

BIOMETRIC SYSTEM VALIDATION ON ORGANIZATION PERFORMANCE: A CASE OF SOUTH EASTERN KENYA UNIVERSITY

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Abstract: Monitoring of staff performance in any organization has been a challenge for over time. With new advancement and technology adoption, organizations are now making use of biometric system to monitor staff arrival times and control movements within departments. The manual methods of signing in attendance sheet, register and swiping an Id card has proven inefficient as they are time consuming and rigorous. It is also difficult to determine who signed for which staff since employees tend to sign for their fellow colleagues as a way of covering one another. Biometric fingerprint identification has been adopted locally, regionally and internationally so that it can help organization rate the performance of employees when they come in for work and when they live as well as those who work overtime. The research looked at the effect of staff validation on organizational performance: a case study of Southern Eastern Kenya University. The study objectives included: The effect of level of security on organization performance and effect of staff authentication on organization performance. The research design was descriptive in nature and the sample size of ninety respondents was drawn by use of simple random sampling. Data was analyzed by use of inferential and descriptive statistics using statistical packages for social sciences version 24.0. Findings were tabulated and results indicated that staff validation had a significant effect on organization performance with a p-value of 0.000 which led to employees to perform their organizational activities within schedule. The study recommends that the institutions should invest on purchase of more scanners and putting them at strategic places which are convenient for everyone to be able to access and hence save time. There should also be further study on other factors affecting organization performance and measures of actual work output.

Keywords: Authentication, Biometric System, Biometric technology, Data capture, Validation.

I. INTRODUCTION

Background to the study

Due to the advancement in technology, many institutions and organizations are pursuing different methods that could help improve employee's productivity by adopting the use of biometric system. Biometrics is defined as statistical analysis of characteristics that are biological in nature as described by Zhang (2000) and had been automated to recognize people based on behavioral or physiological characteristics that are distinctive in an individual (Jain & Hong, 2000). These features included fingerprint, face, palm print, retina scan, iris pattern, keystroke dynamics, signature, and voice pattern (Ashbourn, 2000). This system had been used to eradicate the previous methods such as record keeping, use of register, a sign in sheet and swiping an ID card reducing staff time theft and impersonation.

The traditional methods had proven challenging because they were time consuming and rigorous. This system enhanced the ability to trace the attendance of staff to know when they are coming in and leaving from work. The system can also analyze the working days of employees, total number of staff who work overtime, those employees who came late for work and be able to analyze performance as well as detect delay in work processes among the of staff. Fingerprint system has been useful due to its simplicity, efficiency and difficult to tamper. They are unique and once captured they are stored in a database where each staff will click a scanner for identification (Rai, & Thakral, 2012).

Currently the use of biometric systems had proved to be successful in different places to monitor staff performance. In South Africa for example, the University of Fort Hare used online biometric system to manage and monitor class attendance. The system was enabled to conduct individual registration process and hence addressed the challenges of misplaced sign sheets in various learning centers. The system also provided effective attendance tracking method which prevented impersonation and repeat registration among students hence it lessened the cumbersome work of recording student's attendance computation according to the Daily Nation (2017). Some Kenyan institutions of higher learning have adopted the use of biometric system. for recording attendance, borrowing books and also during exams.

Statement of the problem

The manual attendance could be manipulated by the employees and in some cases attendance of many days could be marked at any time. The manual system of managing staff records and generating monthly report is a huge task because the system involves a lot of paperwork (Bidgoli ,2012).

To improve organizational performance many institutions are embracing the use of biometric systems to record employee attendance rather than using the manual system because the information in the biometric database could not be manipulated and can be monitored by a single person. At South Eastern Kenya University (SEKU) there has been a concern to monitor staff attendance, time of arrival and departure, in an effort to monitor performance to enable provision of quality education (SEKU, 2020).

The need to study how the use of biometrics affected organizational performance arose from the need for institutions to stay competitive in the market and attract student numbers. This study would therefore seek to establish how the use of a biometric system could affect on the overall organization performance.

Research Objectives

- i. To establish the level of security on organization performance in South Eastern Kenya University.
- ii. To establish the effect of staff authentication process on organization performance in South Eastern Kenya University.

