iJRASET
International Journal For Research in Applied Science and Engineering Technology

# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

**Volume:** 8 **Issue:** VII **Month of publication:** July 2020

**DOI:** http://doi.org/10.22214/ijraset.2020.7008

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
*ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429*
*Volume 8 Issue VII July 2020- Available at www.ijraset.com*

# Factors Affecting Productivity in Work Environment

Pranav Naringrekar[1], Daksh R. Jain[2]
[1, 2]*Student, MCA Department Sardar Patel Institute of Technology, Mumbai, India*

***Abstract:*** ***The objective of the study was to identify what importance does an employee give to various productivity factors, what is the perception of employees towards these factors and how they affect the employees' productivity and the overall satisfaction level of the employees in their organizations and that affects the organizations overall success.***
***A sample set was created by circulating google forms to various people working in the IT industry. These were used to collect data and it was analyzed using Python. The findings of the study indicated that most of the employees were satisfied with most of the facilities provided by the organizations. The findings of this research indicates that the work culture has the highest impact on productivity followed by management, working hours, skills required, and appreciation. Location and safety were the factors that had very less impact on people's productivity as indicated by the research.***
***Index Terms: productivity, satisfaction, physical environments, work environments.***

## I. INTRODUCTION

In today's world, organizations are trying various things to improve productivity in the workplace. The performance of the employee has a huge impact on the organization's growth and success [4]. Many statistical types of research have discovered the various aspects of how the employees in the IT fieldwork, the challenges they face, how the different work cultures and the physical environment they work in the impact their performance. However after years of research into understanding and developing better workplace employees still find it difficult to work efficiently. Upon further study, we found that various psychological factors are that had an effect on a person's sentiments played a major role in his productivity [5]. Factors such as Work Culture, Coworkers, Flexibility, Incentives also impacted an employees' productivity. Specifically, this paper addresses the factors which IT employees care about and explores how much do these factors impact an employees' productivity.

### *A. Need for the study*

Employee productivity is a crucial factor that plays a vital role in determining companies' growth [1]. Employees having higher productivity with clear vision and goals tend to contribute more to the company's success [3]. Employees' having low productivity in the work environment leads to demotivation and lack of involvement in company activities which leads to social and communication barriers which reflect a negative impact on the organization as well as causing harm to the employees' psychological health [2]. The dissatisfaction may arise due to different issues like Employee skill set, communication, organization politics, lack of growth opportu- nities within the company, working hours, etc. An organization needs to consider all these factors and should work upon resolving these issues to enhance employee satisfaction which will pave the way to better growth for both employees as well as organization. This research paper focuses on data available from entry-level graduates working in professional organizations where various issues are considered and they are rated as per each individual's experience. Using this data, the aim is to segregate and identify such factors that affect both employees and organizations and allow both this entity to work on improving the discrepancies with the issue.

## II. LITERATURE REVIEW

Various tasks have been performed over time all around the world to understand employee relationships with their peers within the organization and understand productivity in an organization environment with the aim to decrease the misunderstanding barrier between employee and organization. As per Buhai, Cottini, and Nielsen, 2008, the research states that an optimistic organizational climate leads to improved productivity for firms [6]. Sophie Rowan, the author of Happy at Work: Ten Steps to Ultimate Job Satisfaction, states different real-life practical approaches that specify how one can achieve optimal job satisfaction and overcome the obstacles that create barriers in employee and organization which make employees unhappy to work within the environment. As per Hartmono Soewardi(2016), one of the factors affecting productivity is the physical working environment [10]. (Togia et al., 2004) suggests that satisfying each person's needs in the workplace is job satisfaction [7]. The research of (Pascoe et al. 2002) states that acknowledging one's work and honoring it results in an increase in employee encouragement which leads to positive job satisfaction [8]. (Jun et al., 2006) specify providing training increases employees' confidence which indirectly improves job satisfaction, the employee with less knowledge shows less diligence in work [9].

©IJRASET: All Rights are Reserved

## III. METHODOLOGY

Various approaches like Data Collection, Data Transformation, Feature Extraction, Modelling, and Interpretation will be used to create a system that identifies the job satisfaction of employees and compare them with organization ratings.

