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RESEARCH ARTICLE

Modelling the Interrelationship Between Sociological Parameters and Human Satisfaction with Special Reference to University Faculty Members.

Alka Chopra[1], R. K. Pandey[2], Mukesh K. Chowrasia[3], Raj Kumar[4], Anugrah Singh[5*]

[1,5]Suresh Gyan Vihar University, Jaipur, India*
[2]Managing Director, RDG Info services, Lucknow, India
[3]Poornima University, Jaipur, India
[4]Technocrats Institute of Technology, Bhopal, India

Restriction in social lives is known to affect the satisfaction level in academic entities. This has been noticed during past gone pandemic (Covid-19). The imposed lock down severely hit the higher education system thereby affecting the happiness level of university teachers. This prompts to conduct a study that can convincingly identify the sociological and psychological parameters affecting happiness of faculty members. Data generated through extensive survey, (based on convenient sampling) has been used to develop a conceptual framework. This has been used for structural equation modelling study by AMOS V-22.0. A total of fifteen variables were examined and their relative contribution to the happiness index of university teachers were understood. Conceptual framework based statistical modelling in association with the test of parametric significance enabled to identify the factors affecting teachers' happiness. To reinforce the findings by the study a descriptive statistical approach was also made. Here hypotheses relating the identified parameters were subjected to test for significance. Moreover, a machine learning technique is used to observe if there has been concordance of the results obtained by various modeling approach. It is found that the salary and job satisfaction are the most important determinant of happiness index of university members. It is also observed that linear regression s competent technique to predict satisfaction level of an academic set up. Not only that the study offers a newer research direction, but also stimulates corrective actions for better organizational performance.

Keywords: Happiness Index, Pandemic, Higher Education University, Structural equation modeling, University faculty members

1. Introduction

From past to the present, quickly spreading viruses causing pandemic similar to Covid19 has brought about significant societal transformations. In order to check the spread of pandemic and to minimise the loss of lives, the governments all over the world have been compelled to take recourse to mandatory self-isolation through the implementation of lockdown. Unfortunately, restriction of people's freedom of movement and denial of their most important possessions did exacerbate the detrimental impact on happiness levels.

Health, economic, and social elements of people were immediately impacted since people were unprepared for the disruption brought about by the pandemic. Global infectious decease that can cause pandemics adversely influences people's physical, social, and psychological well-being, thereby, leading to a major and vitally important ripple effect. Additionally, it becomes crucial to comprehend how people's psychological states are reflected in such pandemics.

Happiness, described as a feeling of being of a person is supposedly indispensable in one's work place; this is because happy person can only take an organization forward by way of inducing others in making the work place a vibrant one. However, it is to be noted that till date the exactness of the definition of happiness is not universally agreed. Nevertheless, a number ways has been prescribed to define happiness. In effect, happiness is that state of feeling which makes one content in an ambiance. Happiness is not a trait and hence it lasts for a shorter

***Corresponding author:** Anugrah Singh
*Email: anugrahs.phd16.me@nitp.ac.in

time and is changeable with circumstances. Happiness is sensory experience of pleasure. Two broad theories may be cited as (1) Hedonic happiness, considered as gaining experience of more pleasure and less pain, and (2) Eudaimonic happiness, a kind of pleasing mental state, emanating from realizing the purpose and meaning of life [1].

The pandemic's negative effects consequently suppressed many facets of humane social life, including sports, religion, health, education, and economy. As a result, practically everyone's life including regular operations of the majority of businesses houses and institutions were negatively impacted Various structural equation modelling methods are known to have been used to identify the interrelationship between the different attributes that cause happiness in individuals. Structural equation modelling has also been used to analyse education of industrial engineering student in private institution and inferred the teacher's involvement as the most important variable which is responsible for performance of students [2]. Conceptual frame work approach have been utilized by different researchers for framing the hypothesis and developing dependency model for different attributes influencing happiness [3]. Recent studies have shown that a variety of social, individual, demographic, economic, institutional, and environmental variables influence life satisfaction. The key macroeconomic indicators and happiness index have a link as revealed through examination conducted by economists [4].

Most researches on job happiness have concentrated on workers' traits and environmental factors. Knowledge employees' subjective well-being and the relationship between the worker (his or her unique qualities) and the workplace offers some understanding of specific labour market interactions. Contextually, a number of researchers have tried to understand how the academic-related elements and working environments may affect the faculty members' job or life happiness. Numerous studies have been conducted on academic standing, workloads, publications, mobbing, stress, and job security [5]. The studies on the determinants of well-being among university employees have been conducted by various workers. Conceptual framework is used to identify the different factors/attributes which are connected with the happiness index of faculty members in the higher educational institutions. Bhatia, and Mohsin (2020) have identified determinants of happiness among college teachers [6].

From the above information it is clear that the major challenge in mapping the happiness of the university teachers under any critical situation lies identifying the individual and circumstantial factors that appreciably influence the subjective wellbeing. It is apparent that minimal study on the conceptual frame based modelling teachers' happiness is so far reported in literature. Most of the previous researches on analysing on the analysis happiness index as function of variables are based on the selection of significant variables, where the choice of variables have been notional, limited or arbitrary. Therefore, it is envisaged that there are ample reasons to conduct a study which should focus on perceiving how the happiness among university faculty members are related with the factors identified in accordance with a conceptual framework. It can be noticed too that there is no report on, conceptual framework identifying teachers' happiness determining factors and being subsequently validated by structural equation modelling. This deduces the fact that researching to unveil the effect of different variables on the happiness index of university faculty members under a situation of criticality like Covid 19 similar pandemic, is of imminent scientific need.

Therefore, the main objective of the present study is to develop a conceptual framework on the basis of available background information and to subject the above developed framework to validation by structural equation modelling. The above objective raises another question like how to predict the capacity of identified variables in evaluating the happiness of the university faculty members.

In this connection it can be noted that elegant researches for predicting happiness index of a person in relation to potential happiness determinants are based on machine learning [ML] approach; herein, variables connected to the concerns of subjective wellbeing at the levels of individual, family and social attitudes are used as inputs. Adaptive boosting, essentially a supervised learning technique is employed in conjunction regressors like with XG boost and Gradient boosting for such predictive activity [7]. The study has indicated that most of the variables act the determinant of humane happiness. In contrast, machine learning techniques viz. One R and supervised artificial neural network have identified that per capita GDP is the most dominant factor that determines the world happiness (WH) [8]. A recent study has indicated that the random forest based model, outperforms the decision tree and XG Boost algorithms in prediction of happiness on the basis of WH index [9]. Gross national income is found to be the most important happiness

determining factor and that the observation is compatible with that of an earlier report.

