



## Modeling Internal Communication in Multicultural Organizations using Neutrosophic Plithogenic Logic

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### Abstract

In an increasingly multicultural world, workforces become more diverse, and the challenge of internal communications exacerbates. What one group deems clear communication can easily be reinterpreted, countered or found invalid by another group valuing different cultural mores, norms, and expectations. As these issues grow, not only does organizational coherence suffer, but also strategic impact potential fails as globalized realities emerge. There becomes a need for a model that successfully implements the nuance and indeterminacy of such communicative interactions. While models of intercultural communications exist, they often operate on a binary method of understanding that fails to acknowledge the simultaneous presence of varying levels of truth, indeterminacy, and untruths. This is where neutrosophic plithogenic logic intervenes as the advanced form through which these properties can be modeled to suggest cognitive/emotional/symbolic determination as a single potentialized system of assessment. Thus, the challenge emerges to neutralize indeterminacy by fluidly responding to the communicative elements relative to what is present at any given moment over time. Neutrosophic Plithogenic Logic emerges as a viable interdisciplinary approach to understanding internal communication by theoretical and practical means - using epistemology through organizational studies fields and management feasibility - as it successfully presents the shifting and multivalent form of such a communicative process within increasingly multicultural dynamics when existing reconciled methods fail. This contribution is theoretical - as it creates a tool for fields of study to manage structural ambiguity - and practical - for management purposes - as it fosters a model for inclusion in resilient, contextually viable messaging design.

**Keywords:** Internal Communication; Multiculturalism; Plithogenic Logic; Neutrosophy; Indeterminacy; Uncertainty Management; Complex Organizations

### 1. Introduction

Internal communication in multicultural organizations proves to be a key component of operational efficiency and strategic integration in the respect of present business globalization. Multinational markets and geographically dispersed teams create collaborative endeavors across cultural divides; therefore, there is a unique challenge in sharing and understanding organizational messages. The complexity lies within the inherent plurality of such dynamic developments, which is not only linguistic but also based on diverging cognitive approaches, socio-cultural appreciations, and anticipated developments [1]. The link between the quality of internal communication and employee satisfaction, creativity, and financial achievements in multinational companies has only been recently spotlighted by academic research [2]. Thus, understanding a process that could significantly affect viability becomes

an operational necessity for organizational sustainability. Economic globalization and the possibility of information flow have exposed actors to different organizational cultures/nations more frequently than ever before, creating a communicative negotiation space all of the time. This article investigates the significant part relative to how institutions' messages become reinterpreted or, at times, compromised in a multicultural arena. Importance lies in how the management of such communicative considerations can be changed from a uni-lateral endeavor into a bi-lateral one with cultural awareness.

Historically, organization studies grew from a mechanical approach to a hierarchically defined one to interpretive and symbolic suggestions. Classical theories provided an understanding of internal communication used for the efficient transmission of information but could not cultivate the understanding that there was a neutral channel established for reports and guidelines. However, as managerial thinking evolved over time, there was growing awareness that corporate culture and subjectivity relative to meaning construction were important [3]. Growing distinction between cultures through the understanding of Hofstede's cultural dimensions, later adapted by Trompenaars' cultural dimensions, provided scholars with generalizable ideas relative to intercultural distinctions per nationality [4]. However, currently, culture as a stable variable is being questioned due to higher levels of hybridity, transcultural identities, and the fluidity of digital workspaces [5]. This conceptual growth has enhanced our understanding of the phenomenon but has proven models inadequate for successfully achieving understanding in real-time due to intercultural communication being so paradoxical and ambiguous.

The central problem that outlines this research has to do with conventional communication models being ineffective in capturing the realities of partial truths, perceptual indeterminacies, and inconsistent interpretations at multicultural internal communication flows. Too often, organizations develop messages based on one message perceived without a situational aspect; ironically, one announcement can be perceived as truthful by one culture, ambiguous by another, and potentially untruthful by yet another. Yet it is this multivocality that creates systematic misunderstandings, reduces trustworthiness, and limits strategic integration. Thus, research question - how can formal models be applied to map out how internal communication flows operate in multicultural settings? - comes from the reality that on-the-ground solutions based on style guides do not work. Empirically measured success finds that dynamic documents must support documents in professional endeavors; style guides are too rigid for cultural complexities [6].

The scale of this problem is much larger than any one person can comprehend relative to digitalization and virtual team formations where non-verbal contextual aspects are reduced and interpretation is more unclear than ever before. A message can be received via email or note board on a collaborative platform where various interpretations can come from various cultural lenses that create emotional and cognitive reactions reducing cohesion and creative team building [7]. Unfortunately, for managers, there are no predictive devices that can quantify or accommodate for indeterminacy. Thus, analysts are left without assessable definitions that provide diagnoses, conflict anticipation operations, or strategies with resilience to relevant communication frame. The problem is epistemic - there must be some logic to the overlapping truths without falling into gross generalizations where they lose their worth - a message can be clear as mud, certain yet doubtful; but to what degree is it so?

In such a case with real-time messaging problems due to external sources intermingling from internal sources, current solutions fall short based on symbolic operations or conventional statistical analysis. Fuzzy logic handles vagueness in terms of quantitative output; however, it is neither systemic nor comprehensive nor functional. Qualitative research is important but fails due to lacking formalized modeling appeal that creates speculative power on mass levels. Therefore, there is a gap in both theoretical and applied literature solutions over practical approaches that render outcomes applicable - and neutrosophic plitogenic logic grows from such realms of plitogenic potential readings between perceived qualities and their contradictory functions.

