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Statistical analysis work engagement based on variables of their wellbeing

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Abstract---This study design was chosen in order to meet the study goals of. A merge design was adopted, in which a sample of a group was taken on one period. The education remained expressive in nature, meaning it was based on natural observation of the research subject's characteristics rather than planned manipulation of variables or management well over circumstances. Higher education sector using different tests of statistics makes use of deliberate manipulation and different sections is to be organized and different experimental results are being evaluated.

Keywords---Work Life Engagement, Hypothesis, Cross Sectional Design.

Introduction

To achieve the study goals, a survey design was adopted. The researchers utilised an across-sectional design, which involves randomly selecting a sample from the population. The study was descriptive in nature, meaning that the researchers observed the features of their search topic in a natural way without manipulating the variables or controlling the surroundings. The population for this research is made up of faculty members who work in higher education institutions. Higher education encompasses a wide range of subjects. Higher education institutions, such as universities and colleges throughout the nation, may be divided into two types: public institutions that get full or partial government funding, and private schools that are self-funded.

University campuses and colleges with faculty members from the four fields included in the research were used to compile a list of HEIs to contact for data collection. A web connection was created for online data gathering and database preparation at the same time. Personal visits, mailing the questionnaire, and soliciting responses on the internet were all used to gather data. The information was gathered from 41 different institutions and departments. Personal visits assisted in the acquisition of genuine data, the timely collection of data, and the recording of qualitative observations about the institutional work culture, all of which contributed in the interpretation of the findings. Nearly 600 questionnaires were sent out to the intended respondents, and 473 of them were returned, representing a response rate of 78 percent. Because ten of the surveys were incomplete, they could not be utilised. In the end, 463 completed questionnaires were used in the research.

Statistical Analysis Approach

The statistical tools and techniques used for the study included “descriptive statistics, one-way ANOVA, exploratory factor analysis, measurement of scale reliability, correlation analysis, non-metric correlation analysis and hierarchical multivariate regression analysis. The analysis was done using SPSS version 16.0. After entry of the data, the data was checked whether it had been uniformly entered. Data analysis was then performed by applying above said techniques. Brief description of the analytical tools and techniques used for the analysis is given as follows:

Analysis of Variance (ANOVA)

Analysis of Variance (ANOVA) is commonly used for examining the difference of means between two or more populations, based on the information gathered from the samples of the respective populations. This technique was developed by R.A Fisher. ANOVA is based on some assumptions. Each population should have a normal distribution with equal variances. Each sample should be randomly drawn and independent of all other samples. ANOVA is used for comparing the means when there is one metric dependent variable (measured using interval or ratio scale) and one or more non metric or categorical independent variable (Malhotra & Dash, 2011). One-way ANOVA is employed when only one independent variable is used to compare the differences in the mean values of the dependent variable. In one – way ANOVA, testing of hypothesis is carried out by partitioning the total variation of the data in two parts. The first part is the variance between the samples and the second part is the variance within the samples. The variance between the samples can be attributed to treatment effects and the variance within the samples can be attributed to experimental errors. In the present study one-way ANOVA was used to compare the differences in the level of dependent variable namely work engagement of the samples drawn according to each of the personal variables treated as independent variables. The independent variables for testing each of the hypotheses H_{01} to H_{011} stated at the beginning were: type of institution, faculty work area, posting, designation, total experience, experience in current organization, age, gender, educational background and salary respectively. Wherever the difference in mean responses

was found to be significant Post-Hoc test using Least Square Difference (LSD) method was applied.

Exploratory Factor Analysis

The present study has used exploratory factor analysis (EFA) to reduce the large number of variables into manageable number of variables. Factor analysis is a technique used for data reduction which examines the relationships among sets of many interrelated variables and represents in the form of a few underlying factors. This technique is exploratory in nature; hence it is also called exploratory factor analysis (EFA) (Malhotra and Dash, 2011). The key statistics associated with factor analysis which were used by the study are described as follows:

- *Bartlett's test of sphericity*: This statistic was used to test the appropriateness of the data for the factor analysis. Bartlett's test of sphericity examines the null hypothesis that all variables are uncorrelated in the population. It is based on chi-square transformation of determinant of correlation matrix. Large value of the test favors the rejection of null hypothesis (Malhotra and Dash, 2011). Therefore rejection of null hypothesis determines the appropriateness of the factor model.
- *Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy*: This test was also used to test the appropriateness of factor analysis. A value of 0.5 is desirable to pursue factor analysis. High values between 0.5-1.0 indicate appropriateness of factor analysis, whereas value less than 0.5 mean that factor analysis is not appropriate (Malhotra and Dash, 2011).
- *Principal component analysis*: The study used principal component analysis method of factor analysis. In principal component analysis, the total variance in the data is considered. Principal component analysis method is recommended when the primary concern is to determine the minimum number of factors for subsequent use in analysis (Malhotra and Dash, 2011).
- *Eigen values*: In the study Eigen value method was used to determine the number of factors to be retained. Only factors with eigen values greater than 1.0 were retained and other factors were not included in the model (Malhotra and Dash, 2011).
- *Varimax rotation*: In the study the factor matrix was rotated using varimax procedure of rotation. Varimax procedure is an orthogonal rotation which minimizes the number of variables with high loadings on a factor (Malhotra and Dash, 2011).

Scale Reliability

Scale reliability refers to the degree to which a measurement technique can be depended upon to secure consistent results upon repeated application. Reliability is the degree of consistency between multiple measurements of a variable. In this study Cronbach's alpha was computed for reliability assessment of the various scales. Cronbach's alpha is the reliability coefficient which determines the reliability of entire scale. If there is no true score and only error in the items then the coefficient *alpha* will be equal to zero. If all items are perfectly reliable and

measure the same thing, then coefficient alpha is equal to 1. The acceptable limit of Cronbach's alpha is generally 0.70 but the limit may be decreased to 0.60 in case of exploratory research (Hair et al., 2009).

Measures of Association

Measures of Association are statistics for measuring the strength of association between two variables. Correlation measures the degree of association between two variables. Karl Pearson's coefficient of correlation is a measure of the linear correlation between two variables. It is also known as Pearson product-moment correlation coefficient. Pearson's correlation coefficient is the covariance of the two variables divided by the product of their standard deviations. It is commonly represented by the letter r . So if there is one dataset $\{x_1, \dots, x_n\}$ containing n values and another dataset $\{y_1, \dots, y_n\}$ containing n values then formula for r is:

$$r = r_{xy} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2} \sqrt{\sum_{i=1}^n (y_i - \bar{y})^2}}$$

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$$

Karl Pearson's coefficient of correlation takes a value between +1 and -1 where 1 indicates that "total positive correlation, 0 is no correlation and -1 is total negative correlation. In the present study it was used to analyze whether work engagement, as a dependent variable, is associated with each of the ten factors identified through factor analysis namely perceived organizational support, personal and professional orientation, supervisory coaching, climate of participation and recognition, organizational orientation for results, interaction with students, intrinsic rewards, empowerment, task variety, support from associates, as independent variables. Again, it was used to analyze whether work engagement, as a dependent variable, is associated with the three dimensions of job crafting as independent variables; with the three dimensions of work life balance as independent variables; with the four dimensions of work stress as independent variables and finally with organizational commitment as a one dimensional independent variable.

Non-metric Correlation Analysis

Spearman's rank correlation is used to test the association between two ranked variables, or one ranked variable and one measurement variable. It is used to see whether the two variables co-vary. It is assumed that the observations are independent. In the present study Spearman's rho was used to study the correlation between two ordinal scale variables namely the ranking of measures for enhancement of work engagement by subgroups of respondents classified according to gender, type of institution, designation, salary, faculty work area and district of posting.

Hierarchical Multiple Regression Analysis

A multiple regression analysis method in which the researcher, not a computer program, determines the order that the variables are entered into and removed from the regression equation. It is used when the researcher believes that certain variables should be included in the model and in what order. The general form of multiple regression model is” :

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_k X_k + e$$

which is estimated by the following equation

$$\hat{Y} = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + \dots + b_k X_k$$

“The coefficient a represents the intercept, b ’s are partial regression coefficients. The statistics associated with Multiple Regression are:

- ❖ *Adjusted R^2* : R^2 , coefficient of Multiple Determination is adjusted for the number of independent variables and the sample size to account for diminishing returns. After the first few variables, the additional variables do not make much contribution.
- ❖ *Coefficient of Multiple Determination*: The strength of association in multiple regression is measured by square of the multiple correlation coefficient R^2 , which is also called the coefficient of multiple determination.
- ❖ *F test*: The F test is used to test the null hypothesis that the coefficient of Multiple Determination in the population, R^2_{pop} is zero. This is equivalent to testing the null hypothesis $H_0: \beta_1 = \beta_2 = \beta_3 = \dots = \beta_k = 0$. The test statistic has an F distribution with k and $(n-k-1)$ degrees of freedom.
- ❖ *Partial F Test*: The significance of a partial regression coefficient, β_i , of X_i may be tested using an incremental F statistic. The incremental F statistic is based on the increment in the explained sum of squares resulting from addition of the independent variable X_i to the partial regression equation after all the other independent variables have been included.
- ❖ *Partial Regression coefficient*: The partial regression coefficient b_1 , denotes the change in predicted value, $\hat{Y}$ per unit change in X_1 when the other independent variables X_2 to X_k are kept constant.

