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Application of Compensatory Fuzzy Logic to a Legal Analysis of Abandonment of Causes

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Abstract. The Constitution of Ecuador designs a Constitutional State of rights and justice in which the maximum duty of the State is to respect and enforce respect for human rights. The rights to formal and material equality are guaranteed, so that the rights may be exercised, promoted, and demanded individually or collectively before the competent authorities. When a process is declared abandoned, these civil rights are violated. There are numerous reasons to declare a process abandoned. The present investigation was given the task of investigating these reasons, which were found through consultation with experts and the application of Compensatory Fuzzy Logic. From the analysis of the results, a solution proposal was derived to improve the satisfaction of the population in this regard which was processed by the TOPSIS method.

Keywords: abandonment of causes, Compensatory Fuzzy Logic, TOPSIS, solution strategies.

1 Introduction

The Ecuadorian civil procedural rule has an extensive historical background, but its origin was based on the guidelines of the Spanish monarchy, giving the process the characteristics of parsimonious, written, and solemn; in 1863 the Code of Civil Procedure was issued for the first time, which was replaced by the Code of Civil Procedure of 1938. After this, there were some reforms but from the end of the dictatorship in the years of 1976. Ecuador had a great change in its political structure since at last, the winds of democracy arrived in the country that allowed the constituent power to be the one to elect its president, with this new stage of democratic governments that were ruling the country it was also accompanied by the birth of new laws and reforms in other legal bodies [1].

The institution of abandonment in our country has undergone some variations over time and procedural reforms, which is why our repealed Code of Civil Procedure of the year 1987 was established, among other details, and according to the last reform that this same code underwent in 2005, the institution of abandonment came to establish eighteen months counted from the last diligence carried out in the trial, or from the last petition or claim. For a century and a half, this procedural rule remained in force, which was characterized by being a slow, formal, and bureaucratic model that produced a great breakdown in our civil legal system, for which a radical change was imminent both in its structure and in users and legal professionals [2].

The declaration of abandonment of processes when referring to its first characteristic indicates that a judicial process begins from the moment the claim is filed with the competent judicial unit. It must be promoted by the parties, otherwise, the same regulations establish the term for it to be archived. The second characteristic mentioned in previous lines establishes that the judge is the authority that must be aware of which causes are being promoted and which are not so that in this way he can make the corresponding calculation of the time in which the process remained static and declare its abandonment. Even the defendant can request the judge in writing to declare the abandonment and file the process because it has remained without processing for more than eighty days; finally, the third characteristic mentions that once the cause is declared abandoned, the plaintiff will not be able to file a new lawsuit on the same action that was intended in the filed process [3, 4].

Legal effects of abandonment according to the General Organic Code of Processes [1, 5]

By declaring the abandonment of cases by the administrators of justice, legal consequences are produced that, directly, end up affecting the rights and interests of the person who went before the judicial bodies to have a right restored or recognized. Once the declaration of abandonment proceeds, the plaintiff will not be able to propose a

new claim on the same fact, object and person, as determined in article 249, second paragraph of the General Organic Code of Processes (hereinafter COGEP).

With the aforementioned regulations, not only is the free access to justice being limited to citizens or individuals but, in turn, it is violating other Constitutional rights, such as, for example, property rights and the rights of the obligations to give or do. Additionally, constitutional principles such as; effective judicial protection, legal certainty, and the right to equality.

Every judicial process is initiated solely with the purpose that the interested person receives from the Judges the reason or the denial of the facts that are claimed in their claim. That is why in this new procedural system that is applied in Ecuador, the sentences or resolutions are issued orally in the same Hearing, with the declaration of abandonment, due to the failure to appear at the Hearing as established in article 87, number 1 of the COGEP, violates the rights of the procedural parties and that is why the Constitution establishes it in its Article 168, number 6.