For this purpose, data have been collected by conducting extensive survey among different faculty members from various universities. Response data against the questionnaire based on five-point Likert scale. In view of the fact that the respondent faculty members possess different mindsets and work in universities of differing ambiances, the responses to the same questionnaire are likely to give rise to skewed data set. It is important to critically analyze the derived data such that the general relationship between happiness influencing factors and the actual happiness index of university faculty members can be understood. This activity of data analytics may act as a decision support tool of the employers to ensure happiness within its employees and hence to achieve better organizational performance. Therefore, it appears to be an interesting exercise to discover the correlation between the happiness index of specific group of faculty members and the various factors influencing the satisfaction level of university teachers. To aid in forecasting the probable degree of happiness that may prevail in any other group of faculty members, machine learning techniques are employed in the present investigation. In order to address the issue, the current research invokes the use of several machine learning (ML) models which include Decision Tree (DT), Linear Regression (LR), K-nearest Neighbor (KNN) and Random Forest (RF). It is known that data processing precedes the training of models which is followed by testing and validation each with 15% data kept unused during training. Finally, the derivable conclusion depends on the models' predictive accuracy as characterized by the corresponding R^2 values.

1.1. Conceptual framework and hypotheses

1.1.1. Research activities during pandemic

Studies have revealed that professional associations play a vital role in contemporary society and in people's lives by giving members access to desired information and services, a feeling of identity, belongingness, and the chance to connect with others who have similar interests. It is observed that offering personal and professional rewards, professional organizations may boost member retention [10].

1.1.2. Working environment during the last pandemic (Covid 19)

When an organization continues to care for the workers amid the pandemic crisis, it becomes tangible advantage. It implies that the idea of shared interests and a goal-oriented approach is a part of job relationship which positively impacts the organizational mission. In a situation of superior working circumstances, the teachers experience a much less dissatisfaction than the counterparts in academic centers of worse working conditions. It is reported that maintaining good scope for professional development increases teachers' satisfaction with less career regret [11].

1.1.3. Job Security

A study from Howe et al. revealed that, showing empathy, encouraging participation, and providing responsibilities to employees make them feel secured about jobs [12]. Raising salary and timely promotions have direct influence on the satisfaction of employees and hence the of the university faculty members.

1.1.4. Salary

Additionally, it was noted that speaking ability was neglected in online courses, and writing took the place of speaking as the new form of communication. This had a good impact on financing for participation in professional development activities Basic wage, housing allowance, transportation, leave travel allowance, medical reimbursements, special allowances, bonus, Pf/Gratuity, etc. are some of the monetary benefits [13].

1.1.5. Work responsibility

1.1.6. The teachers with more accountability for their instruction at higher level of work engagement get higher job satisfaction than less accountable teachers [14]. It is inferred by researchers that the employees' outcome is boosted for having a good impression of goal setting.

1.1.7. Social Endeavors (SE)

Lack of student motivation and career counselling, stigma against vocational training, and inadequate infrastructure resources are the identified problems in higher education. Similarly, internet connectivity problem, lack in learning platform, curriculum and assessment content, and the readiness of trainers and trainees for e-learning have been identified as challenges during a pandemic. Although a conceptual study unveiled the beneficial effect of 'work-from-home' concept that benefits either side in an organization, conflicting reports, in terms of decline in cognitive ability on achievement of underprivileged students due to instrumental knots in web based learning of experimental sciences are available in literature [15].

1.1.8. Overall, Job satisfaction (OJS)

It has been observed that the majority of people strive to maintain their contentment in spite of feeling less comfortable throughout the stay-at-home phase. It is noted that a favorable relationship exists between daily changes in feeling of happiness, work satisfaction, and positive affect [16]. It is

needed that academic leaders exert substantial effort to ensure that the quality of online courses are made comparable to that of traditional courses.

1.1.9. Social support (SS)

While the factors like social support, anxiety about pandemic, and social isolation may influence the psychological health of stressed individuals, the informal communication received through social support compensates for one's reliance on formal communication in alleviating with uncertainty during a pandemic crisis [17]. It is essential to identify risk and protective factors to reduce acute psychological response with the inclusion of social leader's effort for responding to public health emergency by coordinating community outreach activity.

1.1.10. Assessment of Health in Educational Institutions during COVID- pandemic (AHE)

Need arises for universities to interact and discuss with stakeholders in respect of means to balance financial expenses and public health [18]**.** It is equally important to put efforts to manage pandemic stricken distress, through evolution of solution for psychological health improvement.

1.1.11. Contribution of information technology during the covid pandemic (CIT)

The most adversely affected education system during the last pandemic invoked researches on how to meet the prerequisite of practical training through online mode; it has also been researched to evolve means as to how the current institutional resources may be used to successfully translate formal education into online learning [19].

1.1.12. Work-life balance during covid pandemic situations (WLB)

It is noted that the work interference with personal life (WIPL) and personal interference with work (PLIW) both negatively and significantly impacted employee motivation (EM) and job satisfaction (JS), while JS itself has little influence on performance [20]. The work-life balance of public workers is badly impacted by home-based telecommuting. Remote workers experienced more problems between their personal lives and their work lives. Academics cannot reschedule one domain's demands to accommodate another's. Instead, it struggled to balance work and family commitments simultaneously or quickly [21]**.**

