

## Considerations Regarding Making Ethical Decisions Using Triangular Fuzzy Numbers

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### Abstract

*In the current context of the community development based on knowledge, the ethics represents one of the important features which claims a special attention from all the social, political and economic actors. Each of them claims the compliance of a minimum ethical norm from the partners' side, being imposed the fulfilment of some standards including with regard to the technologies used and the confidentiality of the information.*

*The sustainable feature of any activity has, in the background, fundamental ethical elements. The more complex an activity and it presupposes the involvement of the human factor under ever more sensible aspects, the more the ethical requirements are higher. More often than not, the relating to this concept is a subjective one, lacking quantitative or qualitative elements for the specific punctual evaluation.*

*From this point of view, we propose using the fuzzy elementary numbers in the process of adopting ethical decisions using the qualitative evaluations via experts.*

**Key words:** ethical decisions, qualitative evaluations, triangular fuzzy numbers

**J.E.L. classification:** D91

### 1. Introduction

The process of the ethical decisions making presupposes an identification, analysis and selection process of the alternatives in connection with the ethical principles or ethical standards. These principles can be the object of an institutional, personal ethical code or they sometimes report only to the legislation in force at a given time. In the adoption of the ethical decisions the accent falls on the identification both of the ethical options as well as on the non-ethical ones, no matter the quality of the other performance indicators.

A decision becomes the object of a decisional process from the perspective when several features are fulfilled (Haas and Malouf (2005), Sinaci (2017)):

- The decision is based on generally accepted ethical principles;
- The action is justified by an analysis of the principles;
- The decision is "generally valid"/it can be reproduced, namely it can be taken by anybody found in a similar situation.

More often than not, the decisions are the result of some qualitative analysis or we can speak about subjective experiences even in similar situations. The ethical dilemmas and preoccupations are part of the daily research practice. The ethics does not limit to the qualitative research and not necessarily to the human subjects' research.

The development true triangular fuzzy numbers of the models for the ethical decision adoption represents a natural step for the interdisciplinary approach in which the qualitative and quantitative components can contribute both to the identification of the optimal solution as well as the nuancing of certain features which is closely connected in time and space to a system of principles and concepts placed under ongoing updating and accumulation.

## **2. Literature review**

The majority of the activity domains, professional associations and organisations understood the need to implement ethical specialised conduct codes (Bulmer, 1982; Homan, 1991). Although these codes exist and are often essential components of the professions' and organisations' ground, various analysts, such as, for example Mason (1996, p. 160), raises the issue of the impact of these codes upon the current activity and in the foundation of the ethical decision. Hornsby – Smith (1993) sustained that these organisational behavioral codes are often too restrictive and that in many organizations there exists a general movement towards more general guiding lines for the ethical practice.

### **2.1. Ethics – a nuanced preoccupation**

From the epistemological point of view, the ethical decision concept does not benefit from a unitary accepted definition. In practice, it is observed that the approach of the ethical issues considers three important dimensions specific to any resolution: the person who intervenes, the subject of the intervention and the institution within which the intervention takes place. This approach of the ethical decision adoption process brings into the discussion the tensions, the potential limits or possible conflicts which can take place among the knowledge, beliefs, values, rules involved during the professional interventions or practices.

The ethics becomes the framework of a triple preoccupation which animates any objective undertaken or the person engaged in an analysis which raises the issue of the meaning of the human life: "care for one self", "care for the other" and "care for the institution".

An ethical decisional process brings into discussion two distinct conceptual categories for the grounding of these qualitative research issues, and namely "the procedural ethics" (which usually includes the request for an approval, provided by the relevant ethical committee) and "the practical ethics" (ethical issues which arise daily in the activity). Being known the fact that the procedural ethics cannot offer everything that is needed for the analysis of the important ethical moments in the qualitative research, we base ourselves upon the notion of reflectivity which we consider it to be an important resource.

The laws are evaluated according more likely to their coherence with the basic principles of correctness, than with the simple support based upon the location within the existing social order. That is why it exists an understanding of the fact that the elements of the morality, such as those regarding human life and wellbeing surpass the specific communities and cultures and are sustained disregarding other normative conventions or obligations.

For the argumentation of our point of view we must underline the fact that within the stages of the moral development, Lawrence Kohlberg identified 6 stages or moral rational grouped in 3 major levels. Each level represents a fundamental change from the individual's social and moral perspective:

Level A, the preconventional level in which are included stage I, of the punishment and submission, and namely stage II, in which the accent is placed upon the scope and individual instrumental change.

