



The transformational leadership, sustainable key for the development of ecuadorian companies. A neutrosophic psychology approach

Lisenia Karina Baque Villanueva¹, María Azucena Mendoza², Rosanna Salcedo³ and Aída Margarita Izquierdo Morán⁴

¹ Professor, Universidad Regional Autónoma de Los Andes, Ecuador. E-mail: uq.liseniabaque@uniandes.edu.ec

² Professor, Universidad Regional Autónoma de Los Andes, Ecuador. E-mail: uq.mariamendoza@uniandes.edu.ec

³ Professor, Universidad Regional Autónoma de Los Andes, Ecuador. E-mail: rosannasalcedo_saltos@hotmail.com

⁴ Professor, Universidad Regional Autónoma de Los Andes, Ecuador. E-mail: aiditaizquierdo@hotmail.com

Abstract. The study of leadership is a fairly recurring topic in the scientific literature in recent years. Some approaches concern with the relationship between leadership and some personality traits of leaders. One field where leadership is of great importance is the business world, where leaders are needed to direct the company's progress because they inspire the other members of the organization. This paper aims to propose a mathematical method for measuring the transformational leadership degree in the company. Transformational leadership is the most complete of leaderships; the transformational leader is versatile, charismatic, communicative, empathic, and produces positive changes in the company. The method is based on the opinion of colleagues and subordinates of the leader about its leadership capacity, rather than on the study of its own personality. For the method to be easily usable, it is based on a graphic representation of both, the individual evaluations and the final results. The method is derived from the neutrosophical psychology theory, since it is considered not only the concepts of <leadership> or <anti-leadership>, but for the first time the <a-leadership> is defined to classify those people who exist in the organization that neither direct, nor restrain the development of the company, moreover, the a-leadership can be a component of any leader's personality.

Keywords: Transformational leadership, neutrosophy, neutrosophical psychology theory, neutrosophic crisp personality.

1 Introduction

Historically, leadership has been thought as a myth, there are those who say that leaders must be born, others mention that they are also done on a day-to-day basis, the truth is that today there have been great leaders with positive transcendence and others in a negative way, and have left a legacy to society in general, in this paper we will make it clear that leaders are people who have developed their skills and aptitudes to become persons that motivate, they guide and transform large masses of people, all they want is to fulfill philosophies that cover everyone with the same umbrella, that is, they are united by the same goals.

Ecuadorian companies have been led to an empirical administration, however, due to the economic and political demands of the country, they have changed from know-how to the application of knowledge, so that companies can remain in the market, they evolve over time, changing their structure and improving the direction.

Management experts have conducted multiple studies in recent years to different business groups and institutions worldwide, in which they have been able to determine that the most successful and prominent companies are those that are managed by effective managers or directors, with highly developed managerial skills and abilities, see [1].

Globalization affects the interpersonal and management skills of leaders, so they must be prepared to work effectively on disagreements and understand the culture of the company. In order to improve productivity, organizations are betting on their human resources, technological and knowledge updating, and to establish a culture of excellence, for generating a structural change due to the need of the institution to adapt to the environment, see [2][1].

Thus, leadership is the factor that distinguishes those managers who only give orders from those managers who perform their administrative activities, based on motivational attitudes and actions, which contribute to the well-being of the work environment and the performance of their collaborators, and beyond this, leaders are people who inspire others to perform actions that help meet common goals.

L.K. Baque Villanueva; M.A. Mendoza; R. Salcedo; A.M. Izquierdo Morán. The transformational leadership, sustainable key for the development of Ecuadorian companies. A neutrosophic psychology approach

One of the most acclaimed models of leadership today is precisely transformational leadership, which has the characteristic of promoting significant and sustainable changes in people and companies, there is no doubt that reaching this leadership is to be at a highest level, where both, the leader and his/her followers work together to achieve the same objectives, based on the trust and coherence that the leader generates towards his/her followers. The leader must be a visionary who literally “look” at the entire forest in an appropriate way and not just a few trees.

It is essential to have a correct preparation to meet the current challenges, since there are many companies that have well-defined their objectives, with a long-term vision that guides their employees to good performance. That is why, it is indispensable to look for leaders who fulfill company's goals, and inspire employees in order to empower staff to achieve the expected results, the skills that a manager can count on will be the differentiator when managing a company, because a large number of changes are exogenous and are beyond the control of the organization, see [3].

However, even in Ecuadorian companies, business leaders do not have well defined their leadership style that makes a difference, since in some cases they continue with the application of transactional leadership, that is, with the feeling of only passing information and dictating certain guidelines for their employees. Given this lack of details of the application of transformational leadership, it makes companies not sustainable in their long-term results, since transactional or situational leaders do not form new leaders empowered or trained to manage company coffers.

