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Validation of A Model for Knowledge Management in the Cocoa Producing Peasant Organizations of Vinces Using Neutrosophic Iadov Technique

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Abstract: The work departs with a model for knowledge management in the country productive organizations of cocoa of Vinces, in Ecuador. A model that is developed for the need to boost the correct management of knowledge and development of this type of entrepreneurship. The objective of the present work is to validate the qualitative aspects of the model using neutrosophy and the Iadov technique, due to that these techniques are appropriate for validating knowledge in different areas in the presence of uncertainty and indeterminacy. A final result is obtained that facilitates to calculate the index group satisfaction of the proposed model. The index of group satisfaction (GSI), in this case, is $GSI = 0.85$. Results are positive, which validate the satisfaction with the model. Paper ends with conclusions and future works proposals.

Keywords: knowledge management, cocoa production, neutrosophic logic, Iadov

1. Introduction

The small and medium enterprises (SMEs) of Ecuador, have an impact of 40% in the gross domestic product and 60% in the generation of direct employment, according to Zúñiga Santillán, et al. [1]. These authors recognize that the main factors of the failure of the SMEs, they find in the limited knowledge on the official programs of support and information about sources of available public financings and the absence of competences.

Coincident with the before related authors, refer Messina and Hochsztain [2] that is important the level that possesses the SMEs and especially, the human capital, as for the knowledge, skills, and capacitances that can be converted in factors that induce to the success/failure. Other studies carried out in Ecuador recognize that the main influential elements to lean it take of decisions, are the ones not based in technical elements, nor in the registers took on the products that possess the SMEs.

It is shown in the studies of the before mentioned authors, faulty planning, organization and control of the labor process, about the matter Poveda Morales and Varna Hernández [3], outline the need for better implementation of knowledge management strategies and gaining institutional support [4]. On the other hand, Rodríguez and Gómez [5], recognize as factors of success of the SMEs such as human committed, competent capital, motivated with the business and with the dominion of management tools.

The development of the knowledge in the SMEs of Ecuador corresponds with the sustainable development and the exigencies that the state imposes in this sense [6]. Specifically, for the country productive organizations of cocoa of Vinces in Ecuador, where the economic and social development, requires the management of the knowledge generated [7], favoring:

- The support to takes empiric decisions
- The mechanisms to register historical results
- That the distribution of the work is carried out without the criterion of the managers
- The follow-up and control of the carried out work
- An improvement as for the external contracting pf adviser.

Other difficulties are recognized to keep the experiences of the region in the cultivation of the product, the conditions, and the particular properties of the area, transmit and formalize experiences and knowledge. The producers are developed in an environment that lacks activities that stimulate the management of human talent and knowledge, with impact on the organizational culture and productive results.

The management of human talent in the scientific literature defines the following mains steps: management of human resources, management of the human capital, management of the personnel. However, the fundamental thing is considered to the person or the human being as bearing integrity of the capacitance of work or the human capital, not as a means [8].

It is recognized that entrepreneurship must incorporate a philosophy of management that is based on the belief that the person could generalize the knowledge that generates. To center in the work position for the design of the systems of knowledge management.

It is essential to create the context that facilitated the peoples to acquire the capacitance and the motivation, as well as that, have the opportunity to involve in operation in which promotes collective apprenticeship [9] and it incorporates the organizational culture. In this sense, the effort of the national association of exporters highlights the cocoa producers [10].

The deficiencies and difficulties outlined, result in an exigency for the development of the human talent in the country productive organizations of cocoa of Vinces:

- Deciding the leaders of human talent and identify relevant knowledge
- Making good use of better experiences and transfers it.
- To motivate the personnel to explore and use knowledge
- Propitiating the innovation and the creation of values added in order to achieve competitiveness and sustainability.

Based on the documentary analysis, the literature consulted not recognize studies using knowledge management (KM) of these organizations. As for the KM that it has been effective, it has originated of enlarging interest, and it has been treated from different perspectives, as systems of information, organizational apprenticeship, strategic direction, and [11] innovations, accustomed is insufficient, for these undertakings.

In agreement with it before related, it is of highlighting that the models of knowledge management define in simplified form: symbolic and schematic the components that define it; to delimit someone of your dimensions; permitting an approximate sight; to describe processes and construct; finding one's bearings strategies; as well as to contribute essential data [12] is vital for the SMEs. Therefore, the KM model to boost the human talent in productive organizations of cocoa of Vinces, for later operationalization in specific procedures, contribute to keep the traditions (good practical in the historical conditions-make concrete of the territory), and at the same time to incorporate experiences, tools and knowledge to the increment of the productivity and the effectiveness of the process.

To verify the validity of the model that it is proposed neutrosophic Iadov technique is used. The Iadov technique constitutes an indirect form to study the users' satisfaction [13]

This technique uses [14], the main criterion to formulate questions that validate the proposals, while the questions not related or complementary serve as an introduction and to get additional

information about the proposal. The results of these form the "logical table of Iadov"[15, 16]. In this document, the satisfaction of the emitting actors and the beneficiaries of the strategy of development, are combined to form the receiving actors. The techniques of the criterion of user must be used as a form to evaluate the results in those cases in which the proposal is contextualized, immersed in the context and for finding the applicability of the result [17].

