



Mathematical Modeling of Employee Performance on the Usage of Smartphone's in Higher Educational Institutions

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Abstract- The principle point of this research is to look at the positive and negative impacts of Smartphone on university staff at a higher educational level. We directed an overview consider utilizing surveys. The questionnaires were randomly distributed to various higher educational institutional staffs who hold a cell phone. The cell phone utilization by the faculties at work spot might be considered by certain individuals as a disturbance from work which may contrarily influence efficiency. Some additionally might be of the view that it will improve correspondence and all things considered affect profitability decidedly. This survey finds the cell phone had replaced a PC, and numerous applications like WhatsApp email, Google chrome was for the most part utilized. The universities staffs additionally had used cell phones as a source for information sharing. Online networking applications were very much utilized in instructing and learning. Despite the advantages of cell phone use, employees in higher educational institutions had been adversely influenced. This study additionally uncovers that having a cell phone occupied faculties /staffs' concentration at work, made "check habits", and a forged relationship and they had the sentiments of inadequacy at whatever point cell phones were not with them. The cell phone utilization by the faculties in higher educational institutions may connect by certain individuals as a diversion, which may lower efficiency at work. The time spent on the cell phones by faculties/staffs in establishments were likewise contrasted and each other concentrating on their level of engagement and their performance. Through powerful administration, we can keep up the work effectiveness and profitability of faculties or staff in universities. The time spent on cell phones by teachers or faculties in higher educational institutions highlight their level of engagement and their performances during their working hours.

Keywords: Effective management, Smartphone, Academic staff/faculties, Higher educational institutions.

I. INTRODUCTION

A defining moment in the historical backdrop of broadcast communications was set apart in 2002 in that the number of portable supporters surpassed the quantity of fixed-line endorsers on a worldwide scale: mobiles in this manner turned into the prevailing innovation for voice correspondences. The cell phone has now moved past being a minor specialized gadget to turning into a key 'social article' present in each part of a client's life. In this way, we will demonstrate how current cell phones (Weiser's tabs) can interface within any higher instructive organizations among resources/staff or employees. The developing capacities of PDAs are filling an ascent in the utilization of cell phones as information gadgets to the assets accessible in the earth, for example, arranged showcases, candy machines, and home apparatuses. According to the investigation of Mankiwz (1992) in 1992 and Barro (1999), portrayed that numerous studies are recognized about the correlation of teaching strategies, manual workforce, and productivity. The omnipresence of cell phones gives them the extraordinary potential to be the default physical interface for omnipresent registering applications. Xiaolong Zhu (2014) defined that the cost of pedagogy study, universities, and the career-related learning are the vigorous source of reviving the prosperity in the education sector. Matthias Barth stated that the faculty members became a major source to bring out the numerous tasks that help to establish better coordination among the classified category. The study showed that the participation of faculty members, monetary benefits, and offered several training programs to the employees bring more productivity and enhance efficiency. Smart telephones give a rich arrangement of apparatuses empowering us to control and connect with our surroundings.

These days, cell phones have turned into a piece of each life. Karen Pashby & Vanessa de Oliveira Andreotti (2016), analyzed that moreover researchers have been engaged in several investigations by which they were more focused on continuous growth of academic staff in universities that lead the academic employees to the principled environment across the Globe with rational, propriety and harmony. Minhas Mahsud, Abdul Jalil M. Khalaf, Zafar Mahsud, Arslan Afzal & Farkhanda Afzal (2020) examined that the timeless utilization of cell phone by academic students at the time of their lectures

leads to huge concern about the inappropriate behavior and degree of concentration in the universities across the Globe.