Therefore, the following question arises: Is transformational leadership the key to sustainable development in Ecuadorian companies?

To answer this question, it should be mentioned that transformational leadership is much more successful and complete than other leaderships, based on their personal humility, and professional will. It is much broader and simpler, giving as arguments that this leadership focuses on long-term results, thus building solid paths, such as building trust to the employees, also knowing how to generate explosive motivation in the people, radiating a large energy since he/she is an example to follow, additionally knows how to develop more leaders within the company, that is to say he/she knows how to develop social skills, they are in a constant feedback with employees and environment.

A collaborator does not become productive if he/she has not previously been sensitized to the objectives pursued by the company. This is why leaders must have knowledge about human behavior, in order to bring out the inspiration and creativity of their team. The talent and productivity of workers and the organization does not come suddenly, but arises from the discipline and attention paid by them and their leader, see [4].

This investigation uses the neutrosophic psychology as a mathematical tool to measure transformational leadership. Neutropsyche is the psychological theory that studies the soul or spirit using the neutrosophy and neutrosophic theories ([5]), that is to say, Neutrosophic Psychological Theory. It is based on triadic neutrosophic psychological concepts of the form ($\langle A \rangle$, $\langle \text{neut}A \rangle$, $\langle \text{anti}A \rangle$).

Neutropsychic Personality is a neutrosophic dynamic open psychological system of tendencies to feel, think, and act specific to each individual, based on Neutrosophic Refined Memory: that restructured the division of memory into: consciousness, aconsciousness (which is a blend of consciousness and unconsciousness), and unconsciousness. Aconscious is subdivided into preconscious, subconscious, semiconscious = semiunconscious, subunconscious, and preunconscious.

This paper is dedicated to propose a neutrosophic method to study and assess the transformational leadership based on the neutrosophic psychology. This is because leader's personality consists in degrees of leadership, anti-leadership, and also of indeterminacy, or ambiguity, e.g., he/she is somewhat ignorant, impassive, indifferent, senseless, unfeeling.

This paper has the following structure; section 2 describes some aspects of managerial leadership and the main concepts of the neutrosophical psychology theory. The next section contains the method we designed for measuring leaderships of an individual in the company, according to neutrosophic psychology. The last section is dedicated to conclusions.

2 Neutrosophic psychology approach to enterprise leadership

This section describes the main concepts and theories necessities for understanding the study carried out in this paper. It is divided in two subsections, the first one is dedicated to summarize the main concepts concerned to leadership in enterprises, and the second one contains some ideas of neutrosophic psychology.

2.1 Enterprise leadership

The ideal transformer leader is who lifts his/her group to a higher level of commitment, in which each worker is responsible for the strategy being carried out, empowering him/her of his/her functions and making him/her proud of his/her work.

Cardona in [6], states that “transformational leadership is attractive and motivates people. He/she is an in-conformist, visionary leader, able to holistically appreciate the process, with a broad vision of his/her life goals, with a positive attitude and mainly a strategist, flexible, enterprising and innovative. He/she transforms both the state of things in the company and the same aspirations and ideals of the followers.”

This theory suggests that the leader inspires his/her followers and manages to transcend his/her personal interests related to the objectives of the organization, being able to have a profound and extraordinary effect on his/her subordinates, see [7].

Transformational leaders are always encouraging the creativity of their followers, always looking to explore new ways of doing things, since these are new opportunities to learn.

Transformational leadership offers an individual approach, since it directly supports the followers, because there are open doors of communication, so that all kinds of ideas can flow, and this entails making special recognitions to the people who contribute the most with the value of generating better philosophy.

This is the basis for a leader to have followers, if he/she does not have followers then will only be taking a walk, here the leader fosters a long-term vision capable of articulating his/her followers, this is where the magic that few leaders generate is generated. They perform being able to transmit all that energy to others to generate passion and motivation to achieve objectives.

The leader is a role model, since he/she has all the confidence and respect of his/her followers and that is why everyone wants to emulate his/her actions, therefore, a leader must be integral and coherent in his/her way of acting and making promises to the rest.

The transformational leader does not work in the short term, he/she always has a long-term vision, his/her task is to promote lasting and transcendental changes, these changes are transversal where he/she takes into account the entire structure of the organization to achieve the objectives, that is to say, the leader does not seek momentary or temporary inconsistency solutions, he/she always seeks lasting solutions for the benefit of all.

