A Study of Personality influence in building Work life balance using Induced Bi-directional Associative Memories (IBAM)

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Abstract:

The personality plays an important role in the work life balance irrespective of the organizational setups and other factors. It has become a subject of concern in view of the contemporary demographic, technological, market and organizational changes associated with an individual's personality. The concept of personality and its qualities used in this study were derived from the Big Five Personality traits. In this study an attempt is made to study the holistic picture of the personality influence on the work-life balance using Induced Bi-directional Associative Memories (IBAM) on the basis of expert's opinion.

Keywords: Personality, Work Life balance, Induced Bi-directional Associative Memories

1. Introduction

1.1 Personality

Personality is made up the characteristic patterns of thoughts, feelings, and behaviors that make a person unique. In different situations personality and our responses are generally stable. Personality is psychological, but is influenced by biological needs and processes. Personality of an individual is a set of qualities that make the person distinct from another and assume a role or manner of behavior. Within ones personality the complex of all the attributes such as behavioral, temperamental, emotional and mental are considered. Guest (2002) defined the personality as the extent to which family or work is a central life interest influences the perceptions of balance of every individual [3].

"Personality is the entire mental organization of a human being at any stage of his development. It embraces every phase of human character: intellect, temperament, skill, morality and every attitude that has been built up in the course of one's life", (Warren & Carmichael, 1930, Elements of human psychology). **"**Personality is a result of interaction between the individual and the environment". (B. F. Skinner, 1953, Science and Human Behavior)**. "**An individual's pattern of psychological processes arises from motives, feelings, thoughts and other major areas of psychological function. Personality is expressed through its influences on the body, in conscious mental life, and through the individual's social behavior". (Mayer 2005, Comprehensive handbook of personality and psychopathology CHOPP Vol. 1: Personality and everyday functioning.

1.2 The Big Five Dimensions of Personality

Today, many researchers believe that they are five core personality traits. Evidence of this theory has been growing over the past 50 years, beginning with the research of D. W. Fiske (1949) and later expanded upon by other researchers including Norman (1967), Smith (1967), Goldberg (1981), and McCrae & Costa (1987). The "big five" are broad categories of personality traits are Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness [4]. While there is a significant body of literature supporting this five-factor model of personality, researchers don't always agree on the exact labels for each dimension. However, these five categories are usually described as follows

a) **Extraversion:** This trait includes characteristics such as excitability, sociability, talkativeness

assertiveness and high amounts of emotional expressiveness.

b) **Agreeableness:** This personality dimension includes attributes such as trust, altruism, kindness, affection, and other pro social behaviors.

c) **Conscientiousness:** Common features of this dimension include high levels of thoughtfulness, with good impulse control and goal-directed behaviors. Those high in conscientiousness tend to be organized and mindful of details.

d) **Neuroticism:** Individuals high in this trait tend to experience emotional instability, anxiety, moodiness, irritability, and sadness.

e) **Openness:** This trait features characteristics such as imagination, inventive and insight and those high in this trait also tend to have a broad range of interests.

It is important to note that each of the five personality factors represents a range between two extremes. For example, extraversion represents a continuum between extreme extraversion and extreme introversion. In the real world, most people lie somewhere in between the two polar ends of each dimension.

1.3 Work Life Balance

By definition 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.

1.4 Personality influence on work life balance

An individual should be able to strike a proper balance between work and personal life, there are many factors which are influencing the work life balance, and however an individual's personality also plays a vital role in balancing the work life. Aspects of personality including the need for achievement and propensity for work involvement belong among important individual factors. The approach of psychology of individual differences may be also fruitful for research of Work Life Balance due to the fact that studying aspects of different personality types can enhance our understanding of perceptions of work life balance. Therefore it can be realized that the Personality of an individual can have effects on an individual's balance between work and life.

2. Bi-directional Associative Memories (BAM)

Bi-directionality, forward and backward information flow, is introduced in neural networks to produce two-way associative search for stored stimulus-response associations (A_i,B_i).

A group of neurons forms a field. Neural networks contain many fields of neurons. F_x denotes a neuron field which contains n neurons and F_y denotes a neuron field which contains p neurons.

