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**COMPUTERIZED BIOMETRIC CLOCKING SYSTEM AND EMPLOYEES' PRODUCTIVITY AT
MURTALA MOHAMMED SPECIALIST HOSPITAL, KANO STATE – AN EMPIRICAL STUDY**

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Abstract

Employees' productivity is one of the key factors that influence the indicators of overall organizational performance that counts much in achieving organizational objectives. This study empirically examines roles/effect of Computerized Biometric Clocking System (CBCS) on employee productivity at Murtala Mohammed Specialist Hospital, Kano state. 126 personnel were used and a stratified random sampling technique was employed 114 employees finally used as the sampled of respondents, however, only 86% that is 98 questionnaire returned as such the study used the returned questionnaires for analysis. A statistical investigation utilizing SPSS 25.0's regression function produced results showing a substantial correlation between attendance timing and employees' job productivity. Employees' identification showed negative connection with employees' productivity, while payroll computation was negatively associated with the employees' job performance. The study concluded that, there is positive correlation between attendance timing and employees' performance; however, there is negative correlation between employees' identification, payroll computation and employees' productivity. The study recommends that; Attendance timing must be applied with proper caution. The nature of employees' identification system was not favorable to the current Nigerian situation, as the package may not be enough to cater the needs of the employees, as such employees' engage in other businesses that help them to sustain their life. Therefore, the method needs to be revisited. The stakeholders and the government of Kano state must work together to create a supportive and enabling un-bias payroll computation exercises, which will discourage selfish attitude of the management.

Keywords: Biometric Clocking System Employees, productivity, performance, organization

Introduction

Organizations are increasingly operating in dynamic conditions. Human resources form a large part of the costs that organizations have to incur. Employees' attendance is a major for all the business organizations as it has a direct impact on the performance of an

individual as well as on the performance of the organization. Usually, employees of different organizations are found involve in fake leaves that hurt the performance of the organization (Ciner, 2019). Different types of management techniques are used to maintain the performance of the employees in various

business organizations as well as in banking sectors. In this regard, it is believed that the attendance employees' system has the potential to control the fake leaves and other issues related to the employee's attendance. Adding some transparency to the problem of the fake leaves in the corporate environment in the organization hierarchy is expected to be an effective way of reducing the negative effect of attendance (Adwan, 2016).

Employees' productivity is defined as how an employees' fulfills their job duties and executes their required tasks. It refers to the effectiveness, quality, and efficiency of their output. Employees productivity contributes to our assessment of how valuable an employee is to the organization. Each employee is a serious investment for a company, so the return that each employee provides must be significant (Ciner, 2019). Employees are the force that drives a company forward. So it should come as no surprise that the daily performance of the workforce seriously influences the success or failure of a business or organization. To stay successful in today's business activities, organizations must find ways to maintain and bring out the best performance from their employees. Not only does this help to hire, retain and develop the best talent, but by helping staff to grow within their roles and responsibilities, the company can build a pipeline of future leaders (Hill, 2018). Working to improve employees' productivity is an ongoing process that involves measurement, evaluation, and planning, but it's also a vital step to achieving company goals. Every individual employee contributes to the success (or failure) of a business. Of course, the goal is to continuously improve the quality and efficiency of your workforce. But without a clear understanding of which factors influence employees' job performance; it will be difficult to sustain success. Whether you're a team leader or an employee yourself, it's imperative to assess employees' job performance and see where there's room for improvement (Ciner, 2019). Both the leadership and employees should always know the status of their performance. If performance is suffering, or it's just time for a boost, implementing

best practices for improving the quality and productivity of work can really make a difference.

In different health and other sectors, the lack of attendance increased speedily. Different types of employees take fake leaves, which turn the performance of the hospitals towards the failure (Kocakulah *et al.*, 2016). Moreover, the rate of fake sick leaves is also increasing in different sectors that tend the organizations towards disappointment. To make the business run in flow, attendance management plays different types of roles. In a study, it has showed that if the employee takes fake sick leaves then the burden of work will increase on the other worker which also causes the growth of the businesses. The first thing that runs the health sectors are the performance of the employees' that how they perform to run the hospital in an effective way (Suresh, 2016). The problem, which is faced by different hospitals in Nigeria, is the absenteeism and lack of attendance of the employees in the health sector. Through the lack of attention towards the employee's fake leaves, the performance of the hospitals is decreasing. To drive the health sectors in Nigeria towards success, the management has to focus on the performance of the employees also on the attendance of the employees (Abdalla & Sankar, 2019).

Employee clocking systems have been used for more than two decades for managing time and employee attendance in organizations. Biometrics based time management attendance systems with enhanced features have been developed (Omobogo, 2020).

Computerized employee clocking systems that use biometrics offer an effective means of addressing time management by linking individuals to their personal human resource records and computerized employee clocking systems that incorporate biometrics that have the ability to accurately capture real time and labor data. The use of computerized biometric employee clocking systems is widespread and growing rapidly with many organizations adopting them due to their ability of enhancing employee performance (Abdalla & Sankar, 2019). Biometric technology can help in

accurately tracking employee time and attendance, which can assist in preventing time theft by ensuring that employees arrive at the work place on time and leave at the right time after duty (Lia Ciner, 2019). Employee job satisfaction can be improved when workers feel that their efforts are recognized through balanced workload. Employee attendance timing, employee identification and pay computation are crucial aspects in ensuring that organizations achieve their set operational performance levels (Omobogo, 2020).

Employee attendance has a direct influence on operational performance of an organization. Employees are expected to attend to their duties as scheduled at Murtala Mohammed specialist hospital Kano to enhance employee's job performance. Employee identification is important in ensuring that the actual employee attends to duty. Where employee identification is not done effectively employees who are expected to be on duty may fail to report and their colleagues sign for them if manual attendance registers are used instead of the computerized biometric clocking system. An effective computerized biometric system should address attendance timing, employee identification, and payroll computation (Lia Ciner, 2019). An effectively implemented computerized employee clocking system should lead to more accurate employee attendance records, eliminate the practice where employee clock in and out for their colleagues 'buddy punching', more authentic identification of workers, and more accurate payroll computation for workers, which leads to happier and productive. When working time is managed well, conscientious employees perceive their work is recognized. Employees who do not attend to their duties are identified among the workers in the workplace and are encouraged to improve. Improved job satisfaction may be realized through effective computation of overtime, management of extra workload, and recognition of hard work (Kisame, 2016). The employer can also be able to identify areas of high employee absenteeism in the workplace which can be used to re-organize the work. The general purpose of the study is to assess the effect of

computerized biometric clocking system on employees' productivity in Murtala Mohammed specialist hospital Kano.