Neutrosophic logic was established by Smarandache as every proposition can be observed through three independent perspectives - truth value (T), indeterminacy (I), falsity value (F) - that can mathematically substantiate ambiguous solutions for boundaries less clear. Plitogenic logic is the proposition added by neutrosophic logic that establishes "contradictory attributes" and whatever "contradiction function" establishes the level of contrarianism between them - with multicultural communication problems - one attribute can be "how clear this message is," the other could be "how offending it might be". The goal is to create multidimensionality without homogenizing what shouldn't be homogenized but instead adding it within a framework that substantiates plurality.

Thus, based on neutrosophic plitogenic logic will design and apply an internal communication model appropriate for multicultural organizations where its objective is to formalize what types of interpretations can apply based on varying filters appreciated through linguistic transparency. Thus, appropriate plitogenic referential attributes will be attributed to multicultural measurement - truthful rendering fidelity to intended tone - connotative capacity per receptor - and national culture percent reflection. Levels of contradiction functions will define friction between operating attributes.

This will be accomplished through a case study within a multinational corporation due to real-world demands - a

set of real internal messages will be analyzed through empirical communication efforts for perceptions voiced by people working for different national branches.

Expected results will contribute theoretical organizational communicative implications via new phenomenological workings. Expected results from practical implications will offer either communication professionals or organizational leaders an analytic tool to find points of intercultural friction that create misunderstandings as well as anticipate means through which more means that are resilient may exist. Ultimately, this work will bridge gaps between theoretical complexity over practical communication management efforts because it is time to have an approach as complex as contested ideological international settings bleed into intercultural professionals within today's divisions.

## 2. Related Works.

### 2.1. On plitogenic logic

Let us denote by  $P$  plitogenic logical proposition one that is categorized by many degrees of truth values for many corresponding attribute values (or random variables) that characterize this proposition [8,9]. It is a pluri-logic.

Thus, we will denote it by  $P(V_1, V_2, \dots, V_n)$ ,  $n \geq 1$ , such that  $V_1, V_2, \dots, V_n$  they are the values of the attributes or random variables that define, individually to some extent, the truth value of  $P$ .

These random variables can be independent of each other or have some degree of dependence. The degree of independence or dependence between two random variables is used to define the conjunction operator used to calculate the cumulative truth of the proposition  $P$ .

Random variables can be, namely, classical, fuzzy, fuzzy intuitionistic, indeterminate, neutrosophic, etc.

$P(V_1) = t_1$  denotes the truth value of  $P$  for the random variable  $V_1$ ,

$P(V_2) = t_2$  denotes the truth value of  $P$  for the random variable  $V_2$ ,

...

$P(V_n) = t_n$  denotes the truth value of  $P$  for the random variable  $V_n$ .

$V_1, V_2, \dots, V_n$  They are associated with any type of probability distribution,  $P(V_1), P(V_2), \dots, P(V_n)$ .  $P$  It is characterized by  $n$  Probability distributions or  $n$  sub-truth values. A *cumulative truth value* of the logical proposition.  $P$  It is obtained by combining  $P(V_1), P(V_2), \dots$ , and  $P(V_n)$ .

According to the values taken,  $t_1, t_2, \dots, t_n$  we have the type of Plitogenic Logic:

1. For  $t_1, t_2, \dots, t_n \in \{0, 1\}$ , such that 0 represents falsehood and 1 represents truth, then it is called plitogenic (classical) *Boolean logic*.
2. For  $t_1, t_2, \dots, t_n \in [0, 1]$ , such that  $\exists i t_i \in (0, 1)$ , then it is called *Plitogenic Fuzzy Logic*, which is divided according to the following classification:
  - a. *Single-valued plitogenic fuzzy logic*, if  $t_1, t_2, \dots, t_n$  they are (sharp) single-valued numbers in  $[0, 1]$ .
  - b. *Plitogenic fuzzy logic with subset values* (such as interval values, vacillating values, etc.), when  $t_1, t_2, \dots, t_n$  there are subsets (intervals, vacillating subsets, etc.) in  $[0, 1]$ .
3. It is a *polygenic intuitionistic fuzzy logic* where  $\forall j = 1, 2, \dots, n$ ;  $P(V_j) = (t_j, f_j)$ ,  $t_j, f_j \in [0, 1]$ , and  $t_j + f_j \leq 1$ , where  $t_j$  are the degrees of truth and  $f_j$  are the degrees of falsehood.  $P$  It is classified by:
  - a. *Single-valued intuitionistic fuzzy logic*, if all  $t_1, t_2, \dots, t_n$  and  $f_1, f_2, \dots, f_n$  are single-valued numbers in  $[0, 1]$ .
  - b. *Intuitionistic polygenic fuzzy logic with subset values*, where all  $t_1, t_2, \dots, t_n$  and  $f_1, f_2, \dots, f_n$  are subsets in  $[0, 1]$ .
4. If  $V_1, V_2, \dots, V_n$  they are indeterminate (neutrosophic) functions, with vague or unclear arguments and/or values, then it is a *Plitogenic Indeterminate Logic*.
5. It is a *plitogenic neutrosophic logic* when  $\forall j = 1, 2, \dots, n$ ;  $P(V_j) = (t_j, i_j, f_j)$ ,  $t_j, i_j, f_j \in [0, 1]$ , such that,  $t_j$  are the degrees of truth,  $i_j$  are the degrees of indeterminacy, and  $f_j$  are the degrees of falsity.  $P$  It is classified by:
  - a. *Neutrosophic plitogenic logic of unique value*, if all  $t_1, t_2, \dots, t_n$ ,  $i_1, i_2, \dots, i_n$ , and  $f_1, f_2, \dots, f_n$  are unique value numbers in  $[0, 1]$ .

