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Prioritization of the Social Approach of Employment Modeled by Plitogenic Sets

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Abstract. Employment can only be understood from different approaches, such as the social, economic, and legal approach. To model employment using logic, it is necessary to take into account that these approaches are usually modeled with different logics, e.g., legality is modeled using deontic logic. Furthermore, each of these approaches intrinsically contains indeterminacy. This paper proposes to use plithogenic sets to combine the different logics used to model employment approaches that also include indeterminacy. This idea responds to the definition of Plithogeny as the concept that combines dissimilar entities of different origin to form new entities as a result of their contradictory or non-contradictory interactions. In this article, the social approach is used as the most important attribute within the plithogenic sets. Although plithogenic sets have been used successfully in solving decision-making problems, as far as the authors know, they had never been used to combine different logics on the same concept. Specifically, we link the neutrosophic modal logic in particular neutrosophic deontic modality to describe the social and legal approaches with neutrosophic logic to describe the economic and political approaches.

Keywords: Employment, social sciences, Plithogeny, plithogenic sets, neutrosophic modal logic, neutrosophic deontic modality.

1 Introduction

For Cabanellas [1], in his Elementary Legal Dictionary, *work* is understood as "The human, physical or intellectual effort, applied to the production or acquisition of wealth, it is any activity susceptible of economic valuation by the task, the time or performance ".

By its intrinsic nature, work reflects a social function, by covering basic needs of individuals, such as: food, housing, health, education. This obliges the States to grant the protectionist character of work, as provided in the Carta Magna where the work is established as a social fact under the protection of The State.

In the same way, work has a human character, since this is the man/woman himself/herself who performs the tasks, as a primitive activity of human beings. From the historical point of view, persons have always needed to work in order to survive, which is what originates the duty of work, guaranteeing the satisfaction of needs that, in turn, gives him/her the character of the right to work. Hence, it is appropriate to point out that both the Ecuadorian Constitution and the current Labor Code stipulate it.

From the international scope, in the preamble to the International Labor Organization (ILO) that was created in 1919, and which is attached to the United Nations (UN), this frames human activity developed through work, noticing: "… That there are working conditions that entail such a degree of injustice, misery and deprivation for large numbers of human beings, that the discontent this causes constitutes a threat to universal peace and harmony; considering that it is urgent to improve these conditions", [2].

The American Declaration of the Rights and Duties of Man from 1948, also recognizes the duty of people to work, within their capacities and possibilities. The labor legal system has a protective nature of human beings that allows them to fully function and where they need to exercise in a subordinate way an activity that is remunerated. So that they can guarantee their life, health, normal physical development, rest, safeguard their morals, good customs, and enjoy economic and social benefits, essential to be able to live a decent life.

Convention 122 of the ILO (1996), on employment policy, establishes that States must propose active policies

that promote full employment, [3]. In Ecuador, in the Constitution of Montecristi, work is considered a right and a social duty and the State must guarantee workers full respect for their dignity, a decent life, fair wages and salaries and the performance of a healthy job, freely chosen and accepted.

Therefore, work is one of the highest values in the legal system of the State, due to its character of preeminence that it has as a human right and that consequently it is protected and promoted.

In this study, work is approached as a social fact; it is understood as a determining factor for the development of nations worldwide and therefore the development of Ecuador as a country. Clad with transcendental importance to achieve a marked influence on the historical-progressive development of this century and an economy that shows a globalized performance.

Hence, it is evident the importance of work in the constitutional rank that is provided in the current National Constitution, where it is stated: "Work is a right and a social duty and an economic right, a source of personal fulfillment and the basis of the economy. The State will guarantee working people full respect for their dignity, a decent life, fair wages and salaries, and the performance of a healthy and freely chosen and accepted job", [4].

According to what has been explained, the aforementioned norm gives labor a series of postulates and principles such as that of irrevocability. In virtue of which it assigns to Ecuadorian State its share of responsibility and guarantee of protection and guardianship, making it responsible of remuneration, optimal working conditions, among other important aspects, such as: the social security, right to work, and social justice. All this protection is contemplated not only in the Constitution but also in the Labor Code and in the International Treaties ratified by the Ecuadorian State. It is worth mentioning the field of Labor Law as a "Social Fact", which justifies giving it the multi-dimensional approach, that is, from the social, political, economic and legal points of view, [5].