Statement of the Problem

The role of Public service in Nigeria is to implement government policies and programs. The extent to which this function can be achieved depends greatly on the level of performance of the workers in the public service (Lia Ciner, 2019). Hence, performance is consequently important criterion that relates to the organizational outcomes and success. No organization can exist unless its workers are highly productive. Organizational performance is multifaceted, because public organizations are required to address a range of goals, some of which may be in conflict. Consequently, public organizations are obliged to focus attention on multiple dimensions of performance. Yang et al. (2019) identified attendance, timing, speed and efficiency. While Kisame (2016) identifies employees' identification, efficiency and payroll computation as the bases for measuring employees' job performance. Similarly, Annual Performance Evaluation Reports (APERS) is the major performance measurement criterion in public service (Kano State Civil Annual Evaluation Report). It contains certain dimensions for instance attendance, set target, efficiency, timing, effectiveness, loyalty, etc. This is the reason why certain framework is developed as part of the work conditions. (Acuity Market Intelligence 2018) depicts that current employee performance framework is established to enable workers attend their places of work, perform their assigned duties and close at the right time to achieve organizational goals. Employee Performance in public service is gradually becoming poorer and poorer, day by day, despite government effort to track Employee performance using manual attendance systems, because the attendance monitoring and evaluation adopted by the government have been done conventionally using employee attendance books (the manual way of taking employee attendance, employee payroll computation and employee identification). However, employee attendance monitoring and evaluation goes beyond only attendance, but it ensures

efficient time utilization which maximizes and motivates employee. In today's work environment employee performance is diminishing because some don't come to office they usually assigned their friends to write attendance for them, some will report write their attendance and live, while some will come to office write their attendance but will not perform their assigned responsibilities. This and many other factors lead to truancies and low performance of employees in public service.

Looking at the number of employees that worked in year 2022, in Murtala Mohammed specialist hospital Kano, this clearly indicated that most of the staffs are either truants or on study leave (Record from Kano State Specialist Hospital 2024), because the hospital have one hundred and twenty six staff (126) as of 2022. The hospital has 29 qualified Doctors and 78 nurses with lab technicians and other supporting staffs. This depicts an unhealthy situation that can hinder the performance of hospital. Despite various efforts adopted by different administrations to track employees' productivity in Kano State. Employees' productivity is persistently deteriorating. Public worker absence is a key obstacle to delivering services to the populace. In Kano state, however, beside the educational sector, the health sector is among the leading public sectors with low attendance which consequently affects the employee performance. Lateness and absenteeism is recognized as a critical challenge in even developed countries as there was a total of 2.8 thousand days missed among the 113,154 full-time wage and salary employees in the United States of America in 2017 (Pavithra et al., 2017). The situation is likely to be worse in public institution in developing countries like Nigeria that is still largely reliant on the manual attendance monitoring system due to the cost of the adoption of biometric attendant system and it is affecting productivity. Nonetheless, the manual or traditional system of attendance management has failed to efficiently and effectively manage attendance to yield high job performances in public institutions in Kano State. This manual system takes little or no considerations on impersonation, falsification and the risk of loss of information in event

of misplacement of attendance records, theft or disasters such as fire outbreak or flood (Kisame, 2016) Another weakness of the manual system is error in the computation of the bonuses and deductions in the salary of employees. Also to maintain the attendance records in this manual approach is a very inconvenient task. During the operations at hospital (i.e surgeries) truancy in place of work may be adversely affected if some employees fail to report for duty.

Employee timing and attendance can easily be track, assist in preventing time theft by ensuring that employees arrive at the work place on time and leave at the right time after duty. Employee job satisfaction can be improved when workers feel that their efforts are recognized through balanced workload. Proper pay computation ensures that employees are paid what is due to them. In the statement made by Lia Ciner (2019) when pay is computed accurately it enhances the motivation of workers. Where manual systems of calculating pay are used, errors may occur that lead to employees not being paid accurate salaries. In hospitals workers provide essential services and where pay has errors it may lead to disputes like strikes that disrupt the operation performance. Attendance monitoring and evaluation have been done conventionally using employees attendance books (the manual way of taking employees attendance). However, attendance monitoring and evaluation goes beyond only attendance, but it ensures efficient time utilization which maximizes and motivates employees' attendance (Omobogo, 2015). He further opines that in some years back, employees were assessed manually using time book, where they can sign in and out daily, providing details like name, rank, date, time, signature, etc., especially where enumeration of staff is based on number of days and hours put to work.

Several empirical studies were conducted in relation to this research but found that the variables used are not sufficient. Such as (Omobogo, 2015; Kisame, 2016; Pavithra et al., 2017; Abdalla & Sankar, 2019). This is because the components used by the researchers did not combine the three variables, attendance timing, and payroll computation and employees identification

as the mechanisms for measuring employee productivity. However, this study used the three components which are reliable and encompasses all what it required for measuring the independent variable. Similarly, looking at this study in a geographical context, it's first of its kind. This is because using computerized biometric clocking system in public service was introduced second quarter of last year in specialist hospital Gombe and no known study conducted in relation to this topic. Lastly this study is empirical in nature; most of the studies conducted were conceptual based. These emanate the gap this study on the assessment of the effects of computerized biometric employee clocking system on employees' productivity in Murtala Mohammed specialist hospital Kano filled.

The main aim of thi study is to assess the effect of computerized biometric employees clocking system and employees job performance in Gombe State. The specifics objectives are;

- i. To examine the effect of attendance timing and employees productivity at Murtala Mohammed specialist hospital
- ii. To assess the effect of employees identification and productivity at Murtala Mohammed specialist hospital
- iii. To evaluate the effect of Payroll computation and employees productivity at Murtala Mohammed specialist hospital

The following are the hypotheses of the study;

- iv. **H₀₁**: There is no significant effect of attendance timing and employees' productivity at Murtala Mohammed specialist hospital
- v. **H₀₂**: There is no significant effect of employees' identification and productivity at Murtala Mohammed specialist hospital
- vi. **H₀₃**: There is no significant effect of Payroll computation and employees productivity in Murtala Mohammed specialist hospital

2. Literature Review

2.1 Conceptual Issues

Concept of Employee Performance

Employees are the forces that drive a company forward. So it should come as no surprise that the daily performance of the workforce hugely influences the success or failure of a business. To stay successful in today's market, businesses must find ways to maintain and bring out the best performance from their employees. Not only does this help to hire, retain and develop the best talent, but by helping staff to grow within their roles and responsibilities, the company can build a pipeline of future leaders, all contributing to long-lasting success. Working to improve Employee performance is an ongoing process that involves measurement, evaluation, and planning, but it's also a vital step to achieving company goals (Abdalla & Sankar, 2019).