Null hypothesis

There was no significant effect of staff validation on organization performance in South Eastern Kenya University.

II. LITERATURE REVIEW

Theoretical Review.

This section made use of two theories that informed the study, namely Technology Acceptance Model and Technology Determinism Theory

Technology Acceptance Model (TAM)

Emerging information technology cannot deliver improved organizational performance if it is not accepted and used by potential users. Technology Acceptance Model (TAM) has been used over time and effectively among practitioners and academics (Davis, 1989). TAM is consistent with (Rogers, 1983) theory on diffusion of innovation where technology adoption is a function of a variety of factors including; relative advantage and ease of use. The theory assumes that if one perceives the innovation to be useful, then they will easily adopt it. On the other hand, if a technology or innovation is easily understood and usable, then acceptance becomes easy. The model is useful for this study since acceptance leads to adoption and finally use of the technology. It is then of importance to make technologies in a way that they are acceptable to the user and beneficiary for purposes of easy adoption.

Technology Determinism Theory

According to the theory of technology determinism, technology itself can cause social change, cause interference in processes therefore slowing down functions. It is for this reason that information must be clear to avoid a change in communication which could interfere with adoption process. The theory is therefore essential in managing and examining activities that would cause a change in the society. Technological determinism suggests that society is shaped by its dominant technologies. It presumes that, if people and organizations start viewing technology from a positive angle, then other organs from the society and organizations will follow suit (Cassidy (1997). The theory is also helpful in managing people's perspectives and perceptions to enable understanding of innovation and technologies in a way that will not cause rejection. This theory can then be used to create awareness and sensitization among end users (staff and students) so that the technology causes a positive social change.

III. EMPIRICAL REVIEW

Effects of Staff Validation on Organization Performance

Biological data collection has to be carried out in a manner that is professional to avoid any errors. Data collected from an individual may not discriminate one that is collected from the fingerprint data and other forms of data such as the palm. All information collected is data and therefore it has to be specific. The focus of this data was staff identification and use of signatures. When validation takes place, the biometric systems collect data from a person's fingerprint data or thumb and has to process it through comparison with already existing information in the database. When the validation is done, it identifies the person's identity that matches the already existing information. It is upon validation that the organization allows him or her to gain the organization premises. The ways in which someone could be validated can be described in three ways: something that user knows, something the user has and something the user had (Fingerprints, 2016). Ownership factors involved what the user has such as ID card, security tokens among others.

Validation through biometric systems enables the organization to track the amount of time a person spends in the organization according to research by Bidgoli (2012) on security in organizations. They found out that the amount of time spent in organization premises is an essential feature in monitoring suspicious activities. This discouraged unnecessary presence but allowed only authorized staff to be present which helped the organization run smoothly as everyone was accountable for activities of the day (Kirmani, 2017)

Effect of Security Level on Organization Performance

The concept of human identification and other forms of recognition was used in behavioral-predominant biometrics such as gait and voice recognition (Francis, 2009). According to research done by Obansola, Makinde, Adeshina and Adebayo (2016) on employee development and staff attendance management, the study ascertained whether biometrics could save time and reduce insecurity in institutions. The results of the study showed that there was an improvement on security, employee performance where the tardiness of the lecturer to the lecture rooms reduced greatly, fast, and easy retrieval of data was observed, easy monitoring, reduced paper work and lastly there was less impersonation of staff during the use of the biometric system.

Biometric technologies design models that give reliable personal identification. Fingerprint use was the oldest known technology for user identification purposes. Fingerprints were used as signatures in ancient Babylon in the second millennium BC; to prevent any unrecognized and unauthorized signing. More recently, there was marked improvement where unique features of the fingerprint were captured and described in to detail. This was then continued up to the 19th century where other methods to fingerprint categorization and classification were proposed. There was further research by the Federal Bureau of Investigation (FBI) which funded the development of the first innovation on computerized fingerprint scanner (Ashbourn, 2009).

Human fingerprints are more reliable to use than iris use since they are detailed and unique which then makes it difficult to change any details. The finger prints are preferred due to durability aspect over the life of an individual which then makes it long-term in nature and can identify a person over a long period of time without significant changes. The convenience that the use of finger print use enables has made it more acceptable as a feature of security and performance than other biological features as described by Prabhakar, Pankanti, & Jain (2003). These characteristics had led to fingerprints being applied in many organizations to identify and monitor staff at the workplace.