In this paper we propose to represent the employment situation of a person, the members of a social group or a community, with the help of the Plithogeny theory, [6,7]. This was introduced by F. Smarandache, who defines Plithogeny as "the genesis or origination, creation, formation, development, and evolution of new entities from dynamics and organic fusions of contradictory and/or neutrals and/or non-contradictory multiple old entities."

Plithogeny pleads for the connections and unification of theories and ideas in any field. As "entities" in his study, Smarandache takes the "knowledge" in various fields, such as soft sciences, hard sciences, arts and letters theories, etc. This theory has proven effectiveness in solving decision-making problems.

Specifically in this paper, we deal with the concept of plithogenic sets. A plithogenic set P is a set whose elements are characterized by one or more attributes, and each attribute may have many values. Two fundamental functions of this concept are the degree of appurtenance of the element x to the set P, and contradiction (dissimilarity) degree which is a function of dissimilarity between each attribute and the dominant attribute, [8-14].

The purpose of this research is to propose a model based on plithogenic sets to evaluate the employment situation of a person or human group from the social point of view. For this, we define the work according to its different approaches, each of them responds to a different logic reflected in the degree of appurtenance. Specifically, we use neutrosophic sets to model the political and economic approaches, while the neutrosophic modal logic ([15]), in particular the neutrosophic deontic modality ([16,17]), serves to model the social and legal approaches, where the social approach is the predominant attribute. Neutrosophic deontic modality generalizes the deontic modality, which is used as the logic of ethics, morality, and law.

The novelty of this article is that plithogenic sets are used as a framework to represent different approaches to the same concept, so that they serve to represent and combine different logics such as deontic logic and neutrosophic logic.

This paper is divided into the following sections: section 2 recalls the basic concepts of plithogenic sets and neutrosophic modal logic; especially the neutrosophic deontic modality is introduced. Section 3 introduces the model of employment from the social attribute point of view based on plithogenic sets. Conclusions are at the end of this paper.

2 Preliminaries

This section summarizes the basic concepts of neutrosophic and plithogenic sets in subsection 2.1. Subsection 2.2 contains the preliminaries of neutrosophic modal logic, and deontic logic.

2.1 Neutrosophic and plithogenic sets

Definition 1: ([18]) Let X be a universe of discourse. A *Neutrosophic Set* (NS) is characterized by three membership functions, $u_A(x), r_A(x), v_A(x) : X \rightarrow \,]^-0, 1^+[$, which satisfy the condition $^-0 \leq \inf u_A(x) + \inf r_A(x) + \inf v_A(x) \leq \sup u_A(x) + \sup r_A(x) + \sup v_A(x) \leq 3^+$ for all x∈X. $u_A(x), r_A(x)$ and $v_A(x)$ denote the membership functions of truthfulness, indetermination and falseness of x in A, respectively, and their images are standard or non-standard subsets of $]^-0, 1^+[$.

NS are used only as a philosophical approach, so *Single-Valued Neutrosophic Set* in Definition 2 is defined to guarantee the applicability of Neutrosophy.

Definition 2: ([18]) Let X be a universe of discourse. A *Single-Valued Neutrosophic Set* (SVNS) A on X is an object of the form:

$$A = \{\langle x, u_A(x), r_A(x), v_A(x)\rangle : x \in X\} \tag{1}$$

Where $u_A, r_A, v_A : X \rightarrow [0,1]$, satisfy the condition $0 \leq u_A(x) + r_A(x) + v_A(x) \leq 3$ for all $x \in X$. $u_A(x), r_A(x)$ and $v_A(x)$ denote the membership functions of truthfulness, indetermination and falseness of x in A, respectively. For convenience a *Single-Valued Neutrosophic Number* (SVNN) will be expressed as $A = (a, b, c)$, where $a, b, c \in [0,1]$ and satisfies $0 \leq a + b + c \leq 3$.

Neutrosophic Logic (NL) extends fuzzy logic and a proposition P is characterized by three components:

$$NL(P) = (T, I, F) \tag{2}$$

Where component T is the degree of truthfulness, F is the degree of falsehood and I is the degree of indetermination. T, I, and F belong to the interval [0, 1], and they are independent from each other, [19].