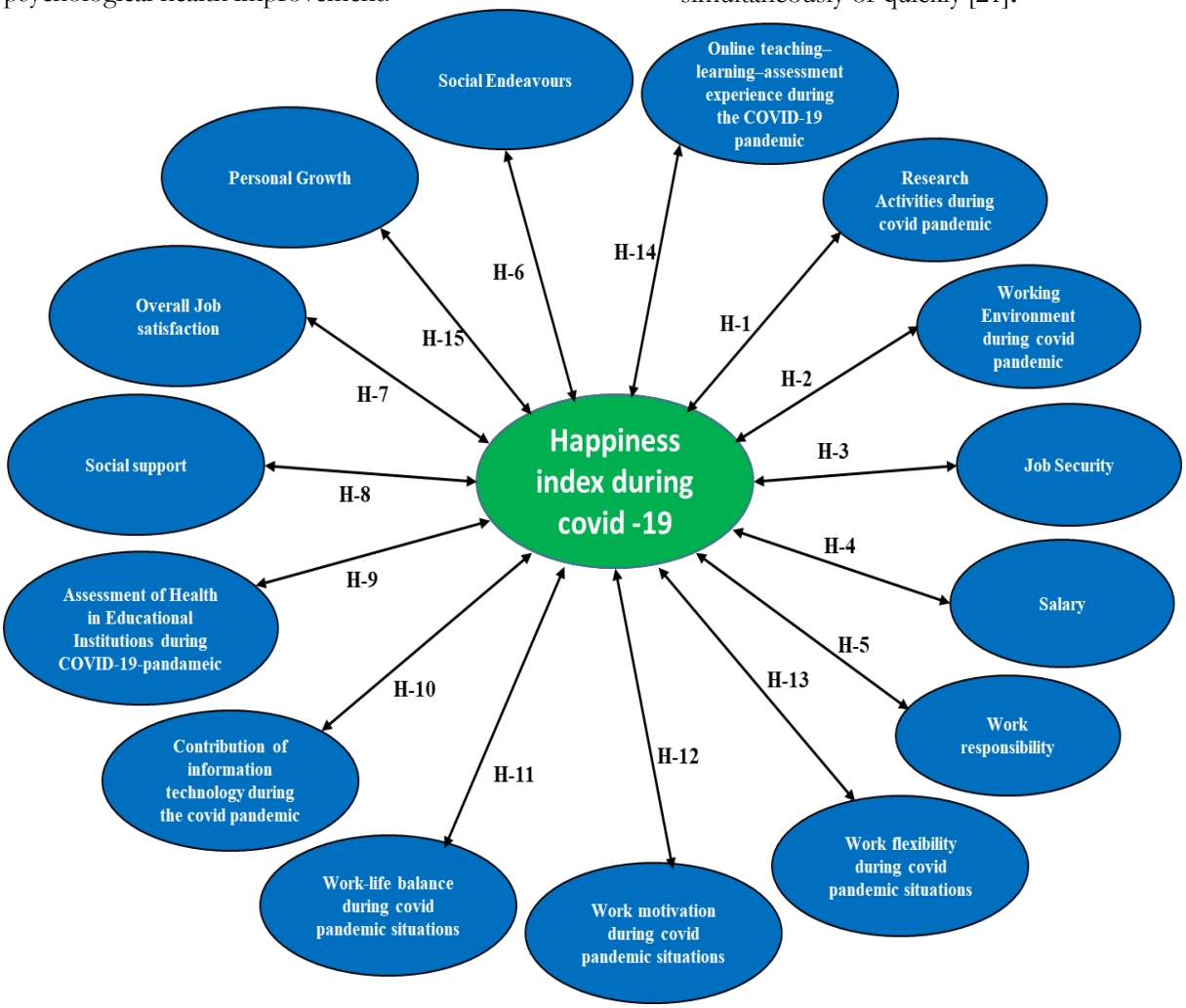

Figure 1. Proposed conceptual framework of the Happiness index during a pandemic for Higher Education University

1.1.12 Work motivation during a pandemic situation (WM)

According to studies, those with high emotional intelligence are better at controlling their emotions, coping with stress, and managing their reactions to it. Educators demonstrated positive behavior and expressed delight in doing e-teaching, and in general there is a need to address the problem of pandemic created worry, tension and disappointment to avoid psychological set back of all section of workers [22].

1.1.13 Work flexibility during pandemic situations (WF)

It is not that every work unit can fully adopt the policy on remote work. Taking a risk and working from the office during the alarming spread of pandemic is of high health risk. Work from home concept widely varies due to dependence on individual's trait, although it is the given alternative during the pandemic emergency [23].

1.1.14 Online teaching-learning-assessment experience during the pandemic? (TL)

The difficulty that universities must overcome is not in the technological implementation of such a system but in the preparation of human resources for this type of education. Utilizing cutting-edge technologies like AR, AI, VR, and others, the web platform has become more sophisticated and user-friendly. The study has demonstrated that test security and manageable assignments are crucial to teaching staff's online assessment literacy. It is further revealed that 63% to 67% of students believe that online communication and teaching–learning activities are good and overall 36.9% of students preferred an equal mixture of onsite and online learning [24].

1.1.15 Personal Growth (PG)

It is found that newly hired faculty members remain unaware of the university ambiance and this causes disappointment in them; the situation can be taken care if more seasoned faculty members are given to mentor and encourage the freshers such that the new faculties adapt to the new environment fast and start delivering [25] .

To summarize the present status of research on modeling of the university teachers' satisfaction level as function of sociological and the associated psychological parameters, a comparison is made among the different studies as documented in literature (Table 1)

Table 1: Comparison of present optimization result with some previously reported strategies

Year Published	Author's	Methodology	Results
Present Work	**Alka et. al.**	Use of conceptual frame work driven statistical modelling in combination with machine learning to determine and forecast happiness index of teachers.	The present study makes estimation of workers' satisfaction possible under different work scenarios. It is found that machine learning can be employed as predictive tool with linear regressor outperforming the other ML techniques as characterized by low MAE~ 0.05 and high R^2 ~ 0.99
2023	Anche Liu et.al. [7]	Adaptive boosting, essentially a supervised learning technique is employed in conjunction regressors like with XG boost and Gradient boosting for the said predictive activity	This elegant research for predicting happiness index of a person is reported to be based on machine learning approach, wherein, variables are connected to the concerns of at the levels of individual, family and social attitude are used as input.
2022	Moaiad Ahmad Khder et. al. [8]	In contrast, machine learning techniques viz. OneR and supervised artificial neural network have identified that per capita GDP is the most dominant factor that determine the world happiness (WH)	The study has indicated that most of the variables act the determinant of humane happiness.
2023	Jannani A et. al. [9]	In this study authors employed multiple regression algorithms and statistical techniques to investigate the relationship between objective and subjective quality of life	The best-performing model for forecasting happiness was the random forest regression, with a R^2 score of 0.93667, a mean squared error of 0.003304,at MAE of 0.05748; this is followed by the XG Boost regression and the Decision Tree regression

2022	H. Kamilçelebi [11]	The author's estimate that the pandemic affects people's happiness and that such situations may differ on the personality traits of people. To this end, they explain both how happiness changes during the pandemic and how individuals with certain personality traits are affected by the pandemic.	The author's in this study advise policy makers to consider happiness and personality traits when determining pandemic policy.
2020	V.D. Aropah et. al. [23]	This study uses census sampling, where all members of the population used as samples. The total respondents of the Government Employee in NPPA is 128 employees, who work mostly from home during the pandemic.	The result of the research showed that leadership and work environment have impact on employees' performance, whereas organizational support has no impact on employee performance.

3.1. Propounding Hypotheses

Based on the above conceptual frameworks and the framed questionnaire, twelve hypotheses have been identified as mentioned in the subsections below. Several sections of the frameworks might have impacted simultaneously on the individual respondent.

3.1.1. Research Productivity and Job Satisfaction:

H1a: Researchers who actively engaged in challenging research activities during the Covid-19 pandemic are more likely to report higher overall job satisfaction.

H1b: Individuals with supportive working environments and opportunities for career advancement during the pandemic are more likely to experience job satisfaction.

3.1.2. Job Security and Work Responsibility:

Hypothesis 2: Timely promotions and pay increase contribute to higher job security perceptions.

3.1.3. Social Support and Overall Job Satisfaction:

Hypothesis 3: Employees receiving support from the organization, larger community, friends, and local government during the pandemic are more likely to report higher overall job satisfaction.

3.1.4. Work-life Balance and Work Flexibility:

Hypothesis 4a: Individuals with a perceived balance between work tasks and available time are more likely to support the transition to more work from home during the Covid-19 pandemic.

Hypothesis 4b: Increased work flexibility options, such as complete or partial work from home, positively impact work-life balance perceptions.

3.1.5. Health and Psychological Well-being

Hypothesis 5a: Positive mental health is associated with reported good overall health, fewer reported unhealthy days, and lower levels of disability.

