

Analyzing the causes of Work Life Imbalance in Working Environment using Induced Fuzzy Cognitive Maps (IFCM)

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Abstract

Work life imbalance is now a concern of modern life. The stress factors in an organizational setting affect one's ability to keep a proper balance between work and life outside work. This study is going to analyze the factors which are inducing work life imbalance in organizational settings. Due to the complexity of the nature of this study, the fuzzy model Induced Fuzzy Cognitive Maps is used to arrive at an appropriate solution to the interest of the study.

Keywords: Work Life balance, fuzzy, cognitive maps, induced fuzzy cognitive maps, work life imbalance, working environment issues.

1. Introduction

1.1 Work Life Balance

Work life balance is about people having measure of control over when, where and how they work. There is a view that work-life balance only in the framework of what the company does for the individual.

However, work-life balance is a two-pronged approach. The other prong of work-life balance, which many individuals overlook, relates to what individuals do for themselves. The core of work life balance could also be summed as achievement with enjoyment.

Achievement and enjoyment at work is a critical part of work-life balance. Furthermore, achievement and enjoyment in the other three quadrants of one's life (e.g. family, friends and self) is critical as well. Work cultures have often demanded a transformation from inflexibility to flexibility. The underlying principle perhaps is the increasing realization that certain issues pertaining to the imbalance in working life and personal life of an individual are being overlooked. With globalization becoming the norm of the day, these issues seem to have taken a back seat for quite a while. Work-life 'imbalance' has over a period of time attracted concern because of increasing problems related to employee health, monotony at

work place, declining levels of productivity and efficiency at the employee level. The imbalance also has a negative impact in the personal life of working people-some of which have even become social hazards- increasing number of divorces, infertility due high stress levels, advent of nuclear families etc.

1.2 Modern Organizational Set up

The nature of work has changed in recent decades due to industrial restructuring, technological advancements, economic recessions and intensified global competition. Due to the advancement in technology, the working life has been changed. One country's work can be done anywhere in the world and this has been resulted in the emergence of outsourcing. Today's organizations and their employees need to be able to adjust quickly to an ever-changing world. This is applicable to both private companies as well as state-run organizations. It is not only an organization's competitors who create this pressure for flexibility, but also an organization's customers and dominant shareholders. This has been resulted in the flexibility in working hours. Especially, when the outsourcing is shared with the other part of the world, employees have to adopt the working hours of onshore country. This puts tremendous pressure on the employees as they need to work on the

graveyard shifts. Alternatively, they need to adopt the working style of the country as well. Also, most of the time less number of people had to share more work and that puts them into the workload pressure. New alternative employments arrangements help create numerical flexibility. Many work places make use of temporary employment contracts. These temporary contracts are, however, only utilized to a limited extent—usually to fulfill a temporary production need or want in competence. By not permanently connecting all employees to the organization, companies place a portion of the uncertainty outside of the company; in other words, uncertainty is placed on the shoulders of those with temporary. The fact that women, to a greater extent than men, are found in the most unfavorable types of employment raises issues of gender and equality in the changing labor market [8].

1.3 Factors causing Work life Imbalance at Workplace

The concept of stress is of central importance when examining how the psychosocial work environment affects health and well-being. Stress is defined as being an interaction between the individual and the situation. When the individual experiences a mismatch between perceived demands and the perception of his capability to meet the demands, stress occurs. Another factor that affects whether stress is experienced is the perceived cost of not coping. For stress to occur, a person must, in part, feel that the demand is beyond her capabilities, and also that the consequences of not coping are serious. The experiencing of stress is thus determined by the cognitive appraisal of both the situation and one's capabilities rather than any objective view of the situation or capabilities in question. If the person manages to cope with the situation, no negative stress reaction will occur. Stress triggers a biological reaction by activating different biological systems which increase a person's ability to perform and adapt to new situations. When these systems are repeatedly activated without the opportunity for recovery or rest, there is a risk for both physical and mental stress-related ill-health. The fact that employees in the private and public sector partly are exposed to different environmental demands and conditions may also

have an influence on their psychological work climate experiences [1].

