

**UNIVERSITY OF KWAZULU-NATAL**

**Employee Perception on the Importance of a Fingerprint Based Attendance  
Management System and Its Association with Punctuality at Information  
Management Unit (IMU) of EThekweni Municipality**

**By**

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**A dissertation submitted in partial fulfillment of the requirements for the degree of**

**Master of Business Administration**

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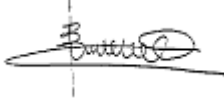
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- And I save the best for last: I thank God for the opportunities, the gift of life and the amazing path He created for me. It's been a hard, yet rewarding, journey thus far.

## **Abstract**

Punctuality is a worldwide phenomenon; critical for fulfilling and satisfying the organisation's obligations to its stakeholders. Non-adherence to it may result in fatalities especially in organisations offering essential services, while it may mean loss of business to commercial companies. The aim of this study was to establish employee perceptions on the importance of a fingerprint-based attendance management system and its effect on punctuality within the Information Management Unit at EThekweni Municipality. The targeted population was the unit's staff complement which amounted to 300. The choice of one unit was due to the manageability of numbers seen to be possible within the timelines set for the study. A total of 285 of the total population belonged to the employee component while 15 belonged to management. As the study employed a mixed methodology, the quantitative approach was administered to employees while the qualitative was administered to management. The pretesting of the questionnaire was administered to 10 participants whereby the results showed a Cronbach's Alpha of 0.8. The sample size for quantitative study was 120 randomly selected participants and was administered through an online questionnaire while the qualitative instrument was administered to managers through individual interviews. Five managers were purposively selected based on their experience within the unit. The survey results showed the participants' perception to be in favour of a fingerprint-based attendance management system. The qualitative portion of the study revealed mixed responses about the importance of punctuality. To some punctuality was mainly important for meetings while others viewed it as important for arriving at their work stations in time as regulated by the collective basic conditions of employment. The study was expected to reveal the employee perceptions of the fingerprint based time management system and its effect on punctuality. It was anticipated that such understanding would encourage extension of the study to other units of eThekweni Municipality thereby enabling employee perception realignment to the fundamental benefits derived from the system; so punctuality, among other things such as performance and productivity, may be enhanced.

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# CHAPTER ONE

## Introduction

### 1.1 Introduction

Employee punctuality is so critical that some organisations classify it as an essential function (HR-Specialist, 2015). They deem punctuality as a task of vital importance for achieving successful performance that should be adhered to by all employees, including those living with disabilities. Punctuality defines the success of an organization. Information Management Unit (IMU) of EThekwini Municipality employs 300 staff. These must be accounted for in terms of task delivery and compensation. Such accountability can be made possible through proper administration of attendance and is critical as it eliminates delays in addressing workplace issues which may affect employment relations.

In deepening the understanding of the topic being studied, a number of pivotal sub-topics are addressed in this chapter. Firstly, the background of the study is discussed as a means of outlining the current status which may be a compelling reason for a rethink on a time management method. The problem statement is dealt with immediately after the background. Thirdly, the objectives of the study will be defined which will subsequently be followed by the research questions. The last section focuses on the aim of the study as well as its significance.

### 1.2 Focus of the Study

The study focuses on employee perceptions on the importance of a fingerprint-based attendance management system and the effect it has on punctuality within the Information Management Unit of eThekwini Municipality.

### 1.3 Problem Statement

The importance of employee punctuality need not be ignored by any organisation that aspires to fulfill their purpose of existence. Nwoye (2016) views employee attendance as a barometer for checking or identifying problems hindering productivity. As a contributor in the achieving of the Council's vision of being a livable city by 2030 (Integrated\_Development\_Plan, 2012/13), the Unit has to embrace punctuality as a way of playing its part. One of the

fundamental tools to make this vision a reality is ensuring that human resources are appropriately and fully utilised. Punctuality is of paramount importance! As things stand lateness at IMU is happening under the pretext of flexi-time. Nobody knows for sure if the late arrivals conform to being the late leavers as should be in keeping with the spirit that governs flexi-time (Oxford, 1970). Lateness seems to be part of the culture with council meetings. Meetings hardly start on time. With the continued use of legacy methods of attendance management, IMU stands to continuously suffer lack of control over their staffs' tardiness as Oloyede et al. (2013) allude to the system's unreliable authentication abilities. This is true as some employees are likely to take advantage of the system's weakness as they become aware of it. Such discovery may result in lateness and tardiness going uncurbed. In addressing productivity problems (Nwoye, 2016) asserted that a reliable attendance management system would need to be implemented.

Unattended lateness may escalate to absenteeism which affects the employee, those present and the company's productivity. Dealing with non-performance issues without reliable means of attendance management may misdirect good effort. As non-attendance can in no way promote acceptable performance, it would be almost impossible to craft a suitable counseling for non-performers without proper means of recording attendance. IMU also has the responsibility to compensate employees for mutual relationship based on the exchange of labor for money.

Since employee punctuality is critical for the successful accomplishment of IMU's mandate, it is necessary to investigate the employee perception on the importance of a fingerprint based attendance management system and its effect on punctuality at IMU of EThekwini municipality as a system which can ensure punctuality.