In this section of the present study, hierarchical multiple regression was used to analyse whether work engagement, as a dependent variable, is predicted by the ten factors identified through factor analysis namely perceived organizational support, personal and professional orientation, supervisory coaching, climate of participation and recognition, organizational orientation for results, interaction with students, intrinsic rewards, empowerment, task variety, support from associates, as independent variables. A two stage hierarchical multiple regression analysis was conducted. All personal variables namely type of institution, faculty work area, posting, designation, total experience, experience in current organization, age, gender, educational background, regional background and salary were entered in stage one to treat them as control variables. In this section of the present study, this technique was used four times to analyze whether work engagement, as a dependent variable, is predicted by job crafting dimensions;

work-life balance dimensions; work stress dimensions and organizational commitment. At each time, a two stage hierarchical multiple regression analysis was conducted. All personal variables were entered in stage one to treat them as control variables". Statistical analyses associated through each research impartial remain abridged in Table 1.

Table1
Statistical analyses associated with research objectives

Objective	Hypotheses	Statistical Technique
To measure the level of work engagement amongst the Employees (faculty members) working in organizations under the study.	N.A	1. Scale Reliability Test 2. Cronbach's alpha 3. Coefficient and descriptive statistics
To study the relationship (if any) between the level of work engagement and personal variables.	H₀₍₁₎ : Cultute of work does notdiffer across the type of institution. H₀₍₂₎ : Cultute of work does notdiffer across faculty work areas. H₀₍₃₎ : Cultute of work does notvary with posting. H₀₍₄₎ : Cultute of work does notdiffer across districts. H₀₍₅₎ : Cultute of work does notvary with designation. H₀₍₆₎ : Work engagement does notvary with total experience. H₀₍₇₎ : Cultute of work does notvary with experience in current organization. H₀₍₈₎ : Cultute of work does notdiffer across age groups. H₀₍₉₎ : Cultute of work does notvary with gender. H₀₍₁₀₎ : Cultute of work does notvary with educational background. H₀₍₁₁₎ : Cultute of work does notvary with salary.	1. One – way ANOVA 2. Post-Hoc tests using Least Square Difference (LSD)
To determine the factors that influence employee engagement at work (faculty members).	N.A	1. Exploratory Factor Analysis 2. Scale Reliability Test – Cronbach's alpha coefficient 3. Correlation Analysis Karl Pearson's coefficient of

		correlation 4. Hierarchical Multiple Regression Analysis
To identify the measures required for enhancement of work engagement amongst the employees (faculty members).	N.A	1. Non-metric Correlation Analysis :Spearman's rank correlation coefficient
To determine if there is a link (if there is one) between the amount of work engagement among workers (faculty members) and: • job crafting initiatives • work-life balance • level of stress • level of organisational commitment	H₀₍₁₂₎: “There is no significant relationship between job crafting and work engagement. H₀₍₁₃₎: There is no significant relationship between work life balance and work engagement. H₀₍₁₄₎: There is no significant relationship between work stress and work engagement. H₀₍₁₅₎: There is no significant relationship between organizational commitment and work”	1. Exploratory Factor Analysis 2. Scale Reliability Test – Cronbach's alpha coefficient 3. Correlation Analysis – Karl Pearson's coefficient of correlation 4. Hierarchical Multiple Regression Analysis

Future Research Prospects

This finding also opened up new avenues for future investigation. A cross-sectional approach has been utilised in the majority of research on job engagement, particularly in the Indian setting, which cannot explain why even highly involved workers may be less engaged on certain days. As a result, longitudinal studies are needed to examine the pattern of daily changes in job engagement as uncover the reasons that contribute to such changes. These studies might have significant consequences for a better understanding of employee well-being. The present research looked at the link between work engagement and job crafting and discovered that there is one. More research into this area may be able to address the issue of whether all workers are equally prone to job crafting. Is it possible to teach individuals to artisan jobs? Is there a link between personality and the way you do your job? The present research emphasises the importance of work-life balance metrics in higher education institutions. Studies that map policymakers' perceptions inside the public and commercial sectors may help determine if such efforts are feasible to implement. They have the potential to drastically alter the office environment and promote work force involvement from a wide range of people, all of which may help to improve overall work engagement. Workplace engagement will last if employee well-being was likewise strong (Robertson and Cooper, 2010). Workplace happiness indexes, which are an aggregate of all essential measurements of

employee well-being, can be developed as a result of additional research on job engagement.