The motivation behind this exploratory investigation is to have a superior comprehension of the utilization and impacts of cell phones on scholastic staff. The utilization of cell phone impacts the worker's profitability and commitment to higher instructive organizations. Fauziyya Umar Adamu (2017) defines the positive perception of high school learners regarding online lectures. Students of high school have more interest in adopting Information Technology as their academic course. The motivation behind this examination is to deal with the exercises of all the higher instructive institutional representatives identified with the utilization of cell phones amid their working hours. Chung-Ming Huang, Chun-Hsien Su & P. K. Chen (2010), envisioned that good understanding and communication effects and enhances the logistic network. The strong connection between the supplier and the customer brings out the intense competition. Albeit how to conquer the issue of diversion by the use of cell phones and how to change over the diversion into efficiency. By powerful administration, we can deal with the worker execution and representative commitment in higher instructive organizations effectively.

Smartphone:

A phone is that controlled by a working framework. It very well may be contrasted with a little PC since it consolidates phone abilities, a camera, and an MP3 player. Ananda Bibek Ray, Suman Deb & Suraksha Devi (2017) stated that the utilization of cyberspace to improve network and communication would be very beneficial to enhance the determination and participation level of employees. With access to the web, understudies utilize the cell phone to discuss, transfer records (i.e., recordings, addresses, digital books, homework, tests, and so on.), run multi-media playback, get to email, see and alter content, send texts, and store materials. Regularly worked by contact, its gadgets join correspondence and processing in a solitary smaller framework.

Employee Engagement

Duty towards work is defined as a positive, fulfilling, doled out errand related perspective that is characterized by power, commitment, and assimilation (Schaufeli et al., 2002)(Jin et al. 2017). Power is characterized as high persuasive vitality and mental adaptability at work. Commitment alludes towards the readiness to give a ton of time and vitality to work given its high hugeness, energy, and related difficulties. Long-Hwa Chen , Tor Eriksson & Tsorng-Chyi Hwang (2010) stated that the utilization of artificial intelligence and laptops had adverse impacts on worker's salary and benefits, as per the survey on Taiwanese.

Employee Performance:

Studies have demonstrated that work commitment is decidedly clubbed to execution in the work environment (for review see Demerouti and Bakker, 2006). In this way, the outcomes look encouraging. Bakker et al. (2004) demonstrated that connected with representatives gets positive input evaluations from their collaborators for their errands, recommending that drew in workers improve and are glad to go an additional mile.

II. RELATED WORK

1-Leung (2008) portrayed that in America about 45% of young people running from 12 to 17 years of age have an individual mobile phone and have different gadgets to associate informal organizations in which wireless is most well-known. Chen-Ching Yang, I-Mei Su, Che Wang, Chang-Hsing Chang & Yun-Hua Bien (2015), envisioned that it allowing periodically attainment of goals that correlated with the worker's efficiency level and their continued determination . Whenever adolescents or youthful grown-ups feel relaxation fatigue, they promptly draw in themselves in SMS or making calls from their PDAs or interfacing web and interpersonal organization locales on their cell phones. It implies that at whatever point they weariness their feel consideration changes over to their mobile phones for interfacing somebody or notwithstanding for playing an amusement on the wireless(Chen DZ 2018).

2. Tien-Hui Hsiao & Yuan-Feng Wen (2011) stated that in the present working atmosphere, strong skills and good understanding is very necessary to work in IT companies and for survival in today's cut-throat market. Moreover, a strong competence level can never be calculated in monetary terms.

3. Flinchy, 1997; Forrester, 1999; Srivastava, 2005 communicated in their exploration that 60 percent of populace remained their cell phones with them constantly, and every one of the spots.

4. Harris TR (Doctoral exposition, Middle Tennessee State University) portrayed that in 2014 cell phones had a huge effect on worker's day by day work life. Under this examination explore that there is a solid bond between the PDA interference and uneasiness state among the representatives which gives negative effects on their occupations and work way of life.

5. Flood et al (2011) in his devotion "Work environment-related weight", including working abundance hours being continually open by strategies for Smartphone or the yearning for holding up be so may result in/ominous outcomes, Vice versa, designates besides pass on individual issues to work, which can be accomplished negative results as well. At long last, Smartphone use in a working environment beats agents' introduction.

