# ORGANIZATIONAL LEARNING BY USING FUZZY COGNITIVE MAPS

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**Abstract**

*The aim of this paper to construct the causes for the lack of knowledge acquisition of organizational learningusing the fuzzy tool called Combined Block Fuzzy Cognitive Maps (COFCMs). Section four discusses the method of determining the hidden pattern and the concept of the problem. The last section deals with the suggestion and conclusion based on our study.*

**Keywords**: FCMs, CBFCMs, Knowledge acquisition.

## I. INTRODUCTION

FCM may be a easy program to calculate the worth of the ideas of a psychological feature map. It follows the standard literature. Essentially it's a Hopfield neural network, though within the incidence matrix connections between an equivalent node will seem. The psychological feature map was introduced by man of science R. Axelfrod [1] for representing social knowledge domain and describing the ways that square measure used for deciding in social and political systems, then Kosko [5] enhances the psychological feature map by giving fuzzy values to the psychological feature map and fuzzy degree of repose relationship between the ideas.

The parts within the FCM square measure the ideas, the casual relationship between the ideas and influence of one construct over the other. The ideas square measure portrayed by vertices, relationship between them is portrayed by directed arcs and numeric price related to arcs known as edges. Every vertex incorporates a state. The sting of a directed arc measures the strength of the result of the initial vertex on the terminal vertex of the arc. This result is valid only the initial vertex is active. In the initial vertex is inactive at your time, it'sthought to possess no result on the terminal vertex, albeit such an impression is incredibly robust once the initial vertex is active. The state area of AN FCM is set at the start by an initial condition and so propagated mechanically through the vertex operate relative to a threshold till a static pattern is reached. A causative reasoning is achieved once the FCM reaches a stable limit cycle or mounted purpose [3].

In few years the speculation of FCM has found several applications in politics, economics, medicine, military and various field of humanities and science relation and knowledge system [2, 3, 12, 14, and 115]. Nithyalakshmi et al. [8] have applied the causes for lapsation of life assurance policies exploitation combined overlap block fuzzy psychological feature maps.

In this paper constructs associated with lack of structure learning of information acquisition. Since the info is unattended and therefore the ideas square measure unsure solely fuzzy tools have the capability to investigate, thus it's chosen for our study. The universal agreement that inborn information powerfully influences future learning, many of the rich details of the matter unit of measurement yet to be investigated.

## II.PRELIMINARIES

Definition2.1[15]

AnFCMisadirectedgraphwithconceptslikepolicies,eventsetc. asnodesand causalitiesasedges. Itrepresentscausalrelationship between concepts.

Definition2.2 [12]

When thenodesof theFCMarefuzzy sets, thentheyare knownasfuzzynodes.

Definition2.3[15]

FCMs with edge weights or causalities from the set $\{-1,0,1\}$ ,are called simple FCMs.

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Definition 2.4 [15]

Consider the nodes or vertices $C_1, C_2, \cdots, C_n$ of the FCM. Suppose the directed graph is drawn using edge weight $e_{ij} \in \{-1,0,1\}$ . The matrix E be defined by $E = \{e_{ij}\}$ where $e_{ij}$ is the weight of the directed edge $c_i c_j$ . E is called the adjacency matrix of the FCM, also known as the connection matrix of the FCM. It is important to note that all matrices associated with an FCM are always square matrices with diagonal entries as zero.

Definition 2.5 [9]: Let $C_1, C_2, \cdots, C_n$ be the nodes of an FCM. $A = (a_1, a_2, \cdots, a_n)$ ,where $e_{ij} \in \{0,1\}$ . A is called the instantaneous state vector and it denotes the on-off position of the node at a moment.

$$a_i = \begin{cases} 1, \text{ if } a_i \text{ is on position, } i=1,2,...,n \\ 0, \text{if } a_i \text{ is on position} \end{cases}$$

Definition 2.6 [12]

Let $C_1, C_2, \cdots, C_n$ be the nodes of an FCM. Let $c_1c_2, c_2c_3, \cdots, c_ic_j$ be the edges of the FCM $(i \neq j)$. Then the edges form a directed cycle. An FCM is said to be cyclic if it possesses a directed cycle. Otherwise it is said to be acyclic.

Definition 2.7 [15]

An FCM with cycles is said to have a feedback.

Definition 2.8 [14]

When there is a feedback in an FCM, i.e., when the causal relations flow through a cycle in a revolutionary way, the FCM is called a dynamical system.