The other factors like unsupportive supervisor and subordinates, long duration of working hours, unreasonable perks and workplace harassment are also affecting the balance of one's work and life outside work.

2. Definition and Illustration of Induced Fuzzy Cognitive Mapping (IFCM)

2.1 Definitions

Definition 2.1.1: An FCM is a directed graph with concepts like policies, events etc. as nodes and causalities as edges. It represents causal relationship between concepts.

Definition 2.1.2: FCMs with edge weights or causalities from the set $\{-1, 0, 1\}$, are called simple FCMs.

Definition 2.1.3: Consider the nodes or concepts C_1, \dots, C_n of the FCM. Suppose the directed graph is drawn using edge weight $e_{ij} \in \{0, 1, -1\}$. 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.

Definition 2.1.4: Let C_1, \dots, C_n be the nodes of an FCM. $A = (a_1, a_2, \dots, a_n)$ where $a_i \in \{0, 1\}$. A is called the instantaneous state vector and it denotes the on-off position of the node at an instant.

$a_i = 0$ if a_i is off and

$a_i = 1$ if a_i is on for $i = 1, 2, \dots, n$.

Definition 2.1.5: Let $\overline{C_1 C_2}, \overline{C_1 C_2}, \dots, \overline{C_{n-1} C_n}$ 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 $i = 1, 2, \dots, n$. The equilibrium state for this dynamical system is called the hidden pattern.

Definition 2.1.6: Finite number of FCMs can be combined together to produce the joint effect of all the FCMs. Let E_1, E_2, \dots, E_p be the adjacency matrices of the FCMs with nodes C_1, C_2, \dots, C_n then the combined FCM is got by adding all the adjacency matrices E_1, E_2, \dots, E_p .

We denote the combined FCM adjacency matrix by $E = E_1 + E_2 + \dots + E_p$. Suppose $A = (a_1, a_2, \dots, a_n)$ is a vector which is passed into a dynamical system E . Then $AE = (a'_1, a'_2, \dots, a'_n)$ after thresholding and

updating the vector suppose we get (b_1, b_2, \dots, b_n) we denote that by $(a_1, a_2, \dots, a_n) \hookrightarrow (b_1, b_2, \dots, b_n)$. Thus the symbol ' \hookrightarrow ' means the resultant vector has been thresholded and updated.

2.2. Algorithmic Approach of IFCM

Even though IFCM is an advancement of FCM it follows the foundation of FCM, it has a slight modification only in Algorithmic approaches. To derive an optimistic solution to the problem with an unsupervised data, the following steps to be followed:

Step 1: For the given model (problem), collect the unsupervised data that is in determinant Factors called nodes.

Step 2: According to the expert opinion, draw the directed graph.

Step 3: Obtain the connection matrix, M, from the directed graph (FCM). Here the number of rows in the given matrix = number of steps to be performed.

Step 4: Consider the state vector $S(X_1)$ by setting C_1 in ON position that is assigning the first component of the vector to be 1 and the rest of the components as 0. Find $S(X_1) \times M$. The state vector is updated and threshold at each stage.

Step 5: Threshold value is calculated by assigning 1 for the values > 0 and 0 for the values < 1 . The symbol ' \hookrightarrow ' represents the threshold value for the product of the result.

Step 6: Now each component in the C_1 vector is taken separately and product of the given Matrix is calculated. The vector which has maximum number of one's is found. The vector with maximum number of one's which occurs first is considered as C_2 .

Step 7: When the same threshold value occurs twice. The value is considered as the fixed Point. The iteration gets terminated.

Step 8: Consider the state vector C_1 by setting C_2 in ON state that is assigning the second component of the vector to be 1 and the rest of the components as 0. Precede the calculations discussed in Steps 4 to 6.

Step 9: Continue Step 9 for all the state vectors and find hidden pattern.

