Analyzing the Personal Factors Causing Work life Imbalance using Induced Fuzzy Cognitive Mapping (IFCM)

A.Victor Devadoss[1] and J. Befija Minnie

Abstract

There are lot of factors affecting the work life harmony especially, stress factors, work related factors, peer pressure, personal factors, etc. The study is aiming to detail the effects of personal factors on the overall health of work life balance. The data arrived just by not considering any other factors but only the personal factors. This gives a vivid picture of the impact of factors which are purely personal and stays outside of the work. Since the data is linguistic in nature fuzzy models are used to arrive at a result of which factor has more influence on disturbing the work life synchronization.

Keywords: Fuzzy, cognitive mapping, fuzzy cognitive mapping, induced fuzzy cognitive mapping, work life balance, personal factors

1. Introduction

1. 1 Work Life Balance

Work life balance is maintaining a proper balance between work and personal life. There is always a life outside the work. If a person is able to attain a well balanced work and life, then the person will be able to achieve his/her personal and professional goals together. A proper balance has to be maintained between all the aspects of life which is including but not limited to work place, family, friends, hobbies, personal care, sleep, community, sports, etc. It is important for the organizations also to help the employees to maintain the work life balance in order to retain the good attrition level and higher production. Nowadays, it became a concept of debate as people are looking at their professional life for their self development and self satisfaction. A successful person in life is a successful person in maintaining the good balance between their professional and personal life. However, the modern life is also demanding high level of flexibility and the working environment has also become stressful. It is important to understand all the factors which are affecting the work life balance in order to tackle the problems associated with this concept.

The concept of work life balance is evolved after the industrial revolution was taken place. From then, the concept keeps on changing and new metrics and parameters were developed to measure it. Due to the impact of globalization and the improved job opportunities, most of the families have both the parents are working, this makes the balancing is more critical. In India, most of the working families are first generation middle class workers and job is essential for them to lead a life without financial burden. Because of which, most of the families are compromising on their personal life. They are also reluctant in the concept of personal care and self development; also they have no time to spend with their loved ones. This leads to the monotony of work, increasing health problems especially non communicable diseases such as stress, heart attack, obesity, blood pressure, alcohol addiction and cancer.

There are various studies conducted on this topic counting the various dynamics of this problem, factors affecting work life balance, measurements to be taken for a well balanced work life, etc. However, most of these studies are conducted in foreign nations, but now India has the growing population in the fields of BPO, IT and servicing sectors. All these fields demand for a high level of pressure coping ability and it also demands for long working hours. Though, these fields have its own growth in the employee's professional career but it needs a maximum level of flexibility. When one aspect of the life demands for maximum hours of their daily clock, people are tended to compromise on their other aspect of life. Thus it results in work life imbalance. These two aspects of an individual life have the same level of influence on their other aspect of life. If one part goes unbalanced, it affects the other one too. So, it is important to understand and study the influence of each aspects of life on the other end and how they enhance or destroy the balance of a person's life. Imbalanced work life may lead to the total destruction of a person's overall life, no matter how successful he is in the other aspect of the life.

1. 2 Personal Life Factors

Any factors which are not related to the professional life will be considered as personal factors. Personal factors will have a huge impact on work life balance as it has the direct impact on the personality of the person and in his professional life. So, it is imperative to maintain a harmony in personal life in order to limit the adverse effect of work life imbalance

It is obvious to understand the personal life factors such as 'unsupported spouse', 'child care', 'too much of household activities', etc. will reduce the balancing and ultimately will reflect in the professional life. In order to maintain a good record of professional for a person, it is must for him to have cordial relationship with his family members and spouse.

Also, the personal life factors may encourage a person to be more successful in his/her career, so it is crucial to know and understand how these personal factors have impact over one another and ultimately influencing the work life synchronization. Few aspects of personal life issues may became uncontrollable and can not be reversed after the initial damage, so it will have a long lasting impact on the other activities of life. Also, professional life factors are also affecting the individual's personal life to some extend with the less magnitude of what personal life does on the professional life.

There may be a single factor or a group of factors ruining both personal and professional life; it is not universal for all. It is very specific with individuals. So, understanding this concept is very difficult and thus it requires a model which studies the linguistic based data and gives the accurate and reliable outcome. Here, the use of fuzzy model is obtained to study the manual data.