Level B, the conventional level composed from the stages of expectations, relations and interpersonal reciprocal conformity, namely stage IV of the social system and of the preservation of the conscience.

Level C, postconventional in which it is brought into discussion stage V of the priority rights and of the utility or that of the social agreement, namely stage VI of the ethical universal principles. We underline that this last stage remains as a final theoretical point, which logically follows the 5 previous stages. In essence, this last level of moral rational entails rationals rooted in ethical principles, based upon the correctness from which the moral laws can be divided and deduce.

There are numerous points of view of the critical nature, of social level, of the rigidity of the stages, but these methodological aspects do not make the object of our research. What we underline is the fact that we have qualitative analysis processes of the ethical decisions in which the nuanced (fuzzy) evaluation can play an extraordinary role in the future development via interdisciplinary approaches of a unitary research model and the grounding of an ethical decision.

Terry Cooper proposes four levels in the ethics of the decision making in the public administration ethics' domain:

- The expressive level: in this stage it is answered to a situation with "spontaneous emotion expressions " in which the point of view is unilateral.
- The level of the moral rules: is the first level in which it is appealed to "moral norms" gained by the individual via the educational process, family, affiliation, personal experiences etc.
- Level of the ethical analysis: there are situations in which a personal moral code conflicts with the situation, or that the alternatives and consequences do not harmonies with the ethical principles.
- The post-ethical level: in this situation it is added an important and relevant ethical standard code for the individual and the organization in the grounding of the decision.

## 2.2. Cooper's decisional ethical model

Beginning from the economic logical decision-making processes, several types of models were developed (Sinaci, 2017): decision making processes based on character (6 stages), ethical fundamental decision-making processes (8 stages, with dual evaluation, of the ethical nature), rational models. These models are structured on 6 or 8 or 10 stages, according to the importance of the sorting of the decisions based on ethical codes.

A special model is Cooper's model used in the evaluation of the public administration ethics. Here it is brought into the analysis the interests of the organization, with those of the beneficiaries and those of the employees, these being, often, in competition or in conflict. Reason why most of the times the ethical standards are defined in great lines and thus more difficult to evaluate with regard to the need to identify the ethical breaches in the system. For the increase of the responsibility, it is imposed defining as specific as possible some standards for each activity.

Cooper proposed a sequential ethical approach model, beginning from a rational decision-making structuring of an ethical issue, specific for any decision-making process, with accent upon the identification of the adequate alternatives and the qualitative evaluation of the consequences. This model is structured via the following stages:

- The description of the activity
- The identification of the ethical issue (here most of the mistaken interpretations are made)
- Inventorying the alternative action directions
- Projecting the possible consequences
- Grounding an optimal

The distinctive contribution consists in defining an adequate solution or alternative as a four-element system:

- Moral rules: these basic standards, which can be attribute to their alternatives and consequences.
- Defence rules: evaluation and alternative alignment with the larger norms accepted in the professional organisation and the political communities of which we are part of.
- Ethical principles: it is considered a larger framework in which an alternative must comply with the safety of a person, organisation and to support equally the justice, even though some moral values are competitive.
- Self-evaluation rules: it is proposed an additional internal evaluation through which an alternative is framed within its own value system.

We observe that between the ethical norms, the plausible argumentations, the ethical principles and the self-evaluation rules, an ethical decision becomes the space of a complex process for which the fuzzy (nuanced) numbers and the fuzzy logic can provide an answer better suited to the concrete situations.

## 3. Findings

The usage of the nuanced numbers is an important step in the development of the ethical decision evaluation methods. Thus, we aim at contributing to the wish for a unitary knowledge, offering an overview and with an increased comparability capacity. These methods can be used

very easily in the conditions of a society based upon knowledge.

The operating manner with various nuanced evaluations (triangular, trapezoidal, bell etc) is defined via the addition, multiplication, deduction, division or multiplication specific mathematical operations with a scalar.

The challenge is to obtain a nuanced evaluation based on some ethic management specific principles. Operating with the obtained values is a very easy one, and it becomes very easy to apply via the usage of specific programs. Weighted averages can be calculated, ordinal variables can be combined with those of the interval type or with the report-type, non-parametric correlation coefficients can be determined etc.