It can be stated that the declaration of abandonment of causes is a way of terminating a judicial process. The inconvenience arises at the time of considering the limitation of access to justice through a new one so that the right is recognized, which entails a serious legal consequence, at the time of declaring the abandonment of the case due to the failure to appear at the hearing by the actor. The abandonment of a process does not provide a solution to a dispute, does not provide a solution to the conflict, nor does it recognize or restore a right, even though this declaration takes the form of *res judicata*.

When analyzing in light of the constitutional norm and comparative law the legal effects caused by the declaration of the abandonment of causes according to the COGEP. This legal body directs the procedures that must be followed in the trials to solve the legal conflicts that occur between civilians, in relation to the abandonment of causes, in chapter V, of articles 245, 246, 247, and 248, it is determined that the abandonment of causes proceeds when the extra parties cease to pursue the same during the term of eighty days, counted from the date of the last ruling. In addition, one of the most drastic legal effects that this declaration of abandonment, made by the judge, produces is that a new claim cannot be filed, in the case of the first instance.

The understanding of the procedural details and basic concepts to take into account regarding the abandonment of the causes and as well as its effects typified in the General Organic Code of Processes. Since today certain constitutional principles are violated such as:

- **Effective judicial protection:** Effective judicial protection is found as a right of protection in article 75 of the Constitution of the Republic which says: that every person has the right to free access to justice and effective, impartial, and expeditious protection of their rights and interests, subject to the principles of immediacy and speed; in no case will he be helpless. Failure to comply with judicial resolutions will be sanctioned by law.
- **Legal security:** it is the protection and confidence that the State will respect all the rights of its citizens, the right to freedom, private property, freedom of expression, and due process, among others, precisely because of the existence of a Prior public norm that imposes, allows or prohibits, and to which not only must the public power adapt its action, but must also inexorably apply it.
- **Equality of rights:** When citing the legal modalities of the principle of equality, it says that there are four; the first, the principle of equality in the strict sense, being considered as a value or principle, citing, as manifest from the innumerable examples that could be given, the declarations of Human Rights and the various International Treaties.
- **Right to Access to Justice:** Access to Justice is equal opportunities that people have to access formal and informal legal resources that generate, apply or interpret laws and normative regulations with a special impact on the social and economic well-being of people. Access to Justice is a fundamental and conditional human right of the Constitutional State of Rights so that all citizens can know and exercise their rights and obligations without any discrimination, ensuring that their legal disputes are treated and resolved in an effective and timely manner.

The present investigation defined the research problem: What are the factors or reasons that frequently lead to the abandonment of causes? To answer the question posed, the following research objectives were planned:

- 1) Determine what are the frequent reasons for abandoning cases
- 2) State the results and process them

Propose alternative solutions to the issue to improve the state of satisfaction of the population with respect to legal processes.

2 Methods

In the investigation, a mixed modality was utilized, with the use of qualitative and quantitative methodology. It was developed under the descriptive model, trying to illustrate the phenomenon analyzed from different positions.

Theoretical methods such as Analytical-Synthetic were used: the one that allowed to inspect documents and establish conclusions regarding the subject of study. In addition, the Inductive-Deductive method was also applied: this research method allows for logical reasoning. While the inductive method starts from specific premises to reach general aspects, the deductive method is the opposite, since it starts from the generic until reaching the particular aspects. However, both methods are essential in the construction of knowledge. The empirical methods used were the survey, applied to the selected sample of law professionals. For the selection of the sample to be used, the following operation was carried out:

Sample:

$$n = \frac{Z^2 pq N}{E^2(N-1) + Z^2 pq} \quad (1)$$

Information processing methods

Compensatory fuzzy logic (CFL): was created by the multidisciplinary scientific group Business Management in Uncertainty: Research and Services (GEMINIS) of the José Antonio Echeverría Higher Polytechnic Institute (ISPJAE), in Havana, Cuba. Dr. Rafael Espín Andrade, a full professor of the ISPJAE, is one of its most representative leaders. CFL constitutes a branch of Fuzzy Logic. It is a new multivalent system that breaks with the traditional axiomatics of this type of system to achieve semantically better behavior than classical systems [6-9].

