



Data integration using DEMATEL to optimize protocols

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Abstract

The first aim of this paper is to solve the problem of protocol optimization by the means of data integration through DEMATEL (Decision Evaluation and Laboratory Testing Method). The research addresses one key question: how can complexities management protocols be extended in relations with systems where interactions as well as feedback of multiple factors make the process full of uncertainties and hard to analyse? In the present setting, where there is transformation of information systems and critical processes are interwoven, there is a need for proper design of viable protocols to avert redundancy and improve effectiveness of operation. This appraisal is especially important considering the challenge of handling massive data volumes and risk management decision making in complex scenarios. Using DEMATEL pens out a systematic procedure in this research to disentangle the complexity of the interrelations of the variables and accomplish the task of identifying and ordering the key elements affecting protocol performance. The results also show that the methodology enables one to have a good perspective of several factors and the procedures followed in establishing the protocols also enhance the concerned decision making. The main contribution of the study lies in providing a robust and adaptable tool that can be used to optimize protocols in various areas, from logistics to network management, offering a theoretical and practical framework of great value for the advancement of research and practice in complex systems management.

Keywords: Data integration; DEMATEL; Protocol optimization; Complex systems; Interdependency management; Decision making; Operational efficiency; Causal relationships; Variable visualization; Performance improvement

1. Introduction

World Health Organization (WHO) reports from 2021 indicate a worrying increase in reports of physical or sexual violence, with some 736 million women affected worldwide, some of whom suffer fatal consequences. This increase in violence figures reflects the seriousness of the problem and the inadequacy of existing protocols despite their proliferation. [1]

In this context, academia must play an important role in creating institutions that address this issue in a comprehensive manner. Although laws and protocols for the prevention of violence exist, in practice they are not achieving their objectives. It is necessary to establish an institution in charge of supervising and ensuring compliance with these protocols, as well as working to reduce the growing rates of gender violence. Gender violence is not limited only to violence against women, but encompasses a broader spectrum of violence related to gender identity.

Gender-based violence, according to the United Nations Refugee Agency (UNHCR), constitutes a serious violation of human rights by harming a person because of their gender, putting their life at risk [2]. Legally, it refers to physical force exerted by one person on another, associated with crimes such as robbery and sexual

crimes. At the international level, this definition has been standardized, although its scope may vary depending on the culture and region [2].

Gender analysis is challenging because of the discrimination associated with it. Often, explaining and addressing this issue fails due to the gaps in understanding it creates between people [3]. Research by [4] suggests that violence is inherent to human history and manifests itself in various ways, influenced by political, social, cultural and legal factors. Violence can be objective when it is visible and sometimes legitimized, and subjective when it manifests itself through cruel violent acts perpetrated by social actors and state apparatuses.

Objective violence is sometimes normalized thanks to the support of symbolic and systemic violence, related to language, ideology and systems of domination. In Ecuador, cases of objective violence have been recorded, such as repression by armed groups in the 1980s. Gender violence involves actions or omissions that violate the physical, psychological and ethical dignity of people because of their gender. [2]

In Ecuador, gender violence, according to the United Nations High Commissioner for Refugees (UNHCR), includes all acts perpetrated against a person due to their gender identity, with women and LGBTI people being the main victims [5]. This violence manifests itself in various settings, such as educational institutions and workplaces, and is often perpetrated by people close to them. The history of violence in Ecuador dates back to its early years as a democratic republic in 1830, with a marked focus on violence against women. The fight for women's rights and the right to vote materialized during the presidency of Eloy Alfaro.

According to the international organization United Nations Population Fund (UNFPA) – Ecuador, a report from March 24, 2021 reveals that in Ecuador, 65% of women have experienced some form of violence throughout their lives simply for being women. The situation has worsened with the COVID-19 pandemic, with an increase in calls related to gender violence to ECU 911, which could underestimate the true magnitude of the problem because many women lack access to complaints. [6]

The suspension of proceedings in cases of violence against women or family members, covering physical and psychological violence when there is no serious harm, is applicable. In cases of psychological violence, where the sentence is 1 year, actions such as verbal abuse, blackmail and discrimination may lead to the suspension of proceedings at the request of the victim to the prosecutor so that the judge orders the application of measures and the psychological rehabilitation of the aggressor. The suspension of proceedings is a legal instrument used in criminal law to guarantee the safety of victims of violence against women or family members and to preserve family stability. [7]

It is important to note that gender-based violence is not limited exclusively to women, as it also affects other groups with diverse sexual orientations, such as the so-called GLBTIQ. The LGBTQ community experiences multiple forms of discrimination, including socioeconomic inequality, cultural and symbolic marginalization, and labor exploitation. Discrimination is rooted in prejudices and stereotypes that arise from a lack of knowledge or ignorance. [8]

In the workplace, over the years, various scientific studies have revealed the existence of inequalities, in which there are various factors that prevent women from fully developing their professional careers. It is important to highlight that this is often invisible, since no regulations foresee any form of limitation to the professional growth of women. This phenomenon is very common in the country's work practices. The LGBTQ population faces discrimination in various aspects, including wage inequality, labor exploitation, sexual harassment and exclusion. To address these problems, it is essential to promote inclusive labor policies that respect universal human rights. Discrimination against the LGBTQ community constitutes a growing form of violence today, which affects both the work life and the general quality of life of people belonging to this group.

