Are Biometric Attendance Registers a Panacea for Workplace Absenteeism in Tanzania? A Lesson from Public Secondary Schools in Nyamagana Municipality

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Abstract

Teachers' workplace absenteeism is widely reported in countries like Tanzania. Left unaddressed, the problem negatively affects institutions and students' academic excellence. In response, use of digital technology, including deployment of biometric fingerprint attendance registers is thought to bring a novel opportunity for mitigating the problem. However, the extent to which biometrics is effective in managing employees' attendance in countries like Tanzania is yet to be known. This study draws experience from Nyamagana Municipality to ascertain the effectiveness of biometric fingerprint attendance registers in addressing teachers' workplace absenteeism. The findings unveil challenges that blur the effectiveness of biometric fingerprint attendance registers in the studied district. With ICT, teachers can still falsify their workplace attendance. More so, unreliable power supply and COVID-19 pandemic have heightened the challenges related to effective utilisation of the fingerprint machines in managing teacher absenteeism. The study recommends that an effective design and use of digital technology in managing teachers absenteeism should take into account the sociological aspects in educational industry.

Key Words: *teachers, absenteeism, biometric attendance register, fingerprint, public secondary schools, Tanzania*

Introduction

Teachers' workplace absenteeism[3] is a chronic problem in East African countries (Garaba, 2021). For example, in Uganda, teachers are consistently reported for absenteeism cases (which range between 21% and 27%), and it affects the execution of all their professional duties like preparation of schemes of work, lesson plans and weekly duties (Zikanga et al., 2021; Khamis, 2009). A relatively similar but higher problem is also noted in Kenya. In Kenya, teachers' absenteeism rate ranges between 20 percent and 44 percent (Donflo & Hanna, 2005; Khamis, 2009; Ejere, 2010). The situation is also echoed in Tanzania where various studies on teachers' workplace absenteeism presuppose that the rate of the problem is even higher than in other East African countries (Baker, 2010; Garaba, 2021). A study by the World Bank (2011) indicated that about one in four teachers in Tanzania is absent from school on any given day. Besides, more than a quarter of pupils and teachers who responded in a study by Betweli (2013) on teachers' professional misconduct in Sumbawanga indicated that absenteeism is still a big challenge. Additionally, Nombo et al. (2020) reported that the rate of teachers' absenteeism heightens in Tanzania, especially during rainy seasons.

Several studies have reported negative consequences of teachers' workplace absenteeism in school management, expenses and students' performance. A study in sub-Saharan Africa, by Harber (2017) revealed that an increase in teachers' absenteeism to 5 percent can reduce learning gains of Grade 5 students (of English and Mathematics subjects) by about 4 percent. A study carried out in Kenya by Muasya (2016) concluded that the escalating teachers' absenteeism resulted into some teachers' failure to cover syllabi and affected pupils' performance. Such a claim corroborates Atetwe's (2021) postulation that there is a significant relationship between teachers' absenteeism and pupils' achievement in primary schools in Vihiga sub-county, Kenya. A similar observation is made by Guidorzi and Karamperidou (2020) who argue that teachers' absenteeism is one of the most troubling obstacles towards the attainment of universal learning in developing countries, for it leads to several negative impacts on teaching and learning together with a serious waste of employer's funds. As Guidorzi and Karamperidou (2020) estimated, losing teaching hours due to absenteeism corresponds to losing approximately 46 cents in every dollar invested in education.

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[3]Workplace absenteeism is a consistent failure to appear for work or other usual duties as per the employment contract (Kozioł & Kozioł, 2016; Kipangule, 2017).

Various measures have been put in place to mitigate the problem of employees' (including teachers) workplace absenteeism. Traditionally, signing attendance register books was the primary technique used by employers for keeping teachers' attendance records and control their workplace absenteeism (URT Public Service Standing Orders, 2009; Mgonja, 2017). The attendance register was an important tool for the management and monitoring of employees who practiced late arrivals, early departures, and/or total absenteeism. More so, attendance registers could provide evidences to testify against a teacher once he/she is charged with absenteeism misconduct, and once proved guilty, a teacher was likely to be warned and/or his/her salary was stopped or deducted. Such a document was also used to determine employees with an outstanding performance, and who might be honoured with financial incentives, among others (Bowers, 2001). However, forgeries of attendance records in such traditional and analogical registers, as Mgonja (2017); Masiaga (2017) as well as Darwis et al. (2021) contend, was a common experience amongst employees that had implications for employees, service beneficiaries, and employers as well.

Thanks to evolution of information and communications technology (ICT), which Hasanain (2016) and Evans (2021) praise to have opened a window for novel opportunities in controlling employees' workplace absenteeism. For example, Evans (2021) notes that digital technology works by either supplementing traditional methods of managing employees' attendance or can replace them by devising new digitised techniques and/or devices. ICT facilities like cameras, smartphones and biometric machines, among others, are used to monitor employees' (teachers) attendance at work.

In India, for instance, pupils were provided with tamperproof date and time functions cameras and instructed to take photos of teachers to prove their attendance in class (Bolton, 2016). Such a program which was done as a trial in remote rural India, where regular monitoring of teaching proved problematic, was effective in increasing teachers' attendance in class. The implication here is that if used properly, technology plays a key role as it shapes employees' behaviour and increases productivity including service delivery performance in an organisation. In Indonesia, Android-based attendance management system (AAMS) was devised to monitor teachers' attendance and their teaching activity at a private university in Jakarta (Suryaman & Mulyono, 2019). Connected to a phone's Global Positioning System (GPS), the device's effectiveness was limited to access of application only to a particular position. The AAMS feature required teachers to complete these three tasks to be counted as present in the class: check students'

attendance in the classroom, describe the topic being taught, and save the data to the system (Suryaman & Mulyono, 2019). However, the AAMS suffered from several challenges: the technology was not time friendly because teachers spent long duration to apply AAMS, and it affected teachers' teaching plans. More so, poor internet connectivity was another barrier of AAMS (Suryaman & Mulyono, 2019). Unexpected cases of AAMS' system error also caused wrongly penalisations of teachers, and some teachers manipulated their attendance by modifying the GPS data input to enable them make forgery of their attendance.