In processes that require decision-making, the exchange with experts leads to obtaining complex and subtle formulations that require compound predicates. The truth values obtained on these composite predicates must be sensitive to changes in the truth values of the basic predicates. This need is satisfied with the use of the CFL, which renounces compliance with the classical properties of conjunction and disjunction, opposing these with the idea that the increase or decrease in the value of the conjunction or the disjunction caused by the change in the truth value of one of its components, can be "compensated" with the corresponding decrease or increase in the other. An increase or decrease in the truth value of the conjunction or disjunction as a result of a change in the truth value of one component may be offset by the increase or decrease in another component. This notion makes CFL a sensible logic [6-9].

In essence, a predicate is a function of the universe X on the interval $[0,1]$, and the operations of conjunction, disjunction, negation, and implication are defined in such a way that being restricted to the domain $(0,1)$ [10] Boolean Logic is obtained. They, along with other operators, guarantee the effective combination of intangible elements valued through experts considering categorical scales of veracity, with quantitative information, which provides truth values through conveniently defined predicates based on such information. [24, 25]

The predicates can be represented in different ways, one of them is trees. For example, a predicate can be represented using a general tree (to avoid associativity) where each node can be an operator. This variant is being implemented due to its recursive and potentially descriptive character. [26, 27, 28, 29] The formulation of a predicate can be as follows: if it is an element X , to meet condition A , it must first meet requirements B and C , then the definition of simple predicates will be:

1. $EB(x)$: Element X meets requirement B .
2. $EC(x)$: element X meets requirement C .

Then the compound predicate is defined as:

$A(x)$: element X satisfies condition A .

The translation of this predicate into calculus language is $A(x) = EB(x) \wedge EC(x)$. The CFL is formed by a quartet of continuous operators: conjunction (c), disjunction (d), fuzzy strict order (o), and negation (n), the first two go from $[0,1]$ to n in $[0,1]$, o goes from $[0,1]$ 2 to $[0,1]$ and n from $[0,1]$ to $[0,1]$, which satisfy the following axioms:

1. $\min(x_1, x_2, \dots, x_n) \leq c(x_1, x_2, \dots, x_n) \leq \max(x_1, x_2, \dots, x_n)$ (Compensation Axiom)
2. $c(x_1, x_2, \dots, x_i, \dots, x_j, \dots, x_n) = c(x_1, x_2, \dots, x_j, \dots, x_i, \dots, x_n)$ (Axiom of Commutativity or Symmetry)
3. If $x_1 = y_1, x_2 = y_2, \dots, x_{i-1} = y_{i-1}, x_{i+1} = y_{i+1}, \dots, x_n = y_n$, such that neither is zero, $y x_i > y_i$, then $c(x_1, x_2, \dots, x_n) > c(y_1, y_2, \dots, y_n)$ (Strict Growth Axiom)
4. If $x_i = 0$ for some i , then $c(x_1, x_2, \dots, x_n) = 0$ (Veto's Axiom)
5. If $o(x, y) \geq 0.5$ and $o(y, z) \geq 0.5$, then $o(x, z) \geq \max\{o(x, y), o(y, z)\}$ (Axiom of Transitivity Diffuse).
6. $n(c(x_1, x_2, \dots, x_n)) = d(n(x_1), n(x_2), \dots, n(x_n)). n(d(x_1, x_2, \dots, x_n)) = c(n(c(x_1), n(x_2), \dots, n(x_n)))$ (De Morgan's Laws)

From the axioms proposed above, we have the following properties:

1. $\min(x_1, x_2, \dots, x_n) \leq d(x_1, x_2, \dots, x_n) \leq \max(x_1, x_2, \dots, x_n)$ (Compensation Property)
2. $d(x_1, x_2, \dots, x_i, \dots, x_j, \dots, x_n) = d(x_1, x_2, \dots, x_j, \dots, x_i, \dots, x_n)$ (Property of Commutativity or Symmetry)
3. If $x_1 = y_1, x_2 = y_2, \dots, x_{i-1} = y_{i-1}, x_{i+1} = y_{i+1}, \dots, x_n = y_n$, such that neither is zero $y_{x_i} > y_i$, then $d(x_1, x_2, \dots, x_n) > d(y_1, y_2, \dots, y_n)$ (Strict Growth Property)
4. If $x_i = 1$ for some i , then $d(x_1, x_2, \dots, x_n) = 1$ (Veto Ownership)
5. $c(x_1, x_2, \dots, x_n) = d(x_1, x_2, \dots, x_n) = x$ (Idempotency Property)

The use of sigmoidal membership functions for increasing or decreasing functions is recommended for modeling vagueness. This is also achieved through linguistic variables, which allows for taking advantage of the knowledge of the experts. These linguistic variables are based on scales such as the one shown in Table 1.

Truth value	Category
0	Fake
0.1	Almost fake
0.2	Pretty fake
0.3	Something fake
0.4	More false than true
0.5	As true as false
0.6	More true than false
0.7	Something real
0.8	True enough
0.9	Almost true
1	Real

Table 1: Scales of linguistic variables. Source: [9]

Considering that CFL can take any truth value within a set of values that oscillate between two extremes, absolute truth, and total falsity. This tool allows us to represent a management model through a non-linear mathematical model, which the authors of this research consider that it is of great importance.

TOPSIS method

The TOPSIS method is a compensatory strategy method, which allows the ordering of a finite set of decision alternatives. Yoon and Hwang developed the TOPSIS method based on the concept that a given alternative should be located the shortest distance from a positive (ideal) ideal solution and the greatest distance from a negative ideal solution (anti-ideal) [11, 12, 17, 18]. TOPSIS defines an index called Similarity (or relative proximity) to the ideal solution by combining the proximity to the ideal solution and the distance from the anti-ideal solution [13, 14, 19, 20]. The alternative that is located as close as possible to the maximum similarity to the positive ideal solution is selected. It can assume values between 0 and 1: if the alternative is closer to the ideal point, it will be closer to 1, on the contrary, if it is closer to the anti-ideal point, its value will be closer to 0. For the methodology of the technique see [15, 21, 22, 23].

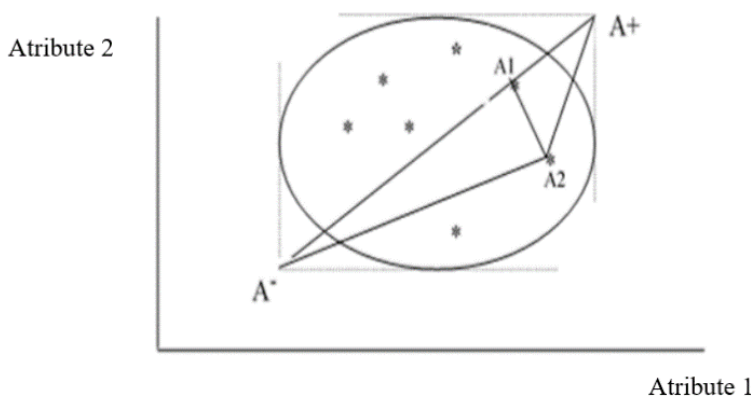


Figure 1: Euclidean distance to the ideal and anti-ideal in a two-dimensional space. Source: [16].