Prior implementation, users' attitudes towards the tool need to be examined and hence the need for the study of employee perceptions on the importance of a fingerprint-based attendance management system and its impact on punctuality at IMU of EThekwini municipality.

#### **1.4 Background of the study**

Administering of attendance management, whether in private or public sector is indisputably a matter of key importance. Workplaces use it for ensuring that the employment relationship becomes a mutual benefit between the parties as is meant to be. Work put in for a specific

duration of time should accordingly be compensated. Its criticalness extends to some educational institutions who find it necessary for things like accurate record keeping, students' assessment and generally encouraging the culture of attending classes to students. It is reported that developing countries stipulate a minimum percentage to class attendance which is better measured with a good attendance management tool (Akinduyite, et al., 2013).

Where primitive methods of attendance management are used, literature attests to increased levels of impersonation in both private and public sectors which are further exacerbated by the presence of ghost employees, especially in government organisations (Akinduyite, et al., 2013). Other than impersonation, challenges such as inaccuracies of records and collusions of employees in time of arrival recording matters could not be addressed (Ami-Narh, Aziale and Akanferi, 2014). Prassanna and Senthinkumar (2012) view the traditional manual attendance management as time consuming, tedious, risky and prone to errors.

### **1.5 Research Questions**

The research questions are outlined below:

1. What are employee perceptions on a fingerprint-based time management system?
2. What are the reasons for employee late-coming at EThekwini Municipality?
3. What is the relationship between a fingerprint-based time management system and punctuality?
4. What strategies have been put in place to curb late coming?

### **1.6 Objectives**

The objectives of the study are to:

1. Establish the perception of employees in relation to a fingerprint-based time management system.
2. Establish the reasons for late coming at EThekwini Municipality.
3. Establish the relationship between fingerprint-based time management system and punctuality.
4. Explore strategies to put in place to curb late coming.

## **1.7 Motivation for the Study**

Information Management Unit has 300 staff members who form part of the eThekweni Municipality which has about twenty five thousands employees (Naidoo, 2016). This number signifies the magnitude of the responsibility a city has in terms of accounting for its human resources. Service delivery does not only rely on employing skilled people or human resources but happens if these resources use their times efficiently. Administering time invested by the human resources requires tools which are able to produce reliable records.

The unit, just like the rest of eThekweni Municipality is characterised by the use of primitive registers as a means of attendance management. These are mainly the physical paper registers normally located at the entry/exit point of each workplace. In some instances the proximity access control system is used in parallel with the physical paper register within the Unit. The usage of fingerprint biometrics is also prevalent though it is used for access control purposes. The biometric are electronic devises that read the fingerprints of registered users in order that they may gain access to the workplace. In return the devise is able identify each worker and to keep record of their time punctuality.

Researchers such as Arulogun et al. (2013) and CHAUDHARI et al. (2014) have shown that administering attendance, whether in the private or public sector is indisputably a matter of key importance. Akinduyite et al. (2013) reported that educational institutions in developing countries stipulate a minimum requirement to class attendance, which is better measured with a good attendance management tool. Workplaces use it for ensuring that the employment relationship becomes a mutual benefit between the parties as is meant to be. While using the primitive means of managing attendance, IMU cannot accurately account for their employees' punctuality. Literature attests to increased levels of impersonation where primitive methods of attendance management are used, both in private and public sectors. Research findings further indicate that use of primitive attendance tools promotes the presence of ghost employees, especially in government organizations (Akinduyite et al. (2013).

The likelihood is that IMU is spending substantive amounts of money in undue compensation as a result of punctuality problems. This may be further exacerbated in situations where impersonation is practiced.

Other than impersonation, challenges such as inaccuracies of records and collusions amongst employees in time of arrival recording times of arrival cannot be accurately monitored and

therefore cannot also be effectively addressed (Ami-Narh, Aziale and Akanferi, 2014). Prassanna and Senthilkumar (2012) and Akinduyite et al. (2013) viewed the traditional manual attendance management system as time consuming, tedious, risky and prone to errors.

Considering the views of Prassanna and Senthilkumar (2012) and Akinduyite et al. (2013) about the traditional attendance management system, IMU's time management system falls within the danger zone. An understanding of employee perceptions regarding attendance management within the unit will be the right step towards implementing an attendance management tool that is reliable.

### **1.8 Brief Research Methodology**

The study employed a mixed methodology whereby a quantitative instrument was administered to employees and the qualitative instrument was administered to management. Participants were chosen from the target population of 300. Of the 300, 15 employees form part of management while 285 are non-management employees. From the target population, 10 were used for pretesting leaving the target population at 290. Five managers were purposively selected for the qualitative study while a sample of 120 used for quantitative study was randomly selected from the population of 285.

### **1.9 Limitations of the Study**

Due to time constraints, the study was unable to extend to a number of Units of the multi-units council. One Unit, IMU, was used as the target population for the study. Increasing the number of Units would have caused the administration of the questionnaire to become a cumbersome task. Of critical importance to this study was the fact that the study was not meant to eliminate the importance of supervision and therefore does not guarantee automatic dedication to work by those individuals who keep time and or who are always at their work stations (Nwoye, 2016). The necessity of supervision function will not change in fact, the responsibility will increase if one would compare the results on the system with that of persons at their work stations.