Technological experiments in controlling employees' absenteeism were also deployed in the Punjab Province of Pakistan in 2011. A smartphone-based system was used in provincial health department to replace the paper-based monitoring system. With the system, collection of data on facility utilisation, resource availability and workers absence were done online (Callen et al., 2016; Bolton, 2016; Hasanain, 2016). The system also allowed health system inspectors to upload the results of their assigned visits to a basic health facility to an aggregating website (dashboard), which instantly transmitted the information to senior government officials, who used it to provide feedback to local staff (*ibid*.). Compared to the previous project in India, Pakistan's project proved effective since it substantially increased doctors' attendance at work (Callen et al., 2016; Bolton, 2016). Furthermore, in Udaipur, India, a non-Governmental Organisation (NGO) called Seva Mandir, installed a date and time-stamping machines in clinics to monitor nurses' attendance and help local government officials implement incentives for good attendance and penalties for absentees (Zhang, 2014). Unfortunately, the initiative was sabotaged by the administrative staff who expected to support the project, thereby denoting the necessity of political will, commitment, and patriotism when dealing with workplace absenteeism.

As exemplified in the cited studies, one can surely say that employers have sincere intention to address employees' absenteeism through deployment of ICT. However, effectiveness of ICT programs in managing human behaviours is still a matter that needs serious scrutiny. In due regard, it is even the case with developing countries like Tanzania where such technological advancement is at the early stage.

Biometric Fingerprint System
One of the possible ways through which information and communications technology (ICT) can benefit the management of human resources worldwide is through the introduction of the biometric fingerprint system. Indeed, ICT

facilities (including biometric fingerprint machines) are now used in many private and governmental institutions and government parastatals in tracking employees' attendance at work across the world. Such fingerprint machines refer to electronically detect an individual's unique identity through some of their measurable physiological or behavioural traits like fingerprint patterns, facial appearance, voice patterns, and iris recognition, among others (Adewole et al., 2014). Thus, the said eccentricities are used for identifying two categories of biometrics, namely, physiological and behavioural biometrics as summarised in Figure 1.
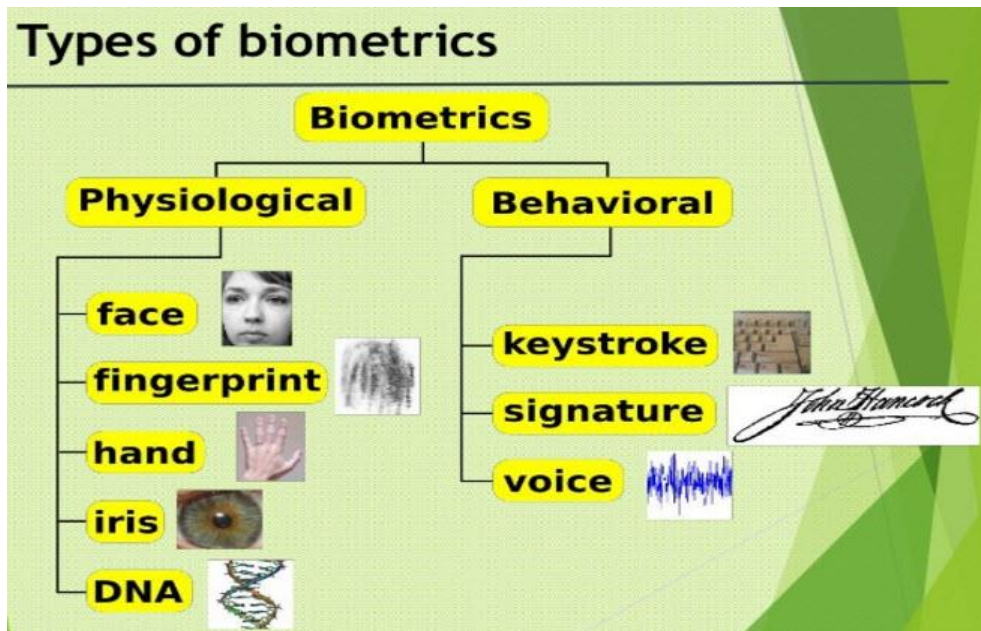

Figure 1: Physiological and Behavioural Biometrics[4]

Figure 1 indicates that physiological biometrics are operated via traits that can identify "what a person is" and they involve measure of physiological parameters of certain parts of an individual's body (as already mentioned in this paper). On the contrary, the behavioural biometrics are concerned with characteristics that are related to "What a person does or how a person uses the body" (Wang et al., 2009). Behavioural biometrics work through recognition of signature, handwriting, typing pattern, emotional cues plus paralinguistic cues, voice, gait and keystroke dynamics, among others (Mittal et al., 2015). Currently, and as Mittal et al. (2015) put it, fingerprint

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[4]https://www.elprocus.com/different-types-biometric-sensors/

recognition is increasingly becoming an official governmental employees' means for registering workplace attendance.