3 Results and Discussion

For the analysis of the possible reasons that lead to the abandonment of causes, the present case study was carried out, for which documents that could provide significant data were reviewed. In addition, an interview was carried out and brainstorming was carried out with a group of lawyers and judges, to corroborate the information consulted. It was evaluated from a qualitative point of view. Among the causes found, the following could be cited:

1. Processes canceled for a term of 18 months
2. Priority to other judicial processes
3. Lack of the actor's technical defender to the audiences
4. Lack of commitment to the work to be done
5. Difficulty in following up on demand
6. Failure to attend the hearing due to the Covid 19 quarantine
7. Failure to pursue the parties
8. Failure to appear
9. Lack of resources to solve the process

The sample consisted of 25 legal professionals, for the selection of the sample the following criteria were taken:

1. That the professionals that integrate it have actively participated in legal processes of Abandonment of Causes
2. Have more than 5 years of experience in cases of this type
3. They were asked to express criteria based on the experience of the last year of work (2021)

Application of Compensatory Fuzzy Logic

For the analysis of the causes that lead to the abandonment of causes, it was found in the bibliography consulted, possible causes that at different levels influence the process, then the following steps were carried out:

1. Analyze by applying Compensatory Fuzzy Logic:
 - a) Statement of simple and compound predicates
 - b) Development of the decision tree
 - c) Calculus of simple and compound predicates
 - d) Determination of the state through linguistic terms.

The results are shown below:

Simple and compound predicates	Calculation expressions
Abandonment of Causes	$CA(X) = IL(X) \wedge EL(X)$
Internal level	$IL(X) = JLC_{1-4}(X)$
External level	$EL(X) = Dc_{1-3}(X) \wedge Ac_{1-2}(X)$
Judges and Lawyers causes	$JLC_{1-4}(X) = JLC_1(X) \wedge JLC_2(X) \wedge JLC_3(X) \wedge JLC_4(X)$
Plaintiff Causes	$Dc_{1-3}(X) = Dc(X) \wedge Dc_2(X) \wedge Dc_3(X)$
Defendant causes	$Ac_{1-2}(X) = Ac_1(X) \wedge Ac_2(X)$
$JLC_1(X)$	Processes canceled for a term of 18 months
$JLC_2(X)$	Priority to other judicial processes
$JLC_3(X)$	Lack of the actor's technical defender to the audiences
$JLC_4(X)$	Lack of commitment to the work to be done
$Dc_1(X)$	Difficulty in following up on demand
$Dc_2(X)$	Failure to attend the hearing due to the Covid 19 quarantine
$Dc_3(X)$	Failure to pursue the parties
$Ac_1(X)$	Failure to appear
$Ac_2(X)$	Lack of resources to solve the process

Table 2: Predicates and calculation expressions. Source: own elaboration

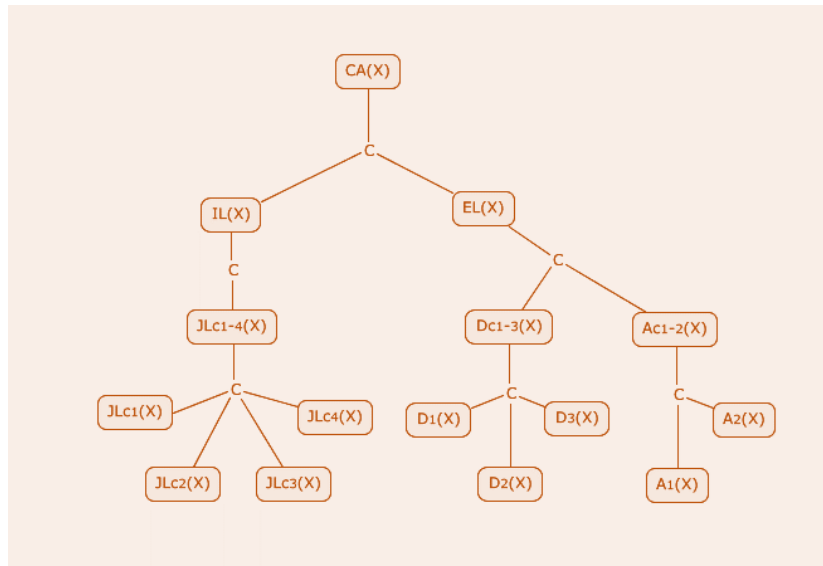


Figure 2: Tree of predicates. Source: own elaboration

Next, the calculation of the predicates by groups of experts using the scales in Table 1 and the mathematical operators in Table 2:

Simple predicates	E1	E 2	E 3	E4	E5	E6	E7
$JLc_1(X)$	0.5	0.4	0.6	0.4	0.5	0.4	0.4
$JLc_2(X)$	0.5	0.5	0.6	0.5	0.5	0.6	0.6
$JLc_3(X)$	0.5	0.5	0.6	0.4	0.5	0.5	0.5
$JLc_4(X)$	0.5	0.4	0.6	0.6	0.4	0.4	0.4
$Dc_1(X)$	0.5	0.4	0.6	0.6	0.5	0.4	0.4
$Dc_2(X)$	0.9	0.7	0.9	0.7	0.9	0.7	0.7
$Dc_3(X)$	0.9	0.7	0.9	0.7	0.9	0.7	0.8
$Ac_1(X)$	0.9	0.7	0.9	0.7	0.9	0.6	0.7
$Ac_2(X)$	0.9	0.7	0.9	0.7	0.9	0.7	0.7

Table 3: Assessment of the Group 1 experts. Source: own elaboration

Simple predicates	E1	E 2	E 3	E4	E5	E6	E7
$JLc_1(X)$	0.4	0.9	0.3	0.9	0.2	0.5	0.5
$JLc_2(X)$	0.9	0.5	0.6	0.5	0.9	0.8	0.9
$JLc_3(X)$	0.6	0.5	0.6	0.4	0.5	0.5	0.5
$JLc_4(X)$	0.9	0.7	0.6	0.9	0.4	0.4	0.9
$Dc_1(X)$	0.9	0.9	0.6	0.7	0.9	0.5	0.4
$Dc_2(X)$	0.4	0.7	0.4	0.7	0.9	0.4	0.5
$Dc_3(X)$	0.5	0.5	0.9	0.8	0.8	0.7	0.5
$Ac_1(X)$	0.9	0.7	0.6	0.7	0.9	0.6	0.7
$Ac_2(X)$	0.9	0.7	0.9	0.7	0.9	0.7	0.7

Table 4: Evaluation of the Group 2 experts. Source: own elaboration

Simple predicates	E1	E 2	E 3	E4	E5	E6	E7
$JLc_1(X)$	0.5	0.5	0.6	0.5	0.7	0.6	0.6
$JLc_2(X)$	0.7	0.3	0.5	0.5	0.6	0.4	0.5
$JLc_3(X)$	0.8	0.5	0.5	0.5	0.5	0.5	0.5
$JLc_4(X)$	0.9	0.9	0.8	0.9	0.6	0.5	0.9
$Dc_1(X)$	0.9	0.9	0.9	0.8	0.9	0.6	0.8
$Dc_2(X)$	0.3	0.5	0.4	0.4	0.5	0.4	0.5
$Dc_3(X)$	0.7	0.7	0.5	0.5	0.5	0.7	0.6
$Ac_1(X)$	0.9	0.7	0.6	0.7	0.9	0.6	0.7
$Ac_2(X)$	0.6	0.6	0.8	0.9	0.6	0.6	0.7

Table 5: Assessment of the Group 3 experts. Source: own elaboration

Simple predicates	Mean by groups		
	Group 1	Group 2	Group 3
$JLc_1(X)$	0.457	0.529	0.571
$JLc_2(X)$	0.543	0.729	0.500
$JLc_3(X)$	0.500	0.514	0.543
$JLc_4(X)$	0.471	0.686	0.786
$Dc_1(X)$	0.486	0.700	0.829
$Dc_2(X)$	0.786	0.571	0.429
$Dc_3(X)$	0.800	0.671	0.600
$Ac_1(X)$	0.771	0.729	0.729
$Ac_2(X)$	0.786	0.786	0.686

