COGNITIVE ERGONOMICS AND EMPLOYEE WELL-BEING IN FINANCIAL COMPANIES

Sanil S.K.*, Vinith Kumar Nair, Hareesh N. Ramanathan*****

**Research Scholar, Bharathiar University, Coimbatore, India. Email: sanilsk@rediffmail.com*
***Associate Professor, TKM Institute of Management, Kollam, India. Email: vinith79@gmail.com*
****Professor and Head, Department of Management Studies, Toc H Institute of Science and Technology Kochi, India. Email: hareeshramanathan@gmail.com*

Abstract *The Cognitive Ergonomics is a subset of the Human Factors and Ergonomics that deals with fitting the job to the worker by putting an emphasis on cognition in work and operational settings so as to optimise human well-being and system performance. Congenial workplace conditions support the cognitive tendencies of employees. Technological advancement in the last two decades has posed numerous challenges to financial service companies which are otherwise marred by unhealthy market competition. To cope with the situation, human capital development has been earmarked as one of the top priorities. It became onus upon the HR managers to keep pace with the industrial standards on welfare and retention strategies. Ergonomic interventions in several forms have been put in place with an eye on better employee well-being. This study is to determine the essential factors of cognitive ergonomics and its major implications on employee well-being in financial service companies. A questionnaire survey was conducted among the randomly selected employees in Banks and NBFCs. Appropriate statistical tools were used to analyse the data. It is found that cognitive ergonomics has an all-encompassing function in the employee well-being of financial service companies.*

Keywords: *Cognitive Ergonomics, Employee Well-being, Job Satisfaction, Financial Companies.*

Introduction

Ergonomics is the discipline that deals with making the job fit the worker. The International Labour Organization defines Ergonomics as the application of the human biological sciences in conjunction with the engineering sciences to the worker and his working environment so as to obtain maximum satisfaction for the worker which at the same time enhances productivity. The ergonomic theories, principles, and design methods optimise human well-being and the overall performance of a system. In the beginning, this concept was mainly applicable to the employees in production sector. In Europe, ergonomics was found to be focused in industry and intended for improving worker performance and satisfaction. But during the 70's, with the advent of artificial intelligence, ergonomics has received attention in the service industries as well. In the 80's, European ergonomists were concerned largely about advanced psychological aspects and as a result the European Association of Cognitive Ergonomics (EACE) was emerged as a representative forum of cognitive science professionals. During the 90's, volatility in global economy and technological boom have added more woes to the work standards especially in the service industrial segment. As a result, ergonomics discipline, particularly the cognitive ergonomics has gained massive attention. Owing to the pressing need of industrial psychology, we combine cognition and ergonomics to study the cognitive aspects of the interaction between people, work system and artifacts with the intention of designing them to make effective interaction. The cognitive ergonomics is originated from the concepts of mental work and cognitive tool or the artifact. The mental work is performed by cognitive systems using the knowledge to produce changes in the domains of work. The cognitive processes such as perception and learning play a critical role in the interaction with artifacts and they must be considered to explain the cognitive tasks that people perform. The cognitive ergonomics is a branch of ergonomics that study cognitive processes at work with an emphasis on the understanding of the situation and the sustainable performance.

The production sector employers have been traditionally addressing the issues related to improvement in the health and wellbeing of employees. Enough Statutes were promulgated in this regard for the employee health and welfare. But, now in the service sector also there is a growing trend in adopting systematic methods to ensure the wellbeing of employees. The well-being of employees encompasses both physical and psychological health of workers. In a study of NHS employees in the UK, Loretto, et al. (2005) demonstrated that there is a wide range of personal as well as workplace factors influencing the employee well-being. The employee well-being concept is discussed generally in a human resource

perspective that advocates the promotion of attitudes and behaviours like commitment and job satisfaction that can shore up continuous development and performance of the employees.