### *A. Data Collections*

This paper focuses on understanding the relationship be- tween job satisfaction and the work environment. The data was randomly collected from entry-level graduates working in different firms where google form having questionnaires were sent through email. These questionnaires covered different factors related to the organization where the aim was to rank them from high (5) to low (1) based on employee satisfaction. The purpose behind designing the questionnaire was to get uniform data which makes it easy to segregate and classify data also helping in the regression process that will be performed in the future. These employees are working in different sectors where the aim was to get data from diverse groups of people and provide it as input to our system. A total of 80 responses were collected through a google form.

1) *Population and Sample Size:* total number of records is 80
2) *Primary Data:* Data obtained from questionnaires from the employee.
3) *Secondary Data*: Rating data obtained through web crawl- ing from glassdoor.
4) *Source of Data:* Google forms shared with user and Glassdoor ratings.

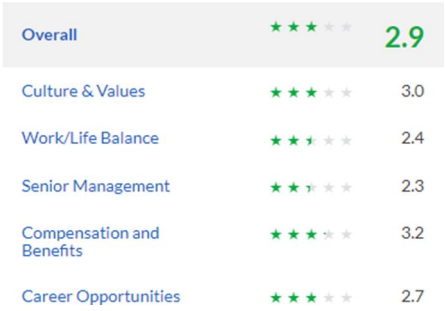



Fig. I. Glassdoor Reviews

The other data regarding organization ratings were fetched from glassdoor. This data was fetched using a technique known as web scraping. The purpose behind getting this data was to compare output generated by the model with the ratings from glassdoor and then determine the prediction for the same.

In order to fetch glassdoor feature ratings, those features which were already available with ratings were directly con- sidered whereas those features without ratings were retrieved using sentiment analysis by searching those particular features for all the reviews.

### *B. Data Processing / Data transformation*

The main objective behind this stage is to convert raw data into structured data so that it is suitable to be used in

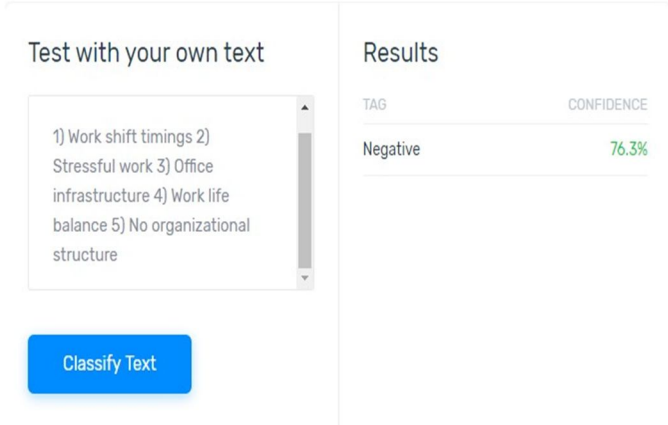



Fig. II. Sentiment Analysis

©IJRASET: All Rights are Reserved

ML models. The data obtained from the questionnaire had missing values hence it needs to be replaced with either null values or aggregate value of that column. Instead of taking null value, the data was processed by calculating the variance of that column and this output was replaced with the missing cells/data. Also, the non-numeric data was handled using a one-hot encoding technique which converted character data into numeric form. The input had gender as male or female since the model needs the input in numeric form; this data was converted in numeric using one-hot encoding. In this model, data processing techniques have been applied using the Python sklearn library. Below are a few code snippets that were used to remove noise in data:
One Hot Encoding : one hot encode. append(arr) Replace Missing Value: df.fillna(df.mean())

*C. Feature Extraction*

This stage consists of the extraction of important features that will be considered for the ML model. At first, all columns were considered and the data was fed as input to the Regression model, the outcome did not match with glassdoor ratings. It was found that there were many too many features that were not necessary to achieve the desired output. A later different subset of features was made, each subset consisting of 5 columns. A total of 5 different subsets were made based on vague estimation. The reason behind making such estimation was to include important features covering different factors like Work Culture, Work Satisfaction, Employee Skills, Extracurricular activities which are shown below.