The World Health Organization, in its 1996 World Health Assembly resolution WHA 49.25, declared violence to be a major and growing public health problem worldwide. It concluded that violence has serious short- and long-term consequences for individuals, families, communities and health services.

As for human rights, they are universal because they are based on the dignity of every human being, regardless of their ethnicity, sex, cultural identity, religion, language, nationality, ideology, age, sexual orientation, disability or any other definition, as stated in the Constitution of the Republic of Ecuador. Since they are accepted by all States and peoples, they apply equally and indiscriminately to all individuals and are equal for everyone, everywhere.

Gender-based violence and serious human rights violations are closely linked and account for 9% of global mortality, with more than five million deaths each year, placing an enormous burden on national economies and costing countries billions of dollars annually in health care.

Victims of Gender Violence (GBV) are considered a priority group according to the Constitution. In Ecuador, gender violence against women manifests itself physically, sexually, psychologically and economically, among other ways, and occurs within the framework of power relations, mainly between close people such as family members, partners or friends.

The Inter-American Court of Human Rights has ruled on the right of every person to be treated with respect for his or her human dignity and not to be subjected to torture or cruel, inhuman or degrading treatment or punishment. It is important that societies do not forget the acts of violence that have occurred in order to avoid the repetition of situations that have led to serious violations of human rights [10]. As part of the actions taken against violence, it is necessary to establish priority levels to better confront it. Choosing the best alternative is difficult, and the process for doing so can be considered a matter of multi-criteria decision making (MCDM) [11], which helps to define it quickly.

2. Theoretical framework

Multi-criteria decision making (MCDM) techniques are used to break down large problems into manageable parts, which can then be reassembled after analysis to provide a comprehensive overview of the problem at hand [12]. Many tools exist to assist in decision making by evaluating multiple factors, such as multi-criteria decision analysis (MCDA), which involves analyzing selection criteria, where a group of specialists or academics give ratings to the criteria [13]. The steps for applying DEMATEL described below can be found in greater detail in the research of [14]:

Step 1. *Construction of the initial direct interdependence matrix.* An $n \times n$ matrix A is constructed, where n represents the decision criteria or variables/attributes of the system to be analyzed. When there are several experts, the components of the matrix a_{ij} are obtained by calculating the arithmetic mean of the opinions of each expert, who rate the level of direct interdependence that the criterion or variable/attribute i (row) exerts on j (column) in four levels: 0 “no interdependence”, 1 “low interdependence”, 2 “high interdependence” and 3 “very high interdependence”. All values on the main diagonal of A are zero.

To identify the pattern of relationships between the n criteria, an $n \times n$ matrix is first generated. The effect of the element in each row is exerted on the element in each column of this matrix. If the opinions of several experts are used, all experts must complete the matrix. The arithmetic mean of all the experts is the average of the elements in the matrix. Expert opinion is used and then a direct relationship matrix X is generated.

$$X = \begin{bmatrix} 0 & \cdots & x_{n1} \\ \vdots & \ddots & \vdots \\ x_{1n} & \cdots & 0 \end{bmatrix} \quad (1)$$

Step 2: *Normalization of the direct interdependence matrix.* The normalized direct interdependence matrix X is calculated by dividing each element of the matrix A by the maximum value of the values obtained from the sum of values in each row or the sum of values in each column of A . Using the elements of X , a graph of direct interdependence (relationship/influence) between the elements of the system can be obtained. The sum of all rows and columns of the matrix is then calculated directly. The largest number of the sums of rows and columns can be represented by k . To normalize, each element of the direct relationship matrix must be divided by k .

$$k = \max \left\{ \max \sum_{j=1}^n x_{ij}, \sum_{i=1}^n x_{ij} \right\} \quad (2)$$

$$N = \frac{1}{k} * X \quad (3)$$

Step 3: *Calculation of the total relationship matrix T .* The matrix T is calculated according to equation (4), where I is the identity matrix reflected in equation (1):

$$T = \lim_{k \rightarrow +\infty} (N^1 + N^2 + \cdots + N^k) \quad (4)$$

In other words, first an $n \times n$ identity matrix is generated, then this identity matrix is subtracted from the normalized matrix and the resulting matrix is inverted. The normalized matrix is multiplied by the resulting matrix to obtain the total relationship matrix.

$$T = N \times (I - N)^{-1} \quad (5)$$

t_{ij} values of the matrix T reflect the direct and indirect interdependence that row element i exerts on column element j. Indirect interdependence is that which an element i can exert on another j through third elements of the system. These indirect interdependencies arise when raising the matrix X to successive powers.

