THE STUDY OF INTERNATIONAL JOINT VENTURES MANAGERS' REPRESENTATIONS ABOUT THE KNOWLEDGE ACQUISITION PHENOMENON: OVERVIEW OF AN ALGERIAN-SPANISH JOINT VENTURE

HANACHI Mustapha Kamel

University of Medea

Abstract: The study of international joint ventures managers' representations, by using the fuzzy cognitive mapping, is the main objective of this research. From individual cognitive maps, we aim to establish a collective cognitive map representing the shared views within a selected joint venture by including the step of defuzzification likely to allow the use of the collective cognitive map for analysis purposes.

Keywords: Managers' representations - fuzzy cognitive mapping - Defuzzification – Knowledge acquisition - International Joint Ventures.

Résumé : L'étude des représentations des dirigeants des coentreprises internationales quant au phénomène d'acquisition des connaissances, en ayant recours à la cartographie cognitive floue, constitue l'objectif principal de cette recherche. A partir des cartes cognitives individuelles, nous visons l'établissement d'une carte cognitive collective représentant les opinions partagées au sein d'une coentreprise sélectionnée et ce, en incorporant l'étape de la défuzzification susceptible de permettre l'utilisation de la carte cognitive collective pour des fins d'analyse.

Mots clés : Représentations des dirigeants – Cartographie cognitive floue – Défuzzification – Acquisition des connaissances – Coentreprises internationales.

I. Introduction:

Understanding the firm's strategy cannot be done without the observation of its managers' cognitive schemes, through which are identified their representations. This task should be carried out through the use of cognitive mapping.

The study of representations in strategic management is popular because it allows understanding the choices of decision-makers (Karray, 2004: 5). Moreover, many researchers (Lee et al., 1992; Huber, 1991) have integrated these representations in the study of the

knowledge acquisition as they constitute a significant predictor of this phenomenon (Allard-Poesi, 1996: 120).

The phenomenon of knowledge acquisition is very important when considered within International Joint Ventures (IJVs) due to the fact that the most common reason for their formation is the transfer of knowledge between partners (Li et al., 2013: 489). Our choice of this type of firms is justified by this reason.

The objective of this study is to explore an IJV managers' representation regarding the phenomenon of knowledge acquisition within their entity through the detection of key factors that can influence this phenomenon and the determination of the relationships between them using the cognitive mapping.

This article will contain several sections. First, the foundations of cognitive mapping will be discussed *(Section II)*. Next, the steps to establish individual fuzzy cognitive maps will constitute a separate section *(Section III)*. The next section *(Section IV)* will clarify the methodology advocated to establish collective cognitive maps. Then, we will expose the defuzzification before presenting approach for its implementation *(Section V)*. Finally, we will present the empirical investigation aiming to present an IJV managers' representation about the knowledge acquisition of their entity *(Section VI)*.

II. Theoretical aspects of cognitive mapping:

The use of maps to explore the members' cognitive structures has become well established in recent years (Eden, 2004: 674).

1. *Definition of cognitive mapping*:

The term cognitive mapping is used to describe the task of mapping a person's thinking about an issue. A cognitive map is: "the representation of thinking about a problem that follows from the process of mapping" (Eden, 2004: 673).

Cognitive maps are called cognitive because they outline entities, causal relations and outcomes that are kinds of individual thoughts. They are stated as maps because they are sketched as digraphs that represent some individual thoughts. But maps are not just a graphical description of what is said; rather they are interpretations of what the individual means (Eden, 2004: 675).

However, the existing literature shows causal maps as the most commonly used form of cognitive mapping. This is mainly due to the fact that people's beliefs about the causes and effects of past events create expectations about the likely outcomes of future events, guide their decision-making process and force researchers to adopt this type of mapping (Budhwar, 1996: 20-21). In other words, a cause map is a cognitive map where the relationships are restricted to "cause-effect" relationships (Tegarden and Sheetz, 2003: 114).

For representational purposes, a cognitive map is usually drawn as short pieces of text linked with unidirectional arrows (Peña et al., 2008: 3). These short pieces of test are called nodes which represent the factors most relevant to the decision environment while the arrows indicate causal relationships among factors (Kang et al., 2004: 546). So, there will be two different kinds of arrows: positive and negative ones.

2. *Benefits of using cognitive mapping*:

Cognitive mapping is of great interest and can be useful (Budhwar, 1996: 22):

- Cognitive maps help researchers wanting to describe and understand the behaviour of actors or social systems by providing a rough approximation of thinking patterns and bases that are assumed to underlie managerial decision-making.
- Cognitive mapping can help to structure peoples' muddled thoughts in a more meaningful way.
- Cognitive maps help to facilitate the transmission of complex ideas from individual to individual and organization to organization.
- Cognitive maps are especially useful tools for modelling complex relationships among variables (Özesmi and Özesmi, 2004: 44).

3. *Fuzzy cognitive maps (FCMs)*:

FCMs are a modelling methodology for complex systems originating from a combination of fuzzy logic and neural networks (Yaman and Polat, 2009: 386). They extend the idea of cognitive maps by fuzzifying arrow values (Kang et al., 2004: 546) and allowing the concepts to be represented linguistically with an associated fuzzy set rather than requiring them to be precise. In order to describe the degree of the relationship between concepts, it is possible to use a number between [-1, 1] (Stylios and Groumpos, 1999: 230), or use fuzzy linguistic terms, such as ''often'', ''always'', ''some'', ''a lot'', etc (Bertolini, 2007: 407).