Effect of Authentication on Organization Performance

Biometrics makes it easy to authenticate and record when a staff signed in and out. Staff would have to report on time and signing out with less supervision making it easy for management to monitor working hours and guiding the staff. These system tracks employees who come late to work and the ones that come early. The advantage of using biometric system is the reduction of errors in enforcement of organization attendance policies according to Bidgoli (2012) in analyzing work performance and use of organizational records.

The concept of staff security and employee recognition was also initiated by other means beyond finger print or iris identification. This was also seen in other predominant behavior patterns that could be used other in identification such as gait and voice recognition. According to research done by Obansola, Makinde, Adeshina and Adebayo (2016) on training of staff and attendance management system. The use of fingerprint identification technique, led to improved modernization techniques of taking staff attendance and checking in other details to analyze work patterns. This was able to ascertain an accurate authenticate process of staff in the institution. The results of the research showed that there was an improvement on security, employee performance where the tardiness of the lecturer to the lecture rooms reduced greatly. There was fast and easy retrieval of information and data, easy follow up of staff reduced paper work and lastly there was less impersonation of staff during the use of the biometric system.

IV. RESEARCH METHODOLOGY

The design that was used in this research was descriptive research design. It was used to describe the existing situation in respect to variables per conditions that were found in each situation (Shields & Rangaran, 2013).

The targeted population of this study was all permanent staff of South Eastern Kenya University who are 491 in number (SEKU- HRM department, 2020). A good maximum sample size is any sample size above 10% of the population as long as it does not exceed 1000 (Kothari, 2004). In this study, the sample size involved 74 respondents which represents 15% of the total population of 491 staff members. Parameters of interest in a research study were also considered, during selection of the sample size.

A questionnaire was developed for this study. Data collection involved gathering information on facts and evidence from the targeted population that allowed making conclusions important to the study by the use of questionnaires. The process used drop and pick method where the questionnaires were handed to the participants to fill and then collected afterwards. Data analysis included structuring and analyzing wide range of the collected data by use of SPSS version 22 and presented in the form of tables and charts.

V. RESULTS AND FINDINGS

Demographic information

Respondents were 57 in number out of the possible 74 giving a percentage response rate of 77% considered to be sufficient (Mugenda & Mugenda, 2013).

Distribution of the Respondents by Department

The findings of this research showed the classification of respondent according to their department where 18.8% belonged to the procurement department, 15.8% belong to finance, 3.5% belong to nursing department, 3.5% by the catering and accommodation service, 8.8% to the academic department, 5.3% to the guest house, 3.5% to the linkage and internal programs, 3.5% to the council of secretary, 5.3 to performance contacting and 3.5% to the postgraduate.

Distribution of Respondents by Work Experience

The respondents indicated the number of years they had worked at SEKU. The results of the findings indicated that 1.8 % of the employees had worked below one year, 15.8% between one to three years, 50.9% had worked for four to six years and 31.6% had worked for seven and above years. This was important because the findings indicated that SEKU was a viable organization to seek employment depending on their rate of staff retention.

Level of Conversance with Biometric System

The findings showed that 93% of the respondents were conversant with the biometric system while 7% were not conversant with the system; which means biometric system awareness and sensitization was well carried out.

Validation of Staff on Organization Performance

Level of Security of the System

The findings of the research showed that 77.2% of staff agreed that the system was secure for monitoring staff validation since it was secure and could only be assessed by individual staff. The level of security was based on use of passwords and finger/thumb prints. The system is also secure since it could only be accessed by authorized staff. However, 22.2% of respondents disagreed that it was secure.

Level of Authentication Process

The findings of the research showed that 68.4% of the respondents agreed with the fact that the authentication process saved time while 31.6% disagreed. The staff do not need to log in using paper and pen or keep a record of hard copy books which can be misplaced.

Level of Logging into the System

The findings of this research showed that 66.7% of the respondents logged into the system twice a day while 26.3% once a day, 1.8% once a week while 5.3% logged into the system at other time as shown in the table below.