The degree of satisfaction- in satisfaction is a psychological state that it shows in the peoples as an expression of the interaction that moves between the positive poles and negative [17]. Neutrosophic Iadov allows to include indetermination and the importance of the user.

Recently, neutrosophy has been introduced as a theory for decision making [18]. The neutrosophic term means knowledge of the neutral thought and this neutral represents the main distinction between fuzzy and intuitionist logic [19]. The theory of neutrosophy introduces a new logic in which is estimated that each proposition has a true degree (t), indetermination degree (i) and a falsity degree (f) [20]. They have proposed many extensions of the classic methods of taking of decisions to treat the indetermination based on the theory of the neutrosophic as TOPSIS [19], DEMATEL [21], AHP [22] and VIKOR [23].

The original proposal of the Iadov method do not allow appropriate management of the indetermination. Another weakness is the impossibility of including users' importance. The introduction of the neutrosophy theory resolves the problems of indetermination that appear in the evaluations, being useful for capturing the neutrals or ambiguous positions of users [24]. Each idea tends to is neutralized, decreased, balanced for other ideas [25].

2. Materials and Methods

In the Iadov technique, questionnaires are used to decide the degree of satisfaction of the users with the proposal to measure the impact of the strategy of the investigator with a total of seven questions, three of those which are closed and four open, whose report is unknown for the subject [26]. These three ask about hidden sections relate through the "logical table of Iadov", that is to present adapted to investigation. The interrelation of the three questions shows the position of each user in the scale of satisfaction. This scale of satisfaction is expressed using SVN numbers [28]. The original definition of true value in the neutrosophic logic is presented as follow [27]:

It is $N = \{(T, I, F) : T, I, F \subseteq [0, 1]\}$ a neutrosophic valuation as a mapped of a group from proportional formulae to N , and for each p sentence then:

$$v(p) = (T, I, F) \quad (1)$$

In order to make easy practical application to real-world, it was developed a proposal of single-valued neutrosophic sets (SVNS) allowing to use of linguistic variables [28, 29], this increase the interpretability of models and the use of the indetermination in practical problems.

Be X a universe of discourse. A SVNS A on X is an object of the form.

$$A = \{(x, u_A(x), r_A(x), v_A(x)) : x \in X\} \quad (2)$$

Where, $u_A(x) : X \rightarrow [0,1]$, $r_A(x) : X \rightarrow [0,1]$ y $v_A(x) : X \rightarrow [0,1]$, con $0 \leq u_A(x) + r_A(x) + v_A(x) \leq 3$ for all $x \in X$. The intervals (x) , (x) and (x) denote the true, indeterminate and false membership of x in A , respectively. For motives of convenience, an SVN number could be expressed as $A = (a, b, c)$, where $a, b, c \in [0,1]$, $y + b + c \leq 3$. The SVN numbers, that it is obtained, is of utility for the systems of decision making. To analyze the results, it establishes as a function of punctuation. To arrange the alternatives uses a function of [30] punctuation adapted

$$s(V) = T - F - I \quad (3)$$

In the case that the assessment corresponds to indeterminacy (I) a process of de-neutrosophication is developed [1]. In this case, $I \in [-1, 1]$. Lastly, we work with the average of the extreme values $I \in [0,1]$ to obtain a single value.

$$\lambda([a_1, a_2]) = \frac{a_1 + a_2}{2} \quad (4)$$

Then, the results are aggregated. In this paper, the weighted average aggregation operator is proposed to calculate the group satisfaction index (GSI). The weighted average (WA) is extensively used [2, 3]. A WA operator has associated a vector of weights, V , with $v_i \in [0,1]$ and $\sum_1^n v_i = 1$, with the following form:

$$WA(a_1, \dots, a_n) = \sum_1^n v_i a_i \tag{5}$$

Where v_i represented the importance of expert i . This proposal allows dealing with indeterminacy and importance of users due to expertise or any other reason making Iadov method more practical [19].

3. Survey to Country Producers of Cocoa in Vinces

A model to promote the knowledge management of the country organizations producers of cocoa of Vinces, province Los Rios, Ecuador was proposed based on the study of a group of models of knowledge management, the legal framework and the particular properties of the sector by means of diagnosis.

The general procedure describes previously proposes five phases: build a work team, creation of the center of strategic information, allies and possibilities, implementation and measurement, and feedback. The conception integrates a series of tools as a methodological solution to the outlined scientific problem. The implementation permits the identification of the main deficiencies and related risks with the integral acting of the human talent and the generation of actions of improvement accordingly, as part of the continuous improvement.

A case study was developed for the validation of the model. A scale with individual expressions satisfaction and its corresponding score value is shown in Table 1.

Table 1. Scale satisfaction with SVN values.