Thus, the elements of a FCM are as follows (Kok, 2009: 124):

- Concepts: They represent the drivers that are considered of importance to the issue under consideration.
- Directed arrows: They represent the relationships between concepts.
- Adjacency matrix: It contains the values of all relationships between concepts, usually between -1 and +1.

Hence, the representation of the relations of causality is constituted by a matrix with positive or negative values among each of the concepts and the rest of them (Espinosa-Paredes et al., 2009: 439). Moreover, it is in this form that we will present the cognitive maps that will be established.

III. Construction of individual FCMs:

In order to construct individual FCMs, several methods exist. For our part, we will build on that developed by Cossette (2003) which contains the following steps:

1. *Exploration of the experts' representations*:

This phase will allow exploring individuals' ideas through different data collection methods. Below, we will present three of the most popular cognitive mapping techniques (Ho and Wilson, 2008: 320):

1.1. *The comparative cause mapping*:

Proposed by Laukannen, this method aims to analyse systematically data gathered from several interview sessions. These interviews are conducted to obtain information regarding the domain of interest. The initial interview aims to elicit concepts and causal beliefs around the anchor themes.

1.2. *The repertory grid technique*:

Developed by Kelly, this method requires generation of elements, either by respondents or researcher based on theoretical considerations. These elements are then subjected to the respondents classifying, ranking and comparing them pair-wise.

1.3. *The self-Q method*:

Developed by Bougon, it sets out a structured approach to interviewing subject and eliciting concepts in a systematic and organised way. This technique allows respondents to collect and verify concepts and examine their causal linkages. It is an interviewing process that utilises a three stage approach in elicitation.

2. *Coding the experts' representations*:

This step intends: "to identify, in the transcribed interview, the different concepts including influence relationships"(Allard-Poesi et al., 2003: 466). Thus, cognitive mapping is a form of content analysis, but it differs from the most common methods that it studies the relationships between cognitive concepts (Gendre-Aegerter, 2008: 246-47).

Generally, some representation collection methods require the development of a specific coding protocol. Therefore, the encoding steps are (Cole and Persichitte, 2000: 4):

- Location of influence relationships within the transcribed interviews.
- Placement of components localized sequentially.
- Selecting the text portion to enter in the coding sheet.

3. *Validation of the experts' representations*:

Introducing this phase in the constructing of individual FCMs process makes it credible. The researcher wants to be certain that the maps reflect the ideas of each expert. However, at this stage, we want also to measure the intensity of the influence between concepts as well to establish an ontological structure to homogenize concepts used by the various experts.

3.1. *Validation of the experts' cognitive map*:

Some representation collection methods provide generally valid maps because they are close to the perception of the experts. Two criteria exist for determining the validity of a cognitive map (Gendre-Aegerter, 2008: 280-82):

- The researcher must ask whether the expert was able to respond as freely as possible to interview questions during the exploration phase.
- The constructed map should reflect the expert's language and logic.

Accordingly, in a second meeting, the researcher will confirm the concepts and links addressed by the expert. The latter can then propose changes and the map will be changed accordingly.

3.2. *Measuring the influence degree*:

Instead of asking the experts to assign a real number to each link in their cognitive map, it would be appropriate to describe each interconnection using a linguistic variable which is then converted into a fuzzy number (Cole and Persichitte, 2000: 10).

3.2.1. *Linguistic variables*:

A linguistic variable is: "a variable whose values are words or sentences" (Mohammad and Rosnah, 2011: 428) such as: strong influence, weak influence, etc (Papageorgiou et al., 2009: 12402). This concept is very useful in dealing with situations which are too complex to be reasonably described in conventional quantitative expressions (Chen, 2001: 68). Therefore, each expert will evaluate the influence degrees through the use of linguistic variables which can be represented by fuzzy numbers.

3.2.2. *Fuzzy numbers*:

A fuzzy number is: "an extension of an ordinary number in the sense that it does not refer to a single value, but rather a related set of possible values, where each possible value

has its own weight between 0 and 1" (Shang and Zaiyue, 2009: 331-32). This weight is called the membership function.

Fuzzy set theory was developed to address the premise that the key elements in human thinking are not numbers, but linguistic terms (Lin et al., 2007: 940). Moreover, the use of fuzzy numbers is especially recommended when the model parameters are difficult to quantify precisely, allowing the incorporation of uncertainty in the assessment of the influence intensity between concepts.

Among a variety of fuzzy numbers' forms, Triangular Fuzzy Numbers (TFMs) - which take the form (*a*, *b*, *c*) - are among the most used. The reason is that they are easy to use and calculate (Lin et al., 2007: 942).

3.3. *Construction of ontology structure*:

To successfully merge the individual maps, common semantic nodes must be identified (Tegarden and Sheetz, 2003: 114). During the exploration phase, experts will give their vision of the studied topics using their own expressions. Nevertheless, and despite the heterogeneity of concepts used within individual cognitive maps, we have to keep in mind that the themes discussed during each interview are the same for all the individuals. Therefore, it is mandatory to study the variability of semantic expressions used by each expert and to establish an ontological structure (Magali and Fontenelle, 2006: 16).

The ontology is: "a set of hierarchically structured terms to describe a field" (Magali and Fontenelle, 2006: 16). In our case, it is a classification of semantic heterogeneity encountered in all the individual cognitive maps (Poignonec, 2006: 108). The objective of this ontological structure is to define a common structure for different maps, keeping the individual wealth of each map.

