitation. Ensure access to clean water and adequate sanitation.	Limited access to clean water and adequate sanitation worsened during the pandemic, complicating hygiene measures needed to control the virus spread.
Occupational Safety	SDG 8: Decent Work and Economic Growth. Fair and safe working conditions.	COVID-19 posed additional risks for essential workers, especially in healthcare, transportation, and agriculture, who were exposed to the virus.
Digital Security	SDG 9: Industry, Innovation and Infrastructure. Promote resilient and innovative infrastructure.	The pandemic accelerated digitalization but also revealed technological access gaps, especially in less developed regions.

students enrolled in institutions committed to the SDGs in the context of the pandemic. The sample was selected based on exposure to security and the pandemic in the context of professional internships and social service in public health institutions.

Instrument: The SDG Security Scale (**Appendix A**) was used. It includes the following dimensions: 1) Health, 2) Food, 3) Economic, 4) Social, 5) Education, 6) Residential, 7) Digital (Table 2).

Procedure: Respondents were informed about the project objectives and the project leaders. They were invited to a focus group session to standardize concepts. They were also invited to a Delphi study to evaluate the items. The scale was administered at the universities.

Analysis: Data were entered into Excel and processed in Google Collab (**Appendix B**). The coefficients for normality, reliability, homoscedasticity, adequacy, sphericity, linearity, fit, and residuals were estimated. Values close to unity, except for residuals, were assumed to be evidence of non-rejection of the hypothesis of significant differences between the theoretical structure and empirical observations (Table 3).

Results

The analysis of the intercepts with significant values suggests that the model predicts the distinction between the theoretical structure and the empirically observed evidence. The values were significantly lower than 0.0001 and are assumed to be evidence of prediction not due to chance.

The analysis of the implied covariance matrix suggests empirical evidence of the model for testing the hypothesis. The findings show a diagonal with values greater than unity, which are assumed to be evidence of prediction between the theoretical covariance matrix and the observed covariance matrix.

The analysis of the residual covariance matrix indicates the prediction of the theoretical model relative to the empirical model, considering the inclusion of other factors and indicators. The diagonal of the matrix shows significant values, which are assumed to be evidence of non-rejection of the hypothesis of differences between the theoretical and empirical matrices.

The analysis of the covariance matrix predicts the difference relative to the observed matrix (Figure 1). The results indicate values close to unity, which are assumed to be evidence of non-rejection of the hypothesis.

The analysis of the factor structure suggests that the empirical model fits the logical model reported in the literature (Figure 2). The results demonstrate the prevalence of four factors related to the health, nutrition, social, and residential dimensions, along with their three respective indicators.

Table 2: Operationalization of the variables.

Dimension	Conceptual Definition	Operational Definition	Instrument	Instrument	Psychometric Properties
Health Security	Conditions that guarantee access to health services, prevention, and medical care in the event of disease risks.	Degree to which the university implements health protocols, distributes protective materials, and communicates preventive measures.	Self-administered survey based on health safety standards (adapted from WHO).	Students and teachers from public universities (n = 500).	Cronbach's alpha ≥ 0.85. Factor analysis: a single factor explains >60% of the variance.
Food Security	Physical, social and economic access to sufficient, safe and nutritious food to meet dietary needs.	Perceptions of the availability of accessible and affordable food in the university setting during the pandemic.	Survey based on FAO indicators (scales adapted for educational settings).	Students at food risk (n = 350).	Cronbach's alpha ≥ 0.80. Factor structure confirmed with RMSEA ≤ 0.06.
Economic Security	Ability to access sufficient financial resources to cover basic needs without resorting to negative coping strategies.	Perception of the financial support offered by the university during the pandemic and its impact on educational continuity.	Survey adapted from World Bank economic security indicators.	Students and administrative staff (n = 400).	Cronbach's alpha ≥ 0.87. CFI ≥ 0.95, TLI ≥ 0.90.
Social Security	Equality in access to basic resources and services, mitigating social and economic gaps within a community.	Perceptions of equity in university policies and support for vulnerable groups during the pandemic.	Scale designed to measure equity in educational contexts (adapted from UN indicators).	Vulnerable university groups (n = 200).	Cronbach's alpha ≥ 0.85. Evidence of convergent validity with r ≥ 0.70 compared to similar instruments.
Educational Security	Guaranteeing uninterrupted access to quality education, ensuring equal opportunities in virtual or hybrid environments.	Evaluation of the educational infrastructure and technical support provided by the university for the continuity of studies.	Survey based on UNESCO educational quality standards.	Undergraduate and graduate students (n = 600).	Cronbach's alpha ≥ 0.90. Discriminant validity between in-person and virtual education confirmed.
Housing Security	Access to safe housing and adequate living conditions to protect health and well-being during critical periods such as the pandemic.	Perception of support in terms of housing provided by the university (student residences, rent subsidies, etc.).	Questionnaire adapted from healthy housing standards (WHO and UN Habitat).	Students in residences and external income (n = 300).	Cronbach's alpha ≥ 0.82. Exploratory factor analysis: explained variance >55%.
Digital Security	Equitable access to digital technologies, connectivity, and resources needed for online education and communication.	Assessment of the availability of devices, connectivity, and digital training offered by the university.	Survey based on ITU (International Telecommunication Union) digital inclusion indicators.	Students and teaching staff (n = 500).	Cronbach's alpha ≥ 0.88. Concurrent validity with correlation r ≥ 0.75 with respect to digital connectivity indices.