Put simply, Employee productivity is how a member of staff fulfills the duties of their role, completes required tasks and behaves in the workplace. Measurements of performance include the quality, quantity and efficiency of work. When leaders monitor the performance of employees, they can paint a picture of how the business is running. This not only helps to highlight what companies could be doing in the present to improve their business, but this information also feeds into future growth plans. However, placing a focus on Employee productivity doesn't just benefit the business. It helps employees to reach their full potential, while also improving overall performance which can have positive effects on morale and quality of work produced. Lastly, but most importantly, when employees are under-performing, customers may be dissatisfied. As a result, the entire business may be affected by poor performance and struggle to reach goals (Kocakulah et al., 2016). Every role is different so the metrics used to measure employee performance will ultimately depend on the type of business the company and employees operate in. But in general, the main ways to gauge performance are: Quality of work. Standard of work produced is a key indicator of performance. Are employees putting in maximum effort to ensure high-quality results? Are performance

objectives being met? Quality of work provides the basis to analyze all other elements of their performance. Speed and efficiency, looking at how much employees accomplish in an average week, month or quarter, how does this match up to your expectations? Are deadlines met, vastly improved on, or is time wasted? Are corners being cut to produce work quickly? Efficiency is the result of maximum output at least cost so this is vital to be aware of within your company. Trust and consistency. Ask yourself if you trust your employees to do all their work to a high standard and deliver it on time. Do they work independently or do you feel that you often have to step in? Do they consistently display company values? Are they punctual and present to the expected standard? High-performing employees can be trusted with autonomy and continue to produce strong results without much supervision. Keep these performance metrics in mind when conducting individual employee performance reviews.

Concept of Computerized Biometric Employees Clocking System

When computerized biometric employees clocking systems are being designed it is important to ensure that physiological and behavioral features are taken into consideration (Kocakulah et al., 2016). The ultimate performance of the biometric system will depend on how well the physiological and behavioral features were considered in the biometric system design. The features that need to be considered include the uniqueness of individual users, permanence, acceptance, and hardness of the system and levels of fulfillment (Lia Ciner, 2019). Biometrics system helps in effective attendance management which helps in increasing employee or worker productivity and generates time and overhead cost savings to enhance the organizations performance by utilizing computerized time management system to track employees' time and attendance (Pavithra et al., 2017). Attendance timing management helps in guiding our methods of managing working hours. The actions that are taken to enhance efficiency were based on the principle of time management. Attendance timing is important for individuals in a workplace as well as

employers. The number of working hours that an employee is expected to put in any given month determines the pay due to the employee. These working hours may be determined by the pattern of work. Employees may work in the regular, shift and over time (locum) patterns.

These working hours are determined based on the legal requirement, collective bargaining agreements for union workers, organizational policy, and best practices in the industry among other considerations. According to Omobogo (2015), biometric authentication system should be designed properly to enhance security. Biometrics based time and attendance devices are considered to be the most secure means of identity and authenticate users. The utilizing electronic based intervention devices enhance security. According to Kocakulah *et al.* (2016) biometrics assists in enhancing accuracy. When an organization utilizes the biometrics employee clocking system effectively, the biometric features that are unique to individual users imply that they cannot be replicated. This enhances the accuracy in identification of the users. The biometrics system helps in eliminating the challenges that may be encountered when other attendance management systems like manual registers and clocking cards are used. Users in biometric attendance management system do not need to remember complicated passwords or carry employment identification cards.

Concept of Attendance Timing

Effective attendance timing in the workplace helps in increasing employees or workers' performance which leads to overhead cost saving that enhance an organizations job performance. Computerized attendance timing systems helps to track employees' attendance (Abdalla & Sankar, 2019). Time management helps in guiding how time is managed in the workplace. The action that is taken to improve efficiency is guided by the principle of attendance timing. Attendance timing is crucial for individuals to match their requirements as employees in the workplace in order to manage work-life balance. Whereas employees are expected to be in the

workplace to work, they have their individual commitments which they also have to attend to. An effective attendance timing systems can ensure that there is a mutual balance between individuals and workplace. The number of working hours that an employee is expected to put in any given month determines the pay due to the employee. These working hours may be determined by the pattern of work. Employees may work in the regular, shift and over time (locum) patterns. These working hours are determined based on the legal requirement, collective bargaining, agreements for union of workers, organizational policy, and best practices in the industry among other considerations. The biometric clocking systems may be used in two modes, that is, identification and verification.

The identity verification of a user takes place when a user logs into the system. The biometric data that is presented to the system is checked against the template that is embedded in the biometric system. The total identification of the users takes place once the computerized biometric system matches the users data with all the records embedded in the identification database (Kisame, 2016). The process of identifying individuals in an organization is technical, costly and challenging. Generally, the accuracy level of identification reduces as the size of a database increases. To increase the level of accuracy in large data bases, the data bases have to be categorized on the basis of biometric data. This ensures that record identification is done within a specific category to minimize the number of records in which a search has to be done. This helps in increasing the level of accuracy. Prior to the identification, a user of the computerized biometric employees clocking system is expected to register into the system. The individual traits of the user have to be captured by the system. Data enrolment has to be done in stages to create high quality of biometric templates that are eventually used for the identification of the users. Enrolment is the process that users go through to register in the biometric system.

Concept of Employee Identification

In order to identify a user, the user's biometric characteristics and the derived biometric template characteristics must be reconciled. This is referred to as enrolment and involves the creation of a data base of the user which is subsequently maintained in the system. The user's data base comprises employees' details and biometric traits (Abdalla & Sankar, 2019). The person to be recognized in a biometric system has to present their biometric characteristic to be captured in a biometric database as a template. On the basis of the recognition biometric template characteristic extracted, a user specific template is created and stored in the biometric data base. As a result of the statistical nature of the biometric templates there is no exact match possible that can be possible from two different users of the system (Kisame, 2016). On the basis of this, the user identification process only assigns biometric data based on a biometric template and confirms recognition where the comparison score outcome exceeds an adjustable threshold. User authentication involves reliable verification of the user's identity. The individual users of the biometric system have to be authenticated and identified by the machine using the characteristics that are embedded in the biometric system database.

According to Kisame (2016) a computerized biometric clocking system can be an authentication system or an identification system. Identification confirms one's identity using an identifier like username. Verification is a confirmation or denial of an identity using a verifier like a password. In biometrics, verification involves authenticating users in conjunction with smart cards and usernames and this is called biometric authentication. Whereas biometric identification compares a user's biometric templates against stored profiles and it finds the one that matches best, authentication deals with individual to template matching of the live reading against the stored profile. Identification responds to the question "Who is this person" while authentication asks "Is this person the person they claim to be?" Authentication is typically utilized for positive recognition, where the aim is to

prevent multiple people from using the same identity (Omobogo, 2015).

Concept of Payroll Computation

Biometric system is an accurate and reliable way to determine whether an employee was actually present. The technical operation of computerized biometric employees clocking system can be evaluated on the ability of the system to match the individual users’ traits with the templates with accuracy. The computerized biometric employees clocking system ensures that data is available for use at all times. The data that is obtained from the computerized biometric machine can be utilized for payroll computation in real time. The initial biometric data that is captured by the biometric system is critical for subsequent authentications of the user. As a result of this the quality of the biometric template must be ascertained to ensure that it is suitable, if not, another biometric template should be obtained from the user (Pavithra et al., 2017). Templates are produced after biometric data

is captured by the biometric machine. The qualities of biometric templates that are subsequently processed depend on the type of biometric technology utilized. The computerized biometric employees clocking system enhances the quality of data. Biometric features neither compared nor stored in their raw format. The raw templates have some irrelevant data, which should not be kept on record. The templates are processed to ensure that only the important characteristics are extracted and retained on the records. This helps in reducing the quantity of data. Biometrics enables employers to keep records of their employees’ time more accurately for payroll computation. The computerized biometric employee clocking system stores payroll accurate data. The computerized biometric employees clocking system enhances employee job satisfaction and retention.