Neuronal Dynamical Systems The neuronal dynamical system is described by a system of first order differential equations that govern the time evaluation of the neuronal activations or membrane potentials.

$$X_i = g_i\left(X, Y, \ldots\right), \quad Y_j = h_j\left(X, Y, \ldots\right)$$

Where x_i and y_j denote respectively the activation time function of the i^{th} neuron in F_x and the j^{th} neuron in F_y. The over dot denotes time differentiation, g_i and h_j are functions of

X, Y etc., where $X(t) = (x_1(t),\ldots\ldots,x_n(t)$, $Y(t) = (y_1(t),\ldots\ldots,y_n(t))$ define the state of the neuronal dynamical system at time t. Additive Bivalent Models describe asynchronous and stochastic behaviour. At each moment each neuron can randomly decide whether to change state, or whether to omit a new signal given its current activation. The BAM is a non-adaptive, additive, bivalent neural network.

2.1. Bivalent Additive BAM

In neural literature, the discrete version of the earlier equations is often referred to as the Bidirectional Associative Memories or BAMs. A discrete additive BAM with threshold signal functions, arbitrary thresholds and inputs, an arbitrary but a constant synaptic connection matrix M and discrete time steps K are defined by the equations.

$$x_i^{k+1} = \sum_j^p S_j\left(y_j^k\right) m_{ij} + I_i$$

$$y_j^{k+1} = \sum_i^n S_i\left(y_i^k\right) m_{ij} + I_j$$

Where, $m_{ij} \in M$, S_i and S_j are the signal functions. They represent binary or bipolar threshold functions. For arbitrary real-valued thresholds $U = (U_1,U_2\ldots,U_n)$ for F_x neurons and $V = (V_1,V_2\ldots,V_n)$ for F_y neurons. The threshold binary signal functions corresponds neurons.

2.2. Synaptic Connection Matrices

Let us suppose that the field F_x with n neurons is synoptically connected to the field F_y with p neurons. Let m_{ij} be a synapse where the axon from the i^{th} neuron in F terminates, m_{ij} can be positive, negative or zero. The synaptic matrix M is a $n \times p$ matrix of real numbers whose entries are the synaptic efficacies m_{ij}. The matrix M describes the forward projections from the neuronal field F_x to the neuronal field F_y. Similarly, M^T, a $p \times n$ synaptic matrix and describes the backward projections F_y to F_x.

2.3. Unidirectional Networks

These kinds of networks occur when a neuron synoptically interconnects to itself. The matrix N is $n \times n$ square matrix.

2.4. Bidirectional Networks

A network is said to be a bidirectional network if $M = N^T$ and $N = M^T$.

2.5. Bidirectional Associative Memories

When the activation dynamics of the neuronal fields F_x and F_y lead to the overall stable behavior, the bi-directional networks are called as Bi-directional Associative Memories or BAM. A unidirectional network also defines a BAM if M is symmetric i.e. $M = M^T$.

2.6. Additive Activation Models

An additive activation model is defined by a system of $n+p$ coupled first-order differential equations that interconnects the fields F_x and F_y through the constant synaptic matrices M and N described earlier. $S_i(x_i)$ and $S_j(y_j)$ denote respectively the signal function of the i^{th} neuron in the field F_x and the signal function of the j^{th} neuron in the field F_y. Discrete additive activation models correspond to neurons with threshold signal functions. The neurons can assume only two values **ON** and **OFF**. ON represents the signal value +1 and OFF represents 0 or -1 (-1 when the representation is bipolar). The bipolar version of these equations yield the signal value -1 when $x_i<U_i$ or $y_j<V_j$.

$$\dot{x}_i = -A_i x_i + \sum_j^p S_j(y_j^k) m_{ji} + I_i$$

$$\dot{y}_j = -A_j y_j + \sum_i^n S_i(y_i^k) m_{ij} + I_j$$

The bivalent signal functions allow us to model complex asynchronous state-change patterns. At any moment different neurons can decided whether to compare their activation to their threshold. An each moment any of the 2^n subsets of F_x neurons or the 2^p subsets of F_y neurons can decide to change state. Each neuron may randomly decide whether to check the threshold conditions in the equations given above.