In the biometric fingerprint attendance register system, one marks their attendance through the electronically captured fingerprints, and such records are stored in a database for future references (Adewole et al., 2014; Dameria et al., 2020). Using such a device seems to some employee as replacing the traditional manual attendance register books, which for a long time was used by employers to track and enforce employees' attendance at work places (Paul, 2014; Benedicto, 2015; Mgonja, 2017; Betweli, 2020; Darwis et al., 2021). Allegedly, this shift might reduce challenges accompanied with the manual attendance register book such as the possible forging of signatures or fraud to falsify good attendance and discipline among employees (Masiaga, 2017). As it is repeatedly reported, employees forge signatures of their colleagues to falsify the latter arrivals at work on time (Darwis et al., 2021). Regarding such case, Dameria et al. (2020) opine that paper-based attendance management systems are inefficient, time consuming and error prone and because of such aspects, employers and other stakeholders have been exerting more efforts to automate employees' attendance management. Digitalised attendance systems, including the introduction of biometrics fingerprint attendance registers, have served that purpose in many countries.

Tanzania is among the countries which have chosen to use the biometric system (fingerprint machines) in managing employee attendance.[5] Such a measure is especially crucial in urban settings. Initially, the system was used in some private organisations like banks, garages and communication companies, among others, to monitor, track and evaluate their employees' working durations and attendances[6] and later on, the system was adopted by public organisations. Currently, most of public organisations like hospitals, universities and secondary schools use biometric fingerprint machines to manage employees' attendance (Packel et al., 2021), a case also reflected in Tanzania.

There have been studies on the efficacy of biometric technology in dealing with employee workplace absenteeism. Studies (for example, McKenzie et al., 2014; Dameria, et al., 2020; Raj & Mahajan, 2021) show that biometric systems are effective tools for managing employees' attendance, and can be opted to combat the problem of employee workplace absenteeism. For instance, according to McKenzie et al. (2014), the fingerprint attendance

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[5]https://www.id4africa.com/2019_event/presentations/InF14/4-Juliet-Kiluwa-FSDT.pdf
[6] https://www.techgurugarage.com/essl-time-attendance-systems-in-Geita/

system is associated with lower rates of employees' (teachers) absenteeism in Indonesia. Likewise, Dameria et al. (2020) comment that fingerprint attendance registers can have influence on employees' working discipline and performance. Such assertions are echoed by Raj and Mahajan's (2021) proposition that there is a positive relationship between fingerprint-based attendance management system and employees' punctuality. Based on these scholars' observations, employers can confidently opt to use biometrics technology in managing workplace absenteeism and behaviour because the strategy promises a significant improvement on the productivity and service delivery performance.

Generally, the reviewed literature presents three viewpoints regarding management of teachers' workplace absenteeism. That is, teachers' workplace absenteeism is still a problem, and it undermines smooth service delivery, using manual attendance register books provide loopholes for teachers to fake their attendance at work and that evolution of science and technology (ICT) can provide novel opportunities for managing workplace absenteeism. Regarding the latter assertion, studies on biometric fingerprint machines, especially in Asia, have shown that the technology is more effective than manual attendance register books. However, the extent to which biometric fingerprint attendance register management is effective in managing the problem of employee workplace absenteeism, especially in countries lagging behind technologically, such as Tanzania, is still unknown. The current study argues that gaining insights into the digitized attendance management systems will inform policy makers to make sound decision. That said, the current study investigates whether or not this current technology can successfully address the problem of workers' absenteeism in Tanzania by focusing on Nyamagana Municipality in Tanzania, one of the districts where biometrics fingerprint attendance registers are used to manage teachers' attendance at work.

Theoretical Perspective
Various theories explain strategies for addressing employees' (teachers) workplace absenteeism. Classical theories, for instance, recommend for scientific management approaches in addressing the problem while other groups of scholars advocate human relations approaches. Frederick Taylor, one of the proponents of scientific management approaches, proposes that workers in an organisation are motivated to perform better when given monetary incentives (Shields et al., 2015; Locke, 1982). That is to say, provided with incentives, teachers are motivated to improve their attendance at work. Such stance is the point emphasised by Victor Vroom's (1964)

expectancy theory. According to him, employees work for a price, they have their own expectations; if their expectations are met, they will show up in the work, but if they are not being satisfied, they will be de-motivated, and so, they will likely not attend as per contractual agreements. However, the major criticisms levelled against scientific management approaches include that the approach is inconsiderate of the view that employees' social factors (human relations) such as culture, social groups, co-operation within an organisation can motivate one to work (Locke, 1982). This argument corroborate Dempsey et al. (2018)'s argument that social factors like peers' behaviour and attitudes can guide or constrain social behaviours without the force of law in an organization. In this case, Korajczyk (1961) argues that employee's position in a group is so important that rather than violate his group's norm of conduct, the employees would not make use of the financial incentives. This implies that employee's (teacher's) decisions on whether to attend to the workplace or not may sometimes not be controlled by financial incentives, or the existing laws, but can be controlled by the social norms existing in an organisation.

The human relations approach founded by Elton Mayo also provide insights on how to deal with employees' problems (workplace absenteeism inclusive) (Korajczyk, 1961; Bruce & Nyland, 2011; Omodan et al., 2020). This approach advances the view that quality relationship in an organisation promotes employees 'effectiveness. As implied, the human relation approaches entail that sociological aspects are important in shaping employees' behaviours in an organisation. As such, any plan to manage employees' behaviour should consider the sociological aspects such as communications, honesty, social relationships, social conformity, culture, among others, surrounding employees who are by foremost social beings.