Table I Factors

| | | | |
|---|---|---|---|
| Work Culture | Training copy | Management | Coworkers |
| Facilities | Safety | Rules | Flexibility |
| Holidays | Health Services | Work Satisfaction | Challenges |
| Environment | Tools | Working Hours | Travel Time |
| Incentives | Skills | Appreciations | Location |

This different feature subset will be provided as input to the ML system to check which among these provide a promising output that matches the output. The one with good accuracy will be considered as ideal features that affect job satisfaction.

*D. Modeling (Using Machine Learning)*

In this phase, the input is split into Training, Validation, and Test Set. Since the number of data is less the dataset splitting proportion considered is 90/5/5%. As the output is a continuous decimal value that might range between 0 to
5 here ML model will use a supervised linear regression algorithm. The training set is one on which training will be done. The validation set will be used to evaluate the model and define the hyperparameter whereas the test set is one on which testing will be done. To implement regression, Python's sklearn model will be used. linear model.LinearRegression().fit(X, y)
In the above parameters that are provided to fit(), X is input set whereas y is output scalar. For each subset, this ML model will be applied which will give different outputs where it will be compared with ratings of glassdoor.
The subset with output values close to glassdoor rating will be considered as optimal features that have a high impact on job satisfaction.

*E. Interpretation*

As per the research performed, the input from the below factors showed the results which closely match the glassdoor ratings.

*1)* Work culture
*2)* Management
*3)* Skills
*4)* Working Hours
*5)* Appreciation

©IJRASET: All Rights are Reserved

*ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429*
*Volume 8 Issue VII July 2020- Available at www.ijraset.com*

## IV. RESULTS AND ANALYSIS

After data modeling, the above bar graph is formed, within X-axis various features affecting work productivity have been described, while the Y-axis depicts the weighted average of the data collected using google forms. From the above graph, among 19 features the highest rated features have been highlighted in red.

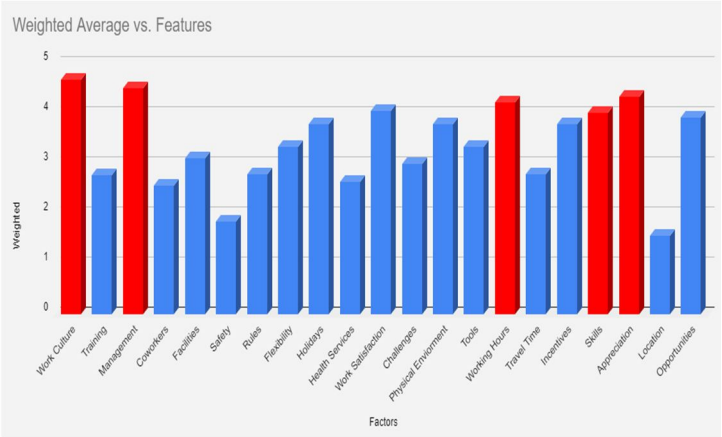



Fig. III. Weighted Average vs Factors

From III and IV, we observe the relationship between the calculated weighted average and organizations' glassdoor ratings. The dataset had multiple ratings for different factors by different employees for the same organizations. So, to merge the multiple ratings of different employees that belonged to the same organization, the below formula is used. Average of all features/number of employees within the company. As discussed in the feature extraction stage, regression was performed on various subsets of factors. Each subset provided as input and *was* trained using a linear regression algorithm and the obtained output was compared with the glassdoor rating related to the factor. For those factors which already had ratings in glassdoor reviews that were readily available were directly fetched. For those factors where ratings were not available sentiment analysis was used to calculate its ratings. Since this metric was in percentage format within the range 0 to 100, they were converted within a 0 to 5 scale. This can be done using the T-test.