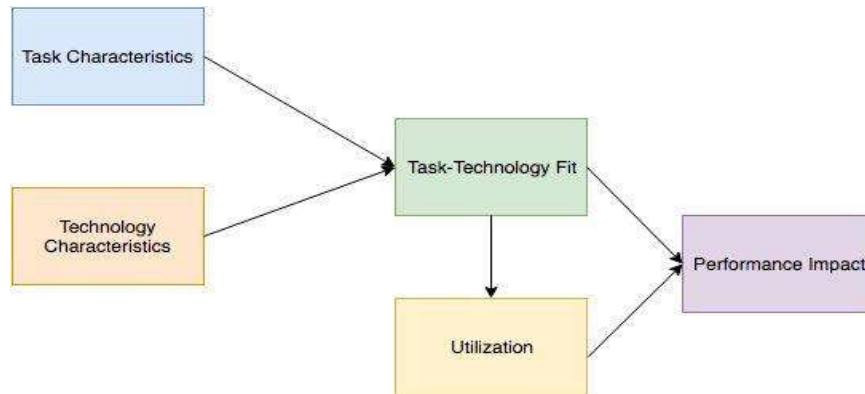


FIGURE 1. Goodhue and Thompson (1995)

6. Kalpna Sagar & AnjuSaha (2019) portrayed that direct customers not so much enjoyed numerous web pages as end-users faced accessibility issues. Comparatively, the woman has been enjoyed well and more satisfied by using several web pages. Many studies have shown that lots of educational web page not so much easy to access and end-users not felt comfortable and satisfied.

III. OBJECTIVE OF RESEARCH

Shi Yang (2018) envisioned the fundamentals, patterns, and structure of maintaining a record of educationalist teaching standards during e-learning. Nonetheless, very few studies have been carried out to affirm the views of the instructors regarding the effective use of their smart phones as a teaching tool. This present study was intended primarily to fill the gap. Hence the purpose of this article was to (1) investigate the use of smart phones as a teaching tool by higher educational institutions; and (2) the perceptions of educators regarding the use of smart phones in teaching. Simply put, the researchers were trying to answer two questions: (1) how do faculty members use smart phones to help their teaching? And (2) what are the perceptions of faculty members regarding using smart phones as a teaching tool? This study investigates the perception of faculty of higher educational institutions towards the usage of mobile phones and at what level it impacts on their performance and their engagement level.