Step 4: Causal diagram of *salience relationship*. In this step, the vectors R (sum of rows of T) and C (sum of columns of T) are first calculated. Then, on the horizontal axis of the causal diagram, "Salience" is defined as the vector R+C. This vector indicates the importance or relevance of each element in the system. The higher the value of R+C, the higher the salience of the element. A high value of R+C indicates that an element:

- a) has a strong influence on other elements,
- b) is greatly influenced by other elements,
- c) influences and is influenced in a balanced manner, resulting in a high sum of both concepts.

When R+C is low, the element is not very "prominent" because both types of influence are low. On the vertical axis, "Relationship" is defined as the RC vector. This vector establishes the net influence of each element. If $RC > 0$, it indicates that the element influences more than it is influenced. This element would be a "cause" (influencer/driving force) of influence. If $RC < 0$, it indicates that the element is more influenced than it emits, then it is considered an "effect" (influencer/receiver). With these values, a relationship map (R+C, RC) can be created. [15]

$$R = \sum_{j=1}^n T_{ij} \quad (6)$$

$$C = \sum_{i=1}^n T_{ij} \quad (7)$$

According to the study of [16], DEMATEL, in its classical conception, is predominantly used in complex multi-criteria decision-making processes, mainly in combination with the Analytic Network Process (ANP) method [17], and to a lesser extent with other methods such as Analytic Hierarchy Process (AHP), Technique for Order Performance by Similarity to Ideal Solution (TOPSIS), balanced scorecard (BSC) and quality function deployment (QFD). It is also used to analyze internal relationships between decision criteria [18]. DEMATEL has a variant that uses fuzzy logic when experts or decision makers cannot assign precise values to the interdependence relationships between alternatives or criteria.

Some recent applications of DEMATEL can be found in [19], where it is used to analyses and understand the barriers hindering supplier-customer collaboration in supply chains in the construction sector; [20] combine it with Interpretive Structural Modelling (ISM) to identify barriers in the use of "green purchasing" and apply it to the Chinese photovoltaic industry. [21] use Fuzzy-DEMATEL combined with Fuzzy-TOPSIS to weight citizens' satisfaction criteria with the quality of municipal services they receive.

3. Methodology

The research methodology is based on the premise that practice is the foundation of social life, culture, knowledge and, therefore, of theory itself. In other words, theoretical forms can only be considered true if they are put to the test in practice. Protocols for prevention and action in cases of harassment and gender violence are the result of social practice; however, the aim is to transform this complex life based on solutions developed theoretically and enriched in praxis. With a dialectical-materialist approach, as a form of theoretical-practical assimilation of reality based on the regularities of the object of study in its rise from the abstract to the concrete, the proposed objective can be achieved.

It follows from the above that the proposed approach involves addressing prevention and action protocols in cases of harassment and gender violence from different perspectives and raising people's awareness about their assimilation and transformation; and is materialized in the use of methods at both theoretical and empirical levels to demonstrate the factual proposal.

In this paper, the use of DEMATEL is proposed to analyses alternatives. In this case, the variables/attributes of the system to be analyzed will be each of the identified factors, and the components of the matrix A will represent the intensity of their direct relationships or exchanges of information. The values obtained in the total relationship matrix T will show: in the rows, the intensity or strength of the relationships or quantity of information that an actor in row i sends, directly and indirectly, to the actor in each column j; in the columns, the intensity or strength of the relationships or quantity of information that an actor in column j receives, directly and indirectly, from the actor in each row i.

The variable R_i (sum of values in row i of T) measures the total strength of the relationship or the amount of information that the actor in row i transmits to the rest of the actors. The variable C_j (sum of values in column j of T) measures the total strength of the relationship or the amount of information that the actor in column j

receives from the rest of the actors. Thus, an actor with a high associated R_i value indicates that this actor maintains frequent contact with others and is therefore very active. On the contrary, an actor with a high associated C_j value indicates that many other actors seek to interact with him.

For all the above, in this methodological proposal it is suggested to apply all the steps of DEMATEL until the calculation of the matrix T and then use the variables R and C to create a CR graph where each actor is positioned based on their R and C values. The following four areas of relevance are established:

- *Highly relevant interest groups* , with high values of both C and R.
- Area II, Central: *Relevant Actors* , who have a C value greater than the average C value plus/minus a threshold value p, and an intermediate value of R plus/minus a threshold value q, or a high value of R plus/minus a threshold value q and an average C value plus/minus the threshold value p.
- Two Areas III: Stakeholders of *Interest* , who would have high C values (above average) and low R values (below average), or vice versa, high R values and low C values. The p and q thresholds should be established by the analysts on a case-by-case basis.
- “*Non-relevant* ” interest groups , which are interest groups with low values of both C and R (below the mean values minus the p and q thresholds).

For the application of DEMATEL the following aspects will be considered:

- Identification of factors: All relevant factors that influence the effectiveness of care protocols will be identified, including barriers and facilitators.
- Relationship Analysis: Use DEMATEL to analyze how these factors interact and which have the greatest impact (direct and indirect) on the effectiveness of the protocols.
- Visualization: Create a causal diagram based on the DEMATEL results that clearly shows cause and effect relationships.
- Prioritization: Identify which areas of the care protocols require priority attention to improve their effectiveness and inclusion.