Definition 3. ([6]) A *plithogenic set* (P, A, V, d, c) is a set P that includes numerous elements described by a number of attributes $A = \{\alpha_1, \alpha_2, \ldots, \alpha_m\}$, $m \geq 1$, which has values $V = \{v_1, v_2, \ldots, v_n\}$, for $n \geq 1$. For V there are two main features attributes values, they are the *appurtenance degree function $d(x, v)$* of the element x, with respect to some given criteria, and the *contradiction (dissimilarity) degree function $c(v, D)$* which is the one between each attribute value and the most important (dominant) one.

Given A a non-empty set of uni-dimensional attributes $A = \{\alpha_1, \alpha_2, \ldots, \alpha_m\}$, $m \geq 1$, and let $\alpha \in A$ be an attribute with its value spectrum is the set S, where S can be defined as a finite discrete set, $S = \{s_1, s_2, \ldots, s_l\}$ $l \in [1, \infty)$, or infinitely countable set $S = \{s_1, s_2, \ldots\}$, or infinitely uncountable (continuum) set $S = (a, b)$, $S = (a, b]$, $S = [a, b)$, or $S = [a, b]$.

Definition 4. ([6]) The *degree of appurtenance* is defined for fuzzy, intuitionistic fuzzy, or neutrosophic degree of appurtenance to the plithogenic set. It is defined as follows:

$$\forall x \in P, d: P \times V \rightarrow \mathcal{P}([0,1]^z) \tag{3}$$

$d(x, v)$ is a subset of $[0,1]^z$, $\mathcal{P}([0,1]^z)$ is the power set of $[0,1]^z$, where $z = 1, 2, 3$, for fuzzy, intuitionistic fuzzy, and neutrosophic degrees of appurtenance, respectively.

Definition 5. ([6]) The attribute value *contradiction degree function* is defined as follows:

$$c: V \times V \rightarrow [0,1] \tag{4}$$

Such that $c(v_1, v_2)$ represents the dissimilarity between two attribute values v_1 and v_2, and satisfies the following axioms:

- $c(v_1, v_1) = 0$, that means the contradiction degree between the attribute value and itself is zero,
- $c(v_1, v_2) = c(v_2, v_1)$.

Definition 6. Given a plithogenic set (P, A, V, d, c) a *Plithogenic Neutrosophic Aggregation Operator* is defined as in Equation 3:

$$(a_1, a_2, a_3)AND_p(b_1, b_2, b_3) = \Big((1 - \bar{c})(a_1 \wedge_F b_1) + \bar{c}(a_1 \vee_F b_1), \frac{1}{2}[a_1 \wedge_F b_1 + a_1 \vee_F b_1], (1 - \bar{c})(a_1 \vee_F b_1) + \bar{c}(a_1 \wedge_F b_1)\Big) \tag{5}$$

Where $\bar{c} \in [0,1]$, $\wedge_F$ is a t-norm and $\vee_F$ is a t-conorm.

It is a *Plithogenic Neutrosophic Intersection* when $\bar{c} = 0$ and it is a *Plithogenic Neutrosophic Union* when $\bar{c} = 1$, [6]. This aggregator is more accurate than both the n-norms and n-conorms between neutrosophic sets.

A plithogenic neutrosophic set can be converted into a crisp value using the following formula, [14]:

$$S(T, I, F) = \frac{1}{3}(2 + T - I - F) \tag{6}$$

2.2 Neutrosophic modal logic

The neutrosophic modal logic is a modal logic where modalities are defined in a neutrosophic framework, [15]. Some types of neutrosophic modalities are the following:

- Neutrosophic Alethic Modalities (related to truth) has three neutrosophic operators:
  - i. Neutrosophic Possibility: It is neutrosophically possible that $\mathcal{P}$.
  - ii. Neutrosophic Necessity: It is neutrosophically necessary that $\mathcal{P}$.
  - iii. Neutrosophic Impossibility: It is neutrosophically impossible that $\mathcal{P}$.
- Neutrosophic Temporal Modalities (related to time):
  - i. It was the neutrosophic case that $\mathcal{P}$.
  - ii. It will neutrosophically be that $\mathcal{P}$.
  - iii. It has always neutrosophically been that $\mathcal{P}$.
  - iv. It will always neutrosophically be that $\mathcal{P}$.
- Neutrosophic Epistemic Modalities (related to knowledge):

    i. It is neutrosophically known that $\mathcal{P}$.
-   Neutrosophic Doxastic Modalities (related to belief):
    i. It is neutrosophically believed that $\mathcal{P}$.
-   Neutrosophic Deontic Modalities:
    i. It is neutrosophically obligatory that $\mathcal{P}$.
    ii. It is neutrosophically permissible that $\mathcal{P}$.