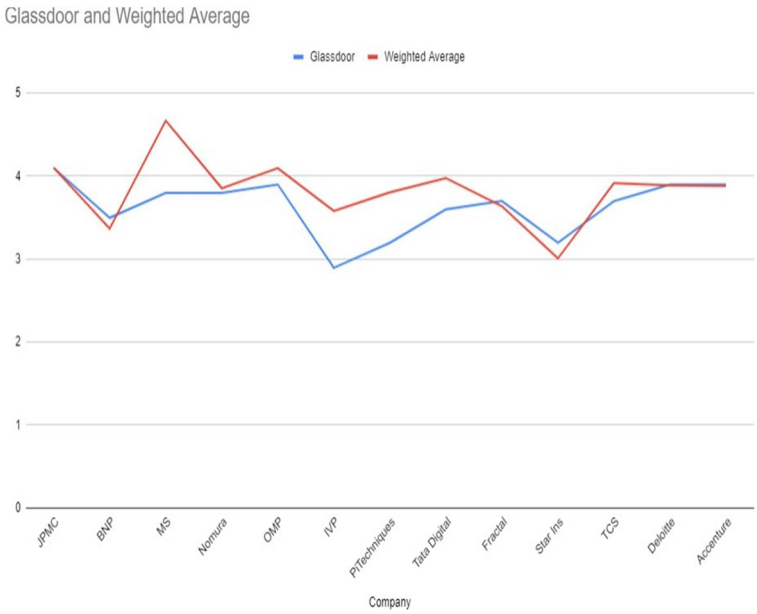



Fig. IV. Glassdoor vs Weighted Average

©IJRASET: All Rights are Reserved

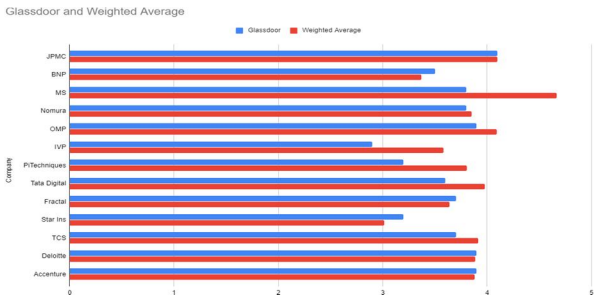



Fig. V. Glassdoor vs Weighted Average

The above image shows the output of the first feature subset. The subset includes the following factors

- Work culture
- Management
- Skills
- Working Hours
- Appreciation

The image depicts that the scattered point defines the cal- culated weighted average values by our regression model whereas the line defines the glassdoor feature ratings. This subset has priority features that affect work satisfaction and it closely matches the glassdoor ratings. The above image depicts the minimum distance between the scattered points(features calculated using regression) and line (glassdoor feature ratings) which is proof that this subset has ideal features that have the highest impact on work productivity.

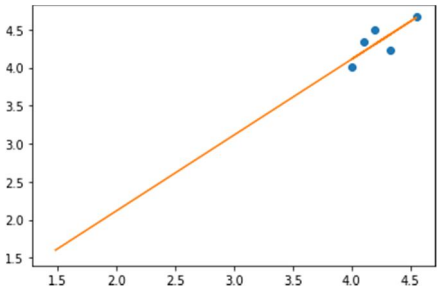


Fig. VI. Subset 1

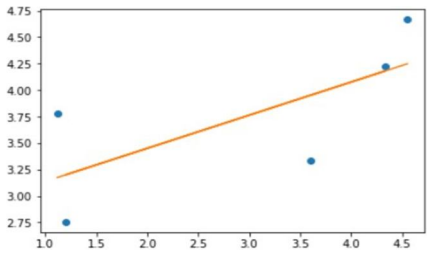


Fig. VII. Subset 2

The above image shows the output of the second feature subset. The subset includes the following factors

- Work culture
- Training
- Skills
- Flexibility
- Holidays

©IJRASET: All Rights are Reserved

This subset depicts that the two points in the top right corner have a high impact on productivity whereas the others have significantly less impact on work productivity.

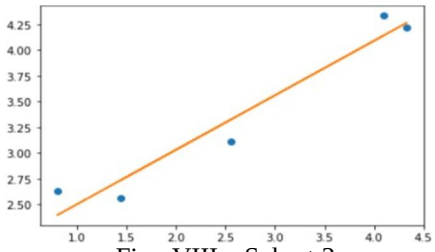



Fig. VIII. Subset 3

The above image shows the output of the second feature subset. The subset includes the following factors

- Facilities
- Coworkers
- Skills
- Health Services
- Appreciation

This subset depicts that the point which lies in the regression line has a high impact on productivity whereas the others have significantly less impact on work productivity.