### **1.10 Significance of the Study**

The purpose of the study is to ascertain the perceptions of employees on the importance of a fingerprint-based attendance management system and its effect on punctuality at IMU of EThekwini Municipality.

This purpose is influenced by the increase in the number of late comers at the IMU. The use of a fingerprint-based attendance management system may contribute positively to IMU in terms of improving discipline, performance and productivity and ultimately enhancing service delivery. The study is therefore significant to all employees of IMU, the citizens of eThekweni Municipality as well as organisations that are keen to improve attendance and punctuality. Since there is a paucity of South African research studies on this topic, this study will therefore, contribute to the pool of South African based studies.

## **1.11 Organisation of the Study**

In addressing the topic, the study covers five chapters which are: The Introduction, The Literature Review, Research Methodology, Results and Discussion, and Conclusion and Recommendations. A brief overview of each chapter is offered in the following paragraphs.

### **1.11.1 Introduction**

This first chapter introduces the study by way of giving a background to the problem, outlining the problem statement, the objectives and the limitations of the study.

### **1.11.2 Literature Review**

Since research builds on existing knowledge where possible, this chapter interrogates the literature to establish any data or information which is of relevance to this study. The Literature Review investigates achievements and gaps in the area of punctuality, perceptions on fingerprint biometric in general and as it specifically relates to attendance management.

### **1.11.3 Research Methodology**

This chapter details the methodology employed in carrying out the study. This chapter elaborates on the following sections: Aims and Objectives of the Study, Participant and Location of the Study, Research Design and Methods which elaborates theoretical perspective, sampling techniques, data collection techniques and research instruments used for the study. It also explains how data analysis was done and then ends with a concluding section.

### **1.11.4 Results and Discussion**

This chapter presents the results as obtained through the use of tools proposed in the methodology chapter and further discusses the findings in the light of existing literature.

### **1.11.5 Conclusions and Recommendations**

This chapter presents the conclusions based on the results presented in chapter four. It further makes recommendations that can be implemented by all organisations to improve punctuality, performance and productivity.

### **1.12 Summary**

Punctuality is, without a doubt, important for the well-being of any organization whether profit making or nonprofit making. No organization is in the business of losing or wasting money. It is in the best interest of any organization to invest on systems that are bound to ensure that they minimize costs the best way possible. Research shows that organizations have lost significant amount of money due to wasted time. Some organizations may have lost business as a result of wasted time or man-hour loss. The study is relevant for IMU of eThekweni Municipality as an enabling wing which makes accountability for public facing units, to a greater extent, possible. This study is necessary because the City is losing a great deal of monetary as a result of employee lateness. It is no wonder Swasa (2016) described punctuality and cleanliness as important contributors to socio-economic development and growth. These are at the heart of local government and the eThekweni Municipality's vision for the future. The fingerprint based attendance management system has been presented as a tool that together with management can provide synergy which can yield high returns if embraced by all. It is for this reason that employee perceptions about the proposed system are critical so that realignment can be done where necessary.

### **1.13 Conclusion**

With the recognized importance of the proposed system, this chapter contextualized the problem under investigation.

The next chapter reviews the literature with the view to finding what secondary research has found of the topic of punctuality. Expected also from the literature is more understanding of the perceptions on the fingerprint biometric.

## **CHAPTER TWO**

### **Literature Review**

#### **2.1 Introduction**

The previous chapter introduced the study on employee perceptions on the importance of a fingerprint-based attendance management system and its effect on punctuality at eThekwini Municipality. This chapter presents literature related to the study. The sections covered in this chapter include the reasons for organisational existence, punctuality, attendance management, perception, biometric in general, reliability of fingerprint biometric and its pros and cons. The chapter is then summarised and concluded.

#### **2.2 The Reasons for Organisational Existence**

Hardly any organisation is formed without a purpose to serve and fulfil some key specific goals for social and/or business reasons. Such goal realisations involve the employment of human resources which are to execute certain tasks within specific time constraints. Punctuality is critical for an organisation's goal achievement. Tardiness and unsatisfactory attendance disrupt and affect production (Akinduyite et al., 2013). The concept of punctuality is of utmost importance as disregarding it may cause turmoil and tragedy to an organisation (Papier et al., 2016). Punctuality gives an impression about employee commitment to their call for duty (Coleman, 2013). South Africa has indicated the requirements for punctuality in sections 29, 31 and 35 of the Basic Conditions of Employment Act whereby the time/s an employee is expected to arrive and leave work during working hours have to be stipulated (Basic\_Conditions\_of\_Employment\_Act, 1997). Section 29(1)(e) of the Basic Conditions of Employment Act clearly states that every employer is obligated to supply a new employee, among other things, with the employee's ordinary hours of work and days of work while section 31(1)(b) directs each employer to keep a record of time worked by each employee. Section 35 outlines the reason why records are to be kept as it reveals that employee remuneration and wages are calculated with reference to hours worked (Basic\_Conditions\_of\_Employment\_Act, 1997). This calls for stricter methods of attendance methods. In this chapter the researcher elaborates on the importance of punctuality, perception and biometric capabilities.