Usually, in classical modal logic the alethic modalities are defined as modal logic. It is characterized in the neutrosophic framework as follows:

$\lozenge_N \mathcal{P}$ means "It is (t, i, f)-possible that $\mathcal{P}$", where "(t, i, f)-possible" means it is t% possible (chance that $\mathcal{P}$ occurs), i % indeterminate (indeterminate-chance that $\mathcal{P}$ occurs), and f % impossible (chance that $\mathcal{P}$ does not occur), using neutrosophic statistics, [20-25].

Let $\mathcal{P}(t, i, f)$ be a neutrosophic proposition, with t, i, f subsets of [0, 1], then the neutrosophic truth-value of the neutrosophic possibility operator is: $\lozenge_N \mathcal{P} = (sup(t), inf(i), inf(f))$.

On the other hand, the Neutrosophic Necessity Operator: $\square_N \mathcal{P}$ means "It is (t, i, f)-necessary that $\mathcal{P}$", where "(t, i, f)-necessity" means t % necessary (chance that $\mathcal{P}$ occurs), i % indeterminate (indeterminate-chance that $\mathcal{P}$ occurs), and f % unnecessary (chance that $\mathcal{P}$ will not occur).

Let $\mathcal{P}(t, i, f)$ be a neutrosophic proposition, with t, i, f subsets of [0, 1], then the neutrosophic truth value of the neutrosophic necessity operator is: $\square_N \mathcal{P} = (inf(t), sup(i), sup(f))$.

The neutrosophic truth threshold is TH $= \langle T_{th}, I_{th}, F_{th} \rangle$, where T_{th}, I_{th}, F_{th} are subsets of [0, 1].

Then we say the proposition $\mathcal{P}(t, i, f)$ is neutrosophically true if:

$inf(t) \geq inf(T_{th})$ and $sup(t) \geq sup(T_{th})$;

$inf(i) \leq inf(I_{th})$ and $sup(i) \leq sup(I_{th})$;

$inf(f) \leq inf(F_{th})$ and $sup(f) \leq sup(F_{th})$.

When T_{th}, I_{th}, F_{th} and t, i, f are single-valued numbers from the interval [0, 1], then we have:

The proposition $\mathcal{P}(t, i, f)$ is neutrosophically true if:

$t \geq T_{th}$;

$i \leq I_{th}$;

$f \leq F_{th}$.

Neutrosophic Semantics of the Neutrosophic Modal Logic are defined as the ordered pair $\langle G_N, \mathcal{R}_N \rangle$, where G_N is a non-empty neutrosophic set, whose elements are called *possible neutrosophic worlds* and $\mathcal{R}_N$ is a neutrosophic binary relation, which is called *neutrosophic accessibility relation* between the possible neutrosophic worlds. Consequently, given $w_N, w_N' \in G_N$, $w_N \mathcal{R}_N w_N'$ represents that the neutrosophic world w_N' is *neutrosophically accessible* from the neutrosophic world w_N.

The formulas of the neutrosophic modal logic are the following:

  1. Every neutrosophic propositional variable $\mathcal{P}$ is a neutrosophic formula.

  2. If A, B are neutrosophic formulas, then $\neg_N A, A \wedge_N B, A \vee_N B, A \rightarrow_N B, A \leftrightarrow_N B, \lozenge_N A$, and $\square_N A$, are also neutrosophic formulas, where $\neg_N, \wedge_N, \vee_N, \rightarrow_N, \leftrightarrow_N, \lozenge_N$, and $\square_N$ represent the neutrosophic negation, neutrosophic intersection, neutrosophic union, neutrosophic implication, neutrosophic equivalence, neutrosophic possibility operator, and neutrosophic necessity operator, respectively.