IV. Construction of collective cognitive maps:

We distinguish between these two main methods:

1. *The aggregation methods*:

They are based on the aggregation of the individual maps. However, there is a variety of methods:

- The average map: It is based on the statistical determination of the concepts and links from the individual maps (Ford and Hegarty, 1984).
- The weighted map: Links and concepts included in this map are weighted by the perceived influence of the group's members (Walsh et al., 1984).
- The socio-cognitive map: It is based on the correlation between cognitive convergence and social connectivity of the group's members (Dunn and Ginsberg, 1986).
- The assembled map: It is based on the assembly of individual maps based on the concepts they have in common (Weick and Bougon, 1986).
- Common elements map: It is based on the assembly of individual maps from the common elements included in, at least, one loop (Bougon, 1992).

2. *The global methods*:

They allow the establishment of the collective map from the organization's data sources or a discussion with a group of concerned members. These methods are:

- The documentary methods: The construction of the map through the coding of the organizations' documents (Huff, 1990).

- The negotiated composite map: It is established after discussion with the group's members about the union of their individual maps (Langfield-Smith, 1992).
- The influence diagram: It represents the interconnections between organizational factors in a strategic area (Ramprasad and Poon, 1985).

V. Defuzzification:

By defuzzification, we mean: "the conversion of a fuzzy number into a real number" (Lee et al., 2003: 392). The method of defuzzification presented in this research is that used by Ghyym Seong which allows the production of a numerical weight to each link in the collective map (Papageorgiou and Kontogianni, 2012: 431). This method requires the following steps (Ghyym, 1999: 1103-4):

a) The evaluation of the decision makers' attitude towards vagueness: This attitude can be considered by measuring an index called the optimism index.

For a TFM (a, b, c), the number $\alpha = \frac{b-a}{c-a}$ can be considered as an index of individual attitude towards vagueness with $\alpha \in [0, 1]$. To calculate the individual's attitude toward vagueness, we should use its own cognitive map, or more precisely its own matrix whose cells contain the influence intensity between the concepts in the form of TFMs (a_{ij} , b_{ij} , c_{ij}), where " *i"* representing the number of the line of the individual matrix and " *j"* the number of the column with: *i, j* = 1, ..., n and n = number of concepts in the individual matrix. Therefore, the calculation of the index of individual attitude toward vagueness α_{indiv} is thus:

$$\alpha_{indiv} = \sum_{i=1}^{n} \sum_{j=1}^{n} \frac{b_{ij} - a_{ij}}{c_{ij} - a_{ij}}$$

The calculation of the collective attitude toward vagueness α_{Total} is done as follows:

$$\alpha_{Total} = \frac{\sum_{indiv=1}^{m} \alpha_{indiv}}{n \times n \times m}$$

with m = the number of individuals.

b) Conversion of TFM into real number: If the first stage of defuzzification was based on individual matrix, this step found in the collective matrix the necessary information for its realisation. Based on the integral values R-L (R: Right, L: Left), the conversion of each TFM is realised following the convex combination of Zadeh:

$$Real\ number = \alpha'_{Total}\ I_R + (1\text{-}\alpha'_{Total})\ I_L$$

with I_R is the R-type integral value and I_L the L-type integral value type that can be defined as follows:

$$I_R = \frac{(b+c)}{2}$$
$$I_L = \frac{(a+b)}{2}$$

VI. Case Study:

The objective of this research is to present representations of an IJV's managers about the process of knowledge acquisition within their entity.

1. *Presentation of the selected IJV*:

We chosen an IJV that confidentiality and respect of anonymity forbid us to mention its name. This IJV, which was established in March 2011, active in the construction industry and specializes in precast concrete elements and ready mixed concrete. It is the result of an alliance linking a private Algerian group to a Spanish one.

2. *Construction of individual FCMs*:

In order to establish the FCMs, two main steps were followed.

2.1. *Exploration of the managers' representations*:

For our case, the use of the comparative cause mapping for data collection appears adequate.

2.1.1. *Data collection*:

The chosen method for extracting managers' representations is that of the semi-structured interview, which helps to properly direct the discourse, through the adoption of an interview guide containing open-ended questions to focus the discussion on the topics interesting us.

Considering the knowledge acquisition as the central concept of individual cognitive maps, managers were asked to name the factors which may influence it. We submitted these factors to a similar questionnaire until the interviewee could not cite any new element.

The following table shows the order in which the interviews were conducted and the duration of each interview:

Tableau 1: List of interviews

Interview No	The interviewees	Interview duration
1	Engineering manager	1h 10mn
2	Construction manager	1h
3	Sales manager	40mn
4	Supply manager	1h 10mn
5	Assembly manager	35mn
6	Administration and Finance manager	1h 30mn
7	Prefabrication manager	1h 15 mn
	Total	**7h 20mn**

All interviews were conducted individually and transcribed manually when the interviewees were answering questions.