## **2.3 The Meaning of Punctuality in a working context**

Punctuality is the opposite of lateness and employee lateness is arrival at work after the time agreed to by employer and employee (Dishon-Berkovits and Koslowsky, 2002). This means that punctuality is the act of arriving at a particular place in or before the time that was agreed to by the owners of the agreement. Though punctuality cannot be said to be the time, the truth is that it cannot be spoken of in the absence of time. This means that the view by Greenberg (1989) of time as a scarce commodity may hold true and time may, therefore, need to be treated as such.

### **2.3.1 The importance of punctuality**

The importance of punctuality cannot be better emphasised than - by human day-to-day life whether at individual level or corporate level. Almost all meaningful goals, achievements, occurrences or events are time-based (Ford and Sullivan, 2004). Technological devices, as a result, have over the years and are still being designed to keep the human race aware of the phenomenon called time (Ellis and Jenkins, 2015). Every company that exists has a form of vision which is time based (Coffey, 1994). Manufacturing companies have what is called product time to market which is the time by which their product should be launched to market (Palmié et al., 2016). It normally takes a chain of events to finish the product which can be delayed if one of the players has tardiness issues. Government is established by a voting system the occurrence of which is time based section 48 of the Act (RSA-Constitution, 1996). Punctuality, therefore, is the ultimate requirement for sustaining a chain of events to its conclusion and is very important (Coleman, 2013).

Research revealed different views authors had of the messages punctuality transmits about an individual or organization. Their views, however, seemed to converge towards one common understanding that projects timekeeping as an honourable act. Condrey (2008) portrayed time keeping as an indicator of a person's commitment to his or her given assignment. He further interpreted timekeeping as an act which goes beyond showing up for duty to ensuring high standards of quality. This view concurred with the definition of Roszkowski et al. (2005) who defined those adhering to punctuality as committed, dedicated or reliable to their tasks. On the other hand Coleman (2013) asserted that the importance of punctuality stands out and argued against downplaying it through the ease of reporting slight delays which can be made possible by latest emerging technologies. Coleman (2013) further viewed upholding of punctuality as portrayal of organization's dedication to its cause and that it further expresses high levels of respect and care it has for its customers. As Frederick

(2011) defined punctuality as one of the qualities that distinguishes a reliable employee from the rest, people who deal with a company that value time will experience reliability. This supports the Back, Schmukle and Egloff (2006) argument that punctuality is a recipe for creating and maintaining relationships as a company's reliability takes its relationship with customers to another level.

HR-Specialist (2015) viewed punctuality as an important factor in ensuring lasting employment relation for employees who work for companies with stricter policies against worker lateness. In their findings, Roszkowski et al. (2005) suggested, based on worker and supervisor perceptions, that punctuality is highly linked to overall job performance. According to Loong, Van Lierop and El-Geneidy (2016) punctuality and workers' enthusiasm towards their work, are deemed as factors that encourage organization productivity.

Since punctuality is projected to be important, investigating the effects caused by lack of it was deemed critical for the study.

### **2.3.2 The effects of a lack of punctuality**

Often waiting is as Zeeli and Isaacs (1988) and Pàmies et al. (2016) is associated with inactivity caused by a delayed occurrence of action planned for a specific time The sources or causes of delays could be natural or caused by human action. Regardless of the cause, waiting is undesirable. In the context of today's average man, whoever commits to an appointment does so at the expense of other competing interests. In this respect waiting is a liability. Friedman and Gerstein (2016) viewed wasting time of any businessman as tantamount to robbing him of his money. They also maintained that causing a business man to wait is indicative of unacceptable business practice and displays poor manners.

Reality dictates that employees often depend on others' contribution before they can complete a task If, in a line setting of ten employees, one or two employees fail to be punctual, the 9 or 8 will be driven to a halt and that is detrimental to the revenue of the organization. This can also cause frustrations to those punctual employees thereby giving rise to conflict and demoralisation within the workers (Dishon-Berkovits and Koslowsky, 2002). They further argued that employee lateness disrupts the day's schedule while it also equates to loss time for the administrator responsible for dealing with lateness.

The harsh reality is that lack of punctuality can and does cost the organizations large sums of money as Coleman (2013), reported that the UK economy loses nine billion pounds per annum due to staff lateness. This corroborates an earlier view by Dishon-Berkovits and Koslowsky (2002) where they labeled employee tardiness as a leading cause to remarkable financial cost emanating from loss of productivity. Swasa (2016) further pointed out the laxness in South Africa, especially in government institutions where waiting times could be up to 2 days in spite of an appointment having been secured. Such long waits are without a doubt costly not only to an organization but to an individual as well.

### **2.3.3 Is punctuality always necessary?**

There is no environment that is not governed by time (FLAHERTY, 2016). Even where employees are not bound to operate within a fixed office space, punctuality will have a way of manifesting itself in the form of deadlines that are to be met.

Papier et al. (2016) pin-pointed punctuality as one of the three desirable attributes that engineering firms emphasised as important for preparing students for workplace. In the same study, employers in the Wholesale and Retail sector concurred with engineering firms that punctuality as in time management is one of the desirable attributes they expected from their employees. The fact that punctuality for students who were with the company formed the top three attributes that impressed employers, speaks volumes about their importance (Papier et al., 2016). As employers' are business minded, punctuality must therefore be making business sense to be recognized as important. Another important aspect in punctuality other than showing reliability and respect for others, is that it reduces wasted time related cost which Coleman (2013) said cost UK economy in region of nine billion pounds per annum.