For a company to be competitive it must be efficient in all functional areas, for this it is essential to have active, competent and mostly motivated employees. A company with a pleasant working environment is no longer a luxury, it is a duty in the organization, and this is because the work environment is considered today a determining factor in the productivity and success of companies ([8]).

This is the reason why leadership and job satisfaction are important, not only because there is a relationship between job satisfaction and some factors that affect the economic success of an organization, but also because there is currently growing humanitarian concerns for some kind of psychological experiences that people have during their lives, especially during their working life ([9]).

Chiavenato as cited in [10] defines the organizational mood as the quality of the psychological environment of an organization, which is achieved with the level of motivation that people maintain. Organizational mood is the appreciation of the work environment enjoyed by the workers of a company.

A transformational leader helps to improve the organizational mood through his/her ability to activate the human group he/she is in charge of, so that they are committed to the organization and can meet the proposed goals and objectives. This kind of leader must generate confidence and motivation in the employees, so that they are an example to follow, with this a better efficiency in the performance of the work will be achieved.

It is important that a leader knows the different types of leadership and puts into practice the most complete one that without a doubt is the one we are studying here, since it is more versatile, it is of deeper changes, of fluid communication.

LEADERSHIP	CONCEPT
NATURAL	They are those leaders who do not have a managerial position, and who displace their leadership on a daily basis, regardless of their position.
PARTICIPATORY	They are those leaders, who are decision-makers and take into account the other collaborators to give their opinions about their ideas, encouraging teamwork.
AUTOCRATIC	It is that leader who makes decisions on his/her own, and that is limited to taking ideas from the other participants, this leadership is good in times of crisis, when it is necessary to take firm positions.
BUREAUCRATIC	This leader is not very open to changes, is not very interested in the personality of his/her collaborators, and is limited to generating motivation for his/her entire team, in this leadership exceptional decisions prevail.
CHARISMATIC	This type of leadership is characterized by having a magnetism towards people, is an optimistic, energetic leader, who generates a lot of passion when exposing his/her ideas, what he/she has as a disadvantage is that he/she usually thinks that even when a project is not present, it will work.

TRANSACTIONAL	These leaders are concerned with maintaining the normal flow of operations in the company, they use the disciplinary issue a lot to align the employees, they only motivate under a style of rewards, which means that it is not sustainable, and this leader only cares to let everything flow normally.
TRANSFORMATIONAL	This leadership is the most complete, since its characteristics are to be versatile, charismatic and decisive, its interest is for people, he/she made its decisions backed by its followers, it is a specialist in motivating people, he/she has an open communication with all the members of the organization, is extremely proactive in directing its actions.

Table 1: Types of leaderships in enterprises.

Intrapersonal skills have to do with the inner development of the human being, this type of skill is acquired, and the leader must know how to manage his/her internal emotions, he/she must know how to separate the personal sphere from the work.

SKILL	CONCEPT
PERSONAL DEVELOPMENT	Adopt new ideas; it is a process of transformation of the person to improve their lifestyle.
EMOTIONAL INTELLIGENCE	The leader must know how to intelligently use his/her emotions to make them work for him/her and the result would be to clearly and calmly manipulate his/her behavior.
ASERTIVITY	The leader must express directly and adequately his/her views respectfully and without offenses, to establish a good dialogue for a better relationship with his/her collaborators.

Table 2: Intrapersonal skills necessary for a good leadership.

The good management of interpersonal skills helps the leader to effectively interact with their collaborators as it promotes good communication management, supports the fulfillment of group or individual goals, cares about their needs, motivates them and encourages them.

They are divided into items in Table 3:

SKILL	CONCEPT
ORGANIZATIONAL BEHAVIOR	Provides compliance with the organization's strategy through effective behavior, whether individual or jointly.
ORGANIZATIONAL COMMUNICATION	It is the set of communication tools which channel the transfer of information from the organization in a secure way without leaks for better decision making.
TIME MANAGEMENT	It is to know how to plan time, prioritize the important activities over the urgent ones, since when using our time effectively it automatically becomes production and profitability.
CONFLICT MANAGEMENT	The manager, leader or collaborator must learn to handle conflicts with serenity and elegance since the human being in constant competition is prone to enter a conflictive environment, the challenge is to know how to take them, since in certain cases a conflict produces true solutions.
NEGOTIATION	It is the interaction between two or more people who need to meet an individual or group need, the purpose of the negotiation is to win or simply reach an agreement, which benefits both parties and manages to comply with the target set.
TRANSFORMING LEADERSHIP	Transformational leadership is the best type of leadership because it motivates, inspires its collaborators by fulfilling the objectives, strategy of the company based on humility and continuous strength.
COACHING	The leader who executes the coaching tool accompanies, guides, instructs, trains a person or collaborator, in a specific activity, has as a goal a greater personal and labor growth, therefore, a greater growth in the profitability of the business.
TRAINING OF WORK TEAMS	Effective teamwork leads to greater growth of the organization, even more so if personnel works in a leadership environment the objectives are easier to achieve since it creates an environment of

	commitment, dynamism, trust, innovation, productivity, humility giving greater value to the organization.
FACULTATION OR EMPOWERMENT	Empowerment is a strategic process based on generating a relationship of partners between the company and its employees, granting them authority, power and autonomy, always in a leadership environment.