Table 1: Logging into the system

Logging into the system	Frequency	Percentage
Twice a day	38	66.7
Once a day	15	26.1
Once a week	1	1.8
Others	3	5.3
Total	57	100

Distribution of the view of Biometric System in SEKU.

The findings of the research on figure 1 showed that 35.1% of the respondents viewed the biometric system to be a good system where as 52.6% view the system to be satisfactory while 12.3% viewed the system to be bad and not practical.

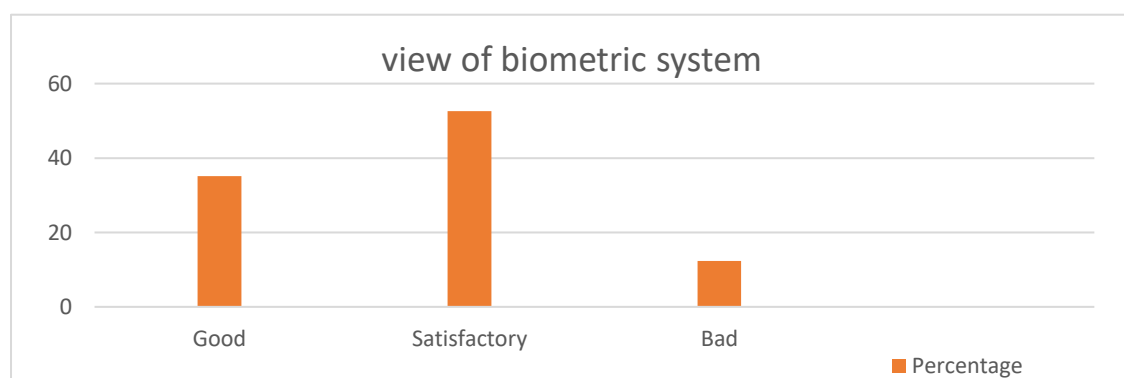


Fig 1: View of the biometric system

Effects of Staff Validation on Organization Performance

Level of Completion of Tasks

The findings of the research showed that 47.4% agreed that biometric system had increased the rate of completion of task since they were able to arrive on time to work and log at the correct time. However, 52.6% disagreed as shown in the chart below.

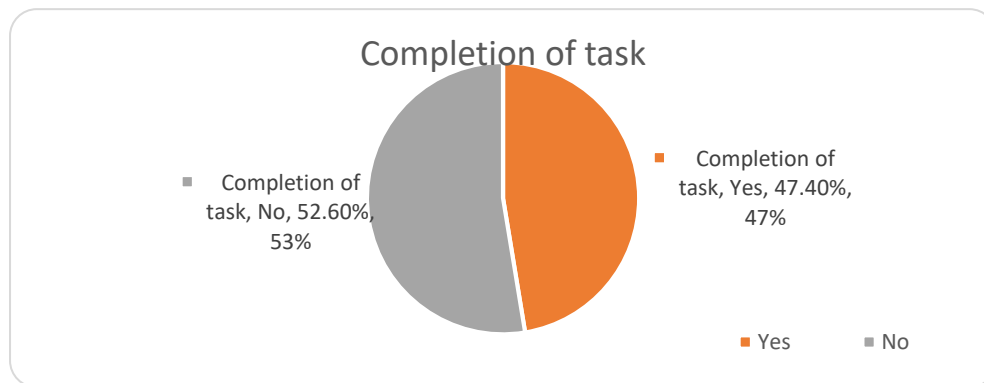


Fig 2: level of completion of tasks

Level of Met Objectives

The respondents were asked to indicate whether there was level of improvement of met objectives after introduction of system validation. Findings of the research as in figure 3 below showed that the 45.6% of the respondents met their objectives after introduction of the biometric system, 40.4% to moderately agreed to have met their objectives, while 14% thought it did not contribute to met objectives.