Swasa (2016) argued that the development of socio-economic growth is reliant on punctuality and cleanliness. Any lawful endeavor capable of encouraging and growing the economy is necessary and as such punctuality has to be important.

Since literature showed how important punctuality is, it necessitated investigating the causes of lateness as its reduction or even eradication can only be achieved once reasoned and understood (Papier et al., 2016; Swasa, 2016; Dishon-Berkovits and Koslowsky, 2002).

#### **2.3.4 The reasons for lateness**

The distance travelled to work was identified by Fourie (1987) as a reason contributing to lateness. This was found prevailing where employees' used more than one mode of transport to get to work. This reason seems to be still prevalent as Loong, Van Lierop and El-Geneidy (2016) in "the road to productivity" study concurred with Fourie (1987) that the transport mode as well as weather conditions not only impacted on punctuality but also on employees enthusiasm towards their work. They argued that workers would lose enthusiasm as a result of their long journey to work. Dishon-Berkovits and Koslowsky (2002) however, viewed employee commitment to the organization and the age of their children as other contributing factors of employee lateness.

Mageni and Slabbert (2014) pointed to an increase in life's demanding roles that employees have to deal with on a daily basis outside their work life. At face value it would seem that lateness does not feature in those roles, but their plea to employers to do their business and still allow employees to live their lives seemed to suggest the conflict of interest around time. They did not associate lateness to it but argued that the roles affect employee job satisfaction. Considering the findings by Dishon-Berkovits and Koslowsky (2002) which revealed that punctual employees had grown-up children compared to those who came late. The finding is suggestive of family roles being contributing to lateness.

Swasa (2016) observed that Japan's realization of the importance of punctuality prompted them to adjust from laxity to preciseness in compilation of their train time-tables. He pointed out that their earlier attitude in 1900's was content with giving a more or less indication of train arrivals times which he conceded that their decision resulted in punctuality being compromised. This suggests that the attitude organizations have towards punctuality determines whether it is prioritized or not. This perspective concurred with the finding by Back, Schmukle and Egloff (2006) which articulated punctuality as an indicator of how self-disciplined and self-organized a person is.

Unlike punctuality, lateness does not bring any positive spinoffs to an organisation's performance. The next section investigates possible means of stimulating punctuality..

### **2.3.5 How to promote punctuality**

Few studies have been done that focused solely on issues around punctuality to a point where it suggested means of promoting it ((Loong, Van Lierop and El-Geneidy, 2016)and (Fourie, 1987)). Loong, Van Lierop and El-Geneidy (2016) recommended in an analysis of commuters' punctuality and energy levels at work or school, that employers and schools needed to encourage cycling to work as findings revealed that cyclists were more enthusiastic towards their work and were often punctual. The study, however, did not present any proof where commuters who had used any other mode of transport other than bicycles, were energised and became punctual for work as a result of being introduced to cycling.

On the other hand Kaimenyi (2015) believed that education, among other things, instils an attitude of punctuality. This may need to be verified by investigating the behaviour of educated people towards punctuality.

Ellis and Jenkins (2015), in trying to establish if punctuality and personality could be predicted by wristwatches, found that the watch wearers arrived significantly earlier to wherever they were meant to be. Such observations may seem to suggest that giving people wristwatches may be a recipe for promoting punctuality. Once again, the integrity and credibility of the findings can, however, be challenged as the study does not divulge the behavior of watch wearers towards punctuality prior to them wearing watches.

Tracking human resources' punctualities is consistent with section 152(1) (a) (b) of the act which mandates local governments to provide democratic and accountable government for local communities and to ensure the provision of services to communities in a sustainable manner (RSA-Constitution, 1996).

The following section defines fingerprint-based attendance management.

### **2.4 Fingerprint-Based Attendance Management**

This is an automatic means of monitoring, recording and tracking attendance of individuals at a particular place of interest (Akinduyite et al., 2013) and (Nwoye, 2016). The place could be a meeting, work, class or any gathering which requires records of attendees. It is made possible by employing technological capabilities which enables the utilisation of physiological traits unique to each individual person. The general concept used for this type of attendance management is termed biometric (Verma and Khan, 2016). Biometric is,

however, a more loaded term as it encapsulates two categories known as physiological and behavioural (CHAUDHARI et al., 2014). This study focuses more on the physiological category which is where the fingerprint technique belongs. More information about the fingerprint technique and other techniques belonging to the physiological category and a few belonging to behavioural family are discussed in section 2.6, Sections 2.7 and 2.8 which deals more specifically with fingerprint biometric. Before the delving on biometric techniques, literature about perception is reviewed in the following section.

## **2.5 What does Perception Mean?**

There are few definitions of the term “perception” given by different sources which are considered in this study for better understanding of the effect it may have on an individual. Perception is defined as an understanding or awareness gained through the use of the senses (Machulla, Di Luca and Ernst, 2016).