The abundance and variability of the qualitative and quantitative features from the ethical decision evaluation processes complicate the representation, combination and aggregation in items and synthetic indicators. Usually, the rule of a model uses only a category, obligating the evaluators to limitations in the analysis processes. Moreover, results are reached for which it is needed an ordinal size to be interpreted as being of the interval or report type. Very often linguistic tags are used. By associating a fuzzy number to a numerical or qualitative variable, which comprises also other elements complementary to the research, we consider that the defining, characterisation of a more complex image can be achieved, as well as with an increased comparability degree.

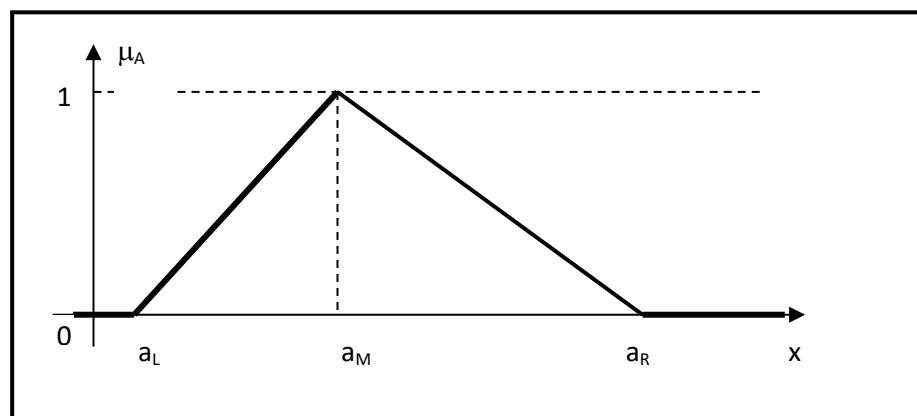
The representation of qualitative and quantitative items via fuzzy numbers is not a new concept. Proposals in this regard can be emphasised in Zadeh (1975), V. Georgescu (1995), Tamura Hatono and M. Umamo (1998), Gil Aluja and Teodorescu (1998), Lazzari and Martinez Panero (2001), Garcia-Lampresta and L. Lamazares (2003), O. Gherasim (2006) etc .

An important step in the development of the ethical decision evaluation processes will represent the usage of triangular fuzzy numbers. For this it is imposed the usage of a new mathematics based upon classes of fuzzy numbers, complex representations and with specific operations.

Definition: A triangular fuzzy number expressed as  $A=(a_L, a_M, a_R) \in F_{tr}$  is defined by its membership function  $\mu_A: \mathbb{R} \rightarrow [0,1]$ , with the following form:

$$\mu_A = \begin{cases} \frac{x - a_L}{a_M - a_L}, & \text{daca } a_L < x < a_M \\ 1, & \text{daca } x = a_M \\ \frac{a_R - x}{a_R - a_M}, & \text{daca } a_M < x < a_R \\ 0, & \text{daca } x \notin (a_L, a_R) \end{cases}, \text{ unde } -\infty < a_L < a_M < a_R < +\infty$$

Figure no. 1 Graphic representation of a triangular fuzzy number



Source: Author's own representation

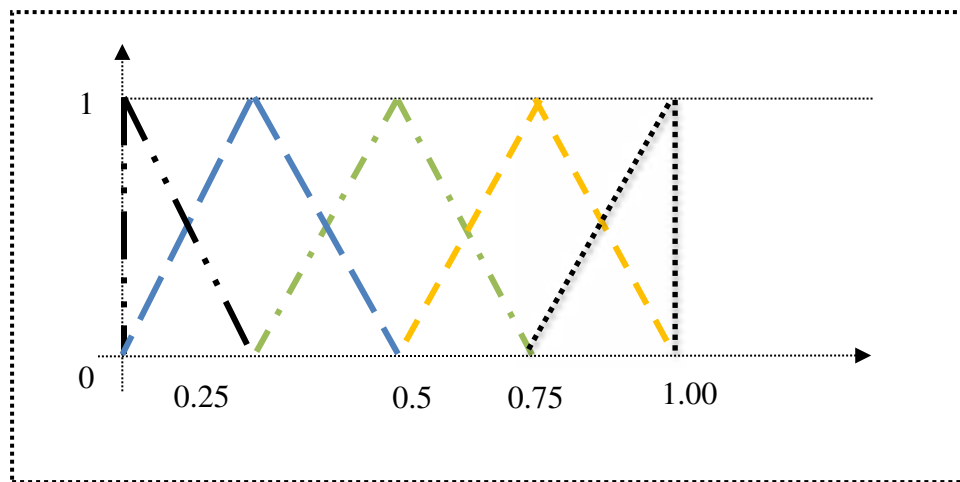
One may notice that  $\mu_A$  is zero in the interval  $(-\infty, a_L)$ , increases linearly up to the value 1 on the segment  $[a_L, a_M]$ , decreases to the value 0 on the segment  $[a_M, a_R]$ , becomes zero for values in the range  $(a_R, +\infty)$ .