Conceptual Framework

The conceptual framework for the research study is presented below

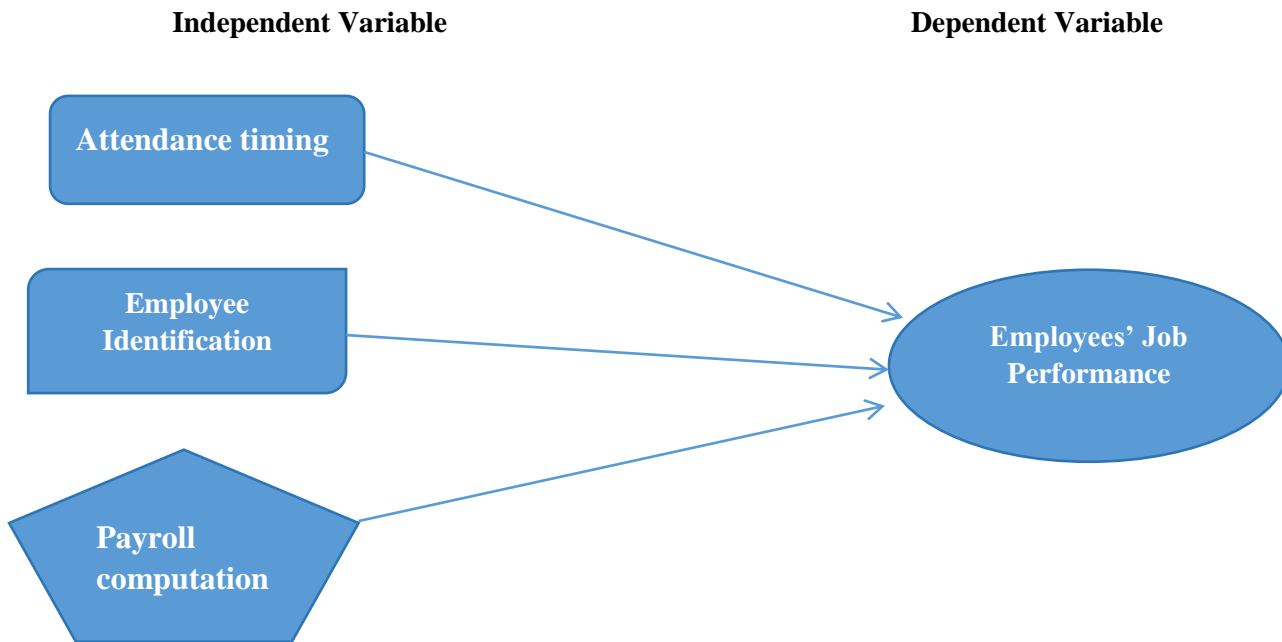


Figure 1: Conceptual framework of the study, 2024

Source: Modified, Kisame (2016)

2.2 Empirical Review

Abdalla and Sankar (2019) opines in a study on biometric authentication systems and service delivery

in healthcare sector in Kenya. This study constituted a descriptive survey involving 43 healthcare facilities that were using biometric systems within Nairobi city

in Kenya. The study objective was to look at the factors affecting the performance of biometrics in the healthcare sector and the impact of its use in service delivery. The findings revealed a number of factors affecting the performance of biometric systems in the healthcare facilities which include system response time, technical accuracy, ease to operate, information output, security, knowledge of biometrics by the IT support, IT support willingness to help, ability to withstand large number of users, system ease of use by patients, system user experience, reliability, promptness of IT support team and patient's manner of usage.

Subsequently, Achour *et al.* (2022) evaluate the capability of hospital staff at MOI Teaching hospital, Kenya to attend their workplace regardless of their backgrounds, jobs, and levels, making it a more accurate representation of the natural operation of hospitals. It contributes to the healthcare resilience body of knowledge, specifically related to hospital staff attendance during and post-disaster events. Data was collected through a questionnaire survey distributed to 1841 hospital staff members from different departments. Results showed that the decision to attend the duty during or post-disaster event involves many complex personal and professional factors that can change, depending on the type of disaster, working environment preparedness and the personal responsibilities of the staff. Dependency, travel, training, and mental health in addition to age and work experience influence the capability to staff attend hospital post disasters. Findings established each of hospital's departments; services and professions play a key role in the provision of healthcare service no matter their backgrounds, role, and hierarchical levels.

Additionally, Lia Ciner (2019) conducted a study on the implication of using biometric system on payment operations of an organization: a case study of one Non-Governmental Organization. The study adopted a descriptive research design. The total population for this study was 100 organizations and client staff. Study results showed that 45% of the respondents agreed that

payment of per diem to clients using BVR has reduced cash handling while three quarters either agreed or strongly agreed that use of BVR has helped reduce fraud drastically. When asked whether use of BS has made payments easy, more than three quarters (83%) agreed or strongly agreed. Nearly one third of staff disagreed that use of the system has fastened the reconciliation of advances.

Kisame (2016) did a study on computerized biometric employee clocking system and operational performance: case study of Moi Teaching and Referral Hospital. The study adopted a descriptive survey research design. The study showed that there was a statistically significant influence of computerized biometric employee clocking system on operational performance MTRH. It was therefore concluded that supervision practices like monitoring, appraisal and feedback and staff coaching on job improves performance of non-academic staff. The study recommends that future researchers should explore comparative studies to explore the extent to which computerized biometric employees clocking systems influence operational performance across organizations.

Roland (2017) focused on an elaboration on measures to promote institutional innovation, transformation, and inclusiveness to enhance public service delivery. The study describes biometric technique as an automated method of recognizing an individual based on certain physiological or behavioral characteristics. Biometrics originated in the indemnificatory systems of criminal activity developed by Alphonse Bertillon based on Francis Galton's theory of fingerprints and physiognomy. In the contemporary era of information technology advancement, some of the commonly used biometric techniques include fingerprints, iris scanning, facial geometry (facial recognition), hand geometry, vein patterning DNA profiling among other emerging ear and nose biometrics

Nyaberi and Kwasira (2018) sought to assess various innovative strategies adopted by the organization's 2014/2017 strategic plan to improve service delivery

in terms of benefits, accessibility and growth in membership. The study was guided by stakeholder theory, technology acceptance theory and Institutional theory. In addition, the study adopted a descriptive research design. Structured questionnaires pilot-tested and further administered. Data collected was analyzed using descriptive and inferential statistics with the aid of the Statistical Package for Social Sciences version 20. A Pearson correlation analysis and a linear regression analysis were done. The correlation analysis done indicated positive correlations between Biometric registration techniques and the dependent variable Service delivery. Based on the results of the regression analysis, the first null hypothesis was rejected since the Biometric registration techniques were found to be having significant positive influence on service delivery at NHIF.