Another important theory in addressing employees' workplace absenteeism is the theory of planned behaviour (TPB) Figure 2).
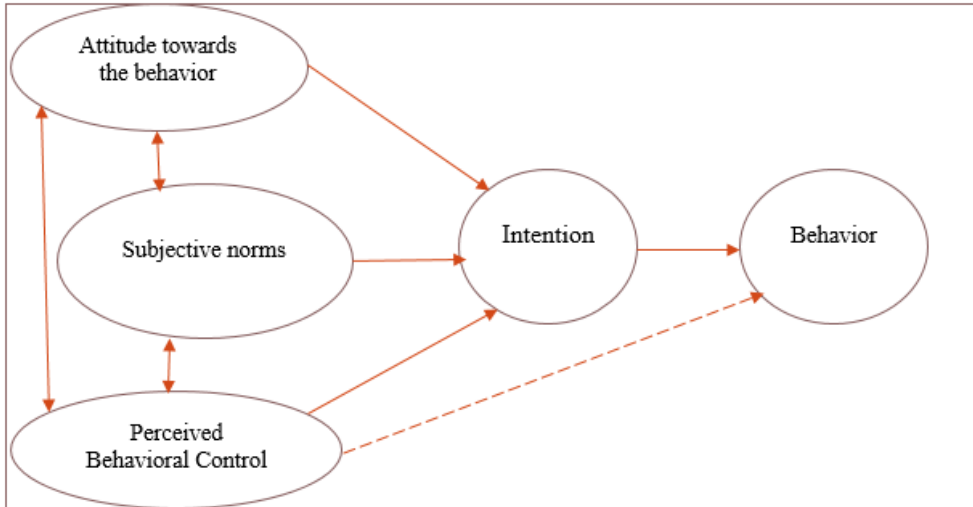
Figure 2: Theory of planned behaviour (TPB)
Source: Ajzen (1991).

The TPB was introduced by Ajzen (1985) as an extension of the theory of reasoned action. The theory is guided by assumptions that an individual's behavioural intentions in an organisation can be shaped by attitude, subjective norms, and perceived behavioural control (Ajzen, 1985). For a person to perform a certain action, he/she must have a supporting attitude on it and a social pressure (subjective norms). However, unforeseen events can cause expected behaviour to change over time and inverse the accuracy of the prediction (Ajzen, 1985). This means that some of the employees' behaviours are performed involuntarily, given unforeseen events that intervene their initial working intentions. That is, where the "behavioural control" approach should come in. "Behavioural Control", which entails people's perception on one's ability to perform a particular behaviour is the focus of TPB (Ajzen, 1985). Even so, Barber (2011) criticises the theory of planned behaviour (TPB) for disregarding the factor that employees may intentionally behave in ways that are irrational. Sniehotta et al. (2014) elaborate that TPB has static explanatory nature, which does not help to understand evidenced effects of behaviour on cognitions and future behaviour.

In a nutshell, the above reviewed theories shed light on the behaviour of employees in an organisation. And thus enable employers to devise strategies to manage them and eliminate problems that may affect productivity and service delivery performance such as workplace absenteeism. Among other things, Taylor in Scientific management theory emphasizes monetary incentives for employees' permanent personal benefits. This means that for

Taylor employees' workplace behaviour can be scientifically shaped through the provision of good salary, bonuses and supervision, among others. Similarly, Eton Mayo emphasizes that employees' needs, like feeling of belonging and recognised in an organisation, are more likely to determine their morale than the physical conditions of the work environment. To him, the informal or formal social grouping in the workplace, such as team effort, social conformity and group loyalty, which determines individual and group behaviour are necessary. Employees are motivated when their social and psychological needs are met, coupled with economic incentives (Bruce & Nyland, 2011; Omodan et al., 2020). Thus, Mayo insists that for monetary incentives to be meaningful must be accompanied by the fulfilment of social and psychological needs. Mayo's arguments in the Human Relations Theory are in line with TPB, which in addition to emphasizing attitude and social norms (social pressure), underscore the existence of other mechanisms of behavioural control in an organisation. The TPB holds that employees' behaviour in an organisation results from their intentions derived from attitude and social norms or social pressure (Ajzen, 1985). So employers need the mechanism to shape employees 'attitudes and social norms towards the desired behaviours.

Although it would seem that no single theory can suffices in explaining employees' behaviour, the TPB was considered the most appropriate for studying the problem of teachers' workplace absenteeism and Biometric attendance registers in Nyamagana Municipality despite the criticism levelled against this theory. The TBP relates to the current study based on view that the study assumes that teachers manifest certain attendance behaviour as motivated by their intentions. However, uncertainties might interfere with some of the employees' intentions and as such, may result into inverse predictions (such as absenteeism). This view calls upon placements of effort to control employees' behaviour to ensure that their intentions for good attendance result into actual behaviour. That said, the current study regards employees 'decision to install biometric fingerprint attendance registers as aiming at controlling teachers' absenteeism behaviour. In Nwobi et al. (2020) views, employers' deployment of electronic register can be regarded as their effort to predict outcomes. Such outcomes can be translated as attempts to reduce teachers 'absenteeism, poor supervision of attendance, and to control institutional culture. Supposedly, this assertion explains the reason employers in Nyamagana Municipality have chosen biometrics fingerprint attendance registers to reduce challenges related to manual attendance register, which hindered accurate and timely attendance monitor. They too might have hoped that technology would shape teachers 'social relationship in work and change

absenteeism culture as it will instil the spirit of good as well as timely attendance at work, which will then increase productivity and service delivery.