Table 3: Interpersonal skills necessary for a good leadership.

Some abilities give the solution to problems, internal or external, complicated that the company or organization has, each action taken in a leadership environment will have an optimal result.

They are divided into the items in Table 4:

SKILL	CONCEPT
STRATEGIC THOUGHT	It is the action proposed by a leader, person, collaborators or organization to reach an end, analyzes the resources available, channels them, always executes them, optimizing time and cost.
INNOVATION	It is the implementation of a creative idea always in order to generate a differentiating value to competition or service.
DECISION MAKING	Process by which the leader must always take an action based on qualitative or quantitative data in order to obtain a favorable result for an individual or organization.
MANAGEMENT TO CHANGE	The leader must manage the strategy to change since it is necessary to generate an environment of trust, taking into account the contributions of employees indicating that this change will not affect their jobs will simply help the company grow and get to meet their goals with greater effectiveness and quality.

Table 4: Skills that the leader of the company must have to handle complex situations.

2.2 Neutrosophic psychology

Sigmund Freud divides memory into three parts: conscious, preconscious, and unconscious, see [5]. Additionally, in the framework of the neutrosophic psychology it is defined the “aconscious”, which means: to be ignorant, impassive, indifferent, senseless, and unfeeling. Thus, according to this theory we have: conscious, aconscious, and unconscious.

Memory is divided into three main parts. It is a symmetric triad of the form ($\langle A \rangle$, $\langle \text{neut}A \rangle$, $\langle \text{anti}A \rangle$) as in neutrosophy:

- 1) Conscious, meaning things that we are currently aware of, it corresponds to $\langle A \rangle$.
- 2) Unconscious, which comprises things that we are not aware of; they are hard to access because they are deep inside our mind. It is the opposite of conscious, corresponding to $\langle \text{anti}A \rangle$.
- 3) Aconscious, which etymologically means away from conscious and unconscious, or neither conscious nor unconscious, but in between, or a mixture of conscious and unconscious, a vague buffer zone between them. It corresponds to $\langle \text{neut}A \rangle$ or Indeterminacy, as in Neutrosophy.

Thus, the consciousness, aconsciousness, and unconsciousness are the sources of positive, neutral (or blended), and negative emotions, thoughts, and behaviours throughout our lifespan.

In human behaviour, there exists a permanent interaction and discussion among conscious, unconscious, and aconscious. Sometimes people are mostly rational, sometimes they are mostly irrational, and others they are indifferent.

This notion can be extended to the *discrete refined neutrosophic memory*, where the triad ($\langle A \rangle$, $\langle \text{neut}A \rangle$, $\langle \text{anti}A \rangle$) is extended to the most general scheme ($\langle A \rangle_1, \langle A \rangle_2, \dots, \langle A \rangle_n$; $\langle \text{neut}A \rangle_1, \langle \text{neut}A \rangle_2, \dots, \langle \text{neut}A \rangle_m$; $\langle \text{anti}A \rangle_1, \langle \text{anti}A \rangle_2, \dots, \langle \text{anti}A \rangle_n$) as in refined neutrosophy, see [5, 11-12].

Carl Jung has divided the unconscious (consciousness) into ([13]):

- personal unconscious, which is specific to each individual, and comprises forgotten or suppressed conscious;
- collective unconscious (consciousness), which is characteristic to the whole human species, and comprises ancestral memories called “archetypes” (universal meaning images) and mental patterns as inherited psychic structures.

- In [5] it is defined the group unconscious (consciousness), which is between the personal and collective unconsciousness. It is characteristic to a specific group that the individual belongs to, and has marked him/her mostly.

The aconsciousness, as an amalgam of consciousness and unconsciousness, is the indeterminate, ambiguous, vague zone where conscious and unconscious interfere. It is a transition space, or a mediation between opposites.