3. Adaptation of the problem

There are many factors contributing to the work life imbalance in the working environment, these

factors and all the work life stress inducing factors will lead to work life imbalance. It is known that all these factors affect the work life balance in some degree. Here the study is made among the ten factors and to find out which factor is triggering other factors more in numbers and influence in provoking the other factors and result in work life imbalance. With the help of expert's opinion the data has been arrived. Since the data is linguistic by nature it makes it very difficult to analyze it with other mathematical tools. Induced FCM is useful in such a way to analyze these linguistic data and make easier to derive the result. With IFCM, the analysis of which factor affects the work life balance directly by inducing the other negative factors have been studied in this paper. The following attributes are taken as the nodes of the IFCM.

- W₁- Working long hours/ beyond 8 hours in a day
- W₂- Unrealistic deadlines and unreasonable demands from managers/supervisors
- W₃- Unmanageable workload
- W₄- Lack of support from coworkers
- W₅- Health problems
- W₆- Lower performance at work
- W₇- Poor working environment
- W₈- Inadequate resources and equipments
- W₉- Inadequate trainings to perform the work
- W₁₀- Poor relationship from subordinates

	W ₁	W ₂	W ₃	W ₄	W ₅	W ₆	W ₇	W ₈	W ₉	W ₁₀
W ₁	0	0	0	0	1	0	0	0	0	0
W ₂	1	0	1	0	0	0	0	0	0	0
W ₃	1	0	0	0	1	1	0	0	0	0
W ₄	0	0	0	0	0	0	0	0	0	1
W ₅	0	0	0	0	0	1	0	0	0	0
W ₆	1	0	1	0	0	0	0	0	0	0
W ₇	1	0	1	0	0	0	0	0	1	0
W ₈	1	0	1	0	0	0	1	0	1	0
W ₉	1	0	0	0	0	1	0	0	0	0
W ₁₀	0	0	0	1	0	0	0	0	0	0

4. Results and discussions

Now let us take the input vector as $C_1 = (1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0)$ where the personality openness is kept in ON state and the rest of the nodes in OFF state.

$$C_1 M = (0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0) = C_1'$$

$$C_1' M \approx$$

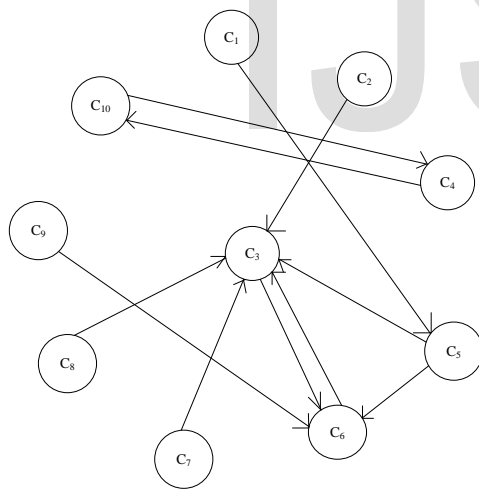
$$\begin{aligned}
 (0000100000)M &= (0000010000) \\
 &= C_2 \\
 C_2M &= (1010000000) = C_2' \\
 C_2'M &\approx \\
 (1000000000)M &= (0000100000) \\
 (0010000000)M &= (1000110000) \\
 &= C_3 \\
 C_3M &= (1010110000) = C_3' \\
 C_3'M &\approx
 \end{aligned}$$

$$\begin{aligned}
 (1000000000)M &= (0000100000) \\
 (0010000000)M &= (1000110000) \\
 &= C_4 \\
 (0000100000)M &= (0000010000) \\
 (0000010000)M &= (1010000000) \\
 &= C_3 = C_4
 \end{aligned}$$

(1 0 0 0 1 1 0 0 0 0) is the fixed point and the triggering pattern is C1→C5 →C3→C3.

The following table gives the triggering pattern for various input vectors.