Literature Review

A congenial office and working environment as envisaged by the ergonomists is required for the employees to deliver their best. Ergonomics is defined by Fernandez (1995), as the scheme to design the workplace, equipment, machine, tool, product, environment, and system taking into account the human's physical, psychological, biomechanical and psychological capabilities and optimising the effectiveness and productivity of work systems by ensuring the health, safety, and well-being of workers. In any work system, the workers and their environment should be considered as an extremely interactive joint cognitive system (Hollnagel and Woods, 2007). The cognitive ergonomics focuses on cognitive processes in the design of environment and technology (Wickens and Hollands, 2000). The cognitive ergonomists facilitate the indulgence of individuals with a system and conduct a cognitive analysis of interaction to reduce learning time, interaction time and human errors. A suitable methodology for this cognitive analysis of interaction could be based on the principle of mutual dependency which establishes the bonding of human cognitive functions involved in the task on the interface (Canas, et al., 2001). The cognitive ergonomists have given adequate care on the individual and group factors involved in decision making. In the initial stages of human factor engineering, they were called to explain why the particular design had not worked. But in the later phase, they were called to intervene directly in the design process (Velichkovsky, 2005; Wickens and Hollands, 2000). The works of cognitive ergonomists in the design process have undergone serious changes over the last few decades. The innovation processes demand the ergonomists to proactively furnish ideas and empirical data to design future artifacts for improving human performance and the general acceptance of new technologies (Akoumianakis and Stephanidis, 2003; Kohler, et al., 2008). The term cognitive ergonomics is often replaced by Human-Computer Interaction (HCI) due to the overwhelming importance of information technology. Alternatively, everyone should talk about cognitive ergonomics of Human-Machine Interaction rather than the preconceived notion of HCI in which the interaction is restricted to computerised artifacts (Sellen, et al., 2009). This is very much applicable to the financial companies as most of the routine activities are automated in such cases. Owing to the technological advancement, the present conditions in workplaces demand speedy responses to the new situation resulting in the problems of dissatisfaction, imbalance in work and family (Cooper and Robertson, 2001; Guest, 2002). Software applications for the business processes are vital ingredients in the computerised work atmosphere of financial companies. Utmost care must be taken when designing the dialogues and also in all other requirements of human-computer interaction for introducing a software application within the common platform (Karwowski, 2005).

O'Donnell (2009), has identified the five types of well-being in employees as emotional, intellectual, physical, social, and spiritual well-being. Employee well-being can be accessed from different behavioural features like job satisfaction, commitment and work life balancing (Jernigan, et al., 2002). Job satisfaction is the positive mindset related to the worthwhile aspects of a job that can lead to quality in performance (Fisher, et al., 2004). It is actually the employee reaction towards the job situations (Wood, et al., 2007). In a way, job satisfaction is considered to be the display of emotional well-being of employees. A recent survey on Australian workers has shown that majority of the workers are satisfied with their work-life balance. However, the trend for dissatisfaction has been increasing in the cases of 25% full time women and 20% full time men (Pocock, et al., 2010). Further, a few studies confirm that when the health and well-being of employees are better, their commitment level will also move up and such employees will perform to the highest degree (Bates, et al., 2003). The commitment of employees in an organisation arises from a psychological contract. Improvement in psychological contract will support a better employment relationship and individual employee behaviour (Aggarwal and Bhargava, 2009).

Neglecting the ergonomic principles and practices at workplaces can lead to physical exhaustive, emotional depression and declining productivity (Shikdar and Sawaqed, 2003). Work stress is a major problem area in the occupational health, safety and well-being of employees (Williams and Cooper, 2002). It has a lot of harmful effects on the employee well-being and the organisational success (Noblet, et al., 2001). Kyriacou (2001) has defined the job stress as an occurrence of negative emotional states such as anxiety, frustration and worry due to work related factors. An employee feels work stress when perceiving negatively towards the environment. A stressful working environment could damage blood vessels and jeopardise the health and well-being of employees (McShane and Von Glinow, 2009). Stress is a result of the divergence in demands of environment and the individual's ability to adapt. The measures of work stress outcome comprise physiological, psychological, and behavioural aspects (De Croon, et al., 2005). Epidemiological studies have proved that ergonomically designed work stations will minimise the stress outcomes (Aaras, et al., 2001). The provision of best-fitting apparatus will increase the rating of an organisation by its employees. Stress level in the present working environment is considerably greater than that of the past generation (Minter, 1999). One of the reasons

can be the longer stay in workstations due to the current job demands as well as the obligations (Konz and Rys, 2003). The studies of Iacovides, et al. (2003) have proven that the longer working hours shall cause various stress outcomes. In a long run perspective, it can be seen that the stretched work hours will affect the employees' health and well-being (Savery and Luks, 2000). The studies of Clark (2002) have pointed out that there are several organisational factors affecting the job stress and that the longer working hours is one among them.