Hypothesis 5b: Individuals with a higher level of psychological well-being are more likely to report higher life satisfaction and positive emotions.

3.1.6. Good Governance and Community Vitality

Hypothesis 6: Positive perceptions of government performance and fundamental rights contribute to increased community vitality, including stronger community relationships and a sense of safety.

3.1.7. Time Use and Living Standards

Hypothesis 7: Individuals with balanced time use between work and sleep are more likely to report higher living standards, including better housing and household per capita income.

4. Methodology adopted for the study.

Following a thorough examination of the literature, the authors created a set of questionnaires with a primary focus on the important factors impacting the university faculty members' happiness index. The recently overcome COVID 19 scenario has enabled the authors to gather appreciable amount of useful data. The selected factors were the pursued research activities during Covid like pandemic, working environment during pandemic, job security, work responsibility, social endeavours, overall job satisfaction, social support, assessment of health in educational institutions during the pandemic, contribution of information technology during the pandemic, work-life balance during pandemic situations, work motivation during pandemic situations, work flexibility during Covid pandemic situations, Online teaching–learning–assessment experience during the past Covid pandemic, has seemingly affected personal growth. This study primarily focuses on the specifics of survey site selection, data collecting methods, survey data

analysis, normalcy and reliability analysis, construction of structural equation modelling, confirmatory factor analysis, and ultimately findings and validation. Finally, a generalization of inferences is accomplished. The formulated sample questionnaires are furnished in Table 1.

4.1. Site Selection and Data Collection

There are over 500 universities in Rajasthan alone. To investigate the link between the dependent and independent variables, a relational-research was used. In this regard, the study looks at many factors that affect university faculty's satisfaction level in accordance with pandemic situation. The leading data was gathered from the universities in the Jaipur area using a survey tool, all based only on primary data. Random convenient sampling method was used to obtain data through self-administered survey questionnaire based on five-point Likert scale. The study was conducted on 325 faculties; of 325 faculty members, 278 duly filled questionnaires were received back via e-mail from March 2022 to June 2022. The IBM Statistical Package of Social Sciences for MAC (SPSS, v22) and AMOS were used for all analyses (v21).

4.2. Data Analysis

In this evident of the responses of the 278 respondents on the questionnaire provided. The hypothesis mentioned in the previous sections have been tested using the IBSM SPSS tool. Two sample T Test analysis were performed on the data set which was examined closely for hypothesis validation.

The responses are collected in the five categorical values viz. Strongly Disagree, Disagree, Neutral, Agreed and Strongly Agreed. These linguistic variables are re allocated from 1 to 5 integer values starting from strongly disagreed as 1 to strongly agreed as 5 and neutral as 3.

Total of 101 questions were provided to respondents, out of which 4 questions were demographic questions. Each of the dimension factors have sub factors and based on which the questionnaire is prepared. The mean of responses for collective sub factors of each dimension has been calculated. These calculated mean values of the sub factors are used for the further data analysis.

Furthermore, the data has been categorized into quasi and non quasi based on the mean values. The linguistic variables whose values are less than 3.3807 are considered to be Non Quasi Respondents and rest all others considered to be Quasi Respondents. Qausi here defines those respondents who have reflected higher satisfactions towards the responses and vice versa for Non quasi respondents.

4.2.1. Analytical methods used:

In order to evaluate the grouped dimensions for hypothesis testing, the t test is performed on the sample. In this case, two sample T test is performed to compare the mean values. The various dimensional variables are selected as per the hypotheses mentioned in the previous section. The mean of 2.5 has been considered.

Moreover, for evaluating component scores and loading (eigenvalues of at least one), the Varimax rotation method (Kaiser normalisation), reliability statistics, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, Bartlett's test of sphericity, degree of freedom (DoF), and degree of significance along with the exploratory factor analyses (EFA) were performed by using the principal component analysis technique (PCA) through the Bivariate correlation analysis (BCA); this was ultimately used to examine the interrelationship among the components. The proposed hypothetical model is to be proved before being fitted to a structural equation modelling (SEM) study by AMOS V-22.0. This comes after the aforementioned analysis is confirmed. A ratio of chi-square to a DoF, a goodness of fit index (GFI), an adjusted goodness of fit index (AGFI), a normed fit index (NFI), a comparative fit index (CFI), and a root mean square error of approximation are used to examine the suggested model's goodness of fit statistics (RMSEA) as per the list of the concerned parameters in questionnaire [Table 1].

Table 1. Representative list of parameters contained in questionnaire

Social support
Assessment of Health in educational Institutions during COVID-19-pandameic.
Contribution of information technology during the covid pandemic.
Work-life balance during covid pandemic situations.
Work motivation during covid pandemic situations.
Work flexibility during covid pandemic situations.
Online teaching–learning–assessment experience during the COVID-19 pandemic.
Personal Growth.

5. Results and discussion.

5.1. Structural equation modelling

5.1.1. Exploratory Factor Analysis

The principal component analysis (PCA) has been used to analyse the data, currently available to determine how many elements are necessary to calculate the happiness index. To assess the homogeneity of the data for sampling adequacy, the KMO test (value higher than 0.7) and Barlett's test (BT) are accomplished prior to conducting PCA analysis (Table 2). According to the available literature, the KMO and BT findings of 0.739 and 10082.786, respectively, with a significance level of 0.000, support the required values. Similar calculations are made by using 17 items, which comprise of 14 factors and 3 performance measures, as shown in Table 3. These calculations have included initial eigenvalues, extraction sums of squared loadings, and rotation sums of squared loadings. With many eigenvalues, the overall variance was 71.75 percentage points.

Table 2 KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.739
Bartlett's Test of Sphericity	Approx. Chi-Square	10082.786
	df	1770
	Sig.	.000

Table 3 Component scores and loadings

Total Variance Explained									
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.903	14.838	14.838	8.903	14.838	14.838	4.115	6.859	6.859
2	4.982	8.304	23.142	4.982	8.304	23.142	3.870	6.451	13.310
3	3.456	5.760	28.903	3.456	5.760	28.903	3.317	5.529	18.839
4	3.192	5.320	34.223	3.192	5.320	34.223	2.937	4.895	23.734
5	2.786	4.643	38.866	2.786	4.643	38.866	2.868	4.780	28.514
6	2.557	4.261	43.127	2.557	4.261	43.127	2.862	4.771	33.284
7	2.334	3.891	47.018	2.334	3.891	47.018	2.644	4.407	37.692
8	2.079	3.465	50.483	2.079	3.465	50.483	2.504	4.173	41.864
9	1.840	3.067	53.549	1.840	3.067	53.549	2.420	4.033	45.897
10	1.798	2.997	56.546	1.798	2.997	56.546	2.412	4.019	49.917
11	1.610	2.683	59.229	1.610	2.683	59.229	2.317	3.862	53.779
12	1.536	2.561	61.790	1.536	2.561	61.790	2.266	3.776	57.556
13	1.435	2.391	64.181	1.435	2.391	64.181	1.965	3.275	60.831
14	1.299	2.165	66.346	1.299	2.165	66.346	1.797	2.994	63.825
15	1.156	1.927	68.273	1.156	1.927	68.273	1.771	2.952	66.777
16	1.074	1.790	70.063	1.074	1.790	70.063	1.522	2.536	69.313
17	1.010	1.684	71.747	1.010	1.684	71.747	1.460	2.434	71.747

Note: Extraction method: principal component analysis

5.1.2 Normality Test

In this study, correlational analysis is also carried out to determine the distributional shape and to evaluate the normality of the provided data obtained from a survey for the happiness index of the university faculty members. The measured values are seen to fall within the range of ± 1.5 as per the study of the skewness and kurtosis. According to Table 4, all the skewness and kurtosis values fall within the allowed range, which is meant to reveal if the data is normally distributed or not. Since the values of skewness and kurtosis are in the range of ± 1.5 for each factor, the test indicates that the data is regularly distributed.