At each moment each neuron defines a random variable that can assume the value ON (+1) or OFF (0 or -1). The network is often assumed to be deterministic and state changes are synchronous i.e. an entire field of neurons is updated at a time. In case of simple asynchrony only one neuron makes a state change decision at a time. When the subsets represent the entire fields F_x and F_y synchronous state change results.

In a real life problem the entries of the constant synaptic matrix M depends upon the investigator's feelings. The synaptic matrix is given a weight age according to their feelings. If $x \in F_x$ and $y \in F_y$ the forward projections from F_x to F_y is defined by the matrix $M.:\{F(x_i,y_j)\} = (m_{ij})=M,\ 1<i<n,\ 1<j<p$. the backward projection is defined by the matrix $M^T.:\{F(y_j,x_i)\} = (m_{ji}) = M^T,\ 1<i<n,\ 1<j<p$.

2.7. Bidirectional Stability

All BAM state changes lead a fixed-point stability. This property holds for synchronous as well as synchronous state changes.

A BAM system (F_x, F_y, M) is bi-directionally stable if all inputs coverage to fixed point equilibrium. Bidirectional stability is a dynamic equilibrium. The same signal information flows back and forth in a bidirectional fixed point.

Let us suppose that A denotes a binary n-vector and B denotes a binary p-vector. Let A be initial input to the BAM system. Then the BAM equilibrates a bi-directional fixed point (A_i,B_j) as

$$A \rightarrow M \rightarrow B$$
$$A' \leftarrow M' \leftarrow B$$
$$A' \rightarrow M \rightarrow B'$$
$$A'' \leftarrow M^T \leftarrow B'$$

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$$.A_f \rightarrow M \rightarrow B_f$$
$$A_f \neg M^T \neg B_f$$

where A', A",.. and B', B" .. represents intermediate or transient signal state vectors between A and A_f , B and B_f. respectively. The fixed point of a bidirectional system is time dependent. The fixed point for the initial input vectors can be attained at different times which are illustrated later. Based on the synaptic matrix M which is developed by the investigators feelings, the time at which bidirectional stability is attained also varies accordingly.

2.8 Induced Bi-directional Associative Memories

Suppose that there are n attributes, say x_1, x_2, …, x_n, where n is finite, associated with the five dimensions of personality and let y_1, y_2, …, y_p be the attributes associated with the characteristics of work life balance. The connection

matrix M of order n X p is obtained through the experts opinion. Let A be the initial input vector. A particular component is kept in ON state and all other components in OFF state and we pass the state vector A through the connection matrix M. To convert the resultant vector as a signal function, choose the positive values to ON state and other values to OFF state with 1 and 0 respectively. Denote this process by the symbol B. The resulting vector is multiplied with M^T and the thresholding yields a new vector A_1. This vector is related with the connection matrix and that vector which gives the highest number of attributes to ON state is chosen as A_2. That is, for each positive entry we get a set of resultant vectors; among these vectors the one which contains maximum number of 1s is chosen as A_2. If there are two or more vectors with equal number of 1s in ON state, choose the first occurring one as A_2. Repeat the same procedure till a fixed point or a limit cycle is obtained. This process is done to give due importance to each vector separately as one vector induces another or many more vectors into ON state. Get the hidden pattern by the limit cycle or by getting a fixed point. Next we choose the vector with its second component in ON state and repeat the same to get another cycle. This process is repeated for all the vectors separately. We observe the hidden pattern of some vectors found in all or many cases. Inference from this hidden pattern highlights the causes.

3. Description of the Study

The Big five personality traits are taken as the attributes of the domain space and the characteristics of work life balance are taken as the attributes of the range space. The attributes of the domain space are described as

P_1 – Openness
P_2 – Conscientiousness
P_3 – Extraversion
P_4 – Agreeableness
P_5 – Neuroticism