Yakup and Diyarbakirlioglu (2011) defined it as a method used by organism to understand their surrounding environment which involves engaging their sensory organs. Based on the definition, these authors further clarify the issue of people’s behaviour is based on their perception of what reality is, not on reality itself.

### **2.5.1 The role of perception**

Perception creation is made possible through the use of information collected through the five human senses which are sight, touch, smell, hearing and taste (Atkinson et al., 2004). These senses are triggered by stimuli which ultimately get interpreted by the brain for final decision making.

Yakup and Diyarbakirlioglu (2011), viewed perception as key in decision making in that decisions made are based on how the brain synthesises information collected by the five senses. Normally, any decision will have its supporters and opponents which are better recognised by their reaction towards the decision. Some perceptions lead to social cohesion while others may lead to societal division (Heere et al., 2016). Such sentiments supports assertions by Atkinson et al. (2004) where they viewed perception as an essential element for encouraging interaction that is healthy and effective within a society and generates options among which the best one is ultimately chosen. If Yakup and Diyarbakirlioglu (2011) assertion is something to go by, then perception is the driver of any decision making process. This further conforms to the assertion by Asiegbu, Powei and Iruka (2012) who advocated

that consumer behaviour towards a product is derived from their perception of the product. This means that consumers buy more or less of a product depending on how they perceive it. The same behaviour can be said of the employee acceptance of the fingerprint-based attendance management system. If they perceive the system to be a positive tool they are likely to embrace it while negative perceptions will encourage rejection. Rodell and Lynch (2016) confirmed, with respect to employee volunteering, that it can be either stigmatised or credited depending on how it is perceived.

### **2.5.2 Fundamentals of perception**

Perception is core in decision making as it has to do with how a decision maker synthesises information which is subject for decision making (Rodell and Lynch, 2016). These authors continued to project perception as the defining means of one's reputation in the workplace as they argued that it influences behaviour. Based on (Rodell and Lynch, 2016) assertion, the bad or hostile behaviour towards anything emanates from perceptions since behaviour is a decision based act. Ariely, Bracha and Meier (2009) also supports the idea that perception determines the human behaviour towards the matter subjected to his assessment.

Atkinson et al. (2004) attributed effective societal cohesion to mastering perception and other people's feeling. Since perception is not only relevant in social gatherings, understanding it within the context of the workplace can also yield valuable results. Perceptions are not fixed as they are formed not only based on specific information but also on how that information is presented (Asiegbu, Powei and Iruka, 2012). It could be for this reason that Rodell and Lynch (2016) are convinced that there are gains in studying building blocks of perception; the understanding of which they suggested can lead to, among other things, rehabilitation of people who have emotional disorders. It is clear that the rehabilitation they are referring to here is not medical one but more behavioural.

### **2.6 What is Attendance Management?**

Attendance Management is the act of taking control of one's working environment by ascertaining the employee presence or absence in a workplace setting (Akinduyite et al., 2013). This shows the magnitude of responsibility management has over attendance of employees under their charge. Ami-Narh, Aziale and Akanferi (2014) called it the act or process for clearly recording the employee's arrival time in an employment workplace. The "clearly recording" may be suggestive of being in control of one's working environment

which concurs with Akinduyite et al. (2013) assertion that attendance management is conducive to maximising and motivating employee attendance. In a different approach, Walia and Jain (2016) described attendance as one of the ethics with greater appeal to employers' interests. Flowing from this definition, attendance management can, therefore, be described as a form of managing employee ethics.

### **2.6.1 Disadvantages of not managing attendance**

All aspects that contribute to business success are meant to be managed for better assessment and evaluation of the successes of an organisation (Asiegbu, Powei and Iruka, 2012). Since attendance is one of such aspects, not managing it could impair organisational achievement as the two are inseparable (Walia and Jain, 2016). Adewole et al. (2014) shared similar sentiments, as they viewed enhancing systems for managing resources as critical to improving productivity which in turn leads to meeting organisational goals.

The other disadvantages of not managing attendance are continued levels of impersonation, employee absence and the prevalence of ghost workers in all tiers of government (Akinduyite et al., 2013).

The literature, thus far reveals a necessity for organisations that have not evaluated their attendance management systems for the past few years to consider doing so.

### **2.6.2 Importance of managing attendance**

Attendance management reduces impersonation, absenteeism and ghost employees for both private and public sectors Akinduyite et al. (2013). Ami-Narh, Aziale and Akanferi (2014) shared the same view about attendance management where they projected it as a means of motivating employee and enhancing organisational levels of productivity .

Likewise, exposing the importance of biometric as a tool for attendance management gives the reader a wider knowledge of the versatility of the device in case there are other areas which may require usage of other forms of biometrics.

### **2.6.3 Historical means of managing attendance**

Among the traditional systems of attendance management are the paper register, proximity card, card clocking and password-based authentication. These systems have an overarching deficiency which is the inability to prevent impersonation and indicated and agreed to by both Josphineleela and Ramakrishnan (2012) and Shoewu and Idowu (2012).

### **2.6.3.1 Paper register**

The paper register is a form of attendance management where each relevant individual signs his arrival and departure times (Walia and Jain, 2016). Some organisations stipulate that individuals sign in and out when going and coming back from lunch respectively. Shoewu and Idowu (2012) viewed this method as vulnerable to impersonation and risky in that the register could be susceptible to theft or loss.