Input Vector	Triggering Pattern
C ₁ ; (1 0 0 0 0 0 0 0 0 0)	C1→C5 →C3→C3
C ₂ ; (0 1 0 0 0 0 0 0 0 0)	C2→C3→C3
C ₃ ; (0 0 1 0 0 0 0 0 0 0)	C3→C6→C6
C ₄ ; (0 0 0 1 0 0 0 0 0 0)	C4→C10→C10
C ₅ ; (0 0 0 0 1 0 0 0 0 0)	C5→C6→C6
C ₆ ; (0 0 0 0 0 1 0 0 0 0)	C6→C3→C3
C ₇ ; (0 0 0 0 0 0 1 0 0 0)	C7→C3→C3
C ₈ ; (0 0 0 0 0 0 0 1 0 0)	C8→C3→C3
C ₉ ; (0 0 0 0 0 0 0 0 1 0)	C9→C6→C6
C ₁₀ ; (0 0 0 0 0 0 0 0 0 1)	C10→C4→C4



The limit point corresponding to C₃ (1 0 0 0 1 1 0 0 0 0) shows that the attributes C₁, C₅ and C₆ are the major factors causing work life imbalance.

5. Conclusion

The result provides clear evidence that the factor 'Unmanageable workload' is standing in the first position in affecting the work life balance of an individual by triggering the other factors such as 'long working hours/beyond 8 hours in a day',

'health problems' and 'lower performance at work'. These factors in turn affect the health of work life balance and resulting in work life imbalance. The next factor standing in the second position is 'Lower Performance at work' which induces the factors like 'long working hours/beyond 8 hours in a day' and 'unmanageable workload' to be active and affects the work life balance negatively.

6. Future direction

Studying on the diverse nature of factors contributing work life imbalance is vital. These factors are gender sensitive and demographic in nature. Thus makes this study is more complex and the other areas like gender sensitive issues and geographical and cultural influence in work set up also have unimaginable effects on the work life balance of an individual. Hence, these are standing in cue for our scope of further studies.

References

[1] Chan Suk-fun, Isabella, "Work life balance: A study on the effect of conflict and facilitation amongst life roles on psychological well being and quality of life of individuals in Hong Kong"(2007).

- [2] Fiona Jones, Ronald Burke and Mina Westman, "Work-Life Balance: A Psychological Perspective". Psychology press (UK), (2006).
- [3] Frank Bauer, Hermann Grob, Gwen Oliver, Georg Sieglén, Mark Smith "Time use and work-life balance in Germany and the UK".(July 2007)
- [4] Kosko B., *Neural Networks and Fuzzy Systems*, Prentice-Hall, Inc., New Jersey, USA, 1992
- [5] Kosko B., *Fuzzy Cognitive Maps*, Int. J. Man-Machine studies (1986), 24, 65-75.
- [6] Mohammad Niaz Asadullah and Rosa M. Fernández, "Work-Life Balance Practices and the Gender Gap in Job Satisfaction in the UK: Evidence from Matched Employer-Employee Data"(2008).
- [7] Pathinathan T., et al., *On tensions and Causes for school Drop outs – An Induced Linked Fuzzy Relational Mapping (ILFRM) Analysis*, In Proc.of the 9th Joint Conference on Information Sciences (JCIS) (pp.1160-1163)
- [8] Niharika Doble and Supriya, M.V, "Gender differences in the perception of work life balance".(2010)
- [9] Vasantha Kandasamy W.B, Florentin Smarandache and Ilanthenral, "Elementary fuzzy matrix theory and fuzzy models for social scientists".(2007).
- [10] Vasantha Kandasamy W.B and Florentin Smarandache, "Analysis of social aspects of migrant labourers living with HIV/AIDS using fuzzy theory and neutrosophic cognitive maps"(2004).
- [11] Vasantha Kandasamy W.B and Florentin Smarandache, "Fuzzy and Neutrosophic Analysis of Women with HIV/AIDS" (2005).

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