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, C_2 ,….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,….C_n be the nodes of an FCM. $A = (a_1, a_2,\ldots,a_n)$ 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, …, n.

Definition2.1.5: Let $\overline{C_1C_2}$, $\overline{C_1C_2}$ ….., $\overline{C_{n-1}C_n}$ 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,…, 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, ….E_p be the adjacency matrices of the FCMs with nodes C_1, C_2, ….C_n 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 $E = E_1 + E_2 + \ldots + E_p$. Suppose $A = (a_1, a_2,\ldots,a_n)$ is a vector which is passed into a dynamical system E. Then $AE = (a'_1, a'_2,\ldots,a'_n)$ after thresholding and updating the vector suppose we get $(b_1, b_2,\ldots,b_n)$ we denote that by $(a_1, a_2,\ldots,a_n) \hookrightarrow (b_1, b_2,\ldots,b_n)$. Thus the symbol '↪' 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 '↪' 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 personal life environment, these factors ultimately will results in 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 eleven 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 very difficult to analyze the problem 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.

W_1- Unsupported Spouse

W_2- Too much of household activities

W_3- Inadequate sleep

W_4- Financial burden

W_5- Difficulties in managing child care requirements

W_6 – No proper food

W_7- No proper time for personal care

W_8- Difficulties in caring ill/aged family members

W_9- Long travelling hours to work

W_{10}- Health problems

W_{11} – Lack of support from family members

The following connection matrix M is given on the basis of expert's opinion

	W_1	W_2	W_3	W_4	W_5	W_6	W_7	W_8	W_9	W_{10}	W_{11}
W_1	0	1	0	0	1	0	1	1	0	1	0
W_2	0	0	0	0	1	0	1	1	0	0	0
W_3	0	0	0	0	0	0	0	0	0	1	0
W_4	0	1	0	0	1	1	0	1	0	0	0
W_5	0	1	1	0	0	0	0	0	0	0	0
W_6	0	0	0	0	0	0	0	0	0	1	0
W_7	0	0	0	0	0	0	0	0	0	1	0
W_8	0	1	1	0	0	0	0	0	0	0	0
W_9	0	0	1	0	0	0	1	0	0	0	0
W_{10}	0	0	1	1	0	0	0	0	0	0	0
W_{11}	0	1	0	0	1	0	1	1	0	1	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 0) where the attribute unsupported spouse is kept in ON state and the rest of the nodes in OFF state.

C_1M = (0 1 0 0 1 0 1 1 0 1 0) = C_1'

$C_1'M \approx$

(0 1 0 0 0 0 0 0 0 0 0) M = (0 0 0 0 1 0 1 1 0 0 0)

= C_2

(0 0 0 0 1 0 0 0 0 0 0) M = (0 1 1 0 0 0 0 0 0 0 0)

(0 0 0 0 0 0 1 0 0 0 0) M = (0 0 0 0 0 0 0 0 0 1 0)

(0 0 0 0 0 0 0 1 0 0 0) M = (0 1 1 0 0 0 0 0 0 0 0)

(0 0 0 0 0 0 0 0 0 1 0) M = (0 0 1 1 0 0 0 0 0 0 0)

C_2M = (0 0 0 0 1 0 1 1 0 0 0)M

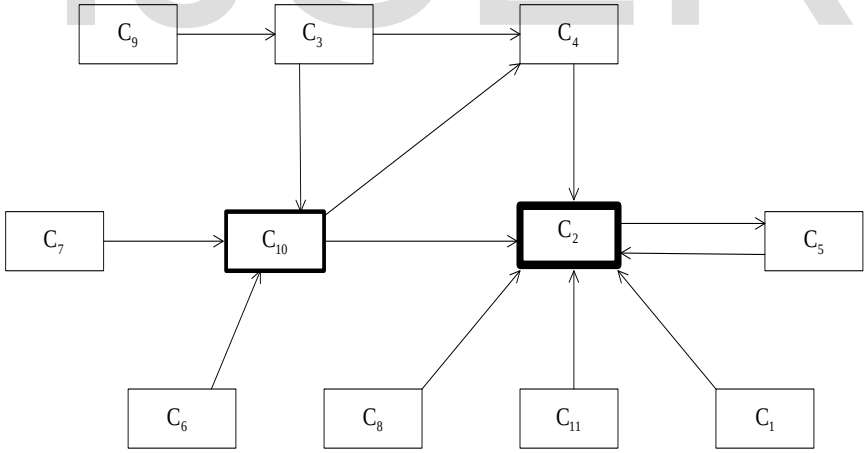
= (0 2 2 0 0 0 0 0 0 1 0)
↪ (0 1 1 0 0 0 0 0 0 1 0)
= C_2'