Table 3: Interpretation of coefficients.

Parameter	Conceptual Definition	Application in CFA	Interpretación
Factor loading (λ\lambdaλ)	It represents the relationship between an observable variable and its latent factor. It indicates how much of the variable's variance is explained by the factor.	It is calculated for each item in relation to its associated factor. It is used to assess whether the items are sufficiently related to the theoretical factor.	Values ≥ 0.5 indicate an adequate relationship. Values close to 1 suggest a strong association between the item and the latent factor. Values < 0.3 are considered weak.
Chi-square (χ2\chi^2χ2)	Statistic that evaluates the difference between the observed and estimated covariance matrix.	It is used to test the null hypothesis that the observed and estimated matrices are equal.	A p value > 0.05 suggests a good fit, although it is sensitive to sample size. In large samples, it can yield significant results even with a good fit.
Root Mean Square Error of Approximation (RMSEA)	Measure of approximation error between the estimated model and the real data per degree of freedom of the model.	It is used to evaluate the overall fit of the model. It is robust to sample size.	Values < 0.05 indicate excellent fit; between 0.05-0.08, acceptable fit; > 0.10, poor fit.
Comparative Fit Index (CFI)	Comparative index that measures the fit of the model relative to a null model (without correlations).	It allows to compare theoretical models with a base model without relationships.	Values ≥ 0.95 indicate excellent fit; between 0.90 and 0.95, acceptable fit; < 0.90, poor fit.
Tucker-Lewis Index (TLI)	Similar to the CFI, but penalizes model complexity, favoring simpler models.	It is used in conjunction with the CFI to assess model fit.	Values ≥ 0.95 indicate good fit. They penalize models with many parameters compared to the CFI.
Standardized Root Mean Square Residual (SRMR)	Average difference between the observed and estimated correlations in the model.	Evaluates the discrepancy between the observed and estimated correlation matrix.	Evaluates the discrepancy between the observed and estimated correlation matrix.
R-Squared (R2R^2R2)	Evaluates the discrepancy between the observed and estimated correlation matrix.	It is calculated for each item. It indicates how well each item represents the underlying latent factor.	Values close to 1 indicate that the observable variable is well explained by the factor. Low values (< 0.5) indicate that the item has low representativeness.
Path Coefficients (β\betaβ)	Coefficients that indicate the strength and direction of the relationship between latent factors (if applicable).	They are used to measure causal relationships between latent factors in a structural model.	Positive or negative values indicate the direction of the relationship. Significant values (p < 0.05) indicate that the relationship is statistically valid.