### **2.6.3.2 Proximity card**

In a proximity card system, an individual presents his or her card to an electronic reader mounted on the wall by the entrance/exit point (Bakshi et al., 2014). The reader relays the recorded transaction to the system controller where decision is taken and the transaction is then kept in the engine's/database. Human factor of dishonesty undermines the reliability of the system as the system has no means of authenticating the transaction in a credible manner (Oloyede et al., 2013). Oloyede et al. (2013) pointed to an astounding cost of nearly seventeen billion pounds which UK economy suffers as a result of employee absence and "buddy punching". This shows a great deal of financial damage companies can suffer under the usage of proximity cards.

### **2.6.3.3 Card clocking**

Card-clocking is an attendance management system where individuals slot their cards into the time clock for recording of their arrivals, breaks and departure times (Akinduyite et al., 2013). This method is normally used where wage or salary payment is calculated based on the number of hours reflected on the card. It is susceptible to impersonation due to its portability nature (Shoewu and Idowu, 2012).

### **2.6.3.4 Password-based authentication**

The password-based authentication system uses password as means of verifying the legitimacy of entrants. Password used as a request for access is one area where security breach can be compromised (Cupido, 2011). As Rhee, Kim and Ryu (2009) articulated, user behaviour contributes largely to information security. Users compromise the password-based authentication by way of sharing passwords when they think the situation demands them to do so.

## **2.6.4 Available technologies**

There are a handful of biometric attendance management tools that are available in the market (CHAUDHARI et al., 2014). They fall within two categories of biometrics which are

physiological and behavioural with the latter being the popular choice. No matter how one investigates, biometric is found to be an integral part of different forms of techniques (Jain et al., 2016). Walia and Jain (2016) studied six of the listed techniques, all of which had fingerprint components as an important integral building block.

- LabView,
- Internet of Things,
- GSM and ZigBee,
- RFID and Android,
- ZigBee, ZigBee,
- DSP and Matlab,
- Cryptography and
- RFID, GSM and .Net

The above names are not universal names as they are only based on tools and techniques employed in constructing and implementing each respective listed system. In all instances findings were that fingerprint biometric was a preferred choice.

Since biometric is popular in the verification and identification of individuals, an in-depth study to reveal and discover more about it is presented in the next section.

## **2.7 Understanding the concept of biometric**

Biometric is an individual's discriminable feature that is capable of being measured (Krishnamurthi et al., 2015). Adewole et al. (2014), defined biometric as a physiological or behavioural means of auto identifying a person. Physiological and behavioural characteristics are two categories of biometrics. According to Cupido (2011) biometric is a scientific field of people identification through the use of computer technology based on physiological characteristics. It is apparent from Cupido's definition that his focus was not on behavioural biometrics. Walia and Jain (2016) shared the same definition of biometric with Adewole et al. (2014). Walia and Jain (2016:1166), however, divided biometrics into what they call the "nine widely used biometric techniques" which are face, fingerprint, hand vein, hand geometry, iris, retinal pattern, voice print, signature, and facial thermograms. Hi-tech-Security (2013/14) listed wrist vein, keyboard rhythm analysis and infrared vein analysis as the three extra techniques which were not mentioned by Walia and Jain. Buciu and Gacsadi (2016), classified the 7 biometric techniques and the 2 listed by Walia and Jain (2016) as

respectively belonging to the physiological and behavioral categories. As a means of obtaining an in-depth understanding of biometrics and its importance, an overview of the nine techniques will be interrogated in the following paragraphs. All biometric readers conform to the same architecture reflected in Figure 2.1 below. The significant findings about the views highlighted in the reviewed literature, was that they all concurred with Shankar, Udupi and Gavvas (2016:42) suggestive of biometrics being about “something-you-are”. Biometric extends to more than the above listed techniques. It is, however, critical to have a snapshot of the importance of biometrics before giving an overview of the nine techniques.

### **2.7.1 The importance of biometrics**

Biometrics are classified as one of many attempts of rendering an authentication process that is robust (Shankar, Udupi and Gavvas, 2016). It was interesting to note that some government sectors, according to Adewole et al. (2014) use biometrics as a means of curbing terrorist activities and rooting out criminal elements. This is done by identifying impostors, thereby allowing authorities to proactively take security enhancing decisions before the undesired acts are committed.

In agreement with Adewole’s assertion, the versatility of biometrics inarguably presents those that recognise its role with solutions of national importance. Such sentiments are supported by Patel and Asrodia (2012) who recognise biometric as a technological means of ensuring secure identification and personal verification which responds to security breaches and fraudulent transactions which are on the increase.

To further emphasise its importance, Josphineleela and Ramakrishnan (2012) asserted that biometric, as a security mechanism, is relied upon when it comes to fighting criminal acts of stealing human identity as is prevalent in communities nowadays. Biometric eliminates the possibility of identity sharing, loss or even forgetting which emanate from human memory deficiency (Shankar, Udupi and Gavvas, 2016).

With regards to cost savings side, Shoewu and Idowu (2012) see biometric use as a means of eliminating costs associated with use of stationery and personnel normally employed for manual attendance management.