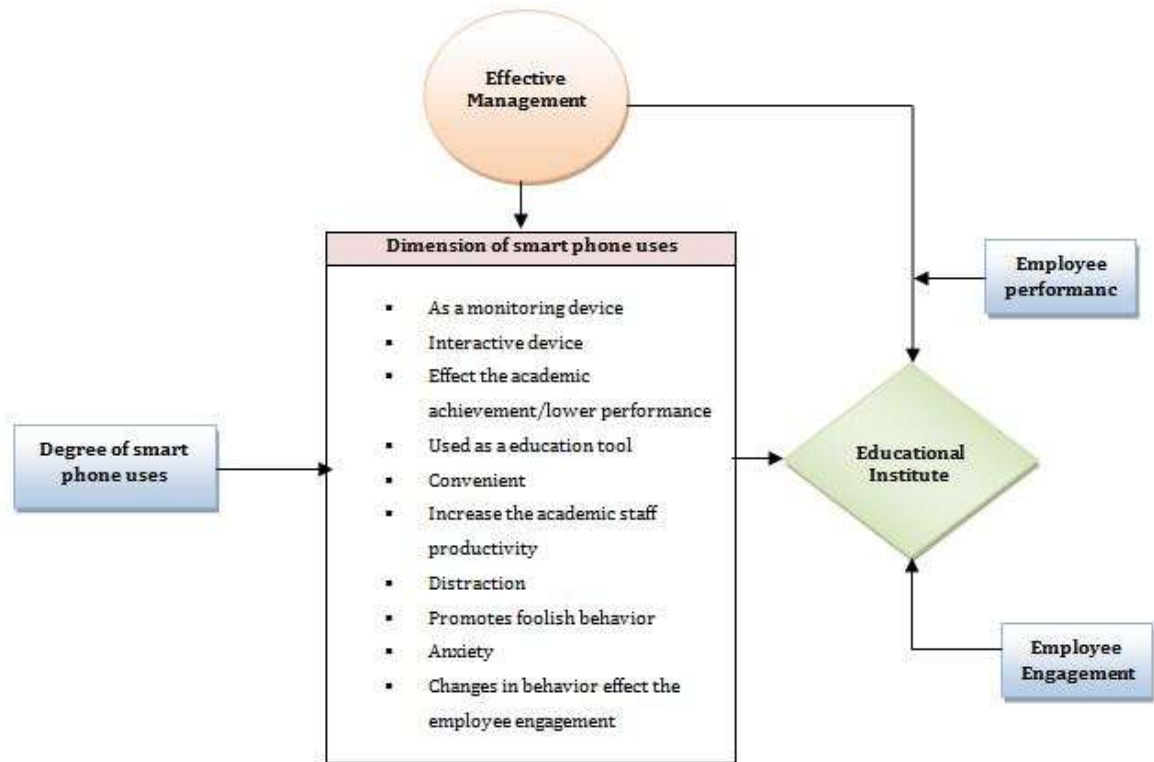


FIGURE 2. *The Framework of this Study*

Fig 2 shown, the study has been conducted to identify the current level of employee engagement and the work-related aspects which need to be improved for employee engagement in the higher educational institutions. The present research will help the management to highlight the areas for improvement in academic staff's productivity in Universities. The results of the research will help to give specific recommendations to the higher educational institutions/Universities regarding the engaged employee in the educational sector which areas to pay more attention to. This study reveals many different dimensions of Smartphone usage which affect the employee's performance and employee engagement positively or negatively in higher educational institutions/Universities all over the World. Through effective management, we will improve the degree of Smartphone usage in a positive manner which provides productive results and improves faculties/staff's efficiency level during their academic tenure in higher educational institutions.

IV. MATERIALS AND METHOD

Materials

The questionnaire survey method as shown in fig.3 was carried out to find the importance of usage of smart phones and preferred tools for communication among the faculties of Higher educational Institutions.

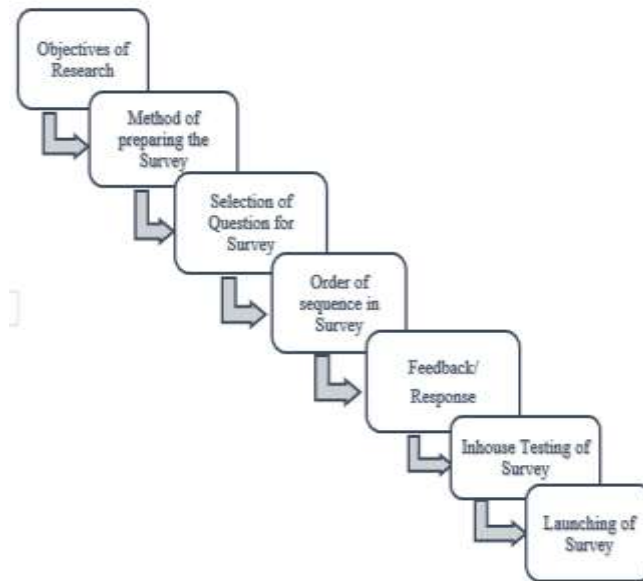


FIGURE 3. Questionnaire Preparation

Input parameter:

The following are the input values (Range of Variables) extracted from the questionnaire filled by the faculties from the different institutions to identify the employee engagement and employee performance. These input values are further used to analyze the role of Smartphone usage in the higher educational institutions (HEIs).