This approach will not only allow us to identify key areas that need improvement, but also to understand how the different components of care protocols are interconnected and how changes in one area can influence others.

Alternatives

Alternatives are possible solutions or interventions designed to improve care protocols. For this case, could include:

1. **Comprehensive Staff Training:** Ongoing training programs for staff who assist victims, focused on gender sensitivity, sexual diversity, and trauma management.
2. **Protocol Updates:** Review and update existing protocols to ensure they are inclusive and adequately address the needs of all victims, regardless of gender, sexual orientation, age, ethnicity, etc.
3. **Multidisciplinary Support Systems:** Implementation of multidisciplinary teams for comprehensive support to victims, including psychological, legal, medical and social support.
4. **Improving Inter-institutional Coordination:** Strengthening the cooperation network between different institutions (health, justice, education) to ensure a rapid and effective response.
5. **Awareness campaigns:** Education and awareness campaigns targeting the general public and potential victims about their rights and available resources.

Criteria

The criteria are the dimensions or aspects that will be used to evaluate each alternative . this case , could be :

1. **Effectiveness:** The ability of the alternative to reduce the incidence of harassment and gender-based violence and improve care for victims.
2. **Inclusion:** The degree to which the alternative addresses the needs of all vulnerable groups, including gender diversity, sexual orientation, ethnicity, etc.
3. **Feasibility:** The practical and economic viability of implementing the alternative, considering available resources and institutional constraints.

4. Sustainability: Capacity of the alternative to be maintained in the long term and adapt to future changes in the social and legal context.
5. Psychosocial impact: The effect of the alternative on the psychological and social well-being of victims and the public perception of the problem of harassment and gender-based violence.

4. Results

In conclusion, the researchers agree with Nateras Gonzáles, who argues that understanding violence requires analyzing it from various political theories addressed in different disciplines. As the researcher indicates, it is not a simple matter; however, violence is associated with the use of physical force, being therefore an interpersonal act intended to cause physical harm. Associated with political theory, there are legitimist positions that conceive violence as inherent to the State and accept the use of physical coercion [4].

Researchers also agree with some gender scholars when it comes to stalking. While it may not materialize into a completed crime against a human being, the mere fact that the stalker engages in acts and actions aimed at degrading the psychological and physical stability of the victim already inflicts harm, ultimately destabilizing the victim psychologically and physically.

Throughout history, humans have distinguished themselves by their rationality and their ability to develop their survival instinct, marking their uniqueness in the animal kingdom. In addition, they possess a unique attribute: the spirit. The survival instinct has led to the creation of methods of protection through intelligence. Etymologically, the word “protocol” derives from the Latin “protocollum”, which in turn comes from the classical Greek “protokollon”, meaning the first sheet or cover glued to an important manuscript with notes on its content.

A protocol is defined as a set of rules and regulations governing social, professional or diplomatic relations, applied in official acts and ceremonies of various kinds. It is worth mentioning that these protocols vary according to culture, country and field, such as official, business, military, religious, sports, tourism and social protocols.

Protocol, in essence, is a set of rules established by customs and traditions to meet social needs, normalize relations between individuals, institutions and governments, and promote courtesy and civility in various social, cultural, business and religious contexts [22]. Its origin dates back to the beginnings of social coexistence, an ancient science present in all periods of history. For example, the Egyptians used protocol in their daily lives, and there are historical records that show the rules, customs and traditions that regulated important events in various periods. As an example, in Spain, royal funerals from Charles V to Alfonso XII have been studied in detail.

Protocols have their foundation in disciplines such as anthropology and sociology, as they have their origin in the socialization and hierarchization of human relations. They arose as a response to the need to live peacefully in groups of individuals who had to coexist and interact with each other. Thus, protocol is a constant in the history of humanity, present in all countries and all times. In prehistory, for example, individuals had to follow established patterns of behavior in order to survive. As civilizations such as the Babylonian, Greek, Egyptian and Roman emerged, more complex protocols were developed to regulate social interactions.

Protocol has been used in different fields, such as sports in ancient Greece (776 BC), the military field during the reign of Alexander the Great (330 BC), Catholic protocol with Constantine as Roman Emperor, social protocol promoted by Louis XII of France and protocol services in the Middle Ages. In Latin America, the Manual of urbanity and good customs by Manuel Antonio Carreño (1853) established standards to improve coexistence in Latin American culture [22].

Currently, protocols have been developed to respond to the growing problem of gender violence, with the creation of prevention and protection laws for both women and families. The protocol is essential to promote human rights and eradicate discrimination, as established by the Constitution of the Republic of Ecuador [23]. The protocol is an essential tool that has evolved throughout history to regulate social relations and promote respect and courtesy between people, in addition to playing a crucial role in promoting human rights and fighting discrimination.