In [5][2] it is defined $SL \in \{\text{preconscious, subconscious, semiconscious} = \text{semiunconscious, subunconscious, and preunconscious}\}$ of the aconsciousness into:

- a) personal aconsciousness at sublevel SL, specific to each individual, and comprising particular things that only the individual is confused (indeterminate) about;
- b) collective aconsciousness at sublevel SL, characteristic to whole human species, and comprising general things that all people are confused (indeterminate) about.
- c) group aconsciousness at sublevel SL, characteristic to a specific group, and comprising group things (customs, traditions, believes) that all group members are confused about.

According to [5], the aconsciousness has a degree of conscious (c), and a degree of unconscious (u), where $c \in [0,1]$, and $0 \leq c + u \leq 2$.

In the neutrosophic psychology there is the following notation:

$$NL(\text{entity}) = (c, a, u) \quad (1)$$

Where c = degree of conscious (truth), a = degree of acounscious (indeterminacy): not sure if it's conscious or unconscious, or a blend of both, and u = degree of unconscious (falsehood).

$NL(\text{conscious}) = (1, 0, 0)$; $NL(\text{acounscious}) = (0, 1, 0)$; and $NL(\text{unconscious}) = (0, a, 1)$, where $a \in (0, 1]$, leaving room for indeterminacy (unknown, unclear).

The Neutropsychic Crisp Personality considers a human person as a universe of discourse U , and three disjoint sets which are the following ([14][3]):

E = set of emotions of this person;

H = set of thoughts of this person;

B = set of behaviors of this person.

Therefore, $U = E \cup H \cup B$, with $E \cap H = \emptyset$, $H \cap B = \emptyset$, and $B \cap E = \emptyset$. Thus, $U = \langle E, H, B \rangle$.

Also, in [5] the trait is measured by degrees of <trait> and degrees of <anti trait>, such that each person is classified in a range between these two opposites and it is dynamic. Additionally, they include a middle position where there exists indeterminacy.

In [5] it is enumerated the most common pair trait-anti trait, as follows:

- Extraversion – Introversion
- Conscientiousness – Unconscientiousness
- Perfectionism – Imperfectionism
- Sensitivism – Insensitivism
- Novator – Conservator
- Self Esteem – Self NonEsteem
- Agreeableness – Disagreeableness
- Openness to Intellect & Experience – Closeness to Intellect & Experience
- Inhibition – Disinhibition
- Flexibility – Rigidity
- Emotivism [Neuroticism (Hans Eysenck)] – Non-Emotivism
- Obsessionality – Nonobsessionality
- Cautiousness – Impulsivity
- Shyness – Boldness
- Honesty – Dishonesty
- Hostility [Psychoticism (Hans Eysenck)] – Nonhostility.

The Neutrosophic Trait Operator is the cumulative degree of individual x with respect to both the Trait and the antiTrait, and it is defined as:

$$d_{\text{Trait} \& \text{antiTrait}} : S \rightarrow [-1, 1] \quad (2)$$

Where, $d_{\text{Trait} \& \text{antiTrait}}(x) = d_{\text{Trait}}(x) + d_{\text{antiTrait}}(x)$.

To classify an individual as belonging to trait or anti trait, a threshold is defined and denoted by Thr for the trait, and antiThr for the anti trait, so that:

- If $d_{\text{Trait} \& \text{antiTrait}}(x) \geq +\text{Thr}$, then the individual is categorized as definitively belonging to the Trait,
- If $d_{\text{Trait} \& \text{antiTrait}}(x) \leq -\text{antiThr}$, then the individual is categorized as definitively belonging to the antiTrait.
- If $d_{\text{Trait} \& \text{antiTrait}}(x) \in (-\varepsilon, +\varepsilon)$, then the individual is categorized as been in a totally indeterminate state between the Trait and antiTrait.
- If $d_{\text{Trait} \& \text{antiTrait}}(x) \in (\varepsilon, \text{Thr})$, then the individual is categorized as mostly belonging to the Trait.
- If $d_{\text{Trait} \& \text{antiTrait}}(x) \in (-\text{antiThr}, -\varepsilon)$, then the individual is categorized as mostly belonging to the

antiTrait.

The way to deal with d_{Trait} & $d_{\text{antiTrait}}$ is illustrated in [5][4] as follows:

“Assume a psychiatrist, after many sessions, neutrosophic questionnaires and observations measured with neutrosophic statistics, has gotten to the conclusion that George P.’s two temperament dimensions are estimated with a certain accuracy as:

- degree of stable (trait) is $d_{\text{GP}}(\text{stable}) = 0.2 \in [0, 1]$,
- degree of unstable (antiTrait) is $d_{\text{GP}}(\text{unstable}) = -0.5 \in [-1, 0]$; and
- degree of extroverted (trait) is $d_{\text{GP}}(\text{extroverted}) = 0.9 \in [0, 1]$,
- degree of introverted (antiTrait) is $d_{\text{GP}}(\text{introverted}) = -0.3 \in [-1, 0]$.