Methodology

Most scholars who studied effectiveness of ICT in managing (employees) teachers' workplace absenteeism used scientific experimentation methods like machine-learning and design-based research (DBR) approach (Suryaman & Mulyono, 2019; Callen et al., 2016). Moreover, despite the available studies on the effectiveness of digital mechanism in managing workplace absenteeism, little is still known regarding the matter, especially in countries disadvantaged technologically and which slowly adopt biometrics as promising means to mitigate the problem like Tanzania. This study employed a qualitative case study design in collecting and analysing data to ascertain an in-depth understanding of success and challenges of the biometric technology in mitigating teachers' workplace absenteeism in Nyamagana Municipality, Tanzania.[7]

Nyamagana Municipality in Mwanza Region was randomly chosen through simple random technique to reduce selection biases. The table of random numbers was used to select the region and district for this study. The research used mainly non-probability sampling strategies in selecting participants because it wanted to gain a thorough understanding of teachers' workplace absenteeism as a phenomenon in the studied region. Thus, the study purposively conducted interviews with 18 key informants (who included one human resource officer (HRO); one municipal education officer; two Teachers Service Commission (TSC) officials; two school inspectors; four secondary school heads and eight teachers who, to cite Aberbach and Rockman (2002), are the most relevant to the study given their professional knowledge of the researched phenomenon. In due regard, the informants were purposively selected by virtue of their positions and their firsthand awareness on the issue studied. The informants were interviewed and the sample size reached data saturation level. It is a phenomenon evoking Aberbach and Rockman's (2002) as well as Newing's (2011) assertion that in qualitative research, the sample size level is determined by the saturation point reached. Table 1 presents a summary of participants of the study.

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[7]Scholars consider qualitative to be the best approach for social sciences' research which aim at finding an in-depth understandings of the issue under study (Tummers & Karsten, 2012; Corbin & Strauss, 2014)

Table 1: Participants of the study

S/N	Category of the Participant	Number
1.	Human Resource Officers (HRO)	1
2.	Municipal Education Officer	1
3.	TSC officers	2
4.	School Inspectors	2
5.	Head of schools	4
6.	Teachers	8
Total		**18**

Amongst the participants, the HRO, DEO/MEO and TSC officials were purposively selected because they act as part of teachers' employers and disciplinary authorities. They have first-hand experience in addressing teachers' disciplinary issues at work. They participate in decision-making sessions on various matters facing teachers (including teachers' workplace absenteeism). Among others, school heads were selected as informants of this study because they have direct supervisory responsibilities in ensuring teachers' attendance and know teachers' behaviour. They spend most of their time dealing with teachers' affairs and crosscheck teachers' attendance registers. Thus, school heads provided the researchers with detailed information on how biometric attendance register contributes to monitoring teachers' attendance, successes, and the challenges they face in using such technology.

Also, teachers were selected for this study because they are, presumably, the kind of individuals' behaviour pertaining to work places' absenteeism. Thus, they provided an account about teachers' absenteeism based on their experiences as practicing teachers. They are individuals, whose records and behaviours are monitored by attendance registers. With such properties, they have experience to speak about the ABCs regarding using the biometric fingerprint technology in managing teachers' attendance.

The study employed in-depth interviews and documentary review in collecting both primary and secondary data, respectively. The in-depth interviews consisted of unstructured questions, which gave room to participants to construct meanings from their own frame of reference or orientation. In-depth interviews were pertinent to this study, for they allowed participants to answer questions in highly flexible and detailed manners. Such detailed flexibility provided the researchers with further information regarding participants' attitudes, values and opinions regarding the use of

biometric attendance registers in mitigating teachers' workplace absenteeism.

In-depth interviews gave the researchers flexibility to ask follow-up questions or revise their questions in order to obtain additional relevant information where the researchers required clarification, and where the information yielded did not match asked questions. The documentary review method was also used. The method involved reviews of existing documents, including Public Service Standing Order of 2009 and Teachers' Service Commission Act of 2015. Complementing the use of the said methods of data collection ensured that the findings that were obtained were reliable.

Regarding data analysis, the study employed the content analysis strategy, which is deemed the most appropriate approach for the analysis of data collected from interviews, books, speeches, web content, and newspapers (Weber, 1990; Neuendorf & Kumar, 2015; Kyngäs, 2020). Thus, qualitative data collection methods used by this study facilitated the said data analysis method. Primary and secondary data (which were obtained from interviews and documentary review respectively) were coded, organised, summarised, and categorised in manageable units to determine patterns of meanings in each unit, as reflected in the proceeding section. The said units were then arranged into statements that denote key themes dealt with in this paper. Similar and related themes were grouped into broad ideas, and were then used to address the objectives of the study.

Teachers' Attendance Register System in Tanzania
The United Republic of Tanzania (URT) Public Service Standing order (2009) directs all public employers to record attendance of their employees daily during office opening and office closing times. For instance, section "F2" of the Public Service Standing Order (2009) states that:

> "In order to maintain a record of the time of arrival of public servants on duty, attendance registers shall be maintained by a public organisation. The register shall be signed by members of staff at all levels employed in offices, teaching institutions, hospitals, etc. except those who are required to work in 'shifts'"

This extract denotes powers vested on public institutions' managers to manage employees' attendance at work by introducing attendance registers, which should be signed by employees on a daily basis to mark their arrival or departure from their workplace. The section also outlines various directives to supervisors on how to administer employees' attendance by describing

official hours in which the public employee is expected to be available in his or her work place. It reads:

> "The supervising officer in the office, institution etc. shall be responsible for the proper maintenance of the register which shall usually be kept at a convenient place in the office premises. He shall ensure that the register is available for signature as follows:
>
> (a) Before the commencement of every working session; a blue or black line shall be drawn at 7.30 a.m. immediately below the last signature of public servants who have signed the register, and Column 5 of the register shall be signed;
>
> (b) After the commencement of the working session, a red line shall be drawn at 7.40 a.m. immediately below the last signature of the public servants who have signed the register and Column 5 of the register shall be signed;
>
> (c) The register shall be withdrawn at 8.00 a.m. and public servants who report for duty after the attendance register has been withdrawn shall report to the supervising officer and sign the register in his presence;
>
> d) Approved late attendance shall be recorded by the supervising officer in the remark's column; and
>
> (e) The supervising officer shall submit the attendance register to the Head of Division or Institution for inspection on the 15th and 30th day of every month" (Tanzania Public Service Standing Order, 2009:114).