$C_2'M \approx$
(0 1 0 0 0 0 0 0 0 0 0) M = (0 0 0 0 1 0 1 1 0 0 0)
= C_3
(0 0 1 0 0 0 0 0 0 0 0) M = (0 0 0 0 0 0 0 0 0 1 0)
(0 0 0 0 0 0 0 0 0 1 0) M = (0 0 1 1 0 0 0 0 0 0 0)
= C_3
(0 0 0 0 1 0 1 1 0 0 0) is the fixed point
and the triggering pattern is $C_1 \Rightarrow C_2 \Rightarrow C_2$

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

Input Vector	**Limit Points**	**Triggering pattern**
C_1 ; (1 0 0 0 0 0 0 0 0 0 0)	(0 0 0 0 1 0 1 1 0 0 0)	$C_1 \Rightarrow C_2 \Rightarrow C_2$
C_2 ; (0 1 0 0 0 0 0 0 0 0 0)	(0 0 1 1 0 0 0 0 0 0 0)	$C_2 \Rightarrow C_5 \Rightarrow C_5$
C_3 ; (0 0 1 0 0 0 0 0 0 0 0)	(0 0 0 0 1 0 1 1 0 0 0)	$C_3 \Rightarrow C_{10} \Rightarrow C_2 \Rightarrow C_2$
C_4 ; (0 0 0 1 0 0 0 0 0 0 0)	(0 0 0 0 1 0 1 1 0 0 0)	$C_4 \Rightarrow C_2 \Rightarrow C_2$
C_5 ; (0 0 0 0 1 0 0 0 0 0 0)	(0 0 0 0 1 0 1 1 0 0 0)	$C_5 \Rightarrow C_2 \Rightarrow C_2$
C_6 ; (0 0 0 0 0 1 0 0 0 0 0)	(0 0 0 0 1 0 1 1 0 0 0)	$C_6 \Rightarrow C_{10} \Rightarrow C_2 \Rightarrow C_2$
C_7 ; (0 0 0 0 0 0 1 0 0 0 0)	(0 0 0 0 1 0 1 1 0 0 0)	$C_7 \Rightarrow C_{10} \Rightarrow C_2 \Rightarrow C_2$
C_8 ; (0 0 0 0 0 0 0 1 0 0 0)	(0 0 0 0 1 0 1 1 0 0 0)	$C_8 \Rightarrow C_2 \Rightarrow C_2$
C_9 ; (0 0 0 0 0 0 0 0 1 0 0)	(0 0 0 0 1 0 1 1 0 0 0)	$C_9 \Rightarrow C_3 \Rightarrow C_4 \Rightarrow C_2 \Rightarrow C_2$
C_{10} ; (0 0 0 0 0 0 0 0 0 1 0)	(0 0 0 0 1 0 1 1 0 0 0)	$C_{10} \Rightarrow C_4 \Rightarrow C_2 \Rightarrow C_2$
C_{11} ; (0 0 0 0 0 0 0 0 0 0 1)	(0 0 0 0 1 0 1 1 0 0 0)	$C_{11} \Rightarrow C_2 \Rightarrow C_2$

Merging all these triggering patterns in a single graph, the following graph is obtained



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It can be seen that the node C_2 (Too much of household activities) becomes the converging point. Too much of household activities have impact over all other factors. Health problems (C_{10}) in the second leading point in destroying work life balance.

5. Conclusion

The result provides clear evidence that the personal factor 'Too much of household activities' stands in the first position in affecting the work life balance of an individual. This factor is triggered by most of the factors such as 'unsupported spouse', 'financial burden', 'No support from family members' and 'Difficulties in caring ill/old family members'. Because of the impact of these factors, it leads to too much of household activities and ends up in work life imbalance. The factor stands in the second position is 'Health problems' which is influenced by the factors like 'inadequate sleep', 'No proper food' and 'Financial burden' and ultimately resulting in negative impact on work life balance.

6. Future direction

Studying on the various natures of factors influencing work life imbalance is essential because of current development in the global market, it demands for high level of flexibility and long working hours from the employees. However, most of the time these factors are psychological than physical by nature, so it is very subjective to study. Because of which the study becomes more critical in nature and requires more understanding in the other factors too. Also it is gender sensitive and subject to personality of the person, and many of the times geographical location is also have an impact on the work life balance, so these are standing in cue for our scope of further studies.

References

[1] Barbara Haddon and Andrew Hede, "*Work life Balance – An integrated Approach*", (2010).

[2] Byrne, U. "*Work-life balance: Why are we talking about it at all*", Business Information Review, Vol. 22, pp: 53-59, (2005)

[3] 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).

[4] Fiona Jones, Ronald Burke and Mina Westman, **"***Work-Life Balance: A Psychological Perspective*", Psychology press (UK), (2006).

[5] Fiona Moore, "*Work-life balance: Contrasting managers and workers in an MNC*", Employee Relations, Vol. 29, Issue 4, pp: 385-399, (2007).

[6] Frank Bauer, Hermann Grob, Gwen Oliver, Georg Sieglen, Mark Smith "*Time use and work–life balance in Germany and the UK*", (July 2007).

[7] Hughes, J. and Bozionelos, N. "*Work-life balance as source of job dissatisfaction and withdrawal attitudes: An exploratory study on the views of male workers*", Personnel Review. Vol. 36, pp: 145-154, (2007).

[8] Kosko B., "*Neural Networks and Fuzzy Systems*", Prentice-Hall, Inc., New Jersey, USA, (1992).

[9] Kosko B.," *Fuzzy Cognitive Maps*", Int, J. Man-Machine studies, 24, 65-75, (1986)

[10] Morris, M. L. and Madsen, S. R.,. "*Advancing work-life integration in individuals, organizations, and communities*", Advances in Developing Human Resources. Vol. 9, pp: 439-454, (2007).

[11] 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, (2006).

[12] Niharika Doble and Supriya, M.V, "*Gender differences in the perception of work life balance*", (2010).

[13] Vasantha Kandasamy W.B, Florentin Smarandache and Ilanthenral, "*Elementary fuzzy matrix theory and fuzzy models for social scientists*", (2007).

[14] 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).

[15] Vasantha Kandasamy W.B and Florentin Smarandache, "*Fuzzy and Neutrosophic Analysis of Women with HIV/AIDS*", (2005).

[16] Victor Devadoss. A and Befija Minnie. J, "*A study of personality influence in building work life balance using Induced Bi-directional Associative Memories*", International Journal of Engineering Research & Technology, ISSN:2278-0181, Vol:2, Issue 11, (2013).

[17] Victor Devadoss. A and Befija Minnie. J, "*A study of work related stress factors affecting work life balance using Combined Overlap Block Fuzzy Cognitive Mapping*", International Journal of Computing Algorithm, Vol: 02, pp: 161- 166, (2013)

[18] Victor Devadoss. A and Befija Minnie. J, "*Analyzing the causes of work life imbalance in working environment using Induced Fuzzy Cognitive Maps*", International Journal of Scientific & Engineering Research, Vol :5, Issue 2, ISSN: 2229- 5518, (2014).

[19] Wilkinson, S. J, "*Work-life balance in the Australian and New Zealand surveying profession*", Structural Survey, Vol. 26, Issue 2, pp: 120-130, (2008).

- *A. Victor Devadoss is currently working in the department of mathematics as a Head and guiding the research students in Loyola College, Chennai, India. E mail - hanivictor@ymail.com*
- *Co-Author Befija Minnie J is currently a research scholar in the department of mathematics in Loyola College, Chennai, India. E mail – befija@yahoo.co.in*