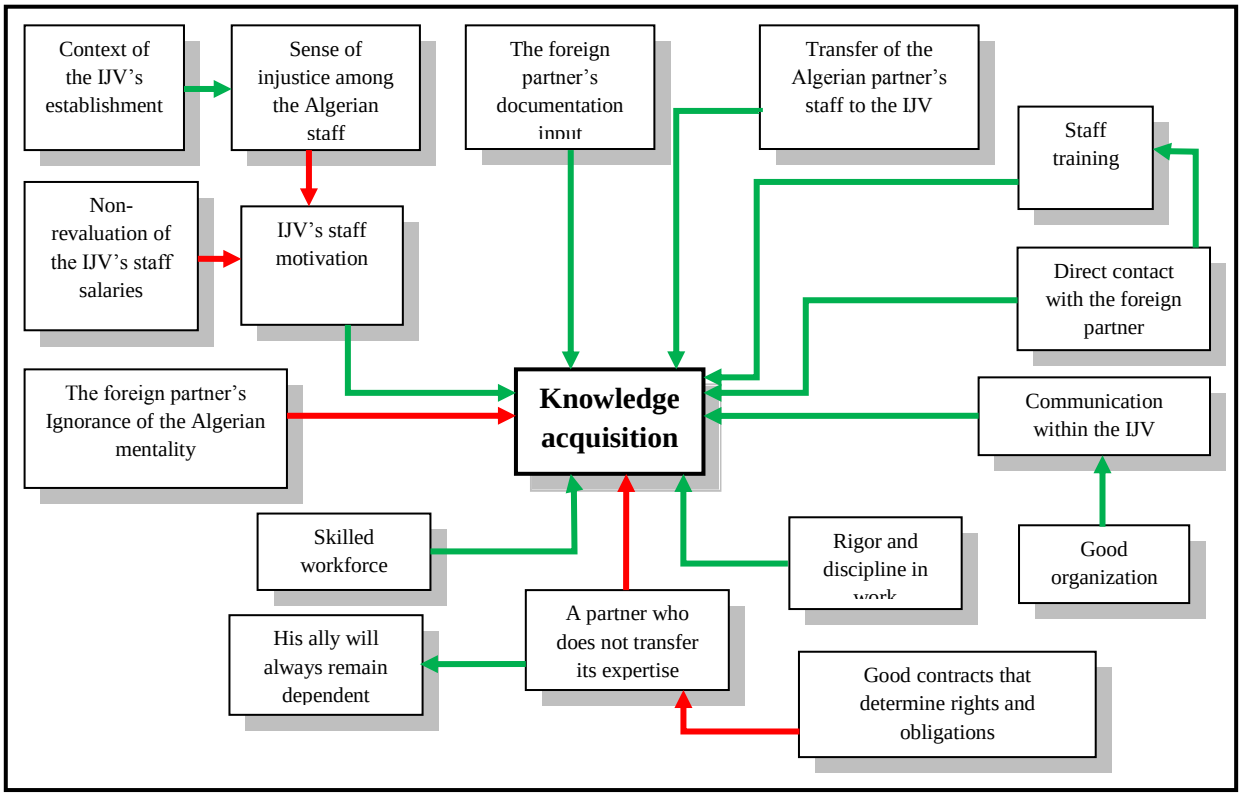
2.1.2. *Coding the managers' representations*:

To carry out the coding of interviews properly, a researcher has a variety of units of analysis (Allard-Poesi et al, 2003: 455). In our case, it is the meaning of a word or group of words that has been considered as a unit for translating interviews into cognitive maps.

Subsequently, it was necessary to have the various concepts mentioned by the respondent on one sheet with the central concept in the middle, that of "knowledge acquisition". All other factors that may influence the central concept were connected by a green arrow, when the influence is positive and with a red arrow, when the influence is negative. Even the influences that exist between other factors - apart from the central concept - were mentioned on the map in the same manner described above.

As an illustration, the Assembly manager's cognitive map is exposed below.

Figure 1: The cognitive map of the Assembly manager



2.2. *Validation of the managers' representations*:

To ensure the individual cognitive maps' credibility, a second interview, at which were discussed several key points, was essential.

2.2.1. *Validation of the individual cognitive maps*:

For each manager, a second interview was scheduled in order to validate the representations that have been made about his opinions. However, none of the managers has proposed significant changes, and the only changes involved the language that did not match, sometimes, what they were really thinking.

2.2.2. *Measuring the degree of influence*:

We offered to each manager a set of eleven linguistic variables so that he can easily assess the degree of influence of each concept on other concepts. The eleven linguistic variables used here are: {negatively very strong, negatively strong, negatively medium, negatively weak, negatively very weak, null, positively very weak, positively weak, positively medium, positively strong and positively very strong}.

We converted these linguistic variables into TFMs - introduced by Chang and Chen (1994) - as follows:

- Negatively very strong: (- 0.75 , - 1 , - 1).
- Negatively strong: (- 0.5 , - 0.75 , - 1).
- Negatively medium: (- 0.25 , - 0.5 , - 0.75).

- Negatively weak: (0 , - 0.25 , - 0.5).
- Negatively very weak: (0 , 0 , - 0.25).
- Null: (0 , 0 , 0).
- Positively very weak: (0 , 0 , 0.25).
- Positively weak: (0 , 0.25 , 0.5).
- Positively medium: (0.25 , 0.5 , 0.75).
- Positively strong: (0.5 , 0.75 , 1).
- Positively very strong: (0.75 , 1 , 1).

2.2.3. *Construction of ontology structure*:

The homogenization of concepts concerned only those directly related to "knowledge acquisition" in order to facilitate the task of respondents. To establish an ontological structure, the following steps were followed:

a) We asked each manager to define exactly what he meant by the concepts.

b) We asked each manager to group concepts whose meaning is similar. Thus, we formed a classification, where each concept is only in one group.

c) The researcher, with labels - each of which contained the name of one of the key factors, cited by the most influential authors in organizational learning in general and knowledge acquisition within IJVs in particular, that may influence the studied process - asked each manager to assign one label to each group already formed. We offered a blank label to each manager to use it when he could not designate the suitable label for group of concepts. In this case, he should of course assign it a name. We should note that before asking the managers to assign these labels to groups of concepts, we introduced a little explanation of the meaning of each factor. The presented labels contain the names of the following factors:

- Partners' commitment: A partner is said committed when undertaking the necessary measures to maintain the joint venture by contributing by staff, time and resources (Williamson, 1983).
- Social interaction between partners: It refers to the mutual and reciprocal actions and knowledge exchange process between partners (Parkhe, 1993).
- IJV's learning intention: It reflects the will of the IJV to learn from its partners (Hamel, 1991).
- IJV's learning capacity: It refers to the IJV's responsiveness and ability to learn from partners (Cohen and Levinthal, 1990).
- Cultural distance between partners: It comes from the existing differences in certain behaviour's values, norms and rules between partners (Parkhe, 1991).
- Knowledge protectiveness: It refers to the degree of protection of a partner vis-à-vis its knowledge base (Ingham, 1994).
- Trust between partners: It reflects the fact that a partner is expecting an honest behavior from its ally and that it should not take advantage of his vulnerability (Inkpen, 1998).
- Partner transparency: It refers to accessibility and completeness of the information through the partner's openness vis-à-vis its ally (Child, 2001).

The table below shows the groupings made by the Assembly manager, the assignment of one of the above factors and the influence intensity of each concept on "knowledge acquisition".

Tableau 2: Establishment of ontological structure – Assembly manager

Grouping No	The concept directly related to the central concept	The influence intensity	The factor
1	The foreign partner's documentation input	Positively strong	Partners' commitment
	Transfer of the Algerian partner's staff to the IJV	Positively strong	
2	Direct contact with the foreign partner	Positively medium	Social interaction between partner
	Staff training	Positively strong	
	Communication within the IJV	Positively strong	
3	IJV's staff motivation	Positively strong	IJV's learning intention
	Rigor and discipline in work	Positively strong	
4	Skilled workforce	Positively medium	IJV's learning capacity
5	The foreign partner's Ignorance of the Algerian mentality	Negatively medium	Cultural distance between partners
6	A partner who does not transfer its expertise	Negatively strong	Knowledge protectiveness

Thereafter, it was necessary to pass from individual cognitive maps showing the influence between the concepts mentioned by managers to individual cognitive maps showing the influence between the factors mentioned above. To achieve this, we have calculated, for each factor, the average of influence intensity of concepts - it includes - on "knowledge acquisition".

We had to convert, above all, the linguistic variables used by each manager to TFMs. Note that the average of TFMs is calculated exactly like the average of ordinal numbers.

For example, from **Table 2**, and to calculate the degree of influence of social interaction between partners on the knowledge acquisition, it was enough to calculate the average between TFMs corresponding to the influence intensity of the concepts listed below on the acquisition of knowledge:

$$\frac{(0.25\ ,0.5\ ,0.75)+(0.5\ ,0.75\ ,1)+\ (0.5\ ,0.75\ ,1)}{3} = (0.42\ ,\ 0.67\ ,\ 0.92)$$

Note that for most arithmetic operations performed for this research the results obtained were rounded for presentation purposes. Then, we transformed each individual cognitive map into a square matrix whose elements are the factors that can influence the knowledge acquisition within IJVs while each cell contain the influence intensity of a factor on another (Özesmi and Özesmi, 2004: 49).

We called these matrices "temporary matrices" because they contain only the cited relationships by each manager, until they will be supplemented by the addition of other relationships in the next phase. This addition will be strictly designed to capture the perceptions of each manager about the relationships he has not mentioned but which were cited by his colleagues.

2.3. *Use of the questionnaire*:

We noticed the existence of relations between some factors that have been cited by some managers as they have not been discussed by the rest. Faced with this embarrassment, we had to decide between two situations:

- Does our interlocutors simply failed to cite these relationships as they really exist?
- Does our interlocutors did not cite these relationships because they are convinced that they do not exist?

Thus, the use of a questionnaire seemed to be necessary. Therefore, a third and final interview was programmed to question managers about the existence of these relationships as well as the intensity of the relationship, if it existed.

Note that if our respondents had no answer regarding the probable existence of a relationship mentioned by their colleagues, the phrase "No idea" will appear in their matrix in the cell which represents the influence intensity between the mentioned factors.

Thereafter, each temporary individual matrix could be supplemented by the addition of relationships that were missing and the passage from the final individual matrices to the collective matrix could be achieved easily. Appendix 1 presents the final matrix of the assembly manager.

3. *Construction of collective cognitive maps*:

We should note the impossibility to openly discuss in group of a huge number of concepts and relationships especially when the subject under discussion is sensitive (Zouaghi and Boccanfuso, 2010: 16). Therefore, our choice fell directly on the aggregation methods and especially the method of individual maps' average.

For each cell containing an influence relationship, we calculated the arithmetic mean of TFMs of the various individual matrices. However, it is necessary to make a significant precision. If, when calculating the average of a cell, there will be cells containing the phrase "no idea", we would divide the sum of TFMs by the number of individual matrices whose cell does not contain the phrase mentioned above. Appendix 2 presents the collective matrix of the selected IJV.

4. *Defuzzification*:

The defuzzification phase allows the production of a matrix whose cells contain real numbers able to be used in future analyzes.