Cupido (2011) attested to the important role of biometric within the borders of South Africa where companies use it for accurate individual identification and attendance tracking.

## 2.7.2 Techniques of Biometric

Although all biometric techniques are based on physiological or behavioural elements, there are different significances in how there are utilised (Bakshi et al., 2014). A brief overview of each technique is given below where advantages and disadvantages are emphasised.

### 2.7.2.1 Iris recognition

Iris recognition biometric is about identifying individuals on the basis of the pattern of their iris. Kalka et al. (2006), deemed this technique as the most dependable with regards to performance in the area of recognition and identification. The inferior quality imaging, however, degrades iris performance with the defocus blur, motion blur and off-angle being the main elements of such degradation. Negin et al. (2000), argued that iris recognition may supersede fingerprint and face recognition on the basis of its biometric discriminatory levels which means that iris may be more accurate.

### 2.7.2.2 Face

The face recognition technology is gaining momentum within the industry. It has its strengths and weaknesses (Jain, Nandakumar and Ross, 2016). Capturing the individual's face has to be done and stored in the database of the system before usage. The process is called enrolment. Enrolment requires about 2 seconds' stillness of an individual before the face scanner. Once enrolment has been done, the day-to-day usage of the system becomes easy and does not necessitate the freeing of hands, only face presentation in front of the biometric. Martino, Samame and Strejilevich (2016) asserted that the credibility of facial recognition was proven through administering its accuracy on individuals going through six emotional changes. This experiment was administered over a period of seven years where accuracy was checked while an individual was either going through emotions such as surprise, anger, sadness, happiness, disgust, or fear (Martino, Samame and Strejilevich, 2016).

Advantages	Disadvantages
<b>It is easy to use</b>	Devices are expensive
<b>It is tolerant to changes</b>	Face to be enrolled every year especially for children
<b>Stableness of metric over prolonged periods</b>	

**Table 2.1:** Advantages and disadvantages of face recognition

**Source:** Adapted from

### 2.7.2.3 Fingerprint

The enrolment of the fingerprint is a simple and fast process. (Jain, Nandakumar and Ross, 2016) rated the fingerprint biometric as a superior one of the nine techniques and deemed it reliable, mature and conforming to the standard of acceptance in the legal field. The unique feature about fingerprint biometrics is that they can be verified either manually or automatically (Karthikaeshwaran and Sivaramakrishna, 2013). The authors, however, cautioned about the tediousness of manual verification and its inability to cope with performance requirements for new applications. The fingerprint biometric, though popular as they are, have age and temperature related limitations (Terblanche, 2011). The limitations relating to children emanates from the fact that their fingers are unreadable especially from 8 years down. This limitation is however no applicable to adult and therefore will not be relevant in the work setting. While the temperature related limitations results from biological changes that happen especially in very low temperatures, it may not be applicable in eThekweni Municipality due to its favourable tropical temperature. It is noted though that should the effect of global warming drive the temperatures lower than normal, the low temperature related limitation may come into effect (Bakshi et al., 2014). The advantages and disadvantages of fingerprint biometric are summarised in Table 2.2.

Advantages	Disadvantages
<b>Faster enrolment</b>	Poor metric for children up to 8 years
<b>Faster recognition</b>	Vulnerability towards ambient temperatures
<b>Stabilized metrics for adults</b>	

**Table 2.2:** Advantages and disadvantages of fingerprint

**Source:** Adapted from

### 2.7.2.4 Hand vein

In the hand vein biometric the enrolment processes involves the usage of infrared technology to extract the biological identification of veins of the hand to be later used in gaining the required access (Terblanche, 2011). Table 2.3 outlines the advantages and disadvantages of hand vein biometric.

Advantages	Disadvantages
<b>Fast scanning time</b>	More time is needed to learn to use the biometric
<b>Has reduced health concern issues</b>	
<b>Works well for all age groups</b>	

**Table 2.3:** Advantages and disadvantages of hand vein recognition

**Source:** Adapted from (Jain, Nandakumar and Ross, 2016)

#### **2.7.2.5 Hand geometry**

Hand geometry refers to the structure of hand which includes lengths and width of fingers as well as thickness, length and contour of palm (Jain, Nandakumar and Ross, 2016).

Scalability is its shortfall and as such this biometric presents low levels of security (Buciu and Gacsadi, 2016). Moreover, enrolling of hand is an inconvenience as it requires a complex hardware and its inappropriateness for computer login. The basis of its recognition is the length, width, thickness and surface area of the fingers and hand. Shankar, Udipi and Gavvas (2016) concurred with Buciu and Gacsadi (2016) on the features focused on for the establishment of individual recognition using this technique.

#### **2.7.2.6 Retinal pattern**

An infrared camera is used for vein pattern capturing. Using this technique demands more effort on the user as expected proximity has to be maintained for credible verification to take place (Bakshi et al., 2014). The overarching benefit that retina has over iris, face or fingerprint is that spoofing its patterns is difficult (Buciu and Gacsadi, 2016).

#### **2.7.2.7 Voice print**

Though voice is produced through the use of physiological traits; it however, leans toward the behavioral trait as a manner of speech belongs to the behavioral characteristic of an individual (Buciu and Gacsadi, 2016). As in all biometrics, enrolment is