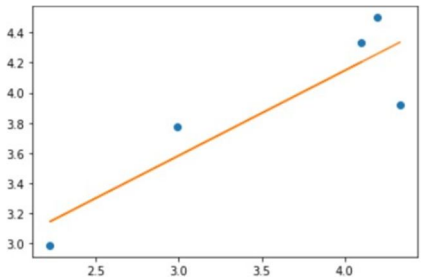



Fig. IX. Subset 4

The above Image shows the output of the f feature subset. The subset includes the following factors

- Opportunities
- Management
- Physical Environment
- Challenges-
- Appreciation

This subset depicts that the point in the top right corner which is closest to the regression line has a high impact on productivity whereas the others have significantly less impact on the work productivity.

## V. CONCLUSION

The findings of this research suggest that the work culture has the highest impact on productivity followed by manage- ment, working hours, skills required, and appreciation. Work Culture has the highest impact as the individual has to adjust to the unspoken and unwritten rules that the organization has for working. It is usually influenced by the organization's experience. The work culture can have an effect on employees' health, well being, and relationships which have a direct impact on productivity. The Management of the workplace is very important as it motivates the people and keeps their productivity high. Working hours also matters a lot to the employees as a high amount of working hours can cause high amounts of stress, in turn reducing the productivity of the individual. Skills are also a very important factor as if an individual is hired for a job that he does not have the skills for will put psychological pressure on the individual reducing their productivity. Appreciation is also an important factor as the individual feels good about what they do and feels that their presence is making a difference. All these factors help to increase a person's productivity and as a result increase the organization's profitability and success.

©IJRASET: All Rights are Reserved

## VI. FUTURE WORK

Although the paper explains the major factors affecting workplace productivity, it does not present the solutions that may be used by the organizations to work towards improving these factors. Future work may include extensive research on various methods that may be used to improve workplace productivity by working on improving these factors for the organizations.