5.1.3 Tests for Reliability and Validity of the Collected Data

Using Cronbach's alpha, the internal consistency of the multiple-item has been calculated to determine the reliability of the items. As shown in Table 4, the results of almost all the factors fall within the acceptable range (equal to or higher than 0.70), with the exception of two-factor alpha values that are less than 0.7. However, internal consistency is revealed best when Cronbach's alpha is greater than 0.6. As a result, working environment during pandemic (Cronbach's alpha = 0.698) and the assessment of health in educational institutions during a pandemic (Cronbach's alpha = 0.638) are taken into consideration for analysis and the construct has

acceptable reliability. The validity of the constructs has then been determined for the subsequent factors, since there are four items for each component, and these items are taken from a thorough review of the literature. Following the accessible information from the literature, the variables with loading greater than 0.4 were taken into consideration, Factor loading is another important analysis to assess the relational association among various sub-criteria regarding their components. It is commonly known from the literature that variables with loading greater than 0.71 can be regarded as exceptional, those with loading less than 0.63 as very good, and those with loading less than 0.55 as acceptable. Any variable with a loading of less than 0.45 is not acceptable, however more research may be needed to enhance the factor loading. In light of the aforementioned criteria, it can be shown in Table 4 that the current rotated component matrix is within acceptable bounds and that cross loading does not advocate for exclusion of any factors on ground of insignificance. In initial analysis at the time of literature review, the most important factors as well as the performance parameters could be denoted in the conceptual framework for understanding the Happiness index of university faculty members. That was clearly reported in the presently developed conceptual framework as shown in Figure 1. However, after PCA analysis, few of the factors relating to 'factor loading' are found to lie below the expected acceptance level and hence, those factors were eliminated for further analysis.

In addition, Kaiser-Meyer-Olkin (KMO), which defines how tiny the partial correlations are in comparison to the original correlations, has been computed to quantify the sampling adequacy. Smaller KMO values, however, show that some of the factors are unable to account for the correlations between pairs of variables. However, all eleven of the factors in Table 4 have exhibited KMO values higher than 0.60, thereby, making them perfectly useable for factor analysis. The bivariate correlations as estimated by way of using data sets made available through a survey on happiness of university faculty members are displayed in Table 5. A positive correlation indicates that these fractions may vary in the same direction, whereas a negative correlation may result in an inverse connection. Additionally, a correlation coefficient of less than 0.5 indicates a positive association between the two fractions, and 1 indicates a perfect correlation. Bivariate correlation analysis has revealed a substantial and favourable correlation coefficient between job satisfaction and salary in educational institutions during the Covid-19 pandemic. In contrast, correlation coefficients of work-life balance during pandemic situations and assessment of health in educational institutions during the COVID-19 pandemic are negative and significant.

Table 4 Factors and its scale reliabilities

	Skewness		**Kurtosis**				
Dimension code	Statistic	Std. Error	Statistic	Std. Error	Factor loading	Cronbach's α	KMO
RA	.023	.146	-.498	.291	0.547	0.798	0.743
	.095	.146	.566	.291	0.832		
	.036	.146	-.171	.291	0.344		
	.402	.146	-.507	.291	0.294		
WE	.726	.146	.126	.291	0.796	0.698	0.695
	-.290	.146	.380	.291	0.639		
	.158	.146	-1.271	.291	0.449		
	.144	.146	-.571	.291	0.291		
JS	-.801	.146	-.338	.291	0.653	0.866	0.711
	-.298	.146	-.052	.291	0.658		
	-.601	.146	-.189	.291	0.87		
	-.213	.146	-.161	.291	0.881		
SA	-.336	.146	-.798	.291	0.868	0.961	0.847
	-.387	.146	-.657	.291	0.916		
	-.474	.146	-.650	.291	0.947		
	-.449	.146	-.661	.291	0.945		
WR	-.007	.146	-.387	.291	0.838	0.795	0.721
	-.023	.146	-.167	.291	0.785		
	.376	.146	-.194	.291	0.734		
	.095	.146	-.334	.291	0.572		
SE	-.527	.146	1.004	.291	0.651	0.768	0.749
	-.412	.146	-.697	.291	0.522		
	-.469	.146	-.802	.291	0.805		
	-.970	.146	-.081	.291	0.817		
OJS	-.843	.146	-.279	.291	0.795	0.747	0.723

	-.204	.146	-.489	.291	0.664		
	-1.106	.146	1.389	.291	0.715		
	-.204	.146	-.506	.291	0.416		
SS	.471	.146	.587	.291	0.791	0.755	0.760
	-.032	.146	-.096	.291	0.727		
	-.078	.146	-.657	.291	0.592		
	.407	.146	-.800	.291	0.713		
AHE	-.533	.146	.257	.291	0.379	0.638	0.642
	-1.014	.146	.008	.291	0.207		
	-.038	.146	-.091	.291	0.718		
	-.141	.146	-.107	.291	0.703		
CIT	-.133	.146	-1.487	.291	0.683	0.802	0.785
	.065	.146	-.189	.291	0.823		
	.318	.146	-.065	.291	0.815		
	.274	.146	-.528	.291	0.794		
WLB	.180	.146	-.706	.291	0.58	0.770	0.709
	.217	.146	-.219	.291	0.752		
	-.047	.146	-.997	.291	0.797		
	-.042	.146	-1.061	.291	0.658		

It appears that the parameters influencing happiness index of the university needs to be ascertained as a prerequisite of fixing the determinant of happiness index. While principal component analysis is needed to find out the effective parameters influencing happiness, the reliability of data is required to be authenticated. Since the data used for the current investigation is collected from survey as well as from research papers authored by various scientists working in different ambiance, data reliability is checked by the calculating the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. The underlying idea is to assess the homogeneity of data. Moreover, the Bartlett's test reveals chi square values for a number of parameters to exceed the critical value of 9.488; this means that significant difference in variances can be there. While the results of KMO reasons out any inappropriateness to adopt factor analysis on the chosen dataset, the Bartlett's test has authenticated the used variables in population correlation are uncorrelated. Therefore, the suitability of factor analysis has been established. The calculation of Cronbach's alpha values of the potential factors affecting happiness index of faculty members has shown that excepting the two factors, work environment and assessment of health during pandemic, all other factors assume the desirable values that is higher than 0.7. Incidentally the KMO values of these two factors also lie below 0.7; Although the other factors bear significance influence on the happiness index, the results of the present research show that the Cronbach's alpha values of salary (SA) and job satisfaction (JS) parameters outweigh the others in respect of significance in affecting the happiness index of teachers during a pandemic. It can be seen that both statistical modelling and the T test results corroborate each other.