Similarly, Jalo et al. (2023) assessed the effect of biometric system (Attendance Timing) on employees' performance of general hospital, Rano, Kano State. The objective of the study is to determine the relationship between attendance timing and employee's productivity in general hospital Gezawa local government. The study reviewed different related literatures sourced from recent peer reviewed journal articles, textbooks, and previous research of scholars that are related to the study. Some of the preliminary findings showed that all the factors in attendance timing have a significant effect on employees' productivity in the state. Therefore, the study recommended that Attendance timing using biometric clocking system is very essential in a hospital setting; as such government should extend the program to other government owned hospitals in the state. The management of private hospital should also introduce the biometric system of attendance timing in order to address the issue of late coming and absenteeism from the place of work un-necessarily.

2.3 Theoretical Framework

Resource Based Theory (Underpinning Theory)

Birger Wernerfelt coined the term in 1984. However, most scholars consider Jay Barney as the father of modern Resource Based View (RBV). Resource based

theory states that the possession of resources is valuable, difficult to imitate, rare and cannot be substituted. The theory suggests that organizations should look inside the company to find the sources of competitive advantage through the use of their resources. The study was anchored in the Resource Based Theory (RBT). There is evidence from research that supports the RBT, Bourdage et al. (2018) argues that organizations compete in dynamic and changing business environment. Firms can attain and achieve a sustainable competitive advantage through their employees (Rubenstein et al. 2019). This can be realized when organizations have a pool of human resources that cannot be imitated or substituted by its rivals or competitors. The RBT as a foundation of competitive advantage is embedded in the utilization of a bundle of valuable resources that are at the disposal of the firm. It is important that firms have to identify the major potential resources. These resources should be valuable, rare in-imitable and non-substitutable among the competitors of the firm in the field that they operate in. A firm's resources must be valuable in order to make firms adopt value creating strategies. The RBT looks at the firm's internal operational environment as an important driver that can create a competitive advantage for the firm. The RBT makes an assumption that an organization is made up of unique capabilities and resources as a foundation for a firm's strategy to compete and be profitable and also have competitive advantage over its competitors (Rubenstein et al. 2019).

Organizations can use the resources at their disposal and capabilities to enhance their operational performance. In order to be competitive, firms should ensure that they carry out their activities in an integrated approach. Firms should also adopt strategies that distinguish them from other firms in the areas that they operate in. As a result, organizations need to explore their frameworks if they envisage remaining relevant in the context of the competitive global environment. Organizations are striving to achieve competitive advantage, they should put into consideration that true competitive advantage requires the resources of an organization to be valuable, rare,

inimitable and non-substitutable. The key aspect of the Resource Based Theory is that firms have to identify their main resources that can make the firms to achieve and sustained a competitive advantage against their competitors. A resource has to be valuable to organizations like specialist hospital Gombe are expected to make optimum use of time and the human resources that they have by ensuring that employees work fully for the scheduled time to enable specialist hospital Gombe enhance its operational performance in delivery of health services.

The critical assumptions of the RBV model explain competitive heterogeneity between companies. To transform a short-run competitive advantage into a sustainable one, the two critical assumptions of RBV are that the resources must be heterogeneous and immobile. Heterogeneous the first assumption is that skills, capabilities and other resources that organizations possess differ from one company to another. Immobile the second assumption of RBV is that resources are not mobile and do not move from company to company, at least in short-run. Resource-based view (RBV) is a modern and promising concept that provides insights on both strategic and organizational matter. It is a manner of viewing the organization and in turn of approaching strategy (Powell, 2007). Sustainable competitive advantages happen when a firm is executing a value-creating strategy that is not being executed by rivals and when these rivals are unable to replicate the benefits of this strategy (Henry, 2008). The achievement of sustainable competitive advantage can be anticipated to lead to higher performance measured in conventional terms such as market-share and profitability (Sheehan & Foss, 2007). Thus, the main purpose of this critique is to determine whether resource based view analysis has a strong relationship with firm's performance in attaining a sustainable competitive advantage. It is also to discuss the merits and demerits of RBV as the best strategy route in the development of a firm's strategy and strengths and weaknesses of the RBV analysis in achieving competitive advantage and the contribution to firm-level value creation.

Henry (2008) criticized the theory based on the dynamic environment faced by several firm, market positioning can become obsolete quickly because of new innovations, process enhancement and competitive environments. To compete successfully in these markets, it is said that organizations need to constantly craft new sources of competitive advantage. In order to achieve sustainable competitive advantage and good performance, it is said that resource based view theory is essential (Klein, 2011). RBV underlines the internal capabilities of an organization in creating strategy to attain sustainable competitive advantage in its market and industries (Henry, 2008). RBV claims that organizations achieve and sustain competitive advantages by deploying precious resources and capabilities that are inelastic in supply (Ray et al. 2004). Competitive advantage happens only in a situation of resource heterogeneity, diverse resources across organizations and resource immobility, the incapability of competing organizations to gain resources from other firms (Madhani, 2009). Given that competitive advantage occurs in a situation of resource heterogeneity, organizations should have some basic threshold resources in order to compete in the market (Andersen, 2011). A division should to be made between capabilities (resources or competences) that are at a threshold level and those that might assist the firms to achieve competitive advantage and higher performance. Threshold resources are significant but it does not of themselves generate competitive advantage or the source of higher performance. These are dependent on a firm having distinctive capabilities that rivals will find it complicated to replicate (Johnson, Scholes and Whittington, 2008). It is held that RBV can be used to discover if the organization possesses any strategic resources which can be able to be utilized to base the firm's strategy on. However, according to RBV, not each and every resources of an organization will be strategic resources. If managers can recognize these resources, it permits them to cherish these resources. Besides that, managers in underperforming organization may exploit the RBV to discover resources that are deficient and inspect if it can be alternate or replicate these resources (Sheehan & Foss,

2007). Strategic assets offer the organization with a source of stable stream of rents so that it achieves a sustained competitive advantage over its competitors. Barney proposes that such advantages depend “in a critical way, on the resource endowments controlled by the firm”. Hence, it is the stock of strategic assets that are significant in determining the organization profitability level. Moreover, managers should highlight on the utilization of already controlled resources to attain economic rents for the organization (Kochhar, 1997).

The study after thorough reviewed of the related theories discovered that resource-based theory explained the relationship between the variables under investigation; Attendance timing, employee identification and payroll computation and Employee performance. It's on the basis of the relationship between the variables that help to answer the study's questions. Resource-based theory therefore is the underpinning theory chosen by the study.

3. Methodology

3.1 Research design

A descriptive survey design was used for this study. The survey design was used to explain, explore and describe the variables. It was used to explore and describe the effect of computerized biometrics clocking system on employees' productivity in Murtala Mohammed specialist hospital using the data collected from the field survey. The method obtained information about people's opinions, attitudes and experiences that are difficult to observe directly.