4.1. *The evaluation of the managers' attitude towards vagueness*:

We refer to the inaccuracy of the managers' assessments that we talk. This phase will be divided into two steps:

4.1.1. *The evaluation of the individual attitude towards vagueness*:

This step had found in the final individual matrices the source representing required data for its completion. For each individual matrix and each cell containing an intensity influence, the $\alpha_{\text{indiv}}$was calculated while a simple addition provides the α_{indiv} of each manager. Below, the indices relative to each manager:

- The Engineering manager's $\alpha_{\text{indiv}} = 12$
- The Construction manager $\alpha_{\text{indiv}} = 12.50$

- The Sales manager α_{indiv} = 12.66
- The Supply manager α_{indiv} = 7
- The Assembly manager α_{indiv} = 7.50
- The Administration and Finance manager α_{indiv} = 8.50
- The Prefabrication manager α_{indiv} = 8.83

4.1.2. *The evaluation of the collective attitude towards vagueness*:

It is appropriate to apply the following formula to have the collective index:

$$\alpha_{Total} = \frac{\sum_{indiv=1}^{m} \alpha_{indiv}}{n \times n \times m}$$

The application of this formula assumes that all of the cells of the matrix are not empty because the denominator $n \times n \times m$ relate to the number of cells of the matrix multiplied by the number of individuals.

However, in our case, the number of cells containing influential relationships is 17. So, to adapt the latter formula for our case, we need to make a change in the denominator by replacing $n \times n$ with the number 17 and we obtain:

$$\alpha'_{Total} = \frac{\sum_{indiv=1}^{m} \alpha_{indiv}}{17 \times m}$$

Consequently, $\alpha'_{Total} = \frac{12 + 12.50 + 12.66 + 7 + 7.5 + 8.5 + 8.83}{17 \times 7} = 0.5798$

4.2. *Conversion of TFM into real number*:

This phase is divided into two successive stages:

4.2.1. *Calculating integral values R-L*:

Within the collective matrix and for each TFM, we calculated the integral values R-L. For example, concerning the intensity of the influence of "partners' commitment" on "knowledge acquisition" represented by the TFM (0.54 ; 0.79 ; 0.98) :

$$I_R = \frac{(0.79 + 0.98)}{2} = 0.88$$
$$I_L = \frac{(0.54 + 0.79)}{2} = 0.66$$

Appendix 3 provides integral values R-L of TFMs contained in the collective matrix.

4.2.2. Calculation of real numbers:

Within the collective matrix and for each cell containing a TFM, the formula introduced by Zadeh was applied.

For example, the conversion of TFM (0.54 , 0.79 , 0.98) - representing the intensity of the influence of "partners' commitment" on "knowledge acquisition" – into real number is obtained as follows:

Real number = 0.5798 * 0.88 + (1 – 0.5798) * 0.66 = 0.79

Appendix 4 presents the collective matrix after defuzzification.

VII. Conclusion:

The exploration of IJV managers' representations regarding the knowledge acquisition phenomenon was the purpose of our study by determining the factors that may facilitate or disabled it. In order to explore this phenomenon, we chose to use cognitive mapping.

Indeed, after a series of interviews with managers of a selected IJV, and after an encoding phase followed by a validation one, we have established individual FCMs. Subsequently, the construction of a collective cognitive map for presenting the shared views within this IJV was followed by a defuzzification step for manipulating the obtained matrix in a rather simple manner.

The use of FCMs allowed us to identify a set of variables that may influence the acquisition of knowledge within IJVs. These variables are such as:

1. Partners' commitment.
2. Social interaction between partners.
3. IJV's learning intention.
4. IJV's learning capacity.
5. Cultural distance between partners.
6. Knowledge protectiveness.
7. Trust between partners.
8. Partner transparency.

VIII. References :

Allard-Poesi F. 1996. Des schémas cognitifs individuels à un schéma collectif: vers une perspective sociocognitive. In "Perspectives en management stratégique: Tome IV". Noël A, Koenig C. and Koenig G. Edition Economica. Paris. pp 117-151.

Allard-Poesi F. Drucker-Godard C. Ehlinger S. 2003. Analyses de représentations et de discours. In "Méthodes de recherche en management". Thiétart R-A et al. Edition Dunod. 2nd Edition. Paris. pp 449-475.

Bertolini M. 2007. Assessment of human reliability factors: A fuzzy cognitive maps approach. International Journal of Industrial Ergonomics. Volume 37. pp 405-413.

Bougon M. 1992. Congregate cognitive maps: an unified dynamic theory of organization and strategy. Journal of Management Studies. Volume 29. Issue 3. pp 369-389.

Budhwar P. 1996. Cognitive Mapping As A Tool To Elicit Managerial Cognitions: Methodology Analysed. Vikalpa. Volume 21. N°4. pp 17-25.

Chang P.L. Chen Y.C. 1994. A fuzzy multi-criteria decision making method for technology transfer strategy selection in biotechnology. Fuzzy Sets and Systems. Volume 63. pp 131-139.

Chen C-T. 2001. A fuzzy approach to select the location of the distribution center. Fuzzy Sets and Systems. Volume 118. pp 65-73.

Child J. 2001. Learning through strategic alliances. In "Handbook of organizational learning and knowledge". Dierkes M. Antal A. Child J. and Nonaka I. Oxford University Press. New York. pp 657-678.

Cohen W and Levinthal D. 1990. Absorptive capacity: A new perspective on learning and innovation. Administrative Science Quarterly. Volume 35. pp 128-152.

Cole J.R. and Persichitte K.A. 2000. Fuzzy cognitive mapping: Applications in eduction. International Journal of Intelligent system. Volume 15. pp 1-25.

Cossette P. 2003. Méthode systématique d'aide à la formulation de la vision stratégique: illustration auprès d'un propriétaire-dirigeant. Journal of « Entrepreneuriat ». Volume 2. N°1. pp 1-18.

Dunn W. and Ginsberg A. 1986. A socio-cognitive network approach to organizational analysis. Human Relations. Volume 40. n°11. pp 955-976.

Eden C. 2004. Analyzing cognitive maps to help structure issues or problems. European Journal of Operational Research. Volume 159. pp 673-686.