Then $d_{\text{GD}(\text{stable}) \& \text{unstable}}(x) = d_{\text{GP}}(\text{stable}) + d_{\text{GP}}(\text{unstable}) = 0.2 + (-0.5) = -0.3$, and

$d_{\text{GD}(\text{extroverted}) \& \text{introverted}}(x) = d_{\text{GP}}(\text{extroverted}) + d_{\text{GP}}(\text{introverted}) = 0.9 + (-0.3) = +0.6$.”

3 Method to measure managerial transformational leadership

In this section we introduce a graphical assessment method to evaluate the managerial transformational leadership of an enterprise’s manager. A pictorial rather than a linguistic or numeric evaluation is a very simple, easy way to measure leadership. Also, here we prefer to avoid identifying the degree of leadership or “anti leadership” by means of traits ([15-16][5]), because it is an indirect way to detect this kind of person (here we denote it by x). Thus, we selected that employees give their opinions about one possible leader by asking them about the degree of leadership and “anti leadership” by mean of some questions, which are the following:

1. Mark a square in the figure below on what degree you consider x is inspiring for the teamwork, to what extent his/her influences to meet the company's goals. The darkest square means "nothing," the lighter one "total."



2. Mark a square in the figure below on what degree you consider x prevents the teamwork’s environment from meeting the company's goals satisfactorily. The darkest square means "total," the lightest one "nothing."



3. Mark a square of the figures below on what degree you consider x meets the following shown characteristics, remembering that the darkest square means "nothing" and the lightest one "total":



- 3.2. He/she has a charm that attracts the staff of the company that knows him/her.



- 3.3. He/she makes positive decisions for the company with firmness and determination.



- 3.4. He/she concerns about meeting the people around him/her, listens and takes their opinions into account when making a decision.



- 3.5. He/she is communicative, kind, gentle with the other workers.



Let us remark that each square represents an approximately 10% of agree about the criterion, and it is additive respect to the number of square on the left, e.g., if the third square is selected, that means the interviewed is approximately 30% agreed with the proposition. This survey should be applied to the majority of workers having a job relationship with x .

Questions 1 and 2 evaluate the degree of leadership (question 1) and the degree of anti-leadership (question 2) of x . To determine the total degree of leadership we only have to count the number of squares on the left of the selected square in question 1 including it (let us denote it by ps), next we count the number of squares on the left of the selected square in question 2 including it (let us denote it by ns), and finally we calculate the x ’s degree of leadership by formula 3:

$$dl = (ps - ns) + \text{sign}(ps - ns) \quad (3)$$

On the other hand, question 3 is concerned to measure the degree of transformational leader x is. In this case, a transformational leader must satisfy all the asked qualities, thus, we use formula 4 to assess this aspect.

$$d_{\text{tl}} = \min(s_1, s_2, s_3, s_4, s_5) \quad (4)$$

Where s_i ($i = 1, 2, 3, 4, 5$) is the number of squares on the left of the marked squares including them for questions 3.1, 3.2, 3.3, 3.4, and 3.5, respectively.

Figure 1 is the discrete 2D pictorial coordinate system representation of the leadership degree of x from the viewpoint of one of his/her colleagues. See that we coined the term “a leadership” to represent no leadership nor anti leadership. The filled squares represent the coordinates. The abscissa represents dl of Equation 3, where respect to the center (labeled as “a leadership” and marked with a red line in figure 1) we have to count $abs(dl)$ squares, either to the left if $sign(dl) < 0$ or to the right if $sign(dl) > 0$, or we situate it in the middle where $abs(dl) = 0$.

The ordinate represents the degree that x is a transformational leader. Figure 1 shows a darkest zone, representing a non-leader, because he/she is an anti-leader. Whereas a brightest zone represents the leadership quality of x , and a central gray zone represents “a leadership”. Upper and righter x is situated, more leader’s qualities he/she has.

To calculate the aggregated value of transformational leadership index we have to calculate the median of dl by every partner of x , and also the median of dtl for every one of them, and these values can be represented in a coordinate system like this shown in figure 1. When the median is not an integer, we approximate it to the nearer lower integer respect to the median.

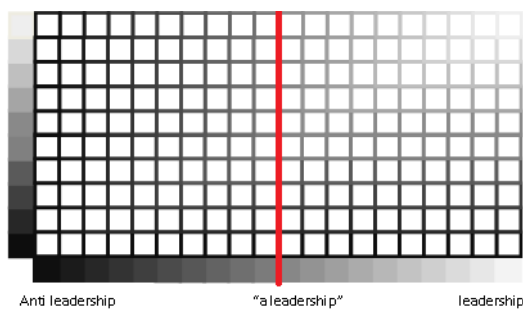


Figure 1: 2D coordinate system to represent leadership.