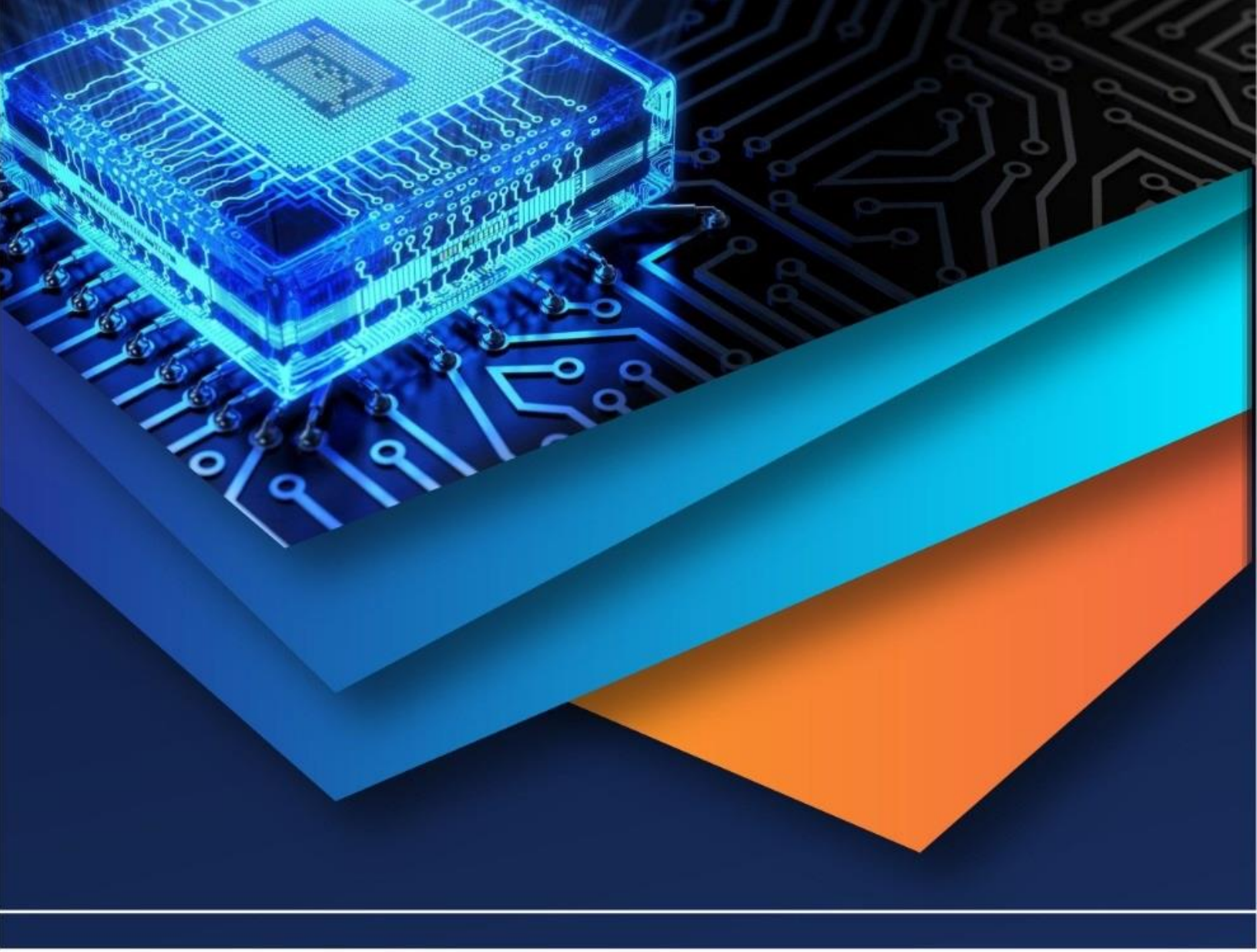
## VII. ACKNOWLEDGEMENT

The research paper was supported by Bharatiya Vidya Bhavan's Sardar Patel Institute of Technology. We thank our MCA department who provided insight and expertise that greatly assisted the research. Thank you to peers who have been helpful throughout the course of writing this paper.

## REFERENCES

[1] Johnson, B., Zimmermann, T., & Bird, C. (2019). The Effect of Work Environments on Productivity and Satisfaction of Software Engineers. IEEE Transactions on Software Engineering, 1-1.
[2] Wright, Thomas & Cropanzano, Russell. (2000). Psychological well- being and job satisfaction as predictors of job performance. Journal of occupational health psychology. 5. 84-94.
[3] R Naga Bhavya Sree, R. Satyavathi, "Employee Job Satisfaction", in International Journal of Engineering and Management Research
[4] D Swaroopa, Prof.B.Sudhir,"A study on the impact of employee satis- faction on quality and profitability of organizations"
[5] C. B. Danielsson and L. Bodin. Difference in satisfaction with office environment among employees in different office types. Journal of Architectural and Planning Research, pages 241–257, 2009.
[6] Buhai, Ioan-Sebastian and Cottini, Elena and Westergaard-Nielsen, Niels, The Impact of Workplace Conditions on Firm Performance (September 3, 2008). Tinbergen Institute Discussion Paper No. 08-077/3. Available at SSRN: https://ssrn.com/abstract=1262698 or http://dx.doi.org/10.2139/ssrn.1262698
[7] Togia, Aspasia & Koustelios, Athanasios & Tsigilis, Nikolaos. (2004). Job satisfaction among Greek academic librarians. Library & Informa- tion Science Research. 26. 373-383. 10.1016/j.lisr.2004.01.004.
[8] Hawkins, A. J. S., Duarte, P., Fang, J. G., Pascoe, P. L., Zhang, J. H., Zhang, X. L., & Zhu, M. Y. (2002). A functional model of responsive suspension-feeding and growth in bivalve shellfish, configured and validated for the scallop Chlamys farreri during culture in China. Journal of Experimental Marine Biology and Ecology, 281(1-2), 13-40.
[9] Watanabe, T., Suzuki, J., Tsukada, H., & Isozaki, H. (2007, June). Online large-margin training for statistical machine translation. In Proceedings of the 2007 Joint Conference on Empirical Methods in Natural Language Processing and Computational Natural Language Learning (EMNLP- CoNLL) (pp. 764-773).
[10] Soewardi, Hartomo & Sari, Amarria & Rizkiningtias, Putrisari. (2016). Development of working environment comfort to improve productivity. 177-180. 10.1109/ICKEA.2016.7803014.

©IJRASET: All Rights are Reserved



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)