Definition 7. ([15]) The *Neutrosophic (t, i, f)-Assignment* is a neutrosophic mapping:

$v_N: S_N \times G_N \rightarrow [0,1] \times [0,1] \times [0,1]$ (7)

Where, for any neutrosophic proposition $\mathcal{P} \in S_N$ and for any neutrosophic world w_N, it is defined:

$v_N(\mathcal{P}, w_N) = (t_{w_N}, i_{w_N}, f_{w_N}) \in [0,1] \times [0,1] \times [0,1]$ which is the neutrosophic logical truth-value of the neutrosophic proposition $\mathcal{P}$ in the neutrosophic world w_N.

3 The plithogenic model of employment

It is intended in this first part of the section to give an updated vision of the economic, social, political, and legal approaches of labor, as a social fact in the Ecuadorian legal system. The approaches explained below:

Legal approach:

To address this approach, work must be understood as the provision of service, performed in favor of a natural or legal person in exchange for remuneration or salary. In the Ecuadorian Legislation, it is given a protectionist character by the State and certain principles are attributed to this ([4]): Irrevocability, Intangibility, Reality about forms or appearances, More favorable interpretation, Nullity of unconstitutional acts, Progressivity of Rights.

It should be noted that General Principles of Labor Law are understood to be those permanent norms that serve as the basis for the labor legal system. Which in turn serve as the basis for the substantive and adjective law in this matter and that these principles must be respected as they are irrevocable and become part of the assets of the workers.

With regard to the social fact of work, a special protection by the State for workers is evidenced, when the Legislation indicates that the State will guarantee the right to work, not only in those principles mentioned above,

but also when it establishes in Article 33 of its Carta Magna: "... The State shall guarantee working people full respect for their dignity, a decent life, fair wages and salaries and the performance of a healthy and freely chosen or accepted job."

All these postulates, previously mentioned, reaffirms social justice and seek the full development of social legislation, based on the fact that just as there are political and legal institutions that protect the right to capital and private property, there are also others that focus on protect the creative activity of work as a social fact.

For all the mentioned above, it is evident that all social activity in the life of human being generates consequences, by the simple fact of relating and living collectively from which legal relationships arise, which in turn bring consequences and also legal effects.

Social approach:

Understanding work, as a lawful exercise of intellectual and physical faculties of a worker, whether for his/her own benefit or that of the others, work as a social function is contemplated in the International American Charter of Social Guarantees as a Declaration of the social rights of the worker, to which Ecuador is engaged as an American State.

It can be highlighted that work as a social fact is essential to boost the economy of the countries. That coupled with the capital factor that most of the time is provided by the employer and that serves as a complement. Sought from this criterion and just as society benefits, the worker and therefore his/her family also benefit as the fundamental nucleus of the society.

Economic approach:

Economically speaking, work involves the exchange of goods and services that suppose the satisfaction of human needs, attributing to work the characteristic of being a productive activity, as Amate et al. pointed out in their work ([26]), whom considers work as a determining factor in the economic and social development of the countries.

From another perspective, for Adam Smith cited by Hurtado ([27]): "labor was considered an exact unit of measurement of quantified value, but not the price factor". David Ricardo supported him by saying that all production costs are made of labor costs that are paid either directly or accumulated to capital and that from these positions arises the theory that prices would depend on the amount of work that was incorporated into the production of the mentioned goods and services.

Undoubtedly, the State supports the economic approach that is attributed to work, each time that, in the Legislation, it is indicated that it must be the guarantor of providing sources of employment, or better said in constitutional terms, guaranteeing full employment.

Political approach:

Work is the object of the Public Administration of the States, through their respective Ministries, as is the case in the Ecuadorian state of the Ministry of Labor, whose purpose is to protect workers, increasing the productive apparatus and strengthening social peace. Importantly, it should be mentioned that Ecuador has been a member of the International Labor Organization (ILO) since 1934 and that therefore it is obliged to adopt International Standards and adapt them to national legislation.

Remunerated work is the dominant form of employment, which justifies intervention by the State through the National Executive and through the Ministry of Labor, which is one of its attributions to decree wage increases guided by the protective nature of work as a social fact.