Most of the times in obtaining the qualitative appreciations it is used the evaluation of the Likert type. For example, the points of view can be evaluated by using a scale made up of five comparability degree: very good, good, average, weak and very weak. From this point of view, we present a possible transformation of these points of view using the triangular nuanced numbers:

- Very weak (0.00, 0.00, 0.25)
- Weak - (0.00, 0.25, 0.05)
- Average - (0.25, 0.50, 0.75)
- Good - (0.50, 0.75, 1.00)
- Very good - (0.75, 1.00, 1.00)

Graphically, these estimations are presented in Figure 2.

Figure no. 2 Representation of the quality items via the triangular fuzzy numbers



Source: Author's own representation

As the main stages of using fuzzy numbers in the process of making ethical decisions using fuzzy numbers the following steps are proposed:

1. The brief structuring of the context / activity based on the data of the input data, of the socio-economic and ethical information
2. defining the ethical problem by analyzing the organizational objectives, identifying the difficulties, the gaps
3. identifying alternative solutions
4. evaluation of the consequences and formalization of alternative solutions by fuzzy numbers which implies:
  - determining the values that must be maintained or promoted
  - identification of the rules, laws and norms that apply
  - assessing the consequences through quantitative and qualitative characteristics of alternative solutions, their uncertainty and subjectivism
  - choosing the best method of formalizing information by fuzzy numbers (by interval, triangular, trapezoidal number, etc.)
  - formalization of information through a matrix of variants and consequences
5. the hierarchy of alternative solutions
  - identification of the best method of ranking the fuzzy solutions (simple ordering, distance to an optimal one, etc.)
  - ordering solutions;
6. choosing the optimal solution on the basis of an optimization criterion;
7. implementation of the solution
8. evaluation of the solution implementation (feedback)

In our opinion, one of the major challenges lies in performing comparisons and ranking the solutions obtained. Most often, a hoped-for, expected optimal solution takes centre stage. To define it, one needs a complex interdisciplinary approach, which is difficult to achieve and sometimes strictly related to the nature of the problem under consideration, at other times incorporating less objective elements, requiring an active input from specialists. The concept of distance between fuzzy numbers is used at this point and solutions are ranked based on a sequence of comparisons. As the basis of these calculations, one can resort to a fuzzy number considered to be as follows:

an „supremum” ( $T_s = [s_L; s_M; s_R]$ )

an „infimum” ( $T_i = [i_L; i_M; i_R]$ )

An „ideal” point of view ( $T_e = [e_L; e_M; e_R]$ ), different from previous numbers.

Can be used different approach for “distance” between fuzzy numbers:

Hamming distance :

$$\delta(T_a; T_b) = \int |\mu_a - \mu_b| dx$$

Euclid distance :

$$\varepsilon(T_a; T_b) = \int \sqrt{(\mu_a - \mu_b)^2} dx$$

Minkowski distance

$$\rho(T_a; T_b) = \int \left( \sqrt{(\mu_a - \mu_b)^\lambda} \right)^{1/\lambda} dx$$

The (principal and secondary) ordering criteria are defined according to the ordering of the solutions, i.e. ascending or descending.

#### 4. Conclusions

From a practical point of view, several reservations have been voiced about the use of fuzzy numbers. This is due both to difficulties in understanding fuzzy numbers and to the failure to promote these theories in the training programmers targeting specialists in various fields and top managers.

In our view, fuzzy numbers allow the opening up of new perspectives in modelling ethical decision-making situations characterised by irreducible or difficult to absorb difference of assessment and difference on the levels of ethics.

We have demonstrated the ease of use of such theoretical constructs in modern management. We emphasise that the use of associated indicators in defining operations with fuzzy numbers simplifies such operations both in terms of facilitating understanding and of application. This addresses a growing trend observed among specialists in the field, namely the need to make the operations easier to implement and to expand the area of interdisciplinary applicability.

Modelling ethical decision making by means of fuzzy numbers raises specific problems linked to their theory and application due to their complexity and difficulty. Despite these limitations, the method provides a new mode of scientific approach to knowledge.

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