According to the Constitution, these protocols are framed within the legal framework established by international conventions on women's rights, such as the Inter-American Convention on the Prevention, Punishment and Eradication of Violence against Women (CEDAW) and the Inter-American Convention on the Prevention, Punishment and Eradication of Violence against Women (Belém do Pará). In addition, they are based on General Recommendations Nos. 19 and 35 of the CEDAW Committee, as well as on current national legislation, in particular the Comprehensive Organic Criminal Code (COIP) and the Organic Law on the Prevention and Eradication of Violence against Women.

In the case of persons with diverse sexual orientations and gender identities, the protocols are based on the Yogyakarta Principles, which contain a wide range of human rights standards and their application. Most of the country's protocols are related to the COIP, since gender-based violence is criminalized under this legal framework.

Gender violence originates in asymmetrical power relations between men and women, which place women in a subordinate position with respect to men. An analysis of various protocols in force in the country reveals that all of them are based on public policies, such as the National Development Plan 2017-2023. However, it is essential to consider some alarming statistics compiled by women's and feminist organizations, the National Network for the Shelter of Women Victims of Violence, the Attorney General's Office, the Ecumenical Commission for Human Rights (CEDHU), the National Institute of Statistics and Census (INEC), as well as reports and news from the media, among others. According to these sources, it is estimated that in Ecuador, a woman is violently murdered every 57 hours.

According to the National Survey conducted by INEC in 2018, it is revealed that violence against women affects more than 60% of the Ecuadorian population, including girls and adolescents. Additionally, this study indicates that 61.4% of cases occur in urban areas, while 58% occur in rural areas. Among the highlighted data, it is found that 53% of cases correspond to psychological violence, and four out of ten women have experienced sexual violence. It is also noted that indigenous and Afro-Ecuadorian women have suffered the highest percentage of gender violence, with 67.8% and 66.7%, respectively. On the other hand, mestizo women report 59.1%. This suggests that ethnic discrimination and other factors are related to these dynamics of violence.

In Ecuador, during 2019, interviews were conducted with a sample of the population, and it was found that 27.3% of respondents reported having experienced some type of violence. Of this group, 94.1% reported having been victims of shouting, threats or mockery, while 45% reported having been arbitrarily detained. Regarding complaints of attacks on personal integrity by security agents, of the total number of people who have experienced violence (27.3%), only 8.3% have filed complaints with the Attorney General's Office, and 19.0% have done so with the National Police of Ecuador.

Regarding the complaints filed, 55.6% did not result in any sanctions. It is important to note that 7.9% of respondents said they did not know if sanctions had been imposed and 9.5% stated that their complaints were still being processed and had not been resolved. It is worth mentioning that this data comes from the National Institute of Statistics and Census (INEC) and was obtained mainly from the cities of Quito, Guayaquil, Portoviejo, Machala, Babahoyo, Ibarra, Santa Elena, Libertad and Manta.

The above-mentioned results reflect the need to evaluate the alternatives that are being worked on to counteract the acts of violence and the level of importance and priority given to them. Taking into account the various criteria in this matter, the DEMATEL multi-criteria method is applied, which contributes to reflecting more precise results, and the different steps necessary to obtain the results are applied.

For the study, five decision-makers participated in the evaluation of the alternatives indicated. They were asked to choose an integer from 0 to 4 that represented the degree of influence of one factor on another, according to the criteria. The data were obtained first by obtaining the evaluation matrices of each of the decision-makers. Tables 1, 2, 3, 4 and 5 show the comparison matrices by pairs of criteria according to the evaluations issued by Experts 1, 2, 3, 4 and 5, respectively.

Table 1: Evaluation by Expert 1 in pairwise comparisons of criteria on the degree of direct influence of the row factor on the column factor.

	C1	C2	C3	C4	C5
C1	0	4	3	2	2
C2	2	0	1	2	1
C3	3	1	0	2	2
C4	1	1	2	0	1
C5	3	2	3	1	2

Source: Prepared by own.

Table 1: Evaluation carried out by Expert 2 in pairwise comparisons of criteria on the degree of direct influence of the row factor on the column factor.

	C1	C2	C3	C4	C5
C1		3	2	0	1
C2	1	0	1	1	3
C3	3	3	1	0	3
C4	1	3	4	0	2
C5	3	3	4	4	0

Source: elaboration own.

Table 3: Evaluation carried out by Expert 3 in pairwise comparisons of criteria on the degree of direct influence of the row factor on the column factor.

	C1	C2	C3	C4	C5
C1	0	3	0	4	1
C2	1	0	1	0	3
C3	2	4	0	0	4
C4	1	3	4	0	2
C5	1	2	2	0	0

Source: elaboration own

Table 4: Evaluation carried out by Expert 4 in pairwise comparisons of criteria on the degree of direct influence of the row factor on the column factor.

	C1	C2	C3	C4	C5
C1	0	3	3	3	4
C2	1	0	1	1	3
C3	4	3	0	0	2
C4	1	2	4	0	2
C5	3	2	1	1	0

Source: elaboration own.