- b. *Neutrosophic plitogenic logic with subset values*, when all  $t_1, t_2, \dots, t_n, i_1, i_2, \dots, i_n$ , and  $f_1, f_2, \dots, f_n$  are subsets in  $[0, 1]$ .
6. It is called *plitogenic logic (other fuzzy extensions)* when it is another extension of fuzzy logic, for example, Pythagorean fuzzy logic, image fuzzy logic, Fermatean fuzzy logic, spherical fuzzy logic, q-step orthopare fuzzy logic, refined neutrosophic logic and refined logic.
7. It is a *plitogenic hybrid logic* when  $P(V_1), P(V_2), \dots, P(V_n)$  They are mixed types of the probability distributions defined above.

**Example 1** ([10-14]): Suppose  $P$  the proposition is, "John loves his city." We have the following random variables:

$V_1$ : low/high percentage of inhabitants infected by the COVID-19 virus,

$V_2$ : non-violent/violent,

$V_3$ : full/deserted,

$V_4$ : clean/dirty,

$V_5$ : quiet/noisy.

Therefore, we can use the notation  $P(V_1, V_2, V_3, V_4, V_5)$ . Then, using a plitogenic neutrosophic logic, we have:

$$P(V_1, V_2, V_3, V_4, V_5) = ((0.86, 0.12, 0.54), (0.18, 0.44, 0.72), (0.90, 0.05, 0.05), (0.09, 0.14, 0.82), (0.82, 0.09, 0.14)),$$

Therefore, based on the percentage of inhabitants infected with the COVID-19 virus, John loves his city with 86% certainty, 12% uncertainty, and 54% dislike. An equivalent argument can be made for the other variables [15-17].

Using the neutrosophic conjunctive operator min/max/max, we obtain:

$$(0.86, 0.12, 0.54) \wedge_N (0.18, 0.44, 0.72) \wedge_N (0.90, 0.05, 0.05) \wedge_N (0.09, 0.14, 0.82) \wedge_N (0.82, 0.09, 0.14) = (\min\{0.86, 0.18, 0.90, 0.09, 0.82\}, \max\{0.12, 0.44, 0.05, 0.14, 0.09\}, \max\{0.54, 0.72, 0.05, 0.82, 0.14\}) = (0.09, 0.44, 0.82).$$

Note that we assume that the five variables are independent of each other; otherwise, we have to use dependency values in the conjunction.

### 3. The model

This study creates a model for evaluating internal communication program effectiveness within a multicultural entity. The model relies on Neutrosophic Plitogenic Logic to account for truth, indeterminacy, and falsity, with respect to employee contributions - relative to their perceived meaning through a cultural relative approach. The model stems from the assessed input components and the respective scales to measure such components. There exists a linguistic measurement scale and a quantitative measurement scale.

**Table 1:** Linguistic scale and associated numerical value

Linguistic value	Associated numerical value
Extremely low	0
Very low	0.2
Low	0.4
Half	0.5
High	0.6
Very high	0.8
Extremely high	1

Source: The authors.

This is the preliminary version of the scale. Evaluators (professionals in communication, sociology, and regional development) will render their assessments in a non-biased fashion. In order to assess a communication project in

a particular domain, the evaluator will indicate where they stand on the response at truthful/perceived clarity of honesty (T), uncertainty/unclear (I), and dishonest/perceived disinformation (F).

For example, a response T = "Very high", I = "Very low", F = "Very low" translates numerically as the triplet (0.8, 0.2, 0.2). If the question concerns the weight or importance of an aspect, an identical response is evaluated as the weight  $w = (0.8, 0.2, 0.2)$ .

The second step is to determine the **aspects (S<sub>j</sub>)** to be measured. In this context, the "aspects" are the key internal communication initiatives being evaluated:

- S<sub>1</sub>: Organizational Restructuring Statement.
- S<sub>2</sub>: Launch of the New Hybrid Work Policy.
- S<sub>3</sub>: Corporate Values Campaign (Inclusion and Diversity).
- S<sub>4</sub>: Implementation of a New Technological Platform (Intranet).

Each of these initiatives is evaluated based on the following **dimensions (D<sub>k</sub>)**, which are derived from the study's objectives (capturing loyalty, emotional impact, and cultural adherence):

- D<sub>1</sub>: Fidelity of the Message (Clarity and precision of the original intention).
- D<sub>2</sub>: Emotional Resonance (Emotional connection and/or motivation generated).
- D<sub>3</sub>: Cultural Adherence (Compatibility with local cultural norms and values).
- D<sub>4</sub>: Action Potential (Clarity in the expected action or behavior).
- D<sub>5</sub>: Perception of Transparency (Perceived degree of honesty and openness).

Thus, if there are  $n$  evaluators (experts), the process evaluation is carried out for each initiative S<sub>j</sub> based on each of the dimensions D<sub>k</sub>. The value is obtained  $v_{ijk} = (T_{ijk}, I_{ijk}, F_{ijk})$  ( $i = 1, 2, \dots, n; j = 1, 2, \dots, 4; k = 1, 2, \dots, 5$ ), which corresponds to the evaluation of the  $i$ -th expert on the  $j$ -th initiative based on the  $k$ -th dimension.