Definition 2.9 [15]

Let $c_1c_2, c_2c_3, \cdots, c_ic_j$ be a cycle. When $C_i$ is switched on and if the causality flows through the edges of a cycle and if it again causes $C_i$ , we say that the dynamical system goes round and round. This is true for any node $C_i$ , for $i = 1,2,...,n$ . The equilibrium state for this dynamical system is called the hidden pattern.

Definition 2.10 [14]

If the equilibrium state of a dynamical system is a unique state vector, then it is called a

fixed point.

Definition 2.11 [12]

Finite number of FCMs can be combined together to produce the joint effect of all the FCMs.Let $E_1, E_2, ..., E_P$ be adjacency matrices of the FCMs with nodes $C_1, C_2, \cdots, C_n$, and then the combined FCM is got by adding all the adjacency matrices $E_1, E_2, ..., E_P$. We denote the combined FCM adjacency matrix by $E = E_1 + E + ... + E_P$.

Definition 2.12 [15]

Let P be the problem under investigation. Suppose let $\{a_1, a_2, \cdots, a_n\}$ be the n attributes associated with P (n is very large). Now divide the number of attributes $\{a_1, a_2, \cdots, a_n\}$ into classes $C_1, C_2, \cdots, C_t$ where the classes are such that

1. $S_i \cap S_{i+1} = \phi$ where the classes such that
2. $\cup S_i = \{C_1, C_2, \cdots, C_n\}$
3. $|S_i| \neq |S_j| \ \ for \ i \neq j$ in general.

Now we obtain the FCM associated with each of the classes $S_1, S_2, \cdots, S_t$. We determine the relational matrix associated with each $S_i$ using these matrices we obtain $n \times n$ matrix. This $n \times n$ matrix is the matrix associated with the Combined Overlap Block FCM (COBFCM) of same sizes.

## III. LACK OF KNOWLEDGE ACQUISITION IN ORGANIZATIONAL LEARNING

Many formal structure activities square measure meant to accumulate info or data. Examples square measure client surveys, analysis and competitor's merchandise. Several informal behaviors are also directed toward getting info or data. The subsequent discussion is organized around many processes through thatorganizations acquire info or data.

The ten concepts {$C_1$, $C_2$,…, $C_{10}$} of the attributes are considered the following

**$C_1$ - Inborn learning**
**$C_2$ - Vicarious Learning**
**$C_3$ - Grafting**
**$C_4$ - Looking out and Noticing**
**$C_5$ - Scanning**
**$C_6$ - Centered search**
**$C_7$ - Performance monitoring**
**$C_8$ - Experimental Learning**
**$C_9$ – Structure experiments**
**$C_{10}$ - Experience-based learning curves**

### 1. Inborn learning

Congenital Learning Organizations don't begin their lives with clean slates. The people or organizations that make new organizations have data concerning the new organization's initial atmosphere and concerning the processes the organization will use to hold out its creator's intentions, and that they build this data obtainable to the new organization's members. a lot ofusually, "organizations square measure driven to include the practices and procedures outlined

by prevailing rationalized ideasof structure work and institutionalized in society. From a replacement organization's perspective, each the institutionalized datanamed by Meyer and mountain ash (1977) and also a lot of context specific data imparted by the organization's creators square measure inheritable data. What a corporation is aware of at its birth can verify what it searches for, what it experiences, and the way it interprets what it encounters.

**2. Vicarious Learning**

Acquiring Second-Hand expertise Organizations normally conceive to study the ways, body practices, and particularlytechnologies of alternative organizations. For instance, borrowing from alternative organizations is one sort of structure learning. Makers like automobile and laptop firms have for years habitually examined thoroughly their competitors' merchandise as they seem within the marketplace. "Corporate intelligence" is that the term related to the thought of checking out info concerning what company competitors do and the way they are doing it Channels for getting this info embrace consultants, skilled conferences, trade shows, publications, vendors and suppliers and, in less competitive environments, networks of pros.

**3. Grafting**

Organizations of increase their store {of data information} by getting and attachment on new members World Health Organization possess knowledge not antecedently obtainable inside the organization. Generally grafting-on of carriers of latestdata is completed on a large-scale basis, as within the case of a sale of an entire organization by another. The last of info acquisition processes to be mentioned is learning by looking out or noticing. The literature looks to point that looking out is that the method most consciously pursued by managers on a day-after-day basis.

**4. Looking out and Noticing**

Organizational info acquisition through search will be viewed as occurring in THE forms: scanning, centered search, and performance watching. Scanning refers to the comparatively wide-ranging sensing of the organization's external atmosphere. Centered search happens once structure members or units actively search during a slender phase of the organization's internal or external atmosphere, typically in response to actual or suspected issues or opportunities. Performance watching is employed to mean each centered and wide-ranging sensing of the organization's effectiveness in fulfilling its own pre-established goals or the wants of stakeholders.