Let DL be the aggregation of dl respect to every interviewed and similarly let DTL be the aggregation of dtl respect to every interviewed, then, a numeric index of transformational leadership of x can be calculated as follows:

$$ITL(x) = DL * DTL \quad (5)$$

See that $ITL \in [-100, 100]$. If $ITL \leq -\varepsilon$ then x is not a good transformational leader, if $ITL \geq \varepsilon$, then x is not a good transformational leader, and if $ITL \in (-\varepsilon, \varepsilon)$, then he/she is an a-leader.

In the following we illustrate the method with an example.

Example 1.

For simplicity we suppose that a survey was made to only three employees denoted by E_1 , E_2 , and E_3 , about the transformational leadership of x , who is a member of the company, the results were the following:

E_1 answered:

Question 1:

Question 2:

Question 3.1:

Question 3.2:

Question 3.3:

Question 3.4:

Question 3.5:

E_2 answered:

Question 1:

Question 2:

Question 3.1:

Question 3.2: 

Question 3.3: 

Question 3.4: 

Question 3.5: 

And E_3 answered:

Question 1: 

Question 2: 

Question 3.1: 

Question 3.2: 

Question 3.3: 

Question 3.4: 

Question 3.5: 

Thus, $dl(x) = 6 - 2 + \text{sign}(6 - 2) = 4 + 1 = 5$, $dl(x) = 5 - 2 + \text{sign}(5 - 2) = 3 + 1 = 4$, and $dl(x) = 8 - 1 + \text{sign}(8 - 1) = 7 + 1 = 8$; according to E_1 , E_2 , and E_3 's criteria, respectively. Additionally, $d tl(x) = \min(6, 7, 7, 6, 8) = 6$, $d tl(x) = \min(5, 5, 6, 6, 5) = 5$, and $d tl(x) = \min(8, 9, 7, 9, 9) = 7$.

Thus, $DL = \text{median}(5, 4, 8) = 5$; $DTL = \text{median}(6, 5, 7) = 6$.

Representing these evaluations in the coordinate system of Figure 1, we obtain the graphic in Figure 2.

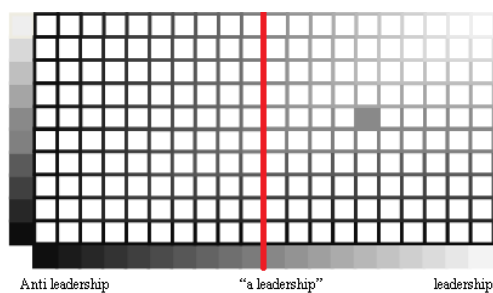


Figure 2: Graphical representation of the transformational leadership degree of x , represented by the filled square, coordinate 5 on the right of the leadership label, and six of height.

Therefore a graphical representation of the transformational leadership of x is approximately medium. According to Equation 5, a numeric measure of this is $ITL = 5 \cdot 6 = 30$.

ITL corresponds to the area limited by the origin of the coordinate system and the point represented in Figure 2, see Figure 3.

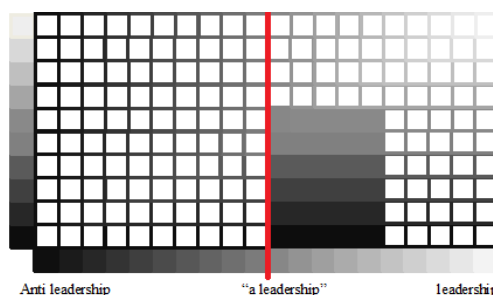


Figure 3: Area in the coordinate system representing ITL with filled squares.

Conclusion

This paper was dedicated to design a new method to assess transformational leadership in any company. The method starts from the evaluation of the leadership of a member of the company according to their peers and subordinates. The advantage of the method is its simplicity and that it can be easily automated. In addition, the way of representing opinions and the final evaluation is entirely graphic, therefore the result can be visualized by all, which in our opinion improves the understanding of what is measured, rather than if numerical measurements were used. For the first time, the term "a-leadership", inspired by the neutrosophic psychology, is coined to mean the part of the individual's behavior that does not correspond to either leadership nor anti leadership. The use of the method was illustrated by one example.