3.2 Population of the study

The population of the study constituted the entire staff of Murtala Mohammed specialist hospital Kano. The hospital has one hundred and twenty six staff (126) as of 2023. The hospital has twenty nine qualified doctors and seventy eight nurses with lab technicians and other supporting staffs (Murtala Mohammed Specialist Hospital, 2023). The break-down is presented in the table below;

3.3 Sample Size and Sampling Techniques

It is the bases of the data where the sample space is enormous. It was determine using the formula for determining the sample size is Krecjie and Morgan.

$$S = X^2 NP (1-p) \div d^2 (N-1) + X^2 P (1-P)$$

Where S = sample size

X^2 = table value of chi square for 1 degree of freedom at the desired confidence level which is 3.841

N = the population size which is 126

D = the degree of accuracy expressed as a proportion which is 2.5

P = population proportion which is 92 based on the Krecjie and Morgan formula

$$\text{Therefore } s = X^2 NP (1-p) \div d^2 (N-1) + X^2 P (1-P)$$

$$N = 126$$

$$S = 3.8416 \times 126 \times 92 \div 2.5 (126-1) + 3.8416 (1-3.8416)$$

$$s = 44,531.827 \div 2.5 (125) + 3.8416 (-2.8416)$$

$$s = 44,531.827 \div 312.5 + (-10.916)$$

$$s = 44,531.827 \div 301.584$$

$$s = 148 - 44$$

$$s = \mathbf{114}$$

Therefore, the sample size is 114 as shown in the Krecjie and Morgan. The sampling technique used in this study is Stratified random sampling technique. The selection is based on the primary common characteristics of interest, the respondents possess and also in considering the research goal.

3.4 Method of Data Analysis

In the course of this study the research used two methods of data analysis; descriptive and inferential statistics.

4. Results and Discussion

Data are presented and discussed thoroughly.

4.1 Descriptive Statistics

This section provides descriptive statistics of the study variables, using minimum, maximum, mean and standard deviation. Below table describe the minimum and maximum coefficient value of the variables

Table 1 Descriptive Statistics of the Study Variables

Variables	N Statistics	Minimum	Maximum	Mean	Std. Div.
AT	98	1.80	3.20	2.277	.441
EI	98	2.60	4.40	3.587	.561
PC	98	1.60	3.80	2.655	.547
EP	98	1.00	5.00	3.544	1.365

Source: SPSS Version 25 Output, (2024)

Table 1 shows the minimum and maximum values of attendance timing (AT) during the study period are 1.80 and 3.20 respectively. The mean of the AT is 2.28. The standard deviation of AT is 44%, this indicates that the attendance timing tried to maintain the minimum development manipulate during the study time. The minimum and maximum coefficient values of employee identification (EI) are 2.60 and 4.40 respectively. Also, the mean and standard deviation of EI are 3.59 and 56% respectively. Payroll computation (PC) also maintained the minimum and maximum coefficient value of 1.60 and 3.80 with mean value of 2.66. The standard deviation of PC is 55%. Additionally, Employee performance (EP) has 1% and the coefficient of 5% for minimum and maximum respectively. The coefficient of mean value is 3.55 and standard deviation is also 1.37.

4.2. Normality Test

A normality test is used to determine whether sample data has been drawn from a normally distributed population (within some tolerance). A number of statistical tests, such as the Student's t-test and the one-way and two-way ANOVA, require a normally distributed sample population. Shapiro-Wilk test, Kolmogorov–Smirnov test, and D'Agostino-Pearson's K^2 test. Normal distribution, also known as the Gaussian distribution, is a probability distribution described with two parameters: the mean and the standard deviation. An assessment of the normality of data is a prerequisite for many statistical tests because

normal data is an underlying assumption in parametric testing. There are two main methods of assessing normality: graphically and numerically.

The quick start guide help the researcher to determine whether the data is normal, and therefore, that this assumption is met in the study data for statistical tests. The approaches can be divided into two main themes: relying on statistical tests or visual inspection. Statistical tests have the advantage of making an objective judgment of normality, but are disadvantaged by sometimes not being sensitive enough at low sample sizes or overly sensitive to large sample sizes. As such, some statisticians prefer to use their experience to make a subjective judgment about the data from plots/graphs. Graphical interpretation has the advantage of allowing good judgment to assess normality in situations when numerical tests might be over or under sensitive, but graphical methods do lack objectivity. However, this study used graphical method despite its objectivity.

4.3 Normal Q and Q Plot

In order to determine normality graphically, we used the output of a normal Q-Q Plot. If the data are normally distributed, the data points will be close to the diagonal line. If the data points stray from the line in an obvious non-linear fashion, the data are not normally distributed. As we can see from the normal Q-Q plot below, the data is normally distributed.

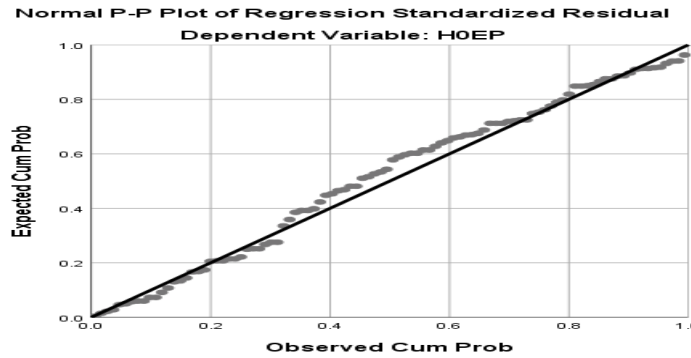


Figure 2: Normal Q and Q Plot
Source: SPSS Version 25 Output, (2024)

Points on the Normal QQ plot provide an indication of univariate normality of the dataset. If the data is normally distributed, the points will fall on the 45-degree reference line. If the data is not normally distributed, the points will deviate from the reference line. The Q and Q plot of the above figure 1 showed that the univariate of the data set is normally distributed at the point from reference line.

4.4 Multicollinearity Test

Multicollinearity test refers to the existence of a perfect or exact linear relationship among some or all

explanatory variables of a regression model (Daoud, 2017). Multicollinearity causes redundant information, which means that what a regression explains about the response is overlapped by what other regression or a set of other deterioration explains (Sannigrahi *et al.*, 2020). This study utilized the variance inflation factor (VIF) to test multicollinearity. The table below showed the collinearity between dependent variable and the independent variables and between the independent variables respectively.

Table 2: VIF Test for Multicollinearity

Model	Collinearity Statistics	
	Tolerance	VIF
AT	.998	1.002
EI	.991	1.009
PC	.993	1.007

Source: SPSS Version 25 Output, (2023)

From Table 2 above suggests that none of the variables has VIF of more than 5.0. Since VIF figure greater than or equal to (\geq) 10.0 shows Collinearity. The highest is 1.009 while the least is 1.002 Thus; the

variables of this study are free from Multicollinearity, as all the VIF values are below 5.0.

4.3 ANOVA

This subsection also presents the ANOVA result. The result is presented in the table below.

Table 3: ANOVA

S/N	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	28.305	3	9.435	5.810	.001
	Residual	152.638	94	1.624		
	Total	180.942	97			

Source: SPSS Version 25 Output, (2024)

Generally, 95% confidence interval or 5% level of the significance is chosen for the study. Thus the p-value should be less than 0.05. In the above table, it is .001. Therefore, the result is significant. Table 3 showed that there is significant relationship between the dependent variable and independent variables. This indicates a positive correlation. F value represents an improvement in the prediction of the variable by fitting the model after considering the inaccuracy

present in the model. A value is greater than 1 for F-ratio yield efficient model. In the above table, the value is 5.810, which is good. These results estimate that as the p-value of the ANOVA table is below the tolerable significance level, thus there is a possibility of rejecting the null hypothesis in further analysis.