**5. Scanning**

Organizational environments amendment. If the shortage of match between a corporation and its atmosphere becomes too nice, the organization either fails to survive or undergoes a pricey transformation.

**6. Centered search**

The structure science literature associated with focus search has dealt primarily with 2 matters: the antecedents to centered search and also the nature of centered search. With relevancy antecedents, early authorities noted that the initiation of center research isn't an off-the-cuff activity amendment.

**7. Performance watching**

One of the clearest and most pervasive sorts of structure search is performance watching. Organizations formally and habitually assess however well they're meeting each their own standards, like inventory levels, and also the expectations of external constituencies and stakeholders.

**8. Experimental Learning**

After their birth, organizations acquire a number of their data through direct expertise. Generally this learning could be a results of intentional, systematic efforts. Far more oft it's no inheritable accidentally or unsystematically. The literature associated with experimental learning is sort of varied, and is mentioned here underneath the followings square measure structure experiments and experience-based learning curves. This subdivision closes with associate analysis of the literature on learning from expertise.

**9. Structure experiments**

Experiential learning is increased by the avail- ability and analysis of feedback. Om approach to facilitating intentional structure learning is to extend the accuracy of feedback concerning cause-effect relationships between structure actions and outcomes. Another is to confirm the gathering and analysis of such feedback each approaches square measure enclosed in formal structure experiments, formal structure experiments don't seem to be wide licensed by structure directors. One reason is that the requirement to project a picture of decisiveness generally causes directors associated alternative leaders to not admit to the uncertainty that will encourage an experiment. The case of either formal experiments or logical fallacy analyses of natural experiments, proprietary and political considerations tend to inhibit dissemination of any however positive findings. In spite of the importance of structure experiments as learning mechanisms, the literature contains only a few studies of experimentation by organizations.

**10. Experience-based learning curves**

The exhausting proof that a corporation expertise enhances its performance. The magnitudes of the reductions square measure typically predictable from a mathematical model (sometimes known as associate "experience curve" or a "learning curve"), and also the predictions square measure of utilized in coming up with.

## IV. METHOD OF DETERMINING HIDDERN PATTERN

**Let** $C_1, C_2, \cdots, C_n$ **be the nodes of the FCM. Let A be the associated adjacency matrix. Lack of hidden pattern is found by keeping $C_1$ in on state. The vector** $X = (1,0,0,0,0,0,0,0,0,0).$ The data should pass through the relation matrix A, this is done by multiplying X by the matrix A. Let $XA = (a_1, a_2, \cdots, a_n)$ with the threshold operation that is by replacing by 1 if $a_i > k$ and by 0 if $0$ (k is the suitable integer). The resulting concepts are updated. The concept $C_1$ is included in the updated vector by making the first coordinate as 1 in the resulting vector. Suppose $XA \to X_1$ then consider $X_1 A$ and repeat the same procedure. This procedure is repeated till we get the limit cycle or fixed point.

**Concept of the Problem**

The following ten concepts $\{c_1, c_2, ...., c_n\}$ as the main nodes of our problem.

$C_1$- Inborn learning
$C_2$- Vicarious Learning
$C_3$ - Grafting
$C_4$- Looking out and Noticing
$C_5$- Scanning
$C_6$- Centered search
$C_7$- Performance monitoring
$C_8$- Experimental Learning
$C_9$–Structure experiments
$C_{10}$ - Experience-based learning curves

Let us divide these concepts in cyclic way of classes, each having the concepts in prime order has following way

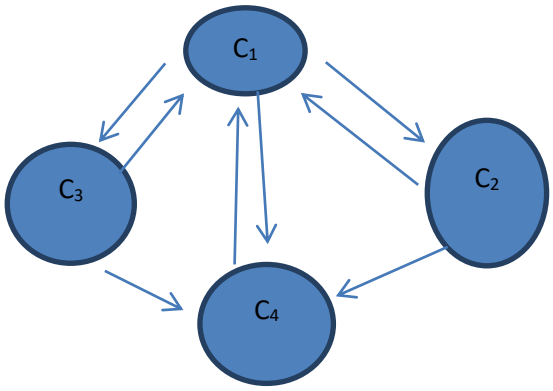
$s_1 = \{c_1, c_2, c_3, c_4\}, s_2 = \{c_3, c_4, c_5, c_6\}, s_3 = \{c_5, c_6, c_7, c_8\}, s_4 = \{c_7, c_8, c_9, c_{10}\}, s_5 = \{c_9, c_{10}, c_1, c_2\}$.