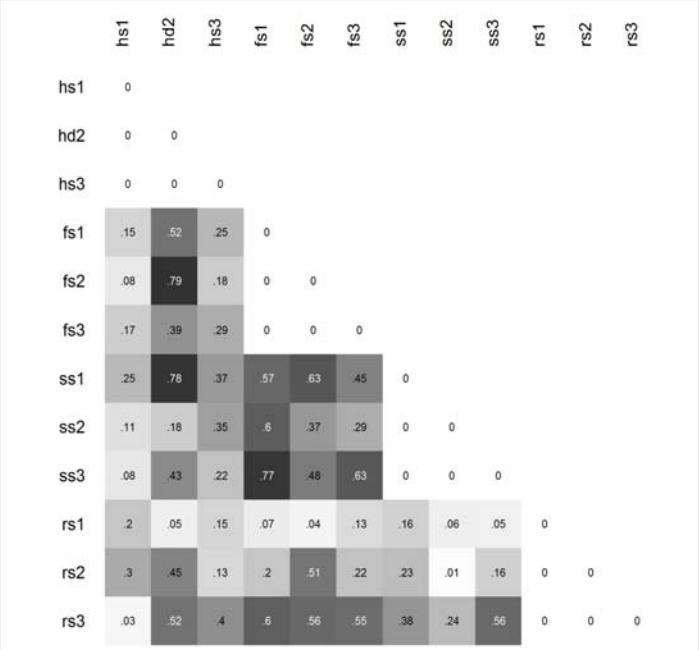

Figure 1: Covariance matrix between indicators.

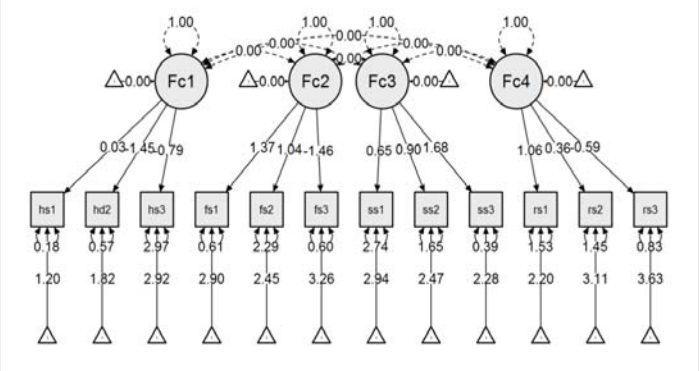

Figure 2: Confirmatory factor model of security in the context of the SDGs and COVID-19.

The fit and residual values [$\chi 2 = 704.946$ (54 df) $p > 0.001$; GFI = 0.936; RMSEA = 0.000] suggest the fit of the proposed empirical model with respect to the logical model reported in the literature, as well as the non-rejection of the hypothesis regarding differences between the theoretical structure and empirical observations.

Discussion

The contribution of this work to the state of the art lies in the confirmation of a four-dimensional factor structure related to health, food, social, and residential security.

The COVID-19 pandemic has had significant impacts on various aspects of society, including gender equality, food security, and the achievement of the Sustainable Development Goals (SDGs). The gender impact of the pandemic and its potential long-term effects on the achievement of the 2030 Agenda for Sustainable Development [15] are discussed. The emphasis is on the health impacts of COVID-19 on the SDG 3 targets [4]. The State of Food Security and Nutrition in the World projects possible outcomes for 2030 based on current trends and considering the impacts of the pandemic on food security and nutrition.

The impacts of COVID-19 on household energy and food security in informal settlements emphasize the need for integrated approaches to the SDGs [59]. An implementation framework for achieving post-COVID-19 food security incorporates precision agriculture and digital technologies into the agri-food supply chain [5]. A case study on improved cookstoves and clean fuel use in households addresses issues related to food security. The resilience of the rice value chain in the context of COVID-19 sheds light on the challenges and opportunities faced by the sector during the pandemic.

A study on the impacts of COVID-19 outbreaks on lower-

income groups and the achievement of the SDGs provides insights for policymakers and organizations to mitigate the effects of outbreaks [55]. A systematic review of the literature on the adverse effects of the COVID-19 pandemic on agricultural food systems proposes strategies for building resilient and sustainable food systems to ensure global food security and achieve the SDG targets. The relationship between socioeconomic shocks, social protection, and household food security during the pandemic highlights the increased level of food insecurity resulting from the pandemic.

Overall, the reviewed literature emphasizes the importance of addressing the impacts of COVID-19 on various aspects of society, including gender equality, food security, and the achievement of the SDGs, and highlights the need for integrated approaches and resilient strategies to overcome the challenges posed by the pandemic [58]. Unlike the state of the art, this study confirms four of the seven dimensions reported in the literature. Therefore, we suggest implementing items that measure the dimensions that remain to be confirmed. The opportunity lies in increasing the scale items in a larger sample than the one surveyed. We suggest extending the model to predict and confirm the dimensions cited in the literature.

Conclusion

The objective of this study was to compare the theoretical structure with empirical observations of the security dimensions surrounding the SDGs during the pandemic. The results confirm four of the seven dimensions, and we suggest extending the study to confirm the remaining three dimensions. Furthermore, the importance of each dimension is recognized in predicting security scenarios in the face of the risks of a health crisis.

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