Within this perspective, at the discretion of Sabino ([28]), Social Policy can be understood as the "set of actions developed by the State, at any of its levels, aimed at increasing the well-being of the population and solving what at a given moment are defined as social problems ".

The important point is to understand these policies as having a public nature aimed at satisfying the needs of citizens and the groups that make up the nations, by investing resources that allow improving the quality of life, avoiding unemployment and reducing poverty rates.

In this paper we will represent the concept of work through the plithogenic set (P, A, V, d, c), where P contains the elements of the plithogenic set (workers). A is the set of attributes $A = \{\alpha_1, \alpha_2, \alpha_3, \alpha_4\}$ such that α_1 represents the attribute "social approach", α_2 the "legal approach", α_3 the "economic approach" and α_4 the "political approach".

The values of V are described as follows:
- For the social approach:

a_1 = "The result of the work contributes significantly to the public purse",

a_2 = "The prosperity and quality of work have a positive influence on the prosperity and quality of life of the community, from the social point of view",

a_3 = "The company or business from which the job is based invests in social and public works",

a_4 = "The company or business from which the employment is based exerts a significant positive influence on the social problems of the community, such as the decrease in crime, unemployment, among other negative aspects",

a_5 = "Employment contributes positively to the level of family life of community members",

a_6 = "The worker receives a fair wage",

a_7 = "The worker has not been discriminated for reasons such as gender, race, ethnicity, sexual preference, or so",

a_8 = "The worker's workplace complies with all the minimum hygienic parameters, such as the existence of necessary means of protection",

a_9 = "The worker is not underemployed",

a_{10} = "The worker is not unemployed",

a_{11} = "The worker receives compensation from the employer in the event of dismissal".

- For the legal approach:

b_1 = "Employers respect the legal rights of their workers",

b_2 = "Employers respect all legal regulations that correspond to them",

b_3 = "The company or business has not been legally prosecuted for acts such as tax evasion, corruption, fraud, abuse of power, illegal hiring of immigrants, among others",

b_4 = "The worker is legally employed, i.e., works under a legal contract",

b_5 = "The worker complies with the law of the country, e.g., he/she is not an illegal employed immigrant."

- For the economic approach:

u_1 = "The result of the work is effective",

u_2 = "The result of the work is efficient",

u_3 = "The result of the work produces sufficient profits for the company or business",

u_4 = "The result of the work is profitable for the company".

- For the political approach:

w_1 = "The worker feels that the Ministry of Labor complies with the established labor policies",

w_2 = "The worker feels that the country's state policy benefits his/her status",

w_3 = "The worker receives compensation from the State in case of dismissal".

V is a 4-dimensional set, with elements (a_i, b_j, u_k, w_l) (i = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11; j = 1, 2, 3, 4, 5; k = 1, 2, 3, 4; l = 1, 2, 3). Thus, V contains 660 elements.

If x is a generic worker, then $d(x, v) \subset [0,1]$ such that if $v = a_i$ (i = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11) or $v = b_j$ (j = 1, 2, 3, 4, 5) we define $d(x, v) = v_N(\mathcal{P}, w_N)$, where $\mathcal{P}$ is the proposition expressed by a_i or b_j and w_N is the possible world that corresponds to a legal or moral judgment. In particular, we recommend using the operator $\mathcal{OP}$ which means "It is neutrosophically obliged that $\mathcal{P}$".

This logical calculation must comply with certain axioms that are used in classical modal logic with deontic modality, one of them is the following:

$\mathcal{O}_N\mathcal{P} \equiv \neg_N \wp_N \neg_N \mathcal{P}$, which means "It is neutrosophically obligatory that $\mathcal{P}$" is equivalent to say "It is not neutrosophically permissible that neutrosophically no $\mathcal{P}$", where $\wp_N$ is the operator of neurosophic permission, whereas $\mathcal{O}_N$ is the operator of neutrosophic obligation.

Additionally, the equivalence $\mathcal{F}_N\mathcal{P} \equiv \neg_N \wp_N \mathcal{P}$ means "It is neutrosophically forbidden that $\mathcal{P}$" is equivalent to say "It is not neutrosophically permissible that $\mathcal{P}$".