In parallel, a set of values is obtained  $w_{ijk} = (T(w)_{ijk}, I(w)_{ijk}, F(w)_{ijk})$ , which represent the weights assigned by each expert to each of the D<sub>k</sub> dimensions within the S<sub>j</sub> initiative.

#### The procedure to follow is as follows:

1. A draft tactic for the S<sub>j</sub> initiative is designed and implemented (e.g., the S<sub>2</sub> communiqué).
2. Before its global deployment (moving from S<sub>j</sub> to S<sub>j+1</sub> or final validation), each expert is asked to evaluate the results (the draft) of initiative S<sub>j</sub>. This evaluation is equal to  $v_{ijk}$ . The weights  $w_{ijk}$  are also collected. To validate the initiative, the following occurs: a. A small threshold of acceptable values is established to indicate error (inconsistency between experts). This value is set at  $\varepsilon = 0.15$ . b. The values  $v_{ijk}$  and  $w_{ijk}$  are converted into crisp values (scores) using the scoring function (Equation 1):

$$S(v) = \frac{2 + T - I - F}{3}$$

The standard deviation of the values is  $S(v_{ij1}), S(v_{ij2}), \dots, S(v_{ijn})$  y  $S(w_{ij1}), S(w_{ij2}), \dots, S(w_{ijn})$  calculated  $v_{ijk} \rightarrow S(v_{ijk})$  y  $w_{ijk} \rightarrow S(w_{ijk})$  for each dimension  $k$ .

If  $stdev(S(v_{ijk}))_{i=1 \dots n} \geq \varepsilon$  o  $stdev(S(w_{ijk}))_{i=1 \dots n} \geq \varepsilon$ , experts are asked to re-evaluate and repeat this step (indicates a high discrepancy). Otherwise, proceed to the next step, ensuring consistency.

3. The plitogenic evaluation is associated with this S<sub>j</sub> initiative as:
 

$\{(D_1, v_{1j1}, w_{1j1}), (D_2, v_{1j2}, w_{1j2}), \dots, (D_5, v_{1j5}, w_{1j5})\}$	(Evaluator 1)	$v_{j1} =$
$\{(D_1, v_{2j1}, w_{2j1}), (D_2, v_{2j2}, w_{2j2}), \dots, (D_5, v_{2j5}, w_{2j5})\}$	(Evaluator 2)	$v_{j2} =$
$\{(D_1, v_{nj1}, w_{nj1}), (D_2, v_{nj2}, w_{nj2}), \dots, (D_5, v_{nj5}, w_{nj5})\}$	(Evaluator $n$ )	$v_{jn} =$

 These values are aggregated for each dimension  $k$  using the following equation (the weighted plitogenic aggregation):

$$Agg_k = (T\_Agg_k, I\_Agg_k, F\_Agg_k)$$

Therefore:

**Aggregation formulas:**

$$T_{Aggk} = \frac{\sum_{i=1}^n T_{ijk} \cdot S(w_{ijk})}{\sum_{i=1}^n S(w_{ijk})}$$

$$I_{Aggk} = \frac{\sum_{i=1}^n I_{ijk} \cdot S(w_{ijk})}{\sum_{i=1}^n S(w_{ijk})}$$

$$F_{Aggk} = \frac{\sum_{i=1}^n F_{ijk} \cdot S(w_{ijk})}{\sum_{i=1}^n S(w_{ijk})}$$

In this way a final (aggregate) evaluation of this  $S_j$  initiative is obtained for all experts, for each dimension  $k$ .

4. It is determined whether the  $S_j$  initiative has been successfully completed (i.e., whether the statement is ready for deployment) by setting a threshold value  $\theta$ , which we recommend taking at 0.7 or higher.
5. If  $S(Agg_k) \geq \theta$  it is determined that the objectives of the initiative have been satisfactorily met in all cases.  $k = 1, \dots, 5$ ,
6. Otherwise, ( $S(Agg_k) < \theta$  for some  $k$ ), it is determined which dimensions were not satisfied and improvements (message redesign) are recommended before re-evaluating or moving on to the next stage.
7. The steps are repeated for the following initiatives ( $j = 1, \dots, 4$ ).

**Application:**

Let's apply this procedure. There are three evaluators ( $n = 3$ ) for the  $S_2$  initiative: "Launch of the New Hybrid Work Policy" in a multinational corporation.

- **Evaluator 1 (E1):** Global HR Manager (Corporate Policy Perspective).
- **Evaluator 2 (E2):** Organizational Sociologist (Group dynamics perspective).
- **Evaluator 3 (E3):** Regional Team Leader - Asia/Pacific (Local cultural perspective).

Let's assume that the evaluation results ( $v_{i2k}$ ) are summarized in Table 2 and the importance results ( $w_{i2k}$ ) in Table 3.