Table 1. Levels of Variables

Input Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Employee Engagement	0	1	2	3	4
Employee Performance	0	1	2	3	4

Method

When the researcher has a one-sample location test then it should be referred to compare the mean. In this case, the sample variance should be known. In some cases, researchers use plug-in test means. If the sample is large then the sample variance is used to give the plug-in test. In this study, normal distribution was carried out on the collected data from the questionnaire by analyzing means and percentages. Standard Z test two-tailed was used and Analysis of Variance (ANOVA) was applied to compare the demographic element. Statistical package SPSS version 21 was applied for data analysis. Absolute values with percentages are being used to state unanswered questions. Groups were tested at 95% significance level ($P < .05$).

Two-Tailed Z test

A two-tailed test is a process in statistical terms in which the critical range of a distribution is double-sided and measures whether a sample is greater or smaller than a certain range of values. This is used in null hypothesis testing and statistical value testing. If the tested sample falls into any of the critical areas, the alternative hypothesis rather than the null hypothesis is acceptable. The two-dose test gets its name from the area test, although the test can be used in other non-normal distributions, below both sides of a normal distribution. Two-tailed measures are used by default to assess the value at 5 percent, indicating that each side of the distribution is cut to 2.5 percent defined by P. H. Peskun (2020).

Working of Two-Tailed Z-Test

A basic principle of inferential statistics is the hypothesis check, which, in conjunction with a population parameter, decides whether or not an argument is valid. A test designed to show that the mean of a sample is significantly higher and significantly lower than the mean of a population is referred to as a double-tailed test.

A two-tailed test is structured such that the probability distribution involved explores both sides of a defined data set. The distribution of probability will represent the likelihood of a given outcome based on predetermined criteria. This includes the determination of a limit for the maximum (or maximum) and lowest (or lower) agreed variable values within the range. Any data point beyond the upper or lower limit is considered beyond the field of acceptance and in an area called the zone of rejection.

There is no universal requirement for the number of data points within the acceptance range. If accuracy is required, such as the development of pharmaceutical drugs, a rate of 0.001% or less can be identified. When accuracy is less important, such as the number of food products in a product bag, a refusal rate of 5 percent might be acceptable (Shetty et al. 2017).

The test statistics are a single number summarizing the information for the sample. The evaluation results are determined as follows:

In this test data is collected in accordance to Y_1, Y_2, \dots, Y_n are (i) independent, (ii) have a common mean μ , and (iii) have a common variance σ^2 the sample average \bar{Y} has mean δ and variance

$$\bar{Y} = \beta^2 / a \dots (1)$$

The null hypothesis is that a given number δ_0 is the mean value of Y . The use of \bar{Y} as a test statistic, rejecting the null hypothesis if $\bar{Y} - \delta_0$ is large.

The standardized statistic is calculated by

$$Z_{test} = (\bar{Y} - \delta_0) / x \dots (2)$$

We need to either know or have an approximate value for β^2 , from which we can calculate

$$x^2 = \beta^2 / a \dots (3)$$

Analysis of Variance (ANOVA)

A popular approach to seeking an effective form of treatment would be to evaluate the days it took to cure patients. We can use a statistical technique that can compare these three samples to demonstrate how different they are. A technique of this type, which compares the samples on their basis, is known as ANOVA. Analysis of Variance (ANOVA) is a statistical methodology used to test if two or more groups differ significantly from each other. ANOVA tracks the effect of one or more variables by comparing the means of different samples (Naik et al 2018).