Here the neutrosophic negation operator is defined as follows:

$\neg_N(T, I, F) = (F, 1 - I, T)$ (8)

Exactly, we propose to define $d(x, \mathcal{P}) = \mathcal{O}_N\mathcal{P}$ or $d(x, \mathcal{P}) = \neg_N \wp_N \neg_N \mathcal{P}$.

On the other hand, $d(x, u_k)$ and $d(x, w_l)$ are single-valued neutrosophic sets (k = 1, 2, 3, 4; l = 1, 2, 3), which can be taken from Table 1, where linguistic terms are associated with plithogenic numbers.

Linguistic expressions	Plithogenic number (T, I, F)
Very poor (VP)	(0.10, 0.75, 0.85)
Poor (P)	(0.25, 0.60, 0.80)
Medium poor (MP)	(0.40, 0.70, 0.50)
Medium (M)	(0.50, 0.40, 0.60)
Medium Good (MG)	(0.65, 0.30, 0.45)
Good (G)	(0.80, 0.10, 0.30)
Very Good (VG)	(0.95, 0.05, 0.05)

Table 1: Linguistic expressions for rendering classification of substitutions. Source [14].

Finally, c is the contradiction degree such that the values of each uni-dimensional attribute are compared to the dominant value of the attribute with respect to dissimilarity. We recommend to fix D = a_2 as the dominant attribute value of the social approach and the other approaches. For aggregating the results of all workers, Equation 5 is used incorporating the results of contradiction degree.

For illustrating the proposed model, we offer a hypothetical example.

Example 1.

Let us assume that four workers x_1, x_2, x_3, and x_4 of Company M are interviewed about 23 of his/her characteristics of the employment, which are those a_i, b_j, u_k, w_l (i = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11; j = 1, 2, 3, 4, 5; k = 1, 2, 3, 4; l = 1, 2, 3). In relation with the social and legal approaches, it is asked to the worker about there is obligation (or there is not permitted no) a_i, b_j. With respect to the economic and political aspects u_k, w_l, it is used Table 1, nevertheless, for the political approach the neutrosophic modal logic can be utilized.

The contradiction degree is preliminarily defined with the following vector:

$c = (0.1, 0, 0, 0, 0.1, 0.1, 0.1, 0.1, 0.1, 0.1, 0.1, 0.25, 0.25, 0.25, 0.25, 0.25, 0.3, 0.3, 0.3, 0.3, 0.2, 0.2, 0.2)$ Let us note that we prioritized the social aspects, which are those having the smallest dissimilarity degrees. Additionally, we compared in dissimilarity every value with respect to the social attributes values.

The answers are summarized in Table 2 in form of plithogenic numbers or single-valued neutrosophic numbers.