Table 5 Bivariate correlation analysis

Correlations													
	RA	WE	JS	SA	WR	SE	OJS	SS	AHE	CIT	WLB	Mean	Std. Dev.
RA	1											4.281	0.5501
WE	.115**	1										3.42	0.634
JS	.029**	.160**	1									4.5	0.604
SA	.048**	.197**	.252**	1								4.42	0.568
WR	.033**	.107**	.168**	.120**	1							4.01	0.62
SE	.136**	.236**	.321**	.219**	.176**	1						3.82	0.578
OJS	.245**	.210**	.236**	.180**	.154**	.238**	1					4.54	0.578
SS	.156**	.141**	.132**	.136**	.129**	.334**	.267**	1				3.24	0.596
AHE	.049**	-.005**	.237**	.117**	.112**	.182**	.127**	.210**	1			4.01	0.777
CIT	.043**	.122**	.021**	-0.003	-.080**	.073**	-.106**	.038**	.095**	1		4.07	0.815
WLB	-.083**	-.006**	-.248**	-.199**	.102**	-.163**	-.048**	-.007**	-.401**	.017**	1	3.76	0.727

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

5.2. Descriptive statistics (T-Test for Hypotheses Testing)

The t-tests done for the stated hypotheses reveal significant findings relating job satisfaction, job security views, work-life balance, psychological well-being, community vitality, and living standards during the pandemic(Table 6).

Regarding hypothesis H1a, which suggests that academics who actively participated in difficult research activities during the pandemic are more likely to report higher overall job satisfaction, the t-value of 9.366 indicates a significant difference between the means of the quasi and non-quasi groups. Hypothesis H1b suggests that individuals who have supportive working environments and opportunities for career advancement are more likely to feel satisfied with their jobs. This is supported by a significant t-value of 10.591, which highlights the influence of supportive environments on job satisfaction, particularly in difficult circumstances.

Regarding hypothesis H2a, which emphasizes the impact of timely promotions and pay raises on increasing perceptions of job security, the significant t-value of 14.295 emphasizes the significance of these factors in employees' job security perceptions, especially during uncertain times such as the pandemic. Hypothesis H3 emphasizes the importance of support systems, such as organizational, community, and governmental assistance, in determining work satisfaction. The t-value of 10.555 indicates a significant difference between those that receive support and those that do not.

The t-values of 10.077 and 10.478 for work-life balance and remote work transitions (H4a and H4b) respectively indicate that the perceived balance between work tasks and time, as well as the availability of work flexibility options such as remote work, have a significant impact on individuals' perceptions of work-life balance during the pandemic. These findings emphasize the importance of adaptable work schedules in preserving employee welfare and contentment during periods of disturbance.

Hypothesis H5 highlights the correlation between psychological well-being and life satisfaction. The t-value of 11.367 suggests a significant connection, showing that greater levels of psychological well-being are associated with good emotions and ultimately contribute to total life satisfaction. This highlights the significance of providing mental health assistance and interventions to enhance overall well-being and contentment, particularly under difficult circumstances.

The t-values of 10.010 and 12.503 for community vitality (H6) and living standards (H7) respectively indicate that positive perceptions of government performance, fundamental rights, balanced time use, and adequate sleep have a positive impact on community relationships, safety perceptions, and living standards. The findings emphasize the interdependence of personal welfare, communal assistance, and socio-economic elements in influencing the overall standard of living during times of crisis.

Overall, the t-test findings indicate substantial correlations between different variables, including workplace engagement, support systems, work-life balance, psychological well-being, community perspectives, and living conditions amidst the pandemic. These findings highlight the complex and varied aspects of well-being and contentment, underlining the importance of having extensive support systems, flexible work schedules, and mental health treatments to encourage resilience and success in individuals and communities dealing with challenges.

Table 6. The results of t-test

Hypothesis Index No.	Hypothesis	**Quasi**	**Non Quasi**	**T-Value**
H1a	Researchers who actively engaged in challenging research activities during the Covid-19 pandemic are more likely to report higher overall job satisfaction.	**8.754**	**7.546**	**9.366**
H1b	Individuals with supportive working environments and opportunities for career advancement during the pandemic are more likely to experience job satisfaction.	**7.851**	**4.123**	**10.591**
H2a	Timely promotions and pay increases contribute to higher job security perceptions.	**12.517**	**5.381**	**14.295**
H3	Employees receiving support from the organization, larger community, friends, and local government during the pandemic are more likely to report higher overall job satisfaction.	**9.154**	**5.487**	**10.555**
H4a	Individuals with a perceived balance between work tasks and available time are more likely to support the transition to more work from home during the Covid-19 pandemic.	**9.154**	**6.547**	**10.077**

H4b	Increased work flexibility options, such as complete or partial work from home, positively impact work-life balance perceptions.	**9.768**	**4.3258**	**10.478**
H5	Individuals with a higher level of psychological well-being are more likely to report higher life satisfaction and positive emotions.	**10.219**	**7.248**	**11.367**
H6	Positive perceptions of government performance and fundamental rights contribute to increased community vitality, including stronger community relationships and a sense of safety.	**9.871**	**7.641**	**10.010**
H7	Individuals with balanced time use between work and sleep are more likely to report higher living standards, including better housing and household per capita income.	**11.279**	**8.397**	**12.503**