4.4 Regression Result

Table 4: Model Summary

Model	R	R Square	Change Statistics				Sig. Change	F
			R Change	R Square Change	F Change	df1		
1	.596	.561	.561		5.810	3	94	.001

Source: SPSS Version 25 Output, (2024)

Table 4 reveals the R^2 value of 56%. This qualifies as a good R-squared value. According to Ozili (2023) assert that, any R-squared value that is between 0.10 and 0.50 (or between 10% and 50% when expressed in percentage) is acceptable in social science research only when some or most of the explanatory variables are statistically significant. The R^2 of 56%, the F change value of 5.810 (Prob. value = 0.001) indicates that the model is fit to explain the relationship

expressed in the study model and further suggests that the explanatory variable are properly selected, combined and used.

4.5 Coefficient of the Regression Result

The Coefficient table below shows the strength of the relationship i.e. the significance of the variable in the model and magnitude with which it impacts the dependent variable. This analysis helps in performing the hypothesis testing for a study.

Table 5: Coefficient Table

S/N	Model	Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Beta	Coefficients	T	
	H0 ₁ AT	1.132	.293	.366	3.861	.000
	H0 ₂ EI	-.312	.231	-.128	-1.348	.181
	H0 ₃ PC	-.156	.237	-.062	-.657	.513

Source: SPSS Version 25 Output, (2024)

Only Sig. value is important in interpretation. This study concern with the level of significances of the variables. If the value of any of the hypotheses is below 5% then we can say its significant and if its above 5% then we can also say is insignificant, and as such we may either accept or reject the null hypothesis. The value should be below the tolerable level of significance for the study i.e. below 0.05 for

95% confidence interval in this study. Based on the significant value the null hypothesis is rejected or not rejected. If Sig. is < 0.05 , the null hypothesis is rejected. If Sig. is > 0.05 , then the null hypothesis is not rejected. If a null hypothesis is rejected, it means there is a positive effect. However, if a null hypothesis is not rejected, it means there is negative effect.

4.6 Test of Hypotheses

H₀₁: There is no significant relationship between attendance timing and employees' productivity at Murtala Mohammed specialist hospital Kano state

Table 5 above indicated that attendance timing with significant value of 0.000. The hypothesis testing result of 95% confidence interval rejected null hypothesis with $0.000 < 0.05$). There are significant changes in the relationship between attendance timing and Employee performance. An increase in attendance timing brings about increase in Employee performance and vice versa. Thus, government and management should pay more attention on attendance which determines the presence of employees in the hospital. Finger print input take lesser time for recording, and attendance data can easily be captured through computerized biometric employee clocking system at Murtala Mohammed specialist hospital. The result corroborates the findings of Kisame (2016) and Nyaberi and Kwasira (2018) which showed that there is a significant relationship between Attendance timing and employee performance at More Teaching and Referral hospital.

H₀₂: There is no significant relationship between the employees' identification and Employee productivity at Murtala Mohammed specialist hospital.

Additionally, table 5 above further revealed the negative relationship between employees' identification and Employee performance, the result of the study showed insignificant evidence between the variables under investigation. The hypothesis testing result of 95% confidence interval accepted null hypothesis with $0.18 > 0.05$). There are no significant changes in the relationship between employees' identification and Employee performance in Gombe State specialist hospital. If the employee identification is higher then, the Employee performance will be at the lower level and vice versa. Biometric-based authentication did not use individual traits, employees also did not carry separate hardware tokens when clocking, all the identification items are secured and lastly all data are connected to all individual

employees of the hospital. This finding also goes in line with result of Lia Ciner (2019) which states that there is no relationship between employee identification and employee performance.

H₀₃: There is no significant relationship between the payroll computation and employees productivity at Murtala Mohammed specialist hospital, However, table 4.5 further revealed a negative relationship between payroll computation and employees performance. The coefficient value of payroll computation is 0.51 after the hypothesis testing result of 95% confidence interval force the study to accept null hypothesis with $0.51 > 0.05$. This depict that a decrease in payroll computation bring about decrease in Employee performance and vice versa. This finding goes in line with the result of Abdalla and Sankar (2019), which states that there is a negative effect of payroll computation and employee performance. Hypothesis from this study also indicated that payroll is not computed based on the hours worked but is computed based on number of days stipulated for employees to cover in every month.

5. Conclusion and Recommendations

Majority of respondents viewed that the attendance timing positively and significantly related to the employees' productivity at Murtala Mohammed specialist hospital. Additionally, given special consideration to attendance timing solve other challenges more effectively and help management to make wise decisions that will contribute to the survival of hospital. The study however, showed how crucial and difficult employees' identification is when using biometric clocking machine in the specialist hospital. The study concludes that there is negative and insignificant relationship between employees' identification and employees' productivity within the specialist hospital. High managerial abilities that exhibited by the management and government discourage employees from engaging on the work instead register/ do the thump print and go back home. Similarly, payroll computation is negatively related to the employees' productivity at the specialist hospital,

because computerized biometric employee clocking system does not help in determining the period within which an employees' work during the week and month because employee can only clock once he reported to his place of work, the machine does not capture the closing time. This is not same in the developed countries where the machine captures both opening and closing time and payroll is computed based on the hours worked.

Going by the study's summary and conclusion, the following recommendations should be taken into account by Kano state government and affected organizations if they want to successfully and efficiently achieve their goals and objectives of improving Employee performance:

- i. Attendance timing must be applied with proper caution. Technical errors such as

inability of the machine to save accurate data of the employee attendance that are prompt most be strictly addressed.

- ii. The nature of employees' identification system was not favorable to the current Nigerian situation, as the package may not be enough to cater the needs of the employees, as such employees' engage in other businesses that help them to sustain their life. Therefore, the method needs to be revisited.
- iii. The stakeholders and the government to create a supportive and enabling un-bias payroll computation exercises, and the packages offered as salary and allowances are not enough to comfort the employees to work effectively.

Reference

- Adams, J. S. (1963). Towards an understanding of inequity. *The journal of abnormal and social psychology*, 67(5), 422.
- Adams, J. S., & Freedman, S. (1976). Equity theory revisited: Comments and annotated bibliography. *Advances in experimental social psychology*, 9, 43-90.
- Albaqqali, N. A., & P Sankar, J. (2019). Empowerment and its relation with the job performance among the bank employees in the Kingdom of Bahrain. *International Journal of Engineering and Management Research e-ISSN*, 2250-0758.
- Abhilash K. Sharma, (2015). Biometric System – A Review. *International Journal of Computer Science and Information Technologies*, September, 2015.
- Achour, N., Elhaj, H., & Ali, A. (2022). Hospital resilience to extreme events: A staff capability of attendance perspective. *International Journal of Disaster Risk Reduction*, 72, 102851.
- AL-Adwan, M. M. (2016). The Impact of Information Technology on Health Sector Performance: Case Study–Saudi Arabia Health Sector. *The Pacific Journal of Science and Technology*.
- Acuity Market Intelligence, (2018). *Biometrics: high value workforce management: The critical role of biometric time and attendance to workforce management solutions*, White Paper, February, 2018
- Adewole K., Adbulsalam S., Babatunde R., Shittu T. & Olotede M. (2014). Development of finger biometric attendance system for non-academic staff in a tertiary institution. *Computer Engineering and Intelligent Systems Review*, 5, 2.
- Akinduyite C.O, Adetunmbi A.O, Olabode O.O. & Ibidunmoye E.O, (2013) Fingerprint-based attendance management system. *Journal of Computer Sciences and Applications*, 2013, 1(5), 100-105
- Bourdage, J.S., Goupal, A., Neilson, T., Lukacik, E. & Lee, N. (2018). Personality, equity sensitivity, and discretionary workplace behavior.