Table 5: Evaluation carried out by Expert 5 in pairwise comparisons of criteria on the degree of direct influence of the row factor on the column factor.

	C1	C2	C3	C4	C5
C1	0	4	3	2	4
C2	2	0	1	1	3
C3	3	3	1	2	4
C4	1	3	4	0	1
C5	1	2	0	1	0

Source: Prepared by own

Table 6: Weights of decision makers.

	Decision maker 1	Decision maker 2	Decision maker 3	Decision maker 4	Decision maker 5
	Very important	Moderately important	Very important	Very important	Very important
Numerical importance	0.214	0.1439	0.214	0.214	0.214

After obtaining the assessments of each expert and their relative importance, the direct relationship matrix is prepared, followed by the calculation of the initial normalized direct relationship matrix D, as shown below:

$$D = \begin{bmatrix} 0.0000 & 0.8516 & 0.7500 & 0.6264 & 0.7304 \\ 0.4680 & 0.0000 & 0.3744 & 0.3871 & 0.7593 \\ 0.8048 & 0.7352 & 0.0000 & 0.4249 & 0.7593 \\ 0.3744 & 0.7091 & 0.8286 & 0.0000 & 0.5760 \\ 0.6857 & 0.6039 & 0.6448 & 0.4926 & 0.0000 \end{bmatrix}$$

The total direct relationship matrix T can then be calculated by obtaining the values:

$$T = \begin{bmatrix} 1.0351 & 1.4414 & 1.2936 & 1.0378 & 1,3975 \\ 0.8813 & 0.8718 & 0.8994 & 0.7381 & 1,0664 \\ 1.1872 & 1.339 & 1.0215 & 0.9372 & 1,3241 \\ 1.0113 & 1.2426 & 1.1631 & 0.7432 & 1,1985 \\ 1.0788 & 1.2149 & 1.1178 & 0.8858 & 1,0298 \end{bmatrix}$$

After obtaining the total direct relationship matrix T, the direct and indirect effects of the above criteria can be determined by analyzing the prominence and relationship axes for the cause-effect group, as shown in Table 7.

Table 7: Axes of protagonism and relationship

	Rhode Island	C _i	R _i +C _i	R _i -C _i
C1	6.2054	5.1937	11,399	1.0117
C2	4.457	6.1097	10,567	-1,653
C3	5.809	5.4954	11.304	0.3136
C4	5.3587	4.3421	9.7008	1.0166
C5	5.3271	6.0163	11.343	-0.689

The data obtained are used to construct the causal diagram shown in Figure 2.

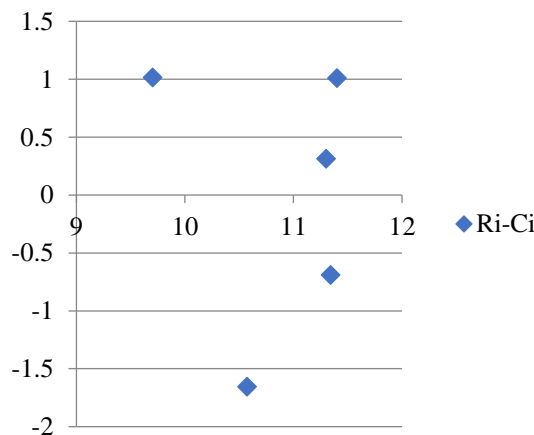


Figure 1. Distribution of prominence and relatedness.

According to the diagram and table above, the alternatives can be evaluated according to their degree of importance in the system and then acted upon accordingly to resolve the problems that arise in the process. Figure 3 shows the hierarchy of these alternatives, where Comprehensive Staff Training is the most important factor with a value of 11.4, while Improving Inter-Institutional Coordination is the least important criterion with a value of 9.701.

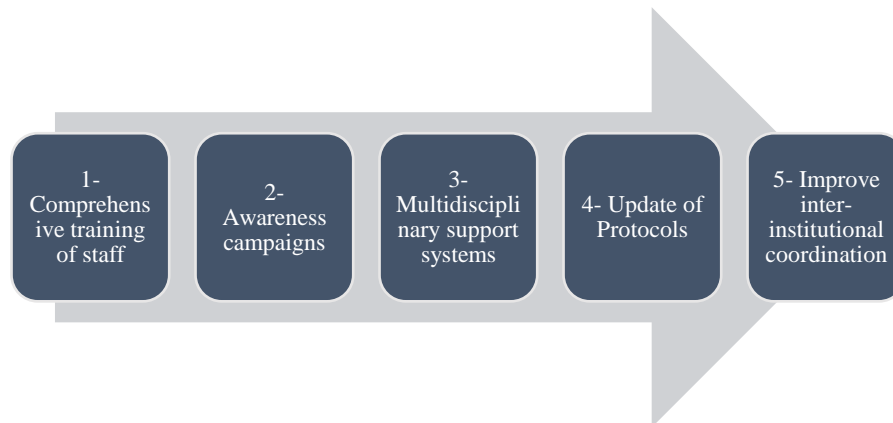


Figure 2. Order of the level of influence of the alternatives.