References

- [1] San Saturnino, N. and Piédrola, J. (2013). Transformational leadership, empowerment and learning (Liderazgo transformacional, empoderamiento y aprendizaje)(In Spanish). *Revista de Educación*, 362, 594-622.
- [2] Escobar, J. and Castillo, S. (2011). *Characterization of the SME in the manufacturer industry in the Metropolitan District of Quito subsector CIU D1711: textile products production (Caracterización de la PYME en la industria manufacturera en el Distrito Metropolitano de Quito subsector CIU D1711: fabricación de productos textiles)*(In Spanish). Bachelor's thesis, Papal Catholic University of Ecuador, Quito.
- [3] Araque, W. (2006). profile of the Ecuadorian enterprising (Perfil del Emprendedor Ecuatoriano)(In Spanish), Available in http://www.repositorio.uasb.edu.ec/contenido_proyecto.php?cd_programa=89., consulted 2018-2-20.
- [4] Nader, M. and Castro, A. (2007). Influence of the principles over the leadership styles: an analysis according to the model of Bass' transformational-transaccional leadership (Influencia de los valores sobre los estilos de liderazgo: un análisis según el modelo de liderazgo transformacional)(In Spanish). *Universitas Psychologica*, 6(3), 689-698.
- [5] Smarandache, F. (2018). *Neutropsychic Personality: A mathematical approach to psychology*. Brussels: Pons.
- [6] Cardona, P. (2005). *Talent keys : influence of the leadership in the Capital Human development (Las Claves del Talento: La Influencia del Liderazgo en el Desarrollo del Capital Humano)*(In Spanish). Colombia: Trilla..
- [7] Morocho Cáceres, L. M. (2010). *Transformational leadership and organizational clima in the educational institutions in Satélite Santa Rosa city, Callao region (Liderazgo transformacional y clima organizacional de las instituciones educativas de la ciudad Satélite Santa Rosa Región Callao)*(In Spanish). Master' Thesis, Escuela de Postgrado Universidad San Ignacio de Loyola, Lima, Peru.
- [8] Narváez Duran, E. G. (2015). *Decisive factors of the transformacional leadership in the organizational climate of Bancolombia de la Castellana located in the northern of Bogotá city (Factores determinantes del liderazgo transformacional en el clima organizacional de Bancolombia de la Castellana ubicada en la zona norte de la ciudad de Bogotá)*(In Spanish). Bachelor's thesis, Universidad Militar Nueva Granada, Bogotá-Colombia.
- [9] Aldape, A., Pedrozo, J., Castillo Perez, M. H. and Mogue Liévano, M. D. (2011). Leadership and satisfaction in the job: Is it worthwhile to study them? Pretium (Liderazgo y Satisfacción en el Trabajo: ¿Vale la pena estudiarlos? Pretium)(In Spanish). *Revista Económica de Finanzas y Negocios*, 1(2), 35-42.
- [10] Serrano Orellana, B. J. and Portalanza Ch., A. (2014). Influence of the leadership on the organizational climate (Influencia del liderazgo sobre el clima organizacional)(In Spanish). *Suma de Negocios*, 5(11), 117-125.
- [11] J. E. Ricardo, and K. de Mora Litardo, "La influencia de la programación neurolingüística en estudiantes universitarios en la República de Ecuador," *LUZ*, vol. 16, no. 1, pp. 104-113, 2017.
- [12] N. B. Hernandez, M. B. Ruilova Cueva, and B. N. Mazacón, "Prospective analysis of public management scenarios modeled by the Fuzzy Delphi method," *Neutrosophic Sets and Systems*, vol. 26, no. 1, pp. 17, 2019.
- [13] N. Batista Hernández, and N. Valcárcel Izquierdo, "Determinación de la prefactibilidad en la aplicación de una estrategia pedagógica para la formación de la competencia Emprender en la educación preuniversitaria como contribución a la formación integral del estudiante," *Dilemas Contemporáneos: Educación, Política y Valores*, 2018.
- [14] J. E. Ricardo, N. B. Hernández, G. R. Zumba, M. C. V. Márquez, and B. W. O. Ballas, "EL ASSESSMENT CENTER PARA LA EVALUACIÓN DE LAS COMPETENCIAS ADQUIRIDAS POR LOS ESTUDIANTES DE NIVEL SUPERIOR," *Investigación Operacional*, vol. 40, no. 5, pp. 638-643, 2019.
- [15] M. Leyva-Vázquez, F. Smarandache, and J. E. Ricardo, "Artificial intelligence: challenges, perspectives and neutrosophy role.(Master Conference)," *Dilemas Contemporáneos: Educación, Política y Valore*, vol. 6, no. Special, 2018.

Received: October 01st, 2019.

Accepted: February 17th, 2020