The basic condition for the test of ANOVA is same if either or both block and treatment factors are considered fixed or random:

$$F_{Between\ treatment} = MST / MSE \dots (4)$$

$$F_{Between\ Blocks} = MSB / MSE \dots (5)$$

$$MST = b \sum_{i=1}^k (\bar{Y}_i - \bar{Y})^2 / (k - 1) \dots (6)$$

$$MSB = k \sum_{j=1}^b (\bar{Y}_j - \bar{Y})^2 / (b - 1) \dots (7)$$

$$MSE = \sum_{i=1}^k \sum_{j=1}^b (Y_{ij} - Y_i - Y_j + \bar{Y} \dots)^2 / (k - 1)(b - 1) \dots (8)$$

Where,

F is Variance ratio

MST is mean of squared deviations for treatments between groups

MSB is mean of squared deviations for blocks

MSE is mean of squared deviations for error within groups

Y_{ij} is an observation, \bar{Y}_j is a treatment group mean, \bar{Y}_j is block mean and \bar{Y} is the grand mean of all observations.

Statistical Package for the Social Sciences (SPSS)

The SPSS software package was developed for the social science data processing and statistical analysis. Initially introduced by SPSS Inc. in 1968, IBM later purchased it in 2009 (J. Bala 2016). Most leading research agencies use SPSS to analyze survey data and mine text data to make the most of their research projects.

V. RESULT AND DISCUSSION

In this study, different statistical tools were used to determine the significant relationship between Smartphone usage, employee performance, employee engagement, and other factors (Age) which shows as below. Fig 4, 5 represent the participation response to the positive question conducted in the survey, and Fig 6 & Fig 7 represent the negative feedback for the usage of Smartphone in HEIs.

The result of the Z test revealed that the usage of smart phones has a positive impact on the faculty's performance and engagement because our result is significant. This study shows that in the modern world it is important and necessary to use a mobile phone to enhance the performance and engagement in the higher education sector towards the work assigned to the employees.

Table, 3 shows the relationship between mobile phone usage and the Engagement of corporate employees. Mean (2.6071) and Standard Deviation (.55795) were used to determine the relationship between the age of employees and the usage of a Smartphone. This method helps to determine how the use of mobile phones dependent on their age