Attention should be paid to the alternatives that stand out in the group of causes, with emphasis on the Comprehensive Training of Personnel, which is the main factor to address in order to contribute to combating and reducing rape in the country.

5. Discussion

Protocols for prevention and action in cases of harassment and gender violence are classified as follows:

- Education primary and basic.
- Higher education.
- Children and adolescents.
- Women and men.
- LGBTQ groups.
- Formation of health teams and activation of the purple code.
- Initial assessment of gender violence.
- Intervention in crisis.
- Comprehensive care specific to the type of violence in adults, which includes a. Comprehensive care for physical violence, b. Comprehensive care for psychological violence, c. Comprehensive care for sexual violence.
- Comprehensive care specific to pregnant women who are victims of gender violence.
- Comprehensive care specific to the type of gender violence in girls, boys and adolescents.
- Comprehensive care specific to elderly victims of gender violence.
- Comprehensive care specific to people with disabilities who are victims of gender violence.
- Comprehensive health care in the context of serious human rights violations, including a. Persons in situations of trafficking and migrant smuggling, b. Torture, cruel, inhuman and degrading treatment, c. Procedure for comprehensive health care in cases of serious human rights violations, d. Referral from the health system to the justice system, e. Referral from the National Health System to the National Justice System,
- Self-care for health care teams that deal with cases of gender violence and serious human rights violations.

In order to understand the procedure for implementing prevention and action protocols in cases of harassment and gender violence in Ecuador, it is essential to consider the institutional Strategic Plan of the National Council for Gender Equality, 2021-2025, as established in article 280 of the Constitution of the Republic. This National Development Plan is the reference for public policies, programs and projects, the programming of the State budget and the investment of resources. Although it is mandatory for the public sector, it is indicative for other sectors.

The National Council for Gender Equality has a history of more than 45 years, having been established as the Women's Department within the Ministry of Social Security and Labour in 1970. In 1984 it evolved into the National Women's Office and in 1986 it became the National Women's Directorate. Its aim throughout these stages was to improve the situation of working women and promote equality in various aspects of life.

In 1997, by Presidential Decree, it was transformed into the National Council of Women (CONAMU), with administrative, financial and technical autonomy, attached to the Presidency of the Republic. Its main function was to incorporate the gender perspective in the plans, programs and projects of the public sector. The 2008 Constitution created the National Councils for Equality, including the Gender Council, as bodies responsible for guaranteeing the rights established in the Constitution and international human rights instruments. In 2009, CONAMU began a transition to define the public institutions responsible for guaranteeing gender equality and the Transition Commission was created.

In 2014, the Organic Law on National Councils for Equality was enacted, which created the National Council for Gender Equality. This law grants the Councils for Equality the power to formulate, mainstream, enforce, monitor and evaluate public gender policies.

Regarding the classification of protocols for addressing gender violence, these are structured according to the Technical Standard for comprehensive care for victims of gender violence and serious human rights violations [10] as follows:

- Entry channels to the National Health System.
- Formation of health teams and activation of the purple code.
- Initial assessment of gender violence.
- Intervention in crisis.
- Comprehensive care specific to the type of violence in adults: a. Comprehensive care procedure for physical violence. b. Comprehensive care procedure for psychological violence. c. Specific comprehensive care procedure for sexual violence.
- Comprehensive care specific to pregnant women who are victims of gender violence.
- Comprehensive care specific to the type of gender violence in girls, boys and adolescents.
- Comprehensive care specifically for the elderly and victims of gender violence.
- Comprehensive care specific to people with disabilities and victims of gender violence.
- Comprehensive health care in the context of serious human rights violations, covering: a. Persons in situations of trafficking and migrant smuggling. b. Torture, cruel, inhuman and degrading treatment. c. Procedure for comprehensive health care in the face of serious human rights violations.
- Referral from the Health System to the Justice System.
- Referral from the National Health System to the National Justice System.
- Self-care for health care teams that deal with cases of gender violence and serious human rights violations.

In the Protocols for prevention and action in gender violence, an initial assessment must be carried out in which the health professional can identify signs and symptoms that allow suspecting Gender Violence (GBV) in a person. Therefore, it is important to consider the following general indications during the consultation and relate them according to the life cycle and the sex-gender condition [24].

- History of seeking medical attention for trauma: unexplained fractures, bruises, wounds, lacerations or burns, injuries to the breasts, abdomen and genitals.
- Frequent headaches and other nonspecific symptoms.
- Difficulty walking
- Chronic pelvic pain
- Sexually transmitted infections (STIs), including HIV/AIDS.
- Malnutrition and anemia
- History of unspecified complications and spontaneous abortions
- History of premature birth and low birth weight
- Detachment premature with normal inserted placenta
- Stillbirth
- Early initiation of sexual intercourse (think forced intercourse) after childbirth or after an abortion
- Pregnancy teenager
- Unwanted pregnancy
- Transient postpartum psychosis
- Stress, depression, anxiety and distress during breastfeeding

- Feelings of loneliness
- Devaluation
- Neglect of health
- Aggressiveness/Passiveness
- Other emotional disorders such as fear, sadness, apathy, depression, suicide attempts and ideation.
- Running away from home or school
- Low academic performance
- Sleep and appetite disorders.
- Enuresis
- Sexualized behaviors not appropriate for their age.