A lot of researches have underlined the importance of ergonomic interventions in the employee well-being. Suitable applications of ergonomic principles in environmental design, facilities design and workplace design have shown many positive results (Resnick and Zanotti, 1997). The workstation design may cause physiological or psychological reactions like aggravating job satisfaction, crowding stress, fatigues and high blood pressure (De Croon, et al., 2005). Other similar kinds of reactions include psychosomatic health complaints such as chronic fatigue, burnout, mental strain and musculoskeletal disorders leading to poor employee performance (De Lange, et al., 2002; Sluiter, et al., 2003). An ergonomic approach in the design of workstation can diminish the stress level and increase productivity through an interaction between different system components (Dempsey, et al., 2004). When the work area design is attempted, an ergonomic stride will bring down the problems out of work stress (Tarcan, et al., 2004). Another study has made out that ergonomically designed workplace with appropriate ergonomic interventions will improve the employee productivity (Yeow and Nath Sen, 2003).

The experimental studies on high commitment HRM practices recommend that the employment relationship is a key intervening variable in explaining the link between human resource management practices and the employee well-being (Guest, 2002; Guest and Conway, 2002). It is suggested that greater attention is required in the current era of globalization to address the imbalance between workplace standards in the developed and developing worlds (Chopra, 2009). The employees in the financial sector have been put through multitasking. Their stress level has reached an all time high. Thus, the Indian financial services sector deserves much more consideration with regard to the workplace standards in view of the radical changes in economic scenario, information technology and in the market structure. Obviously, a special emphasis is required in the cognitive ergonomic part during the course of any such initiative.

Objectives of the Study

- To find out the major dimensions of cognitive ergonomics in financial service companies
- To examine the relationship of cognitive ergonomic factors on employee well-being

Research Methodology

Universe and Sampling Frame

The universe for sampling study is the employees in various financial service companies like Banks and NBFCs. The sampling frame for the present study comprises the employees of a public sector bank, a private sector bank and a non-banking financial company. The sample size was estimated to be 102 and rounded off to 105, based on the mean and variance in the key variables after the pilot study. A top performing public sector bank, a private sector bank and a non-banking financial company in Kerala were selected in the first stage. The share was fixed for all the three categories based on the proportion of employees. One zone from all the three categories was selected randomly and the quota in each category was filled up randomly from the list of employees in the selected zone.

Data Collection

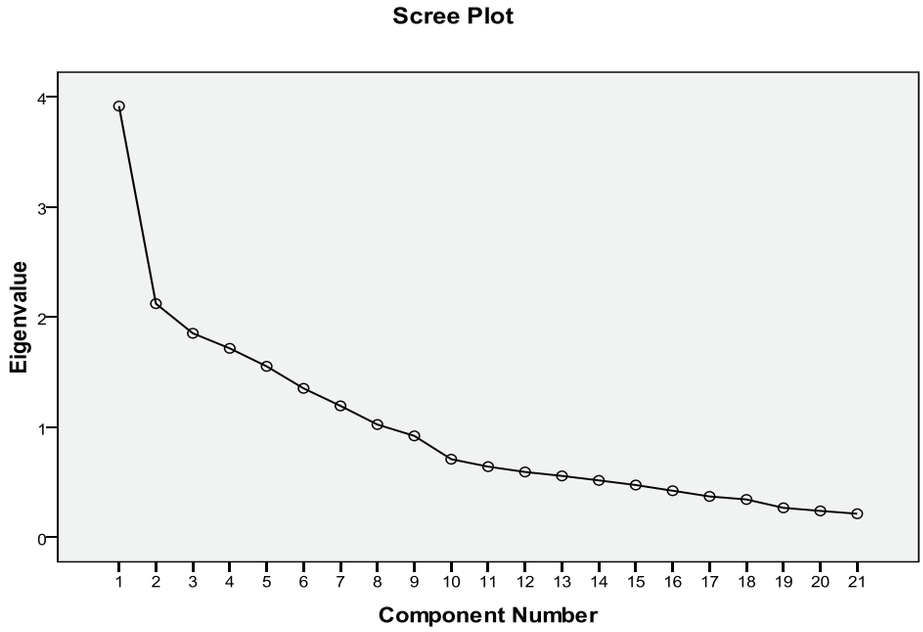
A structured questionnaire with 39 items was used for the primary data collection. In fact, a 50 item questionnaire was initially prepared by considering the works of Ekman and Ehrenberg (2002); Hedge and Erickson (1997); Lemasters and Atterbury (1996); Nag and Nag (2004); and Zafir and Durrishah (2009). Necessary changes have been made wherever required and some new items were included considering the objectives of this study. After analyzing the pilot study results and also based on a preliminary factor analysis, the items have been reduced to thirty nine so as to bring in more clarity as well as internal consistency. The questionnaire format was made with a five point Likert scale to obtain the responses. The one hundred and five randomly selected employees were responded to the validated questionnaire.