It implies that public employees (say teachers) who arrive after 7. 30 a.m. at work can be charged for being late, and one who leaves the office before 3.30 p.m. commits an early departure offence. The information in section "F 2" of the Public Standing Orders indicates that the attendance register is in the form of a book (manual attendance register book). Employees should sign such book(s) and supervisors must draw a margin separating early comers from latecomers. Such directives from the public standing orders reflect the assumption of the TPB theory that employers can put in place mechanisms for shaping employees' attitude and social norms toward good performance (Ajzen, 1985).

Notably, the manual attendance register book has been used to manage employees in Tanzania for quite a long time. However, with advancements in science and technology, there are now various systems to monitor teachers' attendance including biometric fingerprint attendance devices. This study noted that Tanzania uses both systems (manual attendance register book and biometrics fingerprint attendance register) in managing teachers' workplace absenteeism. While biometrics fingerprint attendance register is mostly used in urban schools, the manual attendance register book is used both in urban and, preferably, in rural areas where most schools are yet to install or adopt the new technology. The forthcoming section presents the form of attendance register system used by teachers in Nyamagana Municipality and the extent to which it helps in mitigating teachers' workplace absenteeism.

Experience in Nyamagana Municipality

Nyamagana Municipality is one of the councils in Tanzania that have installed biometric fingerprint attendance infrastructure to manage teachers' attendance, especially in secondary schools. Such adoption conforms to the TPB theory, and is in line with Dameria, et al. (2020) as well as Raj and Mahajan's (2021) proposition that the fingerprint attendance system has significantly changed the way employers manage employees' attendance at work with ease and accuracy. Therefore, suggestive of this assertion, most of secondary schools in the Nyamagana Municipality have transformed from using the manual attendance register books to the biometric fingerprint attendance registers. This study noted that biometric fingerprint attendance register devices are used both as a tool for record keeping and as a means or measure for controlling teachers' workplace absenteeism in Nyamagana. Figure 2 shows a biometric fingerprint machine mounted on the wall of one of the secondary schools in the Nyamagana Municipality.
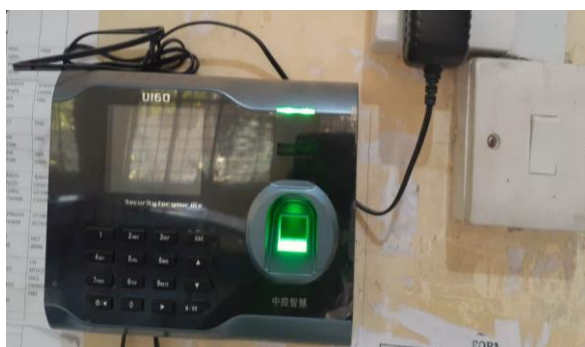

Figure 2:   Biometric fingerprint machine in one of Secondary schools, Nyamagana Municipality.
Source: Field Data, August, 2020.

This modern technology recognizes, matches and keeps records of employees' fingerprints. One has to sign in by putting his or her finger into the machine, and the machine records the time, day, and hour one has signed in.

Nevertheless, in Nyamagana Municipality, it was noted that schools without fingerprint reading machines continue to use the ordinary means — the attendance register book for tracing employees' presence at work. One respondent had this to say:

> "Currently, we are moving from the old manual attendance register to modern technology, which enhances the accuracy of attendance data. However, we have not yet been able to put in place the infrastructure of this new attendance system in all schools. We have started with secondary schools in the city, and intend to install the devices in all schools in Mwanza Region. Presently, schools that have not installed the devices still use the old system" (Interview, NYM 2, August 2020)

Apparently, the fingerprint attendance registers in Nyamagana Municipality came to address the challenges associated with the manual attendance register books. The study ascertained that previously, all schools used manual attendance register books for recording teachers' attendance. However, there were many challenges associated with the method, and it escalated the severity of teachers' absenteeism. For example, some teachers could forge signatures of their colleagues to mark them as early comers at work. Likewise, a teacher may arrive at a work place, say at ten (10:00 a.m.), but he/she indicates an earlier arrival (say at 7:30 AM). In some tricky scenarios, attendance books went missing as employees attempted to hide or falsify their attendance records. They may also tear up pages that bear evidence that they are latecomers. One of the respondents revealed that:

> "Before we started using the biometric device, it was very difficult to ensure that every teacher signed the exact time he/she arrived at work. Many were lying. They will arrive at 8:00 a.m. but falsely signed as though they arrived at 7:30 a.m. ......In some instances, they hid the attendance register. But with this new technology, there is no way a teacher can lie about the time he/she arrived at work" (Interview, NYM 1, August 2020)

It is then evident that those through biometric fingerprint attendance registers, employers and supervisors expect to get the actual time teachers sign in and out of their offices. Such a reality corroborates with Masiaga (2017) as well

as Darwis et al.'s (2021) proposition that the manual attendance register books have several weaknesses including loophole for teachers to lie on their attendance. Fingerprint attendance registers then have come when they are mostly needed in the Nyamagana Municipality. However, the effectiveness of such technology depends further on how well Nyamagana Municipality's management team has organised itself to ensure that technology delivers the expected results in mitigating absenteeism of its employees, a concern dealt in the forthcoming section.