Espinosa-Paredes G. Nuñez-Carrera A. Vazquez-Rodriguez A. Espinosa-Martinez, E-G. 2009. Modeling of the High Pressure Core Spray Systems with fuzzy cognitive maps for operational transient analysis in nuclear power reactors. Progress in Nuclear Energy. Volume 51. N° 3. pp 434-442.

Ford J.D. and Hegarty W.H. 1984. Decision maker's beliefs about causes and effects of structure. Academy of Management Journal. Volume 27. N°2. pp 271-291.

Gendre-Aegerter D. 2008. La perception du dirigeant de PME de sa responsabilité sociale : une approche par la cartographie cognitive. PhD in Economics and Social Sciences. Faculty of Economic and Social Sciences. University of Fribourg. Switzerland.

Ghyym Seong H. 1999, A semi-linguistic fuzzy approach to multi-actor decision-making: Application to aggregation of experts' judgments. Annuals of Nuclar Energy. Volume 26. pp 1097-1112.

Hamel G. 1991. Competition for Competence and Inter-partner Learning within IJVs. Strategic Management Journal. Volume 12. Summer Special Issue. pp 83–103.

Ho M. and Wilson M. 2008. Cognitive mapping methodologies for entrepreneurial cognition research. Applied Geoinformatics for Society and Environment Conference. Stuttgart. pp 311-324.

Huber G. 1991. Organizational learning: The contribution processes and the literatures. Organization Science. Volume 2. N°1. pp 88-115.

Huff A. 1990. Mapping Strategic Thought. John Wiley & Sons Ltd.

Ingham M. 1994. L'apprentissage dans les coopérations: Le cas IBA. In "Perspectives en Management Stratégique: Tome 2", Noël A and Dussauge P. Edition Economica. Paris. pp 159-183.

Inkpen A.C. 1998. Learning and knowledge acquisition through international strategic alliances. Academy of Management Executive. Volume 12. Issue 4. Pages 69-80.

Kang I. Lee S. Choi J. 2004. Using fuzzy cognitive map for the relationship management in airline service. Expert Systems with Applications. Volume 26. pp 545-555.

Karray H. 2004. Mondialisation et stratégies des entreprises familiales: Etude des représentations des dirigeants dans le contexte tunisien. 13th AIMS Conference. pp 1-28.

Kok K. 2009. The potential of Fuzzy Cognitive Maps for semi-quantitative scenario development with an example from Brazil. Global Environmental Change. Volume 19. pp 122-133.

Langfield-Smith K. 1992. Exploring the need for a shared cognitive map. Journal of Management Studies. Volume 29. Issue 3. pp 349-368.

Lee H-M. Lee T-Y. Lee S-Y. Chen J-J. 2003. Assessment of the Rate of Aggregative Risk in Software Development using a Fuzzy Group Model. Modelling and Simulation. pp 389-394.

Lee S. Courtney Jr. O'Keefe R. M. 1992. A system for organizational learning using cognitive maps. Omega. Volume 20. N°1. pp 23-36.

Li L. Qian G. Qian Z. 2013. Do partners in international strategic alliances share resources, costs, and risks?. Journal of Business Research. Volume 66. Issue 4. pp 489-498.

Lin H-Y. Hsu P-Y. Sheen G-J. 2007. A fuzzy-based decision-making procedure for data warehouse system selection. Expert Systems with Applications. Volume 32. Pp 939-953.

Magali P. and Fontenelle G. 2006. Perceptions et attentes des professionnels de Manche Est vis-à-vis de l'écosystème qu'ils exploitent. Final report of the study contract IFREMER – Agrocampus Rennes.

Mohammad A. and Rosnah M.Y. 2011. A fuzzy group decision making model for multiple criteria based on Borda count. International Journal of the Physical Sciences. Volume 6. Issue 3. pp 425-433.

Özesmi U. and Özesmi S. L. 2004. Ecological models based on people's knowledge: a multi-step fuzzy cognitive mapping approach. Ecological Modelling. Volume 176. Pp 43-64.

Papageorgiou E. and Kontogianni A. 2012. Using Fuzzy Cognitive Mapping in Environmental Decision Making and Management: A Methodological Primer and an Application. In "International Perspectives on Global Environmental Change. Young S. and Silvern S. Edition INTECH. pp 427-450.

Papageorgiou E. Markinos A. Gemptos T. 2009. Application of fuzzy cognitive maps for cotton yield management in precision farming. Expert Systems with Applications; Volume 36. pp 12399- 12413.

Parkhe A. 1991. Interfirm diversity, organizational learning, and longevity in global strategic alliances. Journal of International Business Studies. Volume 22. pp 579-601.

Parkhe A. 1993. Strategic alliance structuring: a game theory and transaction cost examination of interfirm co-operation. Academy of Management Journal. Volume 36. N°4. pp 794-829.

Peña A. Sossa H. Gutiérrez A. 2008. Causal knowledge and reasoning by cognitive maps: Pursuing a holistic approach. Expert Systems with Applications. Volume 35. pp 2-18.

Poignonec D. 2006. Apport de la combinaison cartographie cognitive/ontologie dans la compréhension de la perception du fonctionnement d'un écosystème récifo-lagonaire de Nouvelle-Calédonie par les acteurs locaux. PhD thesis presented at the National Superior School of Agronomy of Rennes.

Ramprasad A. and Poon E. 1985. A Computerized Interactive Technique for mapping Influence Diagrams (MIND). Strategic management Journal. Volume 6. pp 377-392.