Empirical Study Results

Reliability Statistics

The reliability and internal consistency of variables were examined and found that the overall Cronbach's Alpha of the entire 39 items under study is 0.886. It is also found that all the 21 items which form part of the constructs for cognitive ergonomics have an Alpha coefficient of 0.759 and the 18 items of dependent variable, viz. the employee well-being, have the coefficient value of 0.897. From this, it is evident that the Cronbach's Alpha coefficients are relatively high, indicating a fairly good internal consistency. Hence the collected data can be considered to be reliable for further analysis.

Figure 1: The Scree Plot Depicting the Eigen Values of Factor Analysis.



Factor Analysis

Factor analysis was conducted with all the twenty one items of independent variables. The result of KMO and Bartlett's Test is shown in Table 1.

Table 1: KMO and Bartlett's Test results for the significance of Factor Analysis

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.621
Bartlett's Test of Sphericity	Approx. Chi-Square	612.554
	df	210
	Sig.	.000

It is estimated that the significance (0.000) is less than the assumed value (0.05) and so we may reject the null hypothesis (i.e. H0: Factor analysis is not valid). Thus, it is concluded that the correlation matrix is not an identity matrix. In other words, factor analysis is valid for the data under study. KMO coefficient is found to be 0.621 which is well above 0.5 and so it is implied that the reduction of data through the factor analysis is very much effective. Based on the total variance explained, eight factors were found to be extracted out by way of principal component analysis with the rotation method of Varimax with Kaiser Normalisation. The Scree Plot is depicted in Figure 1 which also provides that there are eight factors above the Eigen value of one.

Table 2: Factor Scores of Principal Component Analysis

S. No.	Factors	Scores
	I – WORK DESIGN	
1	Work environment	0.870
2	Area design	0.865
3	Better postures	0.827
4	Movement aids	0.815
5	Lower repetitions	0.811
	II – WORK COMFORT	
6	Trouble free sleep	0.819
7	Good health condition	0.756
8	Tension free job	0.715
	III – HUMAN COMPUTER INTERACTION	
9	Computer performance	0.817
10	Reliance on computers	0.784
11	Ease of computer	0.774
12	Computer programme	0.736
	IV – WORKING HOURS	
13	Rest period	0.710
14	Personal life	0.709

These eight factors together explain 70.112 percent of the total variance and they can be classified under the four categories namely, work comfort, human-computer

Table 3: Correlation Matrix of Employee Well-being

		Employee Well-being	Work Design	HCI	Work Comfort	Working Hours
Employee Well-being	Pearson Correlation	1	.148	.221*	.444**	-.378**
	Sig. (2-tailed)		.133	.024	.000	.000
	N		105	105	105	105

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

interaction (HCI), work design, and working hours. The categorization is tabulated and the respective factor scores are given in Table 2.

Correlation Matrix

The bivariate correlation matrix is given in Table 3. Employee well-being is the dependent variable and four of the cognitive ergonomic factors, i.e. work comfort, HCI, work design, and working hours are the independent variables which were taken into consideration for working out the matrix.

It is apparent that the employee well-being has a positive correlation ($r = 0.44$) with work comfort at 1% significance level ($p<0.01$). The Pearson correlation coefficient for employee well-being and human-computer interaction is comparatively less ($r = 0.221$), but it is observed that the correlation is significant at 5% level ($p<0.01$) and it cannot be ignored. Further, it is found that the working hours is another variable which is significant ($p<0.01$) at 1% level. However, unlike in the earlier cases, the relationship of working hours to employee well-being is evolved as a negative correlation with a considerable Pearson coefficient ($r = 0.378$). So it can be concluded that the work comfort and HCI have a significant positive correlation whereas the working hour has a significant negative correlation with employee wellbeing.