Linguistic expression	SVN Number	Scoring
Clearly pleased	(1, 0, 0)	1
More pleased than unpleased	(1, 0.25, 0.25)	0.5
Not defined	I	0
More unpleased than pleased	(0.25, 0.25, 1)	-0.5
Clearly unpleased	(0,0,1)	-1
Contradictory	(1,0,1)	0

Table 2. The Iadov logical table

	Would you consider knowledge management without using the proposed model?								
	No			I don't know			yes		
Do your expectations meet the application of the model for knowledge management?	If you could choose freely, a model for knowledge management, would you use the proposed model?								
	yes	I don't know	No	yes	I don't know	No	yes	I don't know	No
Very pleased.	1 (6)	2 (1)	6	2	2	6	6	6	6
Partially pleased.	2	2	3	2	3 (1)	3	6	3	6
It's all the same to me	3	3	3	3	3	3	3	3	3
More unpleased than pleased.	6	3	6	3	4	4	3	4	4

Not pleased	6	6	6	6	4	4	6	4	5
I don't know what to say	2	3	6	3	3	3	6	3	4

A sample of 21 specialists directed linked to the model were surveyed. The survey elaborated comprises 7 questions, three closed questions interspersed in four open questions, of which 1 fulfilled the introductory function and three functioned as reaffirmation and sustenance of objectivity of the user response.

In this case, the results are shown in Table 3.

Table 3. Results of the application to producers of cocoa in Vices.

Expression	Total	%
Clearly pleased	6	75
More pleased than unpleased	1	12.5
Not defined	1	12.5
More unpleased than pleased	0	0
Clearly unpleased	0	0
Contradictory	0	0

The calculation of the score is carried out. In this case, it two initial user have more expertise with $V = [0.2, 0.2, 0.1, 0.1, 0.1, 0.1, 0.1, 0.1]$. The final result of the index of group satisfaction (GSI) that the method portrays, in this case, is: $GSI = 0.85$. Results are positive, show the satisfaction with the model, as displayed in Figure 1.

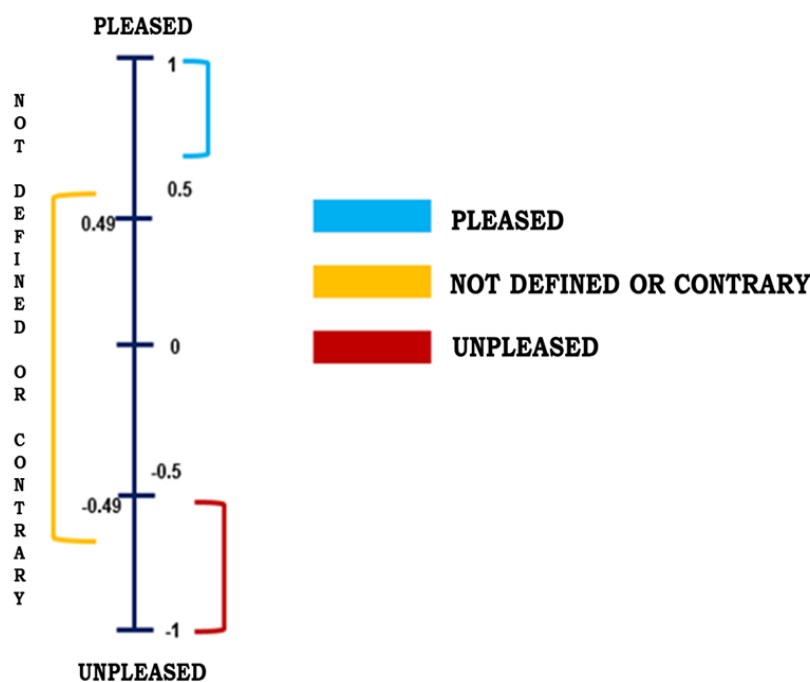


Figure 1. Scale with group satisfaction index.

The proposal to extend the Iadov method with SVN numbers making it easy to use and practical in applications for knowledge management model validation. The inclusions of indetermination allow a more robust and real-world compatible form to represent information in comparison with

the typical application of Iadov. The inclusion of the WA operator improves the traditional method allowing to express the importance of the [34] sources of information or expertise of users. The real-world application of the proposal validates the model for knowledge management in the country productive organizations of cocoa of Vinces, Ecuador.

4. Conclusions (authors also should add some future directions points related to her/his research)

In this paper, the neutrosophic Iadov is used, which contributes to an appropriate method for the management of indeterminacy and for taking into account uncertainty in real-world problems and the importance of the users. The Iadov method with the inclusion of the neutrosophic analysis showed applicability and facility of use in the validation of the knowledge management model. Between the advantages concerning the original, it is that it can incorporate the indetermination in a more natural way. Another advantage is that allows the use of aggregation operators, which permits express the importance or the expertise of the users according to the experience or some other criterion.

The final result is of GSI = 0.85. Results that validate the satisfaction with the model for knowledge management in the cocoa producing peasant organizations of Vinces. Future works will concentrate on including the modeling of knowledge in the proposal through neutrosophic cognitive mapping extending previous works from [35-38].

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Conflicts of Interest

The authors declare no conflict of interest.

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