Conclusion

The paper deals with the research methodology adopted for the achievement of the objectives of the current study. The paper includes a “description of the research design and sampling, data collection, sample description, research instruments employed for the measurement of the variables under study and finally the statistical analysis approach has been explained.

A cross-sectional descriptive study was designed using the quota sampling technique for drawing a fixed number of faculty members from each of the four broad faculty work areas namely Commerce and Business Management (CBM), Science, Engineering and Technology (SET), Applied Medical Sciences (AMS) and Education and Humanities (EHUM) from public and private higher education institutions. The respondents from drawn from higher education institutions located in NCR region. The sample consisted of 463 respondents from 41 Higher Education Institutions/ Departments. The sample was equitably distributed according to gender, type of institution, posting, designation, faculty work area, posting, total experience, current organization experience, educational background, regional background and salary.

The questionnaire used in the present study consisted of eight parts. Part Ideal with factors affecting work engagement for which a 92 item scale was developed that explored the respondents' perception regarding self, current job and current organization. There was a mix of positively and negatively worded statements to which response was sought on a seven -point Likert scale ranging from 0 representing strongly disagree to 6 representing strongly agree. The scale was factor analysed and found to consist of ten unique factors or dimensions with Cronbach's alpha values above the acceptable limit of 0.70 (Hair et al., 2009).

It was found that work engagement of faculty members varies significantly with faculty work area/ discipline, district wise posting, designation, experience in current organization, total experience, age, educational background and salary. However, no statistically significant variation was found with respect to respondent's gender, type of institution – whether government or private and posting at university campus or affiliated college.

Investigation of the relationship between faculty work area and work engagement using one-way ANOVA revealed that the faculty members of Education and Humanities discipline were significantly more engaged than commerce and business management and applied medical sciences. The findings were explained in terms of Job Demands and Resources Model of Work Engagement proposed by Bakker and Demerouti (2008).

Amongst the designation based categories, the work engagement of Lecturers was found to be significantly lower than Associate Professors, Professors and Heads of Departments. Assistant Professors were found to be less engaged than Associate Professors and Heads of Departments. The findings were in agreement with

Barkhuizen and Rothmann (2006) and Winter et al. (2000). Upon comparing work engagement according to total experience it was found that faculty members having total experience of more than 20 years were better work engaged than those with total experience of upto 5 years or 5 to 10 years. The finding was in agreement with a Bakker et al.'s (2004) study of human service professionals including teachers, establishing that certain job resources which come within crease in total experience are associated with higher work engagement. On similar lines when work engagement was compared across current organization experience of faculty members, it was found that faculty members having current organization experience of greater than 20 years were more work engaged than those with ≤ 5 years, $> 05 \leq 10$ as well as $> 10 \leq 15$ years. The higher work engagement of the longer tenured faculty members can be attributed to the development of a strong sense of identification and ownership over a period of time, which is likely to enhance the work engagement. Thus, it has very important implications for HR policy makers to design measures that encourage faculty retention in the current organizations. When work engagement was compared across the various age groups faculty members aged 55 years and above were more engaged in their work as compared to those in the age groups of ≤ 25 years, $> 25 \leq 35$ years and $> 35 \leq 45$ years. This was in consonance with the results obtained according to designation and total experience which are also supposed to increase with age.

According to the educational background, faculty members who had a Ph.D qualification were more engaged than the others with post graduate degrees. The results were explained in the light of Kahn's (1990) model of personal engagement considering Ph.D to be a key intellectual resource which is likely to enhance the psychological availability of a faculty member to immerse fully in one's role. According to salary bracket, the work engagement of faculty members drawing a salary of less than Rs. 30,000 per month was found to be lower than the next higher salary bracket 30,001 to 50,000 per month as well as the highest salary bracket Rs. 1,10,000 and above. The rationale was found in the argument of Hulko-Nyman et al. (2012) stating that dedication which is a key dimension of work engagement is explained by employees perception of benefits and material rewards". Salary is indeed a significant employment resource promoting work engagement, as according Demerouti et al. (2001). Finally, job involvement of faculty members was shown to be unaffected by gender, kind of institution (private, government, or government-aided), or whether they were assigned to the a university campus or an associated college.

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