Shang G. and Zaiyue Z. 2009. Multiplication Operation on Fuzzy Numbers. Journal of Software. Volume 4. N°4. pp 331-338.

Stylios C.D. and Groumpos P. 1999. Fuzzy Cognitive Maps: a model for intelligent supervisory control systems. Computers in Industry. Volume 39. pp 229-238.

Tegarden D.P. and Sheetz S.D. 2003. Group cognitive mapping: a methodology and system for capturing and evaluating managerial and organizational cognition. Omega. Volume 31. pp 113-125.

Walsh J.P. Henderson C.M. Deighton J. 1988. Negotiated belief structures and decision performance: an empirical investigation. Organizational Behavior and Human Decision Processes. Volume 42. pp 194-216.

Weick K. and Bougon M. 1986. Organizations as cognitive maps: Charting ways to success and failure. In "The thinking organization". Sims H. and Gioia D. Jossey Bass Publishers. London. pp 102-135.

Williamson O. 1983. Credible commitments: using hostages to support exchange. American Economic Review. Volume 73. pp 519-539.

Yaman D. and Polat S. 2009. A fuzzy cognitive map approach for effect-based operations: An illustrative case. Information Sciences. Volume 179. pp 382-403.

Zouaghi C. and Boccanfuso D. 2010. La cartographie cognitive comme méthode de planification stratégique: Cas d'une stratégie nationale de développement durable d'un pays en développement. Research Paper GREDI. Volume 10. N° 15. Sherbrooke University. Quebec. pp 1-39.

THE STUDY OF INTERNATIONAL JOINT VENTURES MANAGERS'

Appendix 1: The final matrix of the Assembly manager

	Knowledge acquisition	Partners' commitment	Social interaction between partners	IJV's learning intention	IJV's learning capacity	Cultural distance between partners	Knowledge protectiveness	Trust between partners	Partners transparency
Knowledge acquisition									
Partners' commitment	0.50 0.75 1.00							0.50 0.75 1.00	
Social interaction between partners	0.42 0.67 0.92							0.25 0.50 0.75	
IJV's learning intention	0.50 0.75 1.00								
IJV's learning capacity	0.25 0.50 0.75								
Cultural distance between partners	- 0.25 - 0.50 - 0.75		0 0 0						
Knowledge protectiveness	- 0.50 - 0.75 - 1.00		0 - 0.25 - 0.50						
Trust between partners	0.25 0.50 0.75	0.25 0.50 0.75	0.50 0.75 1.00				No idea		
Partners transparency	0 0.25 0.50		0 0.25 0.50				0 - 0.25 - 0.50		

THE STUDY OF INTERNATIONAL JOINT VENTURES MANAGERS'

Appendix 2: The collective matrix

	Knowledge acquisition	Partners' commitment	Social interaction between partners	IJV's learning intention	IJV's learning capacity	Cultural distance between partners	Knowledge protectiveness	Trust between partners	Partner transparency
Knowledge acquisition									
Partners' commitment	0.54 0.79 0.98							0.57 0.82 0.96	
Social interaction between partners	0.47 0.72 0.92							0.50 0.75 0.96	
IJV's learning intention	0.54 0.79 0.99								
IJV's learning capacity	0.52 0.77 0.93								
Cultural distance between partners	- 0.25 - 0.48 - 0.73		- 0.18 - 0.29 - 0.39						
Knowledge protectiveness	- 0.39 - 0.61 - 0.82		- 0.29 - 0.50 - 0.68						
Trust between partners	0.61 0.86 0.96	0.54 0.79 0.96	0.57 0.82 0.96				- 0.50 - 0.75 - 0.90		
Partner transparency	0.50 0.75 0.93		0.43 0.64 0.75				- 0.38 - 0.63 - 0.75		

THE STUDY OF INTERNATIONAL JOINT VENTURES MANAGERS'

Appendix 3: Integral values R-L

	Knowledge acquisition		Partners' commitment		Social interaction between partners		IJV's learning intention		IJV's learning capacity		Cultural distance between partners		Knowledge protectiveness		Trust between partners		Partner transparency	
	I_L	I_R	I_L	I_R	I_L	I_R	I_L	I_R	I_L	I_R	I_L	I_R	I_L	I_R	I_L	I_R	I_L	I_R
Knowledge acquisition																		
Partners' commitment	0.66	0.88													0.70	0.89		
Social interaction between partners	0.60	0.82													0.63	0.86		
IJV's learning intention	0.67	0.89																
IJV's learning capacity	0.64	0.85																
Cultural distance between partners	-0.37	-0.61			-0.23	-0.34												
Knowledge protectiveness	-0.50	-0.71			-0.39	-0.59												
Trust between partners	0.73	0.91	0.66	0.88	0.70	0.89							- 0.63	- 0.83				
Partner transparency	0.63	0.84			0.54	0.70							- 0.50	- 0.69				

Appendix 4: The collective matrix after defuzzification

	Knowledge acquisition	Partners' commitment	Social interaction between partners	IJV's learning intention	IJV's learning capacity	Cultural distance between partners	Knowledge protectiveness	Trust between partners	Partner transparency
Knowledge acquisition									
Partners' commitment	**0.79**							**0.81**	
Social interaction between partners	**0.72**							**0.76**	
IJV's learning intention	**0.80**								
IJV's learning capacity	**0.76**								
Cultural distance between partners	**- 0.51**		**- 0.29**						
Knowledge protectiveness	**- 0.62**		**- 0.51**						
Trust between partners	**0.84**	**0.78**	**0.81**				**- 0.74**		
Partner transparency	**0.74**		**0.63**				**- 0.61**		