Personality and Individual Differences, 120, 144-150.

- Chou, E., Lin, C. & Huang, H. (2016). Fairness and devotion go far: Integrating online justice and value co-creation in virtual communities. *International Journal of Information Management*, 36 (1), 60-72.
- Cupido, (2011). *The implementation of a time and attendance system at Stellenbosch Municipality – a change management perspective masters project in public administration*. University of Stellenbosch 42
- Ciner, L. (2019). Setup for success: How to improve employee performance.
- Davlembayeva, D., Papagiannidis, S. & Alamanos, E. (2021). Sharing economy platforms: An equity theory perspective on reciprocity and commitment. *Journal of Business Research*, 127, 151-166.
- Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of management review*, 14(4), 532-550.
- Government of Kenya, (2014). *Ministry of health Kenya healthy policy 2014 – 2030* towards attaining the higher standards of health.
- Hitt O. D., Ireland V., & Hoskisson K. K. (2013). IT-Enabled Organizational Agility and Sustainable Competitive Advantage, *Working Paper Series*
- Iqbal, Y. & Bilali, R. (2018). The impact of acknowledgement and denial of responsibility for harm on victim groups' perceptions of justice, power, and intergroup attitudes. *European Journal of Social Psychology*, 48 (4), 397-411.
- Jalo, A. I., Usman, A. S., & Bala, A. (2023). Assessment Of Biometric System of Attendance Timing and Employee Performance at General Hospital Bajoga, Gombe State-A Conceptual Review. *Journal homepage: https://gjrppublication.com/gjrbm*, 3(06).
- Kisame, A. H. (2016). Effect of computerized biometric employee clocking system on operational performance of Moi Teaching and Referral Hospital (MTRH) Eldoret, Kenya. Research Project Submitted in Partial Fulfillment of the Requirement for the Award of the Degree of Master of Business Administration, School of Business, University of Nairobi
- Kim, T., Edwards, J.R. & Shapiro, D.L. (2015). Social Comparison and Distributive Justice: East Asia Differences. *Journal of Business Ethics*, 132 (2), 401-414.
- Kocakulah, M. C., Kelley, A. G., Mitchell, K. M., & Ruggieri, M. P. (2016). Absenteeism problems and costs: causes, effects and cures. *International Business & Economics Research Journal (IBER)*, 15(3), 89-96.
- Lund, D. J., Scheer, L. K., & Kozlenkova, I. V. (2013). Culture's impact on the importance of fairness in interorganizational relationships. *Journal of International Marketing*, 21(4), 21-43.
- Mulumba, M. (2012). *Biometric authentication systems and service delivery in healthcare sector in Kenya*.
- Nyaberi, D., & Kwasira, J (2018). Assessment of Innovative Strategies on Service Delivery at The National Hospital Insurance Fund Nakuru, Kenya. *International Journal of Business and Social Science*, 2(5), 142-14
- Oloyede, J. (2014). Addressing sustainability: a strategy development framework. *International Journal of Sustainable Strategic Management* 1: 3, 303-319.
- Omobayo, A. (2015). *Optimization of bimodal biometrics system for access control authentication in Kenya*, School of Computing, College of Science, Engineering and technology, University of South Africa.

- Omobogo, R.M. (2015). *Contemporary Strategy Analysis*, 4th ed., Oxford: Blackwell
- Ononiwu G. C. & Okorafor, G. N (2012). Radio frequency identification based attendance system with automatic door unit. *Academic Research International*, 2(2), March, 2012.
- Pavitra, E., Raju, G. S. R., Oh, J. H., Bharat, L. K., Jeong, J. H., Huh, Y. S., & Yu, J. S. (2017). (BaSr) 2SiO₄: Eu²⁺ nanorods with enhanced luminescence properties as green-emitting phosphors for white LED applications. *Dyes and Pigments*, 142, 447-456.
- Roland, G. (2017). An Elaboration on Measures to Promote Institutional Innovation, Transformation, and Inclusiveness to Enhance Public Service Delivery. *Review of Public Administration and Management*, 5(2), 1-4.
- Rubenstein, A.L., Allen, D.G. & Bosco, F.A. (2019). What's Past (and Present) Is Prologue: Interactions Between Justice Levels and Trajectories Predicting Behavioral Reciprocity. *Journal of Management*, 45 (4), 1569-1594.
- Russel, M. R. & Taylor, C. E. (2011). Research challenges in sustainable strategic management: change and sustainability. *International Journal of Sustainable Strategic Management*, 1(1), 2-15.
- Shawl D. (2013). *Biometrics* – implementing into the healthcare industry increases the security for the doctors, nurses, and patients.
- Shehu V. & Dika A. (2011). *Using real time computer vision algorithms in automatic attendance management systems*. Proceedings of the ITI 2010 32nd Int. Conf. on Information Technology Interfaces, June 21-24, 2010, Cavtat, Croatia
- Sprecher, S. (2018). Inequity Leads to Distress and a Reduction in Satisfaction: Evidence From a Priming Experiment. *Journal of Family Issues*, 39 (1), 230-244.
- Swanson, R. A. (2013). *Theory building in applied disciplines*, San Francisco, CA: Berrett-Koehler Publishers 2013
- Swift, J. (2010). *Where did time fly*: Practical unconventional tips to save and optimize time, CreatSpace Independent Publishing Platform, Amazon USA ISBN 13: 978-1452855325
- Voußem, L., Kramer, S. & Schäffer, U. (2016). Fairness perceptions of annual bonus payments: The effects of subjective performance measures and the achievement of bonus targets. *Management Accounting Research*, 30, 32-46.
- Walster, E., Berscheid, E., & Walster, G. W. (1973). New directions in equity research. *Journal of personality and social psychology*, 25(2), 151.
- Woodward, G., Combs, J. G, Galbreath, J. & Scholes, K., (2012). *Exploring Corporate Strategy*. 6th Edition, Prentice Hall of India, New Delhi.
- W. Yang, J. Hu, and S. Wang (2017). "A Delaunay quadrangle-based fingerprint authentication system with template protection using topology code for local registration and security enhancement," *IEEE Trans. Inf. Forensics Security*, vol. 9, no. 7, pp. 1179–1192