Discussion and Conclusion

The study has brought out that the comforts offered to the employees, the work design, the human-computer interaction, and the stipulated working hours in financial service companies shall have some association with the employee well-being. A careful assessment was made on each and every constructs of the major cognitive ergonomic factors and other related features in order to get a fair idea about the details of the results and observations. It is conspicuous that the comforts in job may help employees to get relieved from job tension and endow them a better physical and mental health condition. The design of each job with reference to the work area where the employee operates and the ease in its execution shall have a positive effect in employee well-being. It is desirable that the work area is to be free from congestion and the job place to be maintained in a pleasant environment. The banks and NBFCs are now having an extremely elegant ambiance not only in the customer area but even in the back office region as well. By and large, a better physical environment contributes substantially to the vigour and vitality of employees throughout the work time. Such a pleasing internal setting improves mental freshness as also the cohesion and group dynamics all of which are critical in the office routine of any financial company. Likewise, an effective interaction of employees with the artifacts in their job situation may possibly add up to their well-being. There are radical changes in the office routine nowadays. From the dispatch section to the accounting segment of financial service companies, each one of the operational activities is now mechanized. Updated communication technology and alternate delivery channels have made many revolutionary changes in the business proposition and work culture. Consequently, the workforce has also benefited more and more especially in the physical reliefs since the role of a vast majority of employees has become limited mainly to the operative aspects of machines where there is virtually no physical exhaustion.

In the new scenario there is enough room for the effective utilization of cognitive skills of employees when considering the present workplace standards in financial institutions. The effectiveness of human-computer interaction in such institutions can be estimated from the way the employees are enjoying the benefits out of the efficiency of machines, familiarity of its tools, programmes and other related techniques. Since a best part of these companies are interconnected by way of advanced networking technologies for catering to the customer needs on a real time basis, it is ensured that there will not be any failures in the overall system. Thus the interaction might be in tandem. Hence the companies are resorting to all sorts of precautions. Yet, from the empirical study results, we may not be able to fix up a very decisive role of the human-computer interaction towards the well-being of employees. One of the reasons can be the decades old ardent and familiar usage of computers by the employees in this segment and they may not be treating

the comfort of computerisation as an added facility. Anyhow, analyzing the reasons on such observations is beyond the scope of this study. Another important part is the negative correlation found between working hours and employee well-being in the financial companies. As per the extant norms, there are fixed working hours in such companies. The employees can avail some leisure time too. However, in practice, the employees may have to stretch their hours, perhaps without any rest. In other words, the work schedule is becoming a major cause for concern in these companies and so the streamlining of working hours shall fetch some magical effects in the well-being of employees.

Limitations of the Study

The sample size is not diverse enough to furnish a true picture of the financial service companies in the country. Even though the random sampling technique was used, data collection was restricted to a few centres only. The sample does not include employees in all the cadres and the size is also comparatively small. Furthermore, in the case of Pearson's analysis there are only moderate correlations. These results may not suffice exact reasons behind the findings and so it may not be getting much significance. As such, a larger sample size would be ideal particularly in the future empirical studies. Moreover, the data were collected by administering a structured questionnaire only. In addition to this, adopting some other methods for collection of the required data would have been better to obtain superior responses.

Scope for Future Research Studies

This study broadly furnishes a lot of inputs to the HR managers of financial companies especially during the course of job design as also while setting the office procedures and other related standards. However, a comprehensive picture of the cognitive aspects relating to employee well-being has not been brought about. Therefore, the researchers can consider the study in financial companies for developing a right model on the effect of cognitive ergonomics in employee well-being by considering all the related elements in contemporary business environment. Similarly, they can mull over the existing ergonomic practices, its effects and the required ergonomic interventions in Banks and NBFCs of the country so as to have an influence in the cognitive skills of its employees. In a wider spectrum, the research studies can be carried out in the cognitive ergonomic discipline to help out the hefty business activities in different organisations in an attempt to extend overall guidance on behavioural features, skills and abilities of the workforce.

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