Aspect to evaluate/worker	x_1	x_2	x_3	x_4
It is obliged that a_1	(0.25, 0.60, 0.80)	(0.40, 0.70, 0.50)	(0.25, 0.60, 0.80)	(0.10, 0.75, 0.85)
It is obliged that a_2	(0.25, 0.60, 0.80)	(0.50, 0.40, 0.60)	(0.10, 0.75, 0.85)	(0.25, 0.60, 0.80)
It is obliged that a_3	(0.10, 0.75, 0.85)	(0.40, 0.70, 0.50)	(0.10, 0.75, 0.85)	(0.10, 0.75, 0.85)
It is obliged that a_4	(0.25, 0.60, 0.80)	(0.25, 0.60, 0.80)	(0.25, 0.60, 0.80)	(0.10, 0.75, 0.85)
It is obliged that a_5	(0.10, 0.75, 0.85)	(0.50, 0.40, 0.60)	(0.10, 0.75, 0.85)	(0.25, 0.60, 0.80)
It is obliged that a_6	(0.25, 0.60, 0.80)	(0.40, 0.70, 0.50)	(0.25, 0.60, 0.80)	(0.25, 0.60, 0.80)
It is obliged that a_7	(0.10, 0.75, 0.85)	(0.25, 0.60, 0.80)	(0.10, 0.75, 0.85)	(0.25, 0.60, 0.80)
It is obliged that a_8	(0.10, 0.75, 0.85)	(0.25, 0.60, 0.80)	(0.40, 0.70, 0.50)	(0.25, 0.60, 0.80)
It is obliged that a_9	(0.10, 0.75, 0.85)	(0.40, 0.70, 0.50)	(0.10, 0.75, 0.85)	(0.10, 0.75, 0.85)
It is obliged that a_{10}	(0.25, 0.60, 0.80)	(0.25, 0.60, 0.80)	(0.25, 0.60, 0.80)	(0.10, 0.75, 0.85)
It is obliged that a_{11}	(0.25, 0.60, 0.80)	(0.50, 0.40, 0.60)	(0.25, 0.60, 0.80)	(0.25, 0.60, 0.80)
It is obliged that b_1	(0.40, 0.70, 0.50)	(0.50, 0.40, 0.60)	(0.65, 0.30, 0.45)	(0.40, 0.70, 0.50)
It is obliged that b_2	(0.50, 0.40, 0.60)	(0.65, 0.30, 0.45)	(0.50, 0.40, 0.60)	(0.40, 0.70, 0.50)
It is obliged that b_3	(0.40, 0.70, 0.50)	(0.40, 0.70, 0.50)	(0.50, 0.40, 0.60)	(0.40, 0.70, 0.50)
It is obliged that b_4	(0.40, 0.70, 0.50)	(0.40, 0.70, 0.50)	(0.40, 0.70, 0.50)	(0.40, 0.70, 0.50)
It is obliged that b_5	(0.65, 0.30, 0.45)	(0.50, 0.40, 0.60)	(0.65, 0.30, 0.45)	(0.40, 0.70, 0.50)
u_1	(0.80, 0.10, 0.30)	(0.65, 0.30, 0.45)	(0.95, 0.05, 0.05)	(0.65, 0.30, 0.45)
u_2	(0.65, 0.30, 0.45)	(0.80, 0.10, 0.30)	(0.95, 0.05, 0.05)	(0.80, 0.10, 0.30)
u_3	(0.65, 0.30, 0.45)	(0.80, 0.10, 0.30)	(0.95, 0.05, 0.05)	(0.65, 0.30, 0.45)
u_4	(0.95, 0.05, 0.05)	(0.80, 0.10, 0.30)	(0.80, 0.10, 0.30)	(0.80, 0.10, 0.30)
w_1	(0.25, 0.60, 0.80)	(0.10, 0.75, 0.85)	(0.40, 0.70, 0.50)	(0.25, 0.60, 0.80)
w_2	(0.25, 0.60, 0.80)	(0.25, 0.60, 0.80)	(0.65, 0.30, 0.45)	(0.10, 0.75, 0.85)
w_3	(0.40, 0.70, 0.50)	(0.10, 0.75, 0.85)	(0.50, 0.40, 0.60)	(0.10, 0.75, 0.85)

Table 2: Workers' answers to the questions.

Considering a_2 is the dominant characteristic we obtain $(0.14087, 0.59671, 0.84689)$ from aggregating the values of x_1, $(0.048006, 0.636014, 0.943353)$ corresponds to those of worker x_2, $(0.27598, 0.37484, 0.77720)$ to x_3, and $(0.040594, 0.662490, 0.946633)$ to x_4 by using Equation 5. Let us note we selected D = a_2 the dominant attribute value, and we compare it with the other values, even though they correspond to other attributes, this is because of we are prioritizing the social advantages of the employment. $(0.040594, 0.57905, 0.946633)$ is the plithogenic neutrosophic intersection of the values for all the workers, and 0.17164 is the crisp value which is obtained by formula 6. That means Company M has a not good performance with respect to employment from the social viewpoint.

Conclusion

This paper introduces a model of employment based on plithogenic sets. Since Plithogeny is defined as a philosophical theory where new entities are obtained from the interaction, sometimes contradictory, among old entities, it is an adequate theory to represent the four different approaches to the employment: legal, social, economic, and political. Plithogenic sets allow hybridizing the neutrosophic logic with neutrosophic modal logic, particularly the deontic modality. Deontic logic is usually used to model the syntax and semantic related to moral and legal questions, thus, we model legal and social approaches for employment using this logic. On the other hand, neutrosophic logic is applied to model economic and political approaches. This combination of different

semantics is possible due to plithogenic sets. To our knowledge, this is the first time that plithogenic sets are used to model employment situations.

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