Militating Factors
One question, which the current study tackled is the effectiveness of biometric fingerprint attendance devices in mitigating teachers' workplace absenteeism in Nyamagana Municipality. In this regard, it was noted that biometric fingerprint attendance registers in the Nyamagana Municipality have only ended the problem of some teachers committing fraud by signing late, earlier departures or total absenteeism for teachers. This is because as the system involves reading fingerprints, which are unique to a person, there is no possibility for a teacher to sign on behalf of another, as it is in the manual attendance register books. With the biometric fingerprint attendance registers, a teacher must physically arrive at his or her workstation for the biometric fingerprint machine's signing process that must recognise his or her finger. Thus, it becomes easier to get accurate information of late teachers and those who did not attend at work. One respondent had this to say:

> "These fingerprint machines have eliminated the behaviour of one teacher who comes to work early in the morning, and signs on behalf of his or her colleagues to mark them early comers. That habit is over because individuals' fingerprints vary from one person to another. Thus, any forgery can be easily detected" (Interview NYM 5, August 2020).

This implies that biometric fingerprint machines have alleviated the misbehaviour of some employees (teachers) to forge signatures of their colleagues. The eliminated behaviour not only contributed to the problem of employees (teachers) absenteeism being chronic and affected students' performance and employers' investment, but also created a fraud behaviour that could develop other criminal cases such as theft.

However, as stated in the preceding section, the findings from this study show that even with these machines, the problem of teachers' absenteeism persists. This is contrary to McKenzie et al.'s (2014) assertion that biometric

fingerprint attendance system is effective in dealing with employees' (teachers') workplace absenteeism, a claim that this study has proven otherwise. Unexpectedly, with the machines, it is even increasingly becoming highly difficult to prove one's absenteeism when accused. Some teachers can still falsify their attendances and departures from work. Such is so because some teachers can sign early in the morning on a fingerprint machine and subsequently, leave and go where they wish. Then they would go back in the evening to sign off on the machine, pretending to have been at the school at all the time. This is what one of them said:

> "…you know, some of teachers do their businesses here in the city. There are those who have stores for selling clothes, drinks, those who operate *bodaboda* and so forth. So, in the morning they come and sign in and off they go to attend to their business ventures. In the evening, they come back to fake sign offs. Now, how do you get hold of such a person for absenteeism? And since she/he is here in the city, when you call him/her, she/he comes immediately and pretends to have been at work: 'I just went out of the school to buy drinking water or medicine.' When you track him/her, the machine verifies that the person has signed in" (Interview NYM 4, Municipal, August 2020).

This claim implies that biometric fingerprint machines can still be played and create a loophole for teachers to falsify their attendance. This situation reminds one of Suryaman and Mulyono's (2019) report that some teachers can still temper with the digitised system by playing with their handsets' GPS and so, they could falsify their attendance. Thus, the current study avers that neither the traditional attendance register nor the fingerprint machine can accurately tackle the problem of teachers' workplace absenteeism without proper and ethical utilisation.

Thus, one is reminded that although machines control human behaviour, they are still controlled by humans. Sometimes, unethical supervisors, for personal gains, may engage in thwarting employers' efforts to manage employees' (teachers') workplace absenteeism. A good example is in Udaipur India where date and time-stamping machines installed in clinics to monitor nurses' attendance were frustrated by administrative staff who, ironically, are responsible for overseeing staff attendances. In due regard, the biometric technology alone cannot manage employees' workplace absenteeism. The technology can still be manipulated to falsify absence or presence of teachers at work. This takes us back to the TPB assumptions that when one needs to

change or to shape individuals' behaviour, he/she should focus on devising things that will affect attitude, subjective norms or social pressure, culture, among others, because these control the individuals' behavioural intensions (Ajzen, 1985). According to Gopalakrishnan and Damanpour (1997) technological innovations for changing employees behaviours in an organisation should involve a multitude of activities, decisions, individual behaviours and social systems. The prevalence of teachers' workplace absenteeism can partly be explained by having strategies to combat the problems that do not focus on social factors in the education industry. Factors such as participation in decision-making within organizations are of great importance in combating teachers' workplace absenteeism. Unfortunately, it was learned from this study that employers often make decisions that have an impact on the behaviour and performance of teachers without involving them and getting their opinions or ideas. This leads to resistance during the implementation of such strategies.

Evidently, one of unintended mistakes that emerge when making machines or ICT devices for managing human behaviour is that developers look at the technical side without remembering the sociological side. They believe that technology itself can manage humans and forget there are social norms (such as honest, relationships with others etc) that may have implications during implementation. Thus, this study views that it is important for designer and the user of technology meant at shaping human behaviours to also consider sociological dimensions such as social behaviours, culture and social relationships because all these have impact on managing employees' attendance.

Moreover, employers must ask themselves these important questions: who controls those machines? To what extent can one temper with these machines? To what extent can/does the person who uses the machine to control the behaviours of his or her subordinates? All these questions underscore the fact that it is important for an institution to have strong and professional leaders capable of enforcing laws and systems put in place to manage human resource behaviours at work. For example, school heads should have the ability to influence attendance, report attendance to senior officials and those on duty should take action against absent teachers. Biometric fingerprint technology will only mitigate teachers' workplace absenteeism once such working conditions are met.

Indeed, laws give power for the school heads to manage teachers' misconducts at work. For example, Article 12 (2) (1) of Teachers' Service

Commission Act of 2015 entrusts disciplinary powers to the head of the school regarding offences which do not warrant punishment of dismissal, reduction of rank or deduction of salary. Therefore, school heads have an authority to issue warning letters to a teacher alleged of misconduct including absenteeism. Thus, school heads are not only able to note practices of absenteeism but to take early actions against the behaviour. Thus, strong and committed school heads will ensure that laws and systems like biometric fingerprint attendance register put in place to manage teachers' behaviour at work are effectively utilized.

This study also noted that biometric fingerprint machines rely on electricity to operate. However, it was learned that the supply of electricity is unreliable in the Nyamagana Municipality. Sometimes power shading and power cuts interrupt the effective operation of such machines. This contravenes their purpose of being installed, to mitigate teachers' workplace absenteeism, as the following narration clarifies:

> "Sometimes we come in the morning and there is no electricity. Such a situation can also be the case when we want to sign out, and the electricity is off. So, on that day teachers will not sign either in or out. Besides, when teachers discover there is a power cut, they also come late to school or leave earlier because they know the biometric fingerprint attendance register machine is off use" (Interview, NYM 6, August 2020).