**Table 2:** Results of the expert evaluation ( $v_{ijk}$ ) for the  $S_2$  initiative

Dimension/Expert	E1 ( $v_{12k}$ )	E2 ( $v_{22k}$ )	E3 ( $v_{32k}$ )
D1 (Fidelity)	(0.8, 0.2, 0.2)	(0.8, 0.2, 0.4)	(1.0, 0.0, 0.2)
D2 (Emotion)	(0.6, 0.4, 0.2)	(0.5, 0.5, 0.4)	(0.4, 0.2, 0.6)
D3 (Culture)	(0.8, 0.2, 0.2)	(0.6, 0.4, 0.4)	(0.2, 0.2, 0.8)
D4 (Action)	(1.0, 0.0, 0.0)	(0.8, 0.2, 0.2)	(0.8, 0.2, 0.2)
D5 (Transparency)	(0.6, 0.2, 0.2)	(0.5, 0.4, 0.5)	(0.4, 0.4, 0.6)

Source: The authors.

**Table 3:** Results of the weights ( $w_{ijk}$ ) assigned by the experts for  $S_2$

Dimension/Expert	E1 (w <sub>12k</sub> )	E2 (w <sub>22k</sub> )	E3 (w <sub>32k</sub> )
D1 (Fidelity)	(1.0, 0.0, 0.0)	(0.8, 0.2, 0.0)	(1.0, 0.0, 0.0)
D2 (Emotion)	(0.6, 0.2, 0.2)	(0.8, 0.2, 0.2)	(0.5, 0.4, 0.4)
D3 (Culture)	(0.8, 0.2, 0.2)	(1.0, 0.0, 0.0)	(1.0, 0.0, 0.0)
D4 (Action)	(0.8, 0.2, 0.2)	(0.6, 0.2, 0.2)	(0.6, 0.2, 0.2)
D5 (Transparency)	(0.5, 0.5, 0.2)	(0.8, 0.2, 0.2)	(0.8, 0.2, 0.4)

Source: The authors.

Let's set the thresholds  $\varepsilon = 0.15$  (coherence) and  $\theta = 0.7$  (compliance).

**Step 2b: Calculation of Scores and Verification of Consistency**

First, we applied Equation 1 ( $S(v) = \frac{(2 + T - I - F)}{3}$ ) to all evaluations (Table 2) and weights (Table 3) to calculate their sharp scores and standard deviations.

**Table 4:** Results of applying the scoring function to the evaluations ( $v_{ijk}$ ) from Table 2 and their standard deviations

Dimension/Expert	E1 (S(v <sub>12k</sub> ))	E2 (S(v <sub>22k</sub> ))	E3 (S(v <sub>32k</sub> ))	Standard Deviation (SD)	Coherent ( $\leq 0.15$ )
D1	$S(v_{121}) = (2 + 0.8 - 0.2 - 0.2) / 3 = 0.80000000$	$S(v_{221}) = (2 + 0.8 - 0.2 - 0.4) / 3 = 0.73333333$	$S(v_{321}) = (2 + 1.0 - 0.0 - 0.2) / 3 = 0.93333333$	0.08498366	Yes
D2	$S(v_{122}) = (2 + 0.6 - 0.4 - 0.2) / 3 = 0.66666667$	$S(v_{222}) = (2 + 0.5 - 0.5 - 0.4) / 3 = 0.53333333$	$S(v_{322}) = (2 + 0.4 - 0.2 - 0.6) / 3 = 0.53333333$	0.06285394	Yes
D3	$S(v_{123}) = (2 + 0.8 - 0.2 - 0.2) / 3 = 0.80000000$	$S(v_{223}) = (2 + 0.6 - 0.4 - 0.4) / 3 = 0.60000000$	$S(v_{323}) = (2 + 0.2 - 0.2 - 0.8) / 3 = 0.40000000$	0.16329932	No
D4	$S(v_{124}) = (2 + 1.0 - 0.0 - 0.0) / 3 = 1.00000000$	$S(v_{224}) = (2 + 0.8 - 0.2 - 0.2) / 3 = 0.80000000$	$S(v_{324}) = (2 + 0.8 - 0.2 - 0.2) / 3 = 0.80000000$	0.09428090	Yes
D5	$S(v_{125}) = (2 + 0.6 - 0.2 - 0.2) / 3 = 0.73333333$	$S(v_{225}) = (2 + 0.5 - 0.4 - 0.5) / 3 = 0.53333333$	$S(v_{325}) = (2 + 0.4 - 0.4 - 0.6) / 3 = 0.46666667$	0.11547005	Yes

Source: The authors.

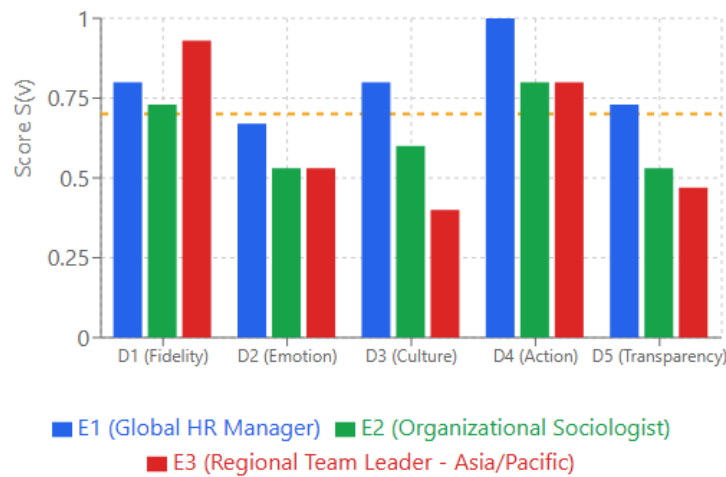


Figure 1. Comparative Scoring by Dimension and Evaluator

Table 5: Results of applying the scoring function to the weights ( $w_{ijk}$ ) in Table 3 and their standard deviations