Protocols on gender violence have procedures for action that are legally valid. One of these procedures is Resolution No. 066-FGE-2021, which establishes the “National Protocol for the investigation of femicides and other violent deaths of women and girls.” This protocol does not contravene any constitutional or legal norm and is used to train prosecutors, secretaries and administrative assistants, as well as missionary administrative staff. Its purpose is to provide theoretical and practical tools for the pre-trial and criminal procedural investigation of crimes such as femicide and others involving violent deaths of women [26].

Furthermore, within the legal regulatory framework, it is relevant to consider the “Justice and Gender Agenda (2023-2025)”, which includes procedures and protocols for action within the justice system. This document was legitimized by more than one hundred organizations in Ecuador, as well as by the presidents of the provincial courts, the National Council of the Judiciary, judges of the judicial units specialized in violence against women and family members, prosecutors, public defenders and other officials of various State institutions. This agenda is the result of initiatives such as the Local Roundtables for Justice and Gender and Justice and Childhood.

In the analysis of the Strategy for the effective application of prevention and action protocols in case of harassment and gender violence in the city of Riobamba, strategies are understood as a set of sequential and interrelated actions that, starting from an initial state determined by the diagnosis, allow progress towards an ideal state thanks to effective planning. What is interesting and relevant in this research is what is proposed by some researchers, who, as a result of a theoretical systematization based on the analysis of several doctoral theses, recognize that a strategy is a theoretical-practical conception to direct processes that, based on the diagnosis, project a set of actions that transform reality and promote the participation of those involved in achieving the proposed objectives.

The term “strategy” refers to the deliberate, reflective and normative application of sequential actions and organized procedures, which are carried out under specific conditions to achieve a given objective. The pedagogical nature of the strategy lies in the fact that the actions planned at each stage allow progress towards the formation of an environmental legal culture, facilitating the connection between the annual Integrative Projects and the Social Engagement activities that are developed during a semester of study. This maximizes the application of the knowledge and values acquired so far in practical contexts. Currently, these strategies are used in legal research related to the prevention and eradication of gender violence.

The strategy of implementing prevention and action protocols in cases of harassment and gender violence is not only important to address a specific type of violence, but is recognized as an urgent need to respond to the problems faced by people who suffer harassment and gender violence, without distinction. The attention to the various cases identified has been disorganized, which highlights the urgency of using scientific research to develop an effective intervention tool.

The creation of an intervention strategy based on social monitoring of the various existing protocols is essential to provide a coherent response to victims of gender violence. This strategy focuses, first of all, on prevention, with the aim of eradicating gender violence.

The strategies to be developed must be based on the analysis of the results obtained with the application of the DEMATEL method, which highlights the criteria of experts who agree that actions must be based on comprehensive staff training and awareness campaigns, as the main alternatives to achieve greater preparation in people. These actions generate a set of activities of diverse nature, which favor forms of social communication, the treatment of people respectful of human rights, and multidisciplinary support systems in accordance with the violations that are occurring to a greater degree in the country.

Updating protocols must be a systematic process that is carried out at all times, in accordance with the law and the most significant facts of society, while respecting all people and their rights within it. Inter-institutional collaboration in social care and the fight against gender violence also plays an important role in

this process. This factor must involve a process of continuous improvement, with the analysis of the difficulties that arise and the search for alternatives that facilitate the process and reduce the difficulties previously presented.

6. Conclusion

The implementation of the Strategy for prevention and action protocols in cases of harassment and gender violence pursues an ambitious general objective: to promote the widespread implementation of prevention and action protocols in decentralized autonomous governments. Where they already exist, the aim is to ensure their effective application and, in those places where they are not available, their creation should be considered, with a focus on comprehensive care for all people who have suffered violence. The implementation of this strategy is based on the need to comprehensively address the problem of violence, and not limit it solely to gender-based violence directed at women. While gender-based violence is a critical issue that deserves priority attention, it is essential to recognize that violence and harassment can affect people of any gender, including men, boys, girls, adolescents and members of the LGBTQ+ community. The use of multi-criteria methods further supports the process of more precise identification of the alternatives and causes that influence a given problem. The application of the DEMATEL criterion in research allows us to determine that the main factor influencing the attention to the problem is the comprehensive training of personnel. The development of actions as part of the strategies developed by State entities to address gender-based violence must consider the results obtained in the application of the multi-criteria method used in the research, which allowed identifying the order of hierarchy for addressing the alternatives and causes that affect the attention to the problem of gender-based violence.

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