The attributes of the range space are described as

W_1 – Planning and organizing priorities

W_2 – Good in coping skills

W_3 – Able to enjoy work and have career progression

W_4 – Good at doing household activities

W_5 – Time for child care/ elder care/ family

W_6 – Time to spend with friends and relatives

W_7 – Adequate time for personal care like sleeping/eating on time etc,

W_8 – Hobbies/leisure time events/ refreshing activities/ fun

W_9 – Time for health care like doing meditation Yoga/ Physical exercise

W_{10} – Time for social activity

W_{11} – Doing things creatively

W_{12} – Good performance at work

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_{12}
P_1	0	1	3	0	0	0	2	4	3	0	5	2
P_2	5	-1	4	0	0	-1	0	-2	0	0	0	4
P_3	-1	0	1	0	0	4	3	3	1	4	0	1
P_4	-4	-1	0	4	3	3	-2	0	0	2	0	-1
P_5	-5	-2	-2	0	0	0	1	-4	-5	0	-4	-3

4. Results and discussions

Now let us take the input vector as A_1 = (1 0 0 0 0 0) where the personality openness is kept in ON state and the rest of the nodes in OFF state.

A_1M = (0 1 3 0 0 0 2 4 3 0 5 2)

↪ (0 1 1 0 0 0 1 1 1 0 1 1) = B_1

B_1M^T = (20 5 9 -4 -19)

↪ (1 1 1 0 0) = A_2

$A_2^{(1)}$ = (1 0 0 0 0)

$A_2^{(2)}$ = (0 1 0 0 0)

$A_2^{(3)}$ = (0 0 1 0 0)

$A_2^{(1)}M$ = (0 1 3 0 0 0 2 4 3 0 5 2)

↪ (0 1 1 0 0 0 1 1 1 0 1 1) = $B_2^{(1)}$

$B_2^{(1)} M^T$ = (1 1 1 0 0)

The sum is 3

$A_2^{(2)}M$ = (5 -1 4 0 0 -1 0 -2 0 0 0 4)

↪ (1 0 1 0 0 0 0 0 0 0 0 1) = $B_2^{(2)}$

$B_2^{(2)} M^T$ = (5 13 1 -5 -10)

↪ (1 1 1 0 0)

The sum is 3

$A_2^{(3)}M$ = (-1 0 1 0 0 4 3 3 1 4 0 1)

↪ (0 0 1 0 0 1 1 1 1 1 0 1) = $B_2^{(3)}$

$B_2^{(3)} M^T$ = (14 5 17 2 -13)

↪ (1 1 1 1 0)

The sum is 4

Therefore, A_3 = (1 1 1 1 0)

A_3M = (0 -1 8 4 3 6 3 5 4 6 5 6)

↪ (0 0 1 1 1 1 1 1 1 1 1 1) = B_3

B_3M^T = (19 5 17 9 -17)

↪ (1 1 1 1 0)

Thus the binary pair {(0 0 1 1 1 1 1 1 1 1 1 1), (1 1 1 1 0)} represents the fixed point.

Input vector	Limit point	Triggering pattern
(1 0 0 0 0)	(0 0 1 1 1 1 1 1 1 1 1 1),(1 1 1 1 0)	$A_1 \Rightarrow A_3 \Rightarrow A_3$
(0 1 0 0 0)	(0 0 1 1 1 1 1 1 1 1 1 1),(1 1 1 1 0)	$A_2 \Rightarrow A_3 \Rightarrow A_3$
(0 0 1 0 0)	(0 0 1 1 1 1 1 1 1 1 1 1),(1 1 1 1 0)	$A_3 \Rightarrow A_3 \Rightarrow A_3$
(0 0 0 1 0)	(0 0 1 1 1 1 1 1 1 1 1 1),(1 1 1 1 0)	$A_4 \Rightarrow A_3 \Rightarrow A_3$
(0 0 0 0 1)	(0 0 1 1 1 1 1 1 1 1 1 1),(1 1 1 1 0)	$A_5 \Rightarrow A_3 \Rightarrow A_3$

5. Conclusion

The result clearly indicates that the personality type 'Extraversion' is striking a proper balance between work and life outside work. The results also represents that personality traits always have influence in the work life balance, Openness and Conscientiousness comes next after Extraversion. To conclude, this study has provided a clear evidence that the personality traits plays a vital role in work life balance and the Extravert people are managing both work and life outside work properly.

6. Future direction

A broad area of personality type behavioral difference at work and outside of work still left unstudied. It is noticeable that each personality behavior is not unique at work and outside of work. This is making the analysis of

psychometric tests to be more complex than it appears. This area can be studied to find out which personality tends to show more difference at professional and personal life and which personality shows less difference.

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