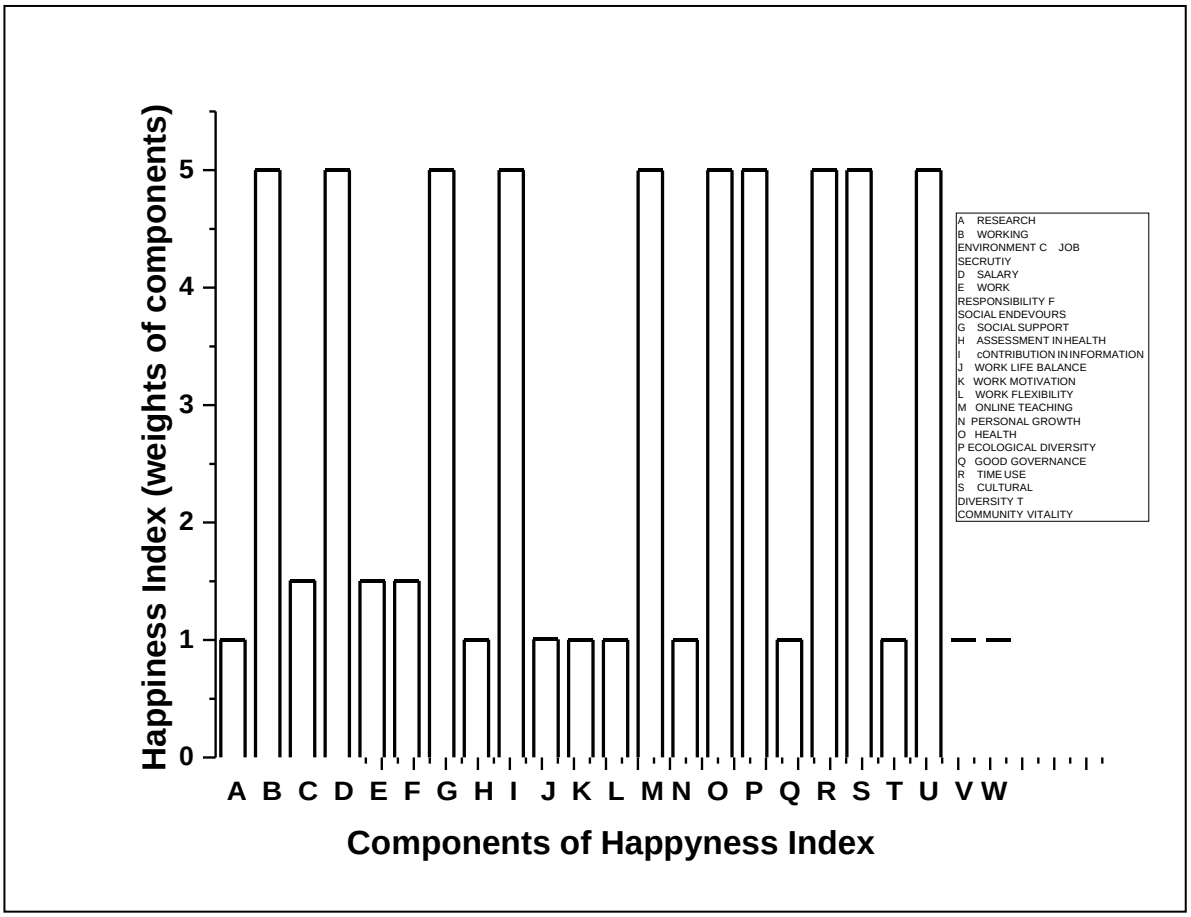

Fig2. Parametric influence on happiness index

Happiness Index = 0.292 - 0.0819A + 0.0727B - 0.0074C + 0.1128D - 0.1262E- 0.2059F + 1.2505G - 0.1118H + 0.0343I - 0.0203J - 0.0642K - 0.0270L + 0.0487M- 0.0482N + 0.1359O+ 0.1824P - 0.1512Q + 0.0324R + 0.0929S - 0.125T + 0.028U- 0.0666V - 0.0399W ----- (Eqn.1)

Where,

A- Research
B- Working environment
C- Job security
D- Salary
E- Work Responsibility
F- Social endeavor
G- Social support
H- Assessment in health
I- Contribution in information
J- Work life balance
K- Work motivation
L- Work flexibility
M- Online teaching
N- Personal growth
O- Health
P- Ecological diversity
Q- Good Governance
R- Time use
S- Cultural diversity
T- Community vitality
U- Psychological well being
V- Living standard
W- Education

The correlations between happiness determining factors and the happiness index is determined by linear regression analysis technique and this is presented in the form of equation 1.After identifying the correlation equations from the details of respondents, the dependencies of the various parameters considered for the hypotheses are determined. The provided equation represents a mathematical representation for computing a Happiness Index using multiple factors represented by letters A to W. Every element is associated with a coefficient that signifies the magnitude and direction of its influence on the Happiness Index.

Factors that have positive coefficients, such as B, D, G, I, M, O, P, R, S, and U, have a positive impact on the Happiness Index. Consequently, greater values of these factors are correlated with elevated levels of happiness.

Variables with negative coefficients (e.g., A, C, E, F, H, J, K, L, N, Q, T, V, W) exert a detrimental influence on the Happiness Index. Greater values of these factors are associated with decreased levels of happiness.

For instance, if factor A denotes stress levels, an increase in the value of A would result in a reduction in the Happiness Index due to its negative coefficient (-0.0819). In contrast, since factor G reflects social support, an increase in its value would have a positive impact (with a coefficient of 1.2505) on the Happiness Index. This suggests that a stronger social support system is linked to better levels of happiness. This equation enables the measurement of happiness by considering many elements, with each factor being assigned a weight based on its significance in affecting overall pleasure. It can be utilized in both research and applied contexts to evaluate and forecast levels of happiness, taking into account particular human or environmental attributes denoted by components A to W.

The above data illustrates different elements of a happiness index, with each element being assigned a weight that indicates its relative significance in contributing to total happiness. Greater weights indicate areas that want more attention or adjustment in order to raise the happiness score. The working environment and salary are the most influential factors in determining happiness. This suggests that enhancing working conditions and raising income levels could greatly improve overall well-being. Additional significant factors include social support, personal growth, health , and ecological diversity. This indicates that fostering robust social networks, facilitating chances for individual advancement, promoting physical and mental well-being, and preserving environmental resources are crucial for increasing levels of happiness. However, research and job security have lower weights, suggesting that they have less impact on overall satisfaction. Nevertheless, their significance is not completely diminished, as even slight enhancements in these domains can still have a favorable impact on the happiness index. To effectively address issues that have a large impact on happiness and well-being, administration, organizations, and individuals should prioritize actions and activities in areas with greater weights.

5.3. Machine learning:

The current work deals with supervised learning regression problems, for which, the coefficient of determination, R^2 value, is known to be a critical performance metric. The R^2 value gives the idea of efficacy of a model in explaining the variation in experimental data set. R^2 can assume any value between 0 and 1; as it is known $R^2 = 0$ is suggestive of inability of ML model to explain the variation in data whereas a 0.5 value means a slight correlation. If the value lies within 0.7 to 0.9, a satisfactory performance may be envisaged. When the value of R^2 exceed 0.9, it is to mean that the model execution is highly satisfactory. However, for a perfect fitting, $R^2 = 1$ and, though unreachable most of the time, it implies that the model does not have any error. Moreover, there are three measures of model performance are taken into consideration to finalize the model suiting a problem most. These are, mean squared error (MSE), mean absolute error (MAE) and root mean squared error (RMSE). MAE is a measure of the mean of differences between the actual and expected value; in contrast, the average of the square of differences between the actual and the model predicted values is described by MSE values. The square root of MSE is called RMSE. For accurate model predictions the lower error values are wanted.