Table 6: Calculation of the weighted means of the rating of the experts of the 3 groups. Source: own elaboration

SP	Mode	Mean	Truth value	Category
$JLc_1(X)$	0.600	0.519	0.642	More true than false
$JLc_2(X)$	0.633	0.590	0.647	More true than false
$JLc_3(X)$	0.500	0.519	0.504	As true as false
$JLc_4(X)$	0.733	0.647	0.733	Almost true
$Dc_1(X)$	0.733	0.671	0.738	Almost true
$Dc_2(X)$	0.533	0.595	0.538	As true as false
$Dc_3(X)$	0.700	0.690	0.633	More true than false
$Ac_1(X)$	0.766	0.743	0.743	Almost true
$Ac_2(X)$	0.666	0.752	0.752	pretty true

Table 7: Calculation of the predicates according to their truth values. Source: own elaboration

Compound predicates	Truth value
$AC(X)$	Something real
$IL(X)$	Pretty true
$EL(X)$	Almost true
$JLc(X)$	Pretty true
$DC(X)$	More true than false
$Ac(X)$	as true as false

Table 8: Truth values of compound predicates. Source: own elaboration

After obtaining the results of the analysis of causes through the CFL, a solution proposal was made to improve the satisfaction of the population and the quality of the processes. The possible solution alternatives proposed were the following:

1. Provide training to legal professionals so that they can carry out their work more effectively.
2. Apply judicial measures such as fines, or others, to the party causing non-attendance at the hearings.
3. Carry out outreach campaigns on the laws and rights of citizens when establishing a lawsuit, as well as informing about the term of completion of the processes.
4. Frequently encourage legal professionals who comply with their cases on time
5. Increase the number of premises willing to carry out the trials, as well as the offices to process the processes, to guarantee promptness in the services

Which will be evaluated under the following criteria:

1. Quality of services to the population
2. Commitment to the task by judges and lawyers
3. Resource economy

Alternatives/Criteria	Criterion 1	Criterion 2	Criterion 3
Alternative 1	0.249574	0.110000	0.020203
Alternative 2	0.249574	0.066000	0.020203
Alternative 3	0.249574	0.088000	0.020203
Alternative 4	0.415956	0.110000	0.025254
Alternative 5	0.415956	0.110000	0.025254

Table 9: Weighted Normalized Matrix. Source: own elaboration

Alternatives	D+	D-	Ri	Hierarchy order
Alternative 1	0.027683117	0.16638244	0.20914293	3
Alternative 2	0.029619117	0.17210205	1.9614E-06	1
Alternative 3	0.028167117	0.16783062	0.11589279	2
Alternative 4	0	0	1	4
Alternative 5	0	0	1	5

Table 10: Calculation of relative proximity to the ideal solution and order. Source: own elaboration

As a proposed alternative, after consulting experts, the following was left: apply judicial measures such as fines, or others, to the party causing non-attendance at the hearings.

Conclusions

The results obtained made it possible to verify that the experts of the consulted groups agree that most of the simple predicates have a high level of significance and presence within the process of abandoning causes. Therefore, it is necessary to develop actions that can serve as a solution to this problem, and in this way, improve the level of satisfaction of the population regarding the processes of abandonment of causes, guaranteeing the principles of good living.

From the analysis of the compound predicates, it can be concluded that the internal level factors, qualified as quite true, are the ones that fundamentally exert important negative effects in terms of the analysis of the reasons for which the causes are abandoned. Because it is the legal authorities that must take measures in this regard to comply with due process.

Within the solution proposals, to reduce the abandonment of cases, taken to expert consultation, the alternative of applying fines or other measures to people who cause non-attendance at trial was selected. Because this cause was found as one of the possible mitigating factors. In addition to providing training to those involved in legal processes.

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