The directed graph and the relation matrix for the class $s_1 = \{c_1, c_2, c_3, c_4\}$ given by following Table 1 and Figure 1.

**Table 1**

| | $C_1$ | $C_2$ | $C_3$ | $C_4$ |
|---|---|---|---|---|
| $C_1$ | 0 | 1 | 1 | 1 |
| $C_2$ | 1 | 0 | 0 | 1 |
| $C_3$ | 1 | 0 | 0 | 1 |
| $C_4$ | 1 | 0 | 0 | 0 |

**Fig. 1**

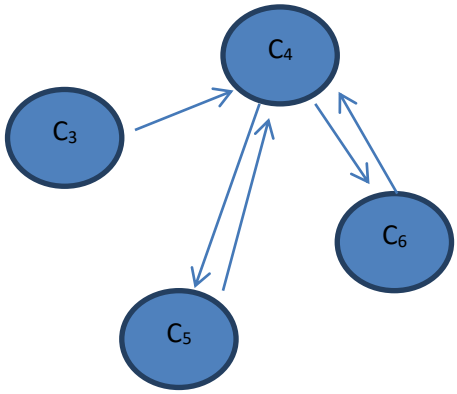



The directed graph and the relation matrix for the class $s_2 = \{c_3, c_4, c_5, c_6\}$ given by following Table 2 and Figure 2.

**Table 2**

| | $C_3$ | $C_4$ | $C_5$ | $C_6$ |
|---|---|---|---|---|
| $C_3$ | 0` | 1 | 0 | 0 |
| $C_4$ | 0 | 0 | 1 | 1 |
| $C_5$ | 0 | 1 | 0 | 0 |
| $C_6$ | 0 | 1 | 0 | 0 |

**Fig. 2**

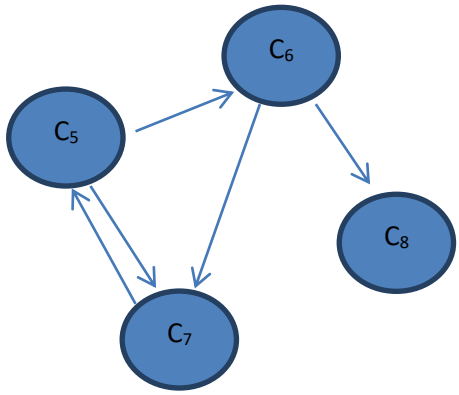



The directed graph and the relation matrix for the class $s_3 = \{c_5, c_6, c_7, c_8\}$ given by the experts is as following Table 3 and Figure 3.

**Table 3**

| | $C_5$ | $C_6$ | $C_7$ | $C_8$ |
|---|---|---|---|---|
| $C_5$ | 0` | 1 | 1 | 0 |
| $C_6$ | 0 | 0 | 1 | 1 |
| $C_7$ | 1 | 0 | 0 | 0 |
| $C_8$ | 0 | 0 | 0 | 0 |

**Fig. 3**

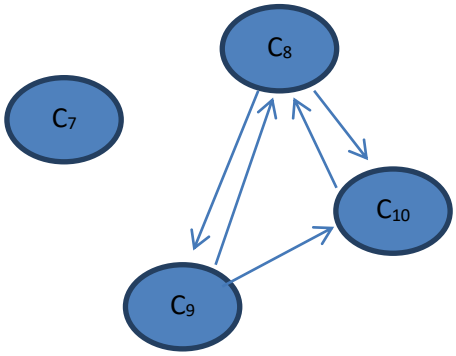



The directed graph and the relation matrix for the class $s_4 = \{c_7, c_8, c_9, c_{10}\}$ given by following Table 4 and Figure 4.

**Table 4**

| | $C_7$ | $C_8$ | $C_9$ | $C_{10}$ |
|---|---|---|---|---|
| $C_7$ | 0` | 0 | 0 | 0 |
| $C_8$ | 0 | 0 | 1 | 1 |
| $C_9$ | 0 | 1 | 0 | 1 |
| $C_{10}$ | 1 | 0 | 0 | 0 |

**Fig. 4**

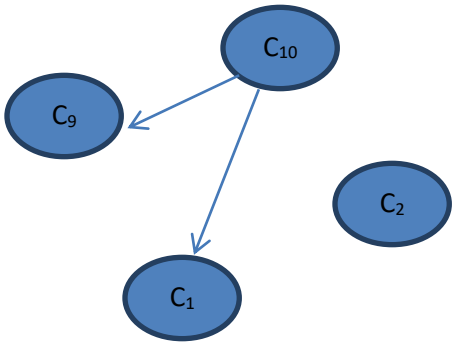



The directed graph and the relation matrix for the class $s_5 = \{c_9, c_{10}, c_1, c_2\}$ given by following Table 5 and Figure 5.