It implies from this narration that one of the many challenges hindering the use of modern technologies in advancing development in third world countries is electricity power cut. As the technology relies heavily on electricity for it to be effective, poor supply of electricity hinders its reliability. Such a problem is reminiscent of Suryaman and Mulyono's (2019) report on how bad internet connectivity culminated for the collapse of an android-based attendance management system (AAMS) in Jakarta, Indonesia. It is then implied that internet connectivity and unreliable electricity systems in developing countries are hampering development efforts.

Thus, the use of ICT to manage employees' behaviours holds back development efforts. This calls upon the Government to ensure the availability of reliable internet connection and electricity supply before they opt to use ICT gadgets. Biometric fingerprint machines that use alternative energy systems such as solar energy should preferably be a choice given unreliability or lack of stable energy to power the machines. That said, it will

be possible to manage employees' attendance, biometric fingerprint machines when are operating at all times.

Since this study was conducted when Tanzania was battling with COVID-19 pandemic, various measures put in place to reduce the spread of the corona virus also seemed to threaten the effective use of biometric fingerprint registers. One measure recommended by health experts was that people should avoid touching various surfaces of objects touched by many people. Interestingly, teachers referred to such measure as an excuse for not using biometric fingerprint machines to sign their attendance at work so as to reduce the spread of the COVID-19 virus. Such a move deterred employers from using the biometric fingerprint attendance registers. It was interesting to note that although one can still use biometric fingerprint machines, and thereafter, sanitize their hands and the machine used, teachers still opted not to use the machine at all. One respondent argued that:

> "Absentee teachers seem reluctant to use the fingerprint machine because it exposes them. They insist that they have been advised by health personnel to take precautions against the COVID-19 disease by avoiding touching surfaces that are touched by many including fingerprint machines. Thus, they are afraid of using fingerprint machines that will increase their likelihood of contracting COVID-19. However, the truth is that they can still sanitize their hands after signing on the biometric fingerprint machines" (Interview, NYM 9, August 2020).

Thus, although it is appropriate to take precautions against COVID-19, the quote denotes the disease as being the cause of employees' resistance to adopt the new technology and the situation holds back efforts employed in the fight against teachers' workplace absenteeism in Nyamagana Municipality.

Conclusion

This paper discusses the effectiveness of the biometric attendance system in managing teachers' workplace absenteeism in Tanzanian. The study focused on public secondary schools in Nyamagana Municipality as the case study. The discussion reveals that fingerprint attendance registers in Nyamagana Municipality have only ended the problem of signature fraud to teachers. As of now, in the studied schools, every individual teacher must sign the biometric attendance register by himself or herself. However, biometric fingerprint attendance registers face several challenges that impair their effective use in mitigating teachers' workplace absenteeism.

For example, although it is easy to capture late comers and/or earlier departures or total absent teachers via the machine, this does not mean that the biometric attendance register system has ended the problem of teachers' workplace absenteeism. Even with these machines, the problem of teachers' absenteeism persists. As discussed in the previous sections, teachers have found a technique of falsifying their attendance without being noticed, and the evidence of such falsification cannot be captured by the machines. Some teachers sign early in the morning on a biometric attendance machine but may leave to go where they wish. They then would come back in the evening to sign off on the machine, and leave, pretending that they were at the school at all the times. Moreover, effective utilisation of the fingerprint machines is also deterred by unreliable electricity supply and the loophole created by regulations for controlling COVID-19 pandemic.

This suggests that teachers' workplace behaviour is socially anchored, so much so that they are accustomed to co-operation, helping and protecting each other most of the time. This has been proved by the findings of this study that teachers in Nyamagana Municipality have been falsifying their attendance despite having digital technology (fingerprint attendance registers), and protecting each other from being penalized. In this context, neither the traditional attendance register nor the fingerprint machine when not considering social and organisational contexts can tackle the problem of teachers' workplace absenteeism. Thus this paper is in line with the TPB's argument that mechanisms, say biometric fingerprint attendance registers, for changing employees' behaviour at work should focus first on shaping their attitudes and social norms (social pressure) towards the desired behaviour.

Given the furnished findings, this study recommends that the use of digital technology in managing teachers' absenteeism should, among other things, take into account sociological aspects in education industry such as social behaviour, culture and social relationships because all these have impact on managing teachers' attendance.

More so, the study recommends that regular ethical trainings should be available for ordinary teachers. Such trainings would generate an understanding of their expected conducts, their rights and responsibilities while at work. Also, such trainings should provide teachers with work related ethical pedagogies and professionalism.

Also, the study recommends that supervisors (school heads) are critical persons in influencing employees' effectiveness. School heads can promote

or frustrate government efforts in controlling teachers' workplace absenteeism. Given such critical roles, school administrations should consist of individuals recruited on the basis of their merits. If such individuals have supervisory and ethical qualifications, they will help to ensure those whom they supervise work with commitment and integrity. They too can manage well the available institutions and systems adopted to ensure good teachers' attendance as well as discipline at work. The study suggests that there should be regular training for school administrators (school heads). The training should focus on providing management skills. It will help school administrators to have skills and capacity to handle and/or reduce various workplace misconducts like workplace absenteeism.

Lastly, the Government and employers should ensure that there is reliable electricity supply in the schools. This will prevent unexpected power cuts and load shedding, the very things in the deployment of key electronic systems in schools, biometric fingerprint machines inclusive. This move can be done by installing systems alternative sources of energy such as solar power.

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