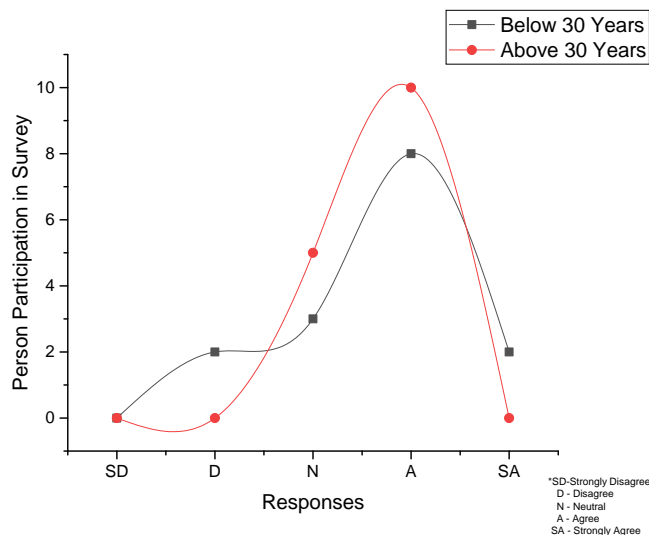


FIGURE 4. Response of Positive Category 1

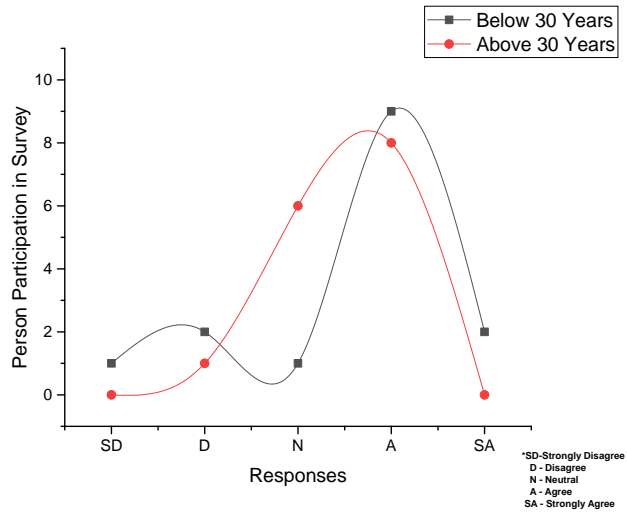


FIGURE 5.Response of Positive Category 2

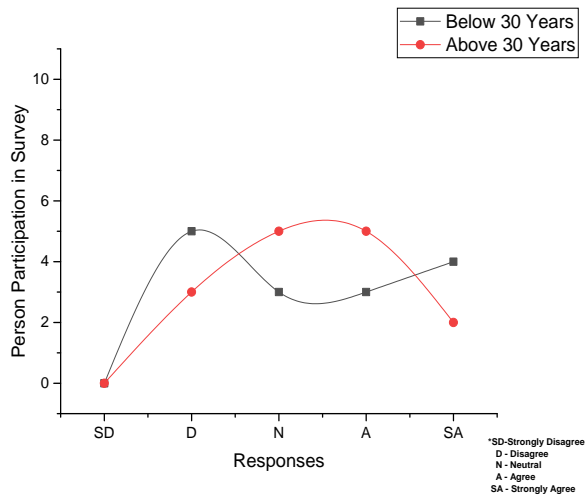


FIGURE 6.Response of Negative Category 1

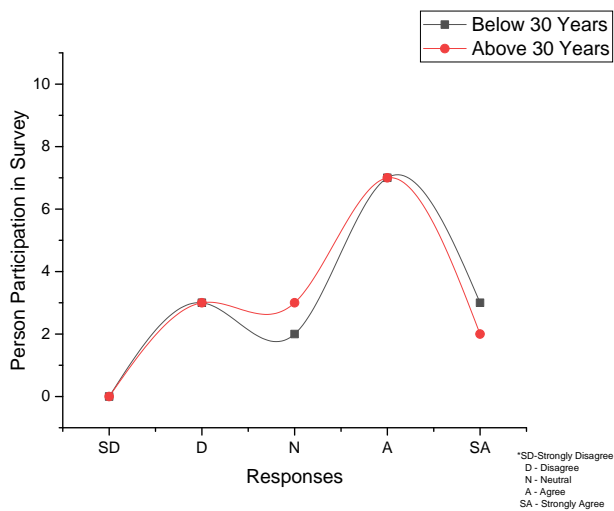


FIGURE 7.Response of Negative Category 2

Table 2.*The Z test – Two-tailed*

S. No	Parameters	N	Mean	Std. Dev	df	Z-Test	Sign.
1	Avg.	34	2.5903	0.5032	33	6.278	0

Table 3.*Descriptive Statistics*

S. No	Comparative Groups	N	Mean	S. D.
1	Up to 33 years	15	2.6619	0.71758
2	Above 36 years	15	2.3578	0.35145
	Total	30	2.6071	0.55795

Since the assumption of normally of data is not met for this convenience data, we obtained as F (29, .409) =.282, p=.600(or,>.01), we can conclude that the value of significant is greater than 0.05. Hence, the null hypothesis accepted. As a result, there is no impact of age on employee engagement.

Table 4.*ANOVA for determining differences between groups*

S. No	Group Type	Sum of Square	df	Mean Square	F	Sig.
1	Between Groups	0.09	1	0.09	0.282	0.6
2	Within Groups	8.938	28	0.319		
	Total	9.028	29			

VI. CONCLUSION

It is concluded that there is no impact on the faculty's age on Smartphone usage in the context of their performances and engagement in higher educational institutions. The analysis shows that Smartphone has been used as a productive device and used as the most common interactive tool among the faculties in the Universities. Despite minor negative impacts, the Smartphone has been a very convenient, affordable, and reliable device as compare to any other device such as a computer. The Smartphone helps faculty/staff to improve their performance and engagement level in their jobs by receiving all updates within time and connect with their colleague, students, and supervisors easily. By this survey, shows the positive relationship between Smartphone usage, employee performance, and employee's engagement level in higher educational institutions.

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