Dimension/Expert	E1 ( $S(w_{12k})$ )	E2 ( $S(w_{22k})$ )	E3 ( $S(w_{32k})$ )	Standard Deviation (SD)	Coherent ( $\leq 0.15$ )
D1	$S(w_{121}) = (2 + 1.0 - 0.0 - 0.0) / 3 = 1.00000000$	$S(w_{221}) = (2 + 0.8 - 0.2 - 0.0) / 3 = 0.86666667$	$S(w_{321}) = (2 + 1.0 - 0.0 - 0.0) / 3 = 1.00000000$	0.06285394	Yes
D2	$S(w_{122}) = (2 + 0.6 - 0.2 - 0.2) / 3 = 0.73333333$	$S(w_{222}) = (2 + 0.8 - 0.2 - 0.2) / 3 = 0.80000000$	$S(w_{322}) = (2 + 0.5 - 0.4 - 0.4) / 3 = 0.56666667$	0.10069234	Yes
D3	$S(w_{123}) = (2 + 0.8 - 0.2 - 0.2) / 3 = 0.80000000$	$S(w_{223}) = (2 + 1.0 - 0.0 - 0.0) / 3 = 1.00000000$	$S(w_{323}) = (2 + 1.0 - 0.0 - 0.0) / 3 = 1.00000000$	0.09428090	Yes
D4	$S(w_{124}) = (2 + 0.8 - 0.2 - 0.2) / 3 = 0.80000000$	$S(w_{224}) = (2 + 0.6 - 0.2 - 0.2) / 3 = 0.73333333$	$S(w_{324}) = (2 + 0.6 - 0.2 - 0.2) / 3 = 0.73333333$	0.03142697	Yes
D5	$S(w_{125}) = (2 + 0.5 - 0.5 - 0.2) / 3 = 0.60000000$	$S(w_{225}) = (2 + 0.8 - 0.2 - 0.2) / 3 = 0.80000000$	$S(w_{325}) = (2 + 0.8 - 0.2 - 0.4) / 3 = 0.73333333$	0.08498366	Yes

Source: The authors.

**Coherence Analysis (Step 2b):**

From the results shown in Tables 4 and 5, almost all standard deviations are less than  $\epsilon = 0.15$ .

However, in **Table 4**, **Dimension 3 (Cultural Adhesion)** shows a standard deviation (SD) of 0.16329932, which is **greater** than 0.15. This indicates significant inconsistency among the experts. The scores (0.8, 0.6, 0.4) show a clear disagreement: the global expert (E1) sees high adherence, while the regional expert (E3) sees very low adherence, which is central to the problem of multicultural communication.

According to step 2b, the experts are asked to reassess. After a deliberation session, experts E2 and E3 adjust their assessments for D3 to better reflect the consensus:

- $v_{123}$  (E1) maintains:  $(0.8, 0.2, 0.2) \rightarrow S = 0.80000000$
- $v_{223}$  (E2) adjusts:  $(0.6, 0.4, 0.4) \rightarrow (0.6, 0.2, 0.4) \rightarrow S = \frac{(2 + 0.6 - 0.2 - 0.4)}{3} = 0.66666667$
- $v_{323}$  (E3) adjusts:  $(0.2, 0.2, 0.8) \rightarrow (0.5, 0.2, 0.5) \rightarrow S = \frac{(2 + 0.5 - 0.2 - 0.5)}{3} = 0.60000000$

#### Re-evaluation verification:

- New scores for D3:  $\{0.80000000, 0.66666667, 0.60000000\}$
- New Standard Deviation  $SD(D3) = stdev(0.8, 0.66666667, 0.6) = 0.08498366$
- $0.08498366 < 0.15$  Coherence has been achieved.

We proceed to the aggregation calculations (Step 3) using the **re-evaluated values** for D3.

#### Step 3: Plitogenic Aggregation (Equation 3)

Now, we calculate the added value ( $Agg_k$ ) for each dimension  $k$  using Equation 3.

##### Dimension D1 (Fidelity):

- $\sum S(w_{1k}) = 1.00000000 + 0.86666667 + 1.00000000 = 2.86666667$

##### Calculations:

$$\begin{aligned} T_{Agg}^1 &= \frac{[(0.8 \times 1.00000000) + (0.8 \times 0.86666667) + (1.0 \times 1.00000000)]}{2.86666667} \\ &= \frac{[0.8 + 0.69333334 + 1.0]}{2.86666667} = \frac{2.49333334}{2.86666667} = 0.86979167 \end{aligned}$$

$$\begin{aligned} I_{Agg}^1 &= \frac{[(0.2 \times 1.00000000) + (0.2 \times 0.86666667) + (0.0 \times 1.00000000)]}{2.86666667} \\ &= \frac{[0.2 + 0.17333333 + 0.0]}{2.86666667} = \frac{0.37333333}{2.86666667} = 0.13020833 \end{aligned}$$

$$\begin{aligned} F_{Agg}^1 &= \frac{[(0.2 \times 1.00000000) + (0.4 \times 0.86666667) + (0.2 \times 1.00000000)]}{2.86666667} \\ &= \frac{[0.2 + 0.34666667 + 0.2]}{2.86666667} = \frac{0.74666667}{2.86666667} = 0.26041667 \end{aligned}$$