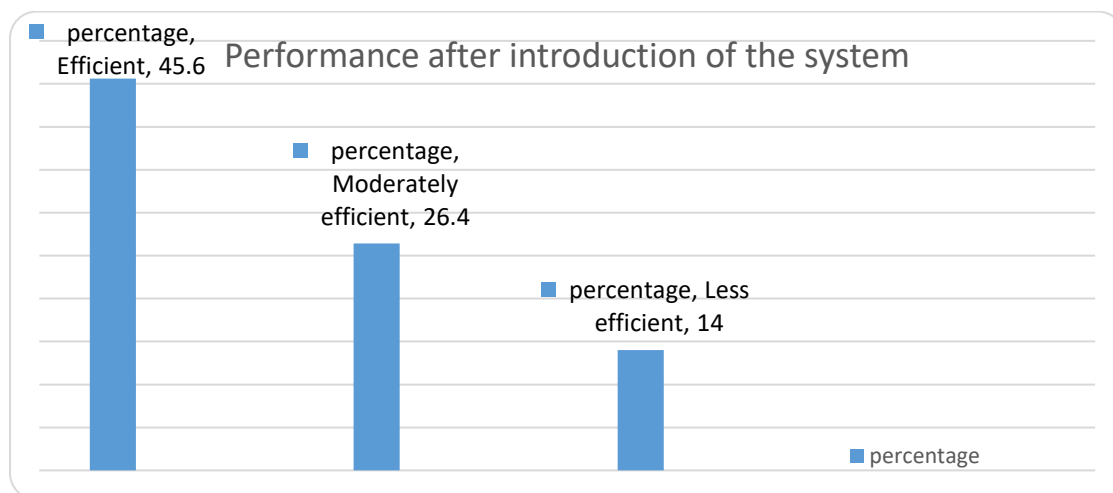


Fig 3: Level of met objectives

Inferential statistics

Correlations Analysis

The findings on table 2 show that staff validation on organization performance had a positive effect as indicated by the following analysis: $r = 0.681$; $p = 0.000 < 0.05$.

Table 2: Association between Staff Validation and Organization Performance

		1	1
Pearson Correlation	1	1.000	.681
	1	.681	1.000
Sig. (1-tailed)	1	.	.000
	1	.000	.
N	1	57	57
	1	57	57

Regression Analysis

The study findings in table 3 below indicate that there was a positive effect of staff validation on organization performance ($r = 0.681$). Adjusted R square of 0.455 means that the variables studied contribute to 45.5 % of the factors that affect organization performance and hence other factors contribute to 54.5% of organization performance.

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.681 ^a	.464	.455	.923

a. Predictors: (Constant), Staff Validation

b. Dependent Variable: Organization Performance

Analysis of Variance

The results in table 4 below show that the regression model had a significant predictive power ($f = 47.663$; $p = 0.000 < 0.05$). since the P-value is lower than significance level, the effect is statistically significant and hence, we reject the null hypothesis that there is no effect of staff validation on organization performance.

Table 4: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	40.611	1	40.611	47.663	.000 ^b
	Residual	46.863	55	.852		
	Total	87.474	56			

a. Dependent Variable: Organization Performance

b. Predictors: (Constant), Staff Validation

Regression Coefficients

The data findings presented on table 5 below indicate that taking all other independent variables at zero, a unit increase in use of staff validation increases organization performance by 0.602 which is quite significant.

Table 5: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.224	.313		3.914	.000
	1	.602	.087	.681	6.904	.000

a. Dependent Variable: Organization Performance

b. Predictors: (Constant), Staff Validation

VI. CONCLUSIONS AND RECOMMENDATION

Conclusion

Based on the findings above, it was concluded that biometric system affects organization performance by saving time unlike the use of paper and pen. It also recognizes staff accurately hence increasing the efficiency of staff in the organization. The study further concluded that the biometric system has security features hence allowing only authorized staff to access it as well as log in through user details alone. There was an agreement that organization objectives were met upon use of the system.

Recommendation

From the findings of the research, it is recommended that the institutions should invest more on buying new scanners and putting them at strategic places which are convenient for everyone to save time rather than going to the human resource department to log in and out of the system hence they should increase the access points to reduce system traffic the scanners

should be installed in every department. The research also recommends there should be a power back up to increase efficiency in the organization such that employees can still log into the system. In cases where there is system failure the study recommends; they should enhance the use other alternatives like password and Iris Scans for job completion also the system speed should be increased to fasten the authentication process.

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