As mentioned above, the accuracy of predictions made by machine learning models increases with decrease in error factors; at the same time a perfect correlation is indicative of a good modelling performance. Table 6 displays the performance metrics of the machine learning models utilized in the study for predicting the Happiness Index (HI). It may be seen from results of Table 6 that R^2values of DT and KNN regressors lie within 0.7 to 0.9. This signifies that the performance of these models with the given data set is more or less satisfactory; however, the error values for these regressors are rather high and hence a very good predictive accuracy cannot be expected. RF is found to still inferior. On the contrary it is clear that the linear regression model outperforms the other three models with prediction accuracy of 99% at very low error levels.

Table 6: Performance of the ML models in predicting Happiness Index.

ML Model	R-squared value	Mean absolute error (MAE)	Root Mean Squared Error (RMSE)
Decision Tree Regressor	0.76	0.3865	0.4709
Random Forest Regressor	0.69	0.4397	0.5434
Linear Regression(LR)	0.99	0.05416	0.0690
KNN Regression	0.74	0.4360	0.4968

Table 6 shows the relations between the predicted and the actual values (in terms of R2 values) of happiness index for all the four models studied in the present work. The results make it clear that excellent agreement between predicted and true values of happiness index is achievable in the case of linear regressor. The same table however shows that acceptable level of agreement between the true happiness index values of university teachers and model predicted is achievable in the case of two other ML, viz. DT and KNN. Thus, it may be stated that the data on university teachers' happiness index can be analyzed by DT and KNN machine learning with moderate accuracy whereas the predictive activity of LR in respect of university teachers' happiness index is proved to be excellent.

It is understood that characteristics of individual learning tool influences the predictive performance of artificial intelligent tools in a great way. For example, one can improve the performance efficiency of decision tree regressor by way of fine tuning the optimum number of trees. However, the performance of ML is highly responsive to data size and acceptably good performance can be expected only with bigger data size. In the present case the major limitation is that community survey data has been used for modelling and in spite of a great deal of effort, data size could not be made reasonably high. Besides data size the diverse mindset and other human factors might have interfered with the seriousness of the respondents. All these could have impacted the present task of machine learning. Nevertheless, the present approach, absolutely new in this domain of research provides a newer vista while handling community survey data irrespective of the purpose for which the survey is conducted. It seems prudent to extend the work with bigger data size and the average of a number of repeated experiments may be a good representative of actual relationship between input factors and the response variable.

Conclusions

The analysis of the relationship between happiness, subjective well-being, and work satisfaction among university faculty employees have led to the following findings:

1. The authors conclude that conceptual frame work assisted structural modelling with machine learning as a predictive support system makes up a novel strategy to map university teachers happiness under situation of odds. This insure much higher organizational performance.
2. It is found that use of conceptual frame work driven statistical modelling in combination with machine learning for determination and forecasting happiness index of university faculty members in socially tougher situations is a novel approach and is not attempted as yet. The adopted methodology opens a new vista researching factor affecting teachers' happiness thus helping to identify corrective measures.
3. The present study establishes that a structural model for comprehending the happiness index among university faculty members could be successfully constructed. This study also aids decision-makers in education and policy to achieve the desirable objectives thorough enhancement of faculty members' happiness.
4. The overall variance, which was calculated using several eigenvalues, was 71.75 %. In the current study, each sub-criteria's skewness and kurtosis are within 1.5.
5. The inter-correlation matrix appears to be virtually perfect for factor analysis since the KMO values of the factors range from 0.80 to 0.90, which is higher than 0.70.
6. Cronbach's alpha values lie mostly above 0.7 thereby revealing that the internal consistency is rather good for all the variables. However, Cronbach's alpha values of working environment during pandemic and assessment of health in educational institutions during a pandemic scenario are less significant (Cronbach's alpha is less than 0.7) whereas it is 0.961 for salary is indicative of highest significance.
7. As revealed in bivariate correlation study, nine factors are significantly and positively correlated during a dreadful pandemic. Work-life balance during such type of pandemic conditions has negative and statistically significant connection coefficients.
8. The results of the present study make the authors conclude that such societal picture is generic and

applies to any demography amidst a prevailing pandemic.

9. The present results enable the academic institutions or universities to determine the happiness index on the basis of the proposed structural model.
10. It is inferred that salary (SA) and job satisfaction (JS) parameters affect the happiness more significantly than other parameters considered for the study. This finding implies that the major objective of the study, which is to identify the critical factors that influence the teachers' happiness index the most, is fulfilled aright.
11. It is found that Machine learning approach can be successfully employed for prediction of happiness index from a survey data. In the present problem, linear regressor is found to be much better performer than DT, KNN and RF regressors with its high R^2 (~ 0.99) value and low mean absolute error (MAE~0.05416). This is better than the result (R^2=0.93667and MAE= 0.0.05748) due to Jannani, A, et.al. [9].
12. As revealed in bivariate correlation study, nine factors are significantly and positively correlated during a Covid like pandemic. Work-life balance during such type of pandemic conditions has negative and statistically significant connection coefficients. Based on covid-19 experience, the results of the present study make the authors conclude the such societal picture is generic and applies to any demography amidst a prevailing pandemic.
13. The present results enable the academic institutions or universities to determine the happiness index on the basis of the proposed structural model.
14. Test of significance by T-tests agrees with the inference derivable from statistical modelling.
15. The overall happiness index of university faculty members can be given by the relation

Happiness Index = 0.292 - 0.0819A + 0.0727B - 0.0074C + 0.1128D - 0.1262E- 0.2059F + 1.2505G - 0.1118H + 0.0343I - 0.0203J - 0.0642K - 0.0270L + 0.0487M- 0.0482N + 0.1359O+ 0.1824P - 0.1512Q + 0.0324R + 0.0929S - 0.125T + 0.028U- 0.0666V - 0.0399W where A……. W refers to the factors introduced in Fig.2

16. The main limitation of the work is the less amount of data that could be collected through meaningful responses from the university teachers. It is there suggested that the collection of relevant data from various sources should be collected and this should precede all the steps in predictive analytics. The hidden relationship between the input factors and the university teachers' happiness index may be learnt by neural network technique and this may be reinforced with a suitable optimization tool say, genetic algorithm such that effective measures can be taken up by the employers for keeping the employees happy and thereby yielding maximum organizational performance benefit.

Table 5 Bivariate correlation analysis

Correlations													
	RA	WE	JS	SA	WR	SE	OJS	SS	AHE	CIT	WLB	Mean	Std. Dev.
RA	1											4.281	0.5501
WE	.115**	1										3.42	0.634
JS	.029**	.160**	1									4.5	0.604
SA	.048**	.197**	.252**	1								4.42	0.568
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SS	.156**	.141**	.132**	.136**	.129**	.334**	.267**	1				3.24	0.596
AHE	.049**	-.005**	.237**	.117**	.112**	.182**	.127**	.210**	1			4.01	0.777
CIT	.043**	.122**	.021**	-0.003	-.080**	.073**	-.106**	.038**	.095**	1		4.07	0.815
WLB	-.083**	-.006**	-.248**	-.199**	.102**	-.163**	-.048**	-.007**	-.401**	.017**	1	3.76	0.727

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

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