$$Agg(D1) = (0.86979167, 0.13020833, 0.26041667)$$

##### Dimension D2 (Emotion):

- $\sum S(w_{2k}) = 0.73333333 + 0.80000000 + 0.56666667 = 2.10000000$

##### Calculations:

$$\begin{aligned} T_{Agg}^2 &= \frac{[(0.6 \times 0.73333333) + (0.5 \times 0.80000000) + (0.4 \times 0.56666667)]}{2.10000000} \\ &= \frac{[0.44 + 0.4 + 0.22666667]}{2.10000000} = \frac{1.06666667}{2.10000000} = 0.50793651 \end{aligned}$$

$$I_{Agg}^2 = \frac{[(0.4 \times 0.73333333) + (0.5 \times 0.80000000) + (0.2 \times 0.56666667)]}{2.10000000}$$

$$= \frac{[0.29333333 + 0.4 + 0.11333333]}{2.10000000} = \frac{0.80666666}{2.10000000}$$

$$= 0.38412698$$

$$F_{Agg}^2 = \frac{[(0.2 \times 0.73333333) + (0.4 \times 0.80000000) + (0.6 \times 0.56666667)]}{2.10000000}$$

$$= \frac{[0.14666667 + 0.32 + 0.34]}{2.10000000} = \frac{0.80666667}{2.10000000} = 0.38412698$$

$$Agg(D2) = (0.50793651, 0.38412698, 0.38412698)$$

**Dimension D3 (Culture) - (Using reevaluated values):**

- Values  $v_{123}$ : (0.8, 0.2, 0.2), (0.6, 0.2, 0.4), (0.5, 0.2, 0.5)
- Valores  $S(w_{123})$ : 0.80000000, 1.00000000, 1.00000000
- $\Sigma S(w_{3k}) = 0.80000000 + 1.00000000 + 1.00000000 = 2.80000000$

**Calculations:**

$$T_{Agg}^3 = \frac{[(0.8 \times 0.80000000) + (0.6 \times 1.00000000) + (0.5 \times 1.00000000)]}{2.80000000}$$

$$= \frac{[0.64 + 0.6 + 0.5]}{2.80000000} = \frac{1.74}{2.80000000} = 0.62142857$$

$$I_{Agg}^3 = \frac{[(0.2 \times 0.80000000) + (0.2 \times 1.00000000) + (0.2 \times 1.00000000)]}{2.80000000}$$

$$= \frac{[0.16 + 0.2 + 0.2]}{2.80000000} = \frac{0.56}{2.80000000} = 0.20000000$$

$$F_{Agg}^3 = \frac{[(0.2 \times 0.80000000) + (0.4 \times 1.00000000) + (0.5 \times 1.00000000)]}{2.80000000}$$

$$= \frac{[0.16 + 0.4 + 0.5]}{2.80000000} = \frac{1.06}{2.80000000} = 0.37857143$$

$$Agg(D3) = (0.62142857, 0.20000000, 0.37857143)$$

**Dimension D4 (Action):**

- $\Sigma S(w_{4k}) = 0.80000000 + 0.73333333 + 0.73333333 = 2.26666666$

**Calculations:**

$$T_{Agg}^4 = \frac{[(1.0 \times 0.80000000) + (0.8 \times 0.73333333) + (0.8 \times 0.73333333)]}{2.26666666}$$

$$= \frac{[0.8 + 0.58666666 + 0.58666666]}{2.26666666} = \frac{1.97333332}{2.26666666} = 0.87062201$$

$$I_{Agg}^4 = \frac{[(0.0 \times 0.80000000) + (0.2 \times 0.73333333) + (0.2 \times 0.73333333)]}{2.26666666}$$

$$= \frac{[0.0 + 0.14666667 + 0.14666667]}{2.26666666} = \frac{0.29333334}{2.26666666} = 0.12941177$$

$$F_{Agg}^4 = \frac{[(0.0 \times 0.80000000) + (0.2 \times 0.73333333) + (0.2 \times 0.73333333)]}{2.26666666}$$

$$= \frac{[0.0 + 0.14666667 + 0.14666667]}{2.26666666} = \frac{0.29333334}{2.26666666} = 0.12941177$$

$$\mathbf{Agg(D4) = (0.87062201, 0.12941177, 0.12941177)}$$

**Dimension D5 (Transparency):**

- $\Sigma S(w_{5k}) = 0.60000000 + 0.80000000 + 0.73333333 = 2.13333333$

**Calculations:**

$$T_{Agg}^5 = \frac{[(0.6 \times 0.60000000) + (0.5 \times 0.80000000) + (0.4 \times 0.73333333)]}{2.13333333}$$

$$= \frac{[0.36 + 0.4 + 0.29333333]}{2.13333333} = \frac{1.05333333}{2.13333333} = 0.49372385$$

$$I_{Agg}^5 = \frac{[(0.2 \times 0.60000000) + (0.4 \times 0.80000000) + (0.4 \times 0.73333333)]}{2.13333333}$$

$$= \frac{[0.12 + 0.32 + 0.29333333]}{2.13333333} = \frac{0.73333333}{2.13333333} = 0.34372385$$

$$F_{Agg}^5 = \frac{[(0.2 \times 0.60000000) + (0.5 \times 0.80000000) + (0.6 \times 0.73333333)]}{2.13333333}$$

$$= \frac{[0.12 + 0.4 + 0.44]}{2.13333333} = \frac{0.96}{2.13333333} = 0.45000000$$