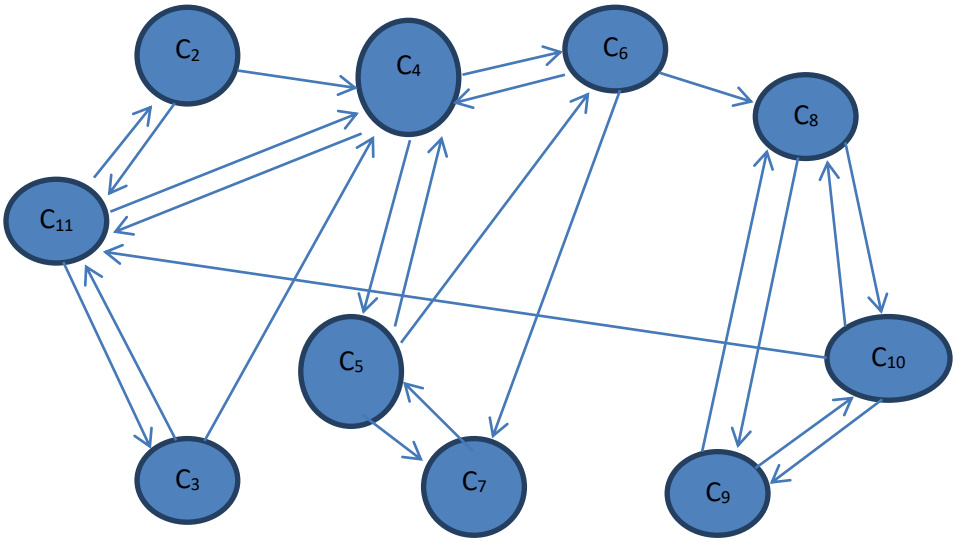
**Table 5**

| | $C_9$ | $C_{10}$ | $C_1$ | $C_2$ |
|---|---|---|---|---|
| $C_9$ | 0` | 0 | 0 | 0 |
| $C_{10}$ | 1 | 0 | 0 | 0 |
| $C_1$ | 0 | 0 | 0 | 0 |
| $C_2$ | 0 | 0 | 0 | 0 |

**Fig. 5**




The combined direct graph and combined overlap block FCM of equal size is as follows



$$A = \begin{pmatrix} & c_1 & c_2 & c_3 & c_4 & c_5 & c_6 & c_7 & c_8 & c_9 & c_{10} \\ c_1 & 0 & 2 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ c_2 & 2 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ c_3 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ c_4 & 1 & 0 & 0 & 0 & 2 & 1 & 0 & 0 & 0 & 0 \\ c_5 & 0 & 0 & 0 & 2 & 0 & 1 & 1 & 0 & 0 & 0 \\ c_6 & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 1 & 0 & 0 \\ c_7 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ c_8 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 2 & 1 \\ c_9 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 2 & 0 & 2 \\ c_{10} & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 2 & 0 \end{pmatrix}$$

Using the above matrix A of the combined overlap block FCM, the hidden pattern is determined. Suppose the concept $C_1$ is in the ON State and all other nodes are in the OFF state then the initial input vector is $X = (1,0,0,0,0,0,0,0,0,0)$.

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The effect of on the dynamical system A is given by

$XA = (0,2,1,1,0,0,0,0,0,0) \rightarrow (1\ 1\ 0\ 1\ 1\ 0\ 0\ 0\ 0\ 0) = X_1$

$X_1A = (0\ 2\ 0\ 1\ 1\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 0\ 0\ 0\ 0\ 0) = X_2$

$X_2A = (\ 5\ 0\ \ 0\ 4\ 2\ 2\ 1\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 0\ 0\ 0\ 0) = X_3$ (say) Where denotes the resultant

$X_2A = (\ 4\ 10\ \ 2\ 11\ 14\ \ 6\ \ 4\ \ 2\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 0\ 0\ 0\ 0) = X_4$

vector after thresholding and updating $X_4$ is the lack of lack ofhidden pattern, which is the fixed point.

## V. CONCLUSION

From the analysis of above problem, constructs related to organizational learning of knowledge acquisition of organizational memory were examined, and the literature related to each was described and critiqued. Because the literature on knowledge acquisition is voluminous and multifaceted, the process was portrayed. Examination of the related literatures indicated that, while much has been learned about experiential learning, there is a lack of cumulative work and a lack of synthesis of work from different research groups. Congenital learning, vicarious learning, and grafting were found to be information acquisition.

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