$$\mathbf{Agg(D5) = (0.49372385, 0.34372385, 0.45000000)}$$

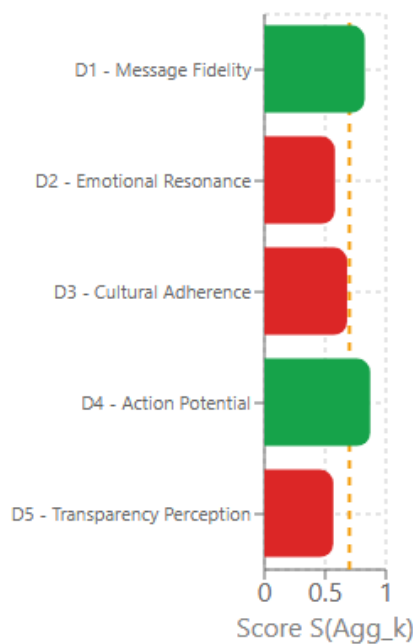
**Steps 4, 5 and 6: Classification and Decision**

Table 6 summarizes the results of the aggregation (Equation 3) and the application of the scoring function (Equation 1) to these aggregated values. They are compared with the compliance threshold  $\theta = 0.7$ .

**Table 6:** Aggregation results (Equation 3) and application of the scoring function for each dimension

Dimension	Neutrosophic Conjunctive Aggregation (Agg <sub>k</sub> )	Scoring Function S(Agg <sub>k</sub> )	Meets ( $\geq 0.7$ )
D1 (Fidelity)	(0.86979167, 0.13020833, 0.26041667)	$S = (2 + 0.86979167 - 0.13020833 - 0.26041667) / 3 = \mathbf{0.82638889}$	Yes
D2 (Emotion)	(0.50793651, 0.38412698, 0.38412698)	$S = (2 + 0.50793651 - 0.38412698 - 0.38412698) / 3 = \mathbf{0.57989418}$	No
D3 (Culture)	(0.62142857, 0.20000000, 0.37857143)	$S = (2 + 0.62142857 - 0.20000000 - 0.37857143) / 3 = \mathbf{0.68095238}$	No
D4 (Action)	(0.87062201, 0.12941177, 0.12941177)	$S = (2 + 0.87062201 - 0.12941177 - 0.12941177) / 3 = \mathbf{0.87059949}$	Yes
D5 (Transparency)	(0.49372385, 0.34372385, 0.45000000)	$S = (2 + 0.49372385 - 0.34372385 - 0.45000000) / 3 = \mathbf{0.56666667}$	No

Source: The authors.



**Figure 2.** Final Aggregated Scores vs. Threshold

**Final Analysis (Step 6):**

Table 6 reveals that the scoring function output for dimensions D1 and D4 is above the threshold  $\theta = 0.7$ , while dimensions D2, D3 and D5 do not comply with the threshold.

Decision: The  $S_2$  initiative (the statement on the hybrid work policy) satisfactorily meets its purpose. Therefore, proceed but with some adjustments for:

- Increased emotional and motivational connection (D2).
- Culturally more aligned to avoid cultural friction (D3).
- Greater perception of honesty and transparency (D5).

The initiative does not need to be reassessed before implementation, but the above adjustments should be made in good faith.

#### 4. Discussion

The outcomes of this research suggest that the neutrosophic plitogen model is suitable for understanding multicultural internal communication complexities as it does not merely provide an end classification (Meets/Does Not Meet the criteria) but manages and represents the inherent uncertainty and conflict.

A particularly interesting finding was the model's ability to indicate inconsistency ( $SD > \epsilon$ ) for Dimension 3 (Cultural Adherence). This should not be seen as a limitation of the model but rather, its ultimate strength as a mathematically derived process. The model found where multicultural friction occurred: while the local evaluator (E3) identified a cultural conflict (high Falsehood), the global evaluators (E1, E2) considered it a low conflict. The assessors had to discuss a consensus (reducing SD), which links to the status of managers having to negotiate meaning in real life.

Moreover, this mirrors the realities of why  $S_2$  failed in dimensions D2 (Emotion), D3 (Culture), D5 (Transparency). It is widely understood that hybrid policies do not work. Corporate language is viewed with emotional detachment (D2), as culturally dominating (D3), and not fully transparent about watchfulness or need (D5). The ability of the model to convert subjectively perceived conclusions allows management to pinpoint which message dimensions require reworking.

#### 5. Conclusion

This study aimed to generate a means of internal communication for multicultural organizations based on neutrosophic plitogenic logic by operating under the goal of a formal model construct that is representational of message processing through cultural filters at varying degrees of truth, indeterminacy, falsity. The creation of this model has proven to be reliable for communication assessment. Establishing relevant polygenic characteristics (Loyalty, Emotional Resonance, Cultural Adherence, Action Potential, and Transparency) and applying neutrosophic weighted aggregation allowed for the management of ambiguity, subjectivity, and conflict naturally found within employee perceptions. Thus, this work presents a twofold contribution. Firstly, to the theoretical realm of organizational studies by introducing a uniquely determined approach beyond conventional binary logic in hopes for a more representational reality that aligns with fields operating on such complexities. Secondly, to real world enterprise situations, meaning manager's benefit from transferable models stemming from ease of use and a systematic process that not only includes consistency-assessing verification but also operationalizes multicultural friction as an auditing step for inclusive, resilient and situationally appropriate directed communications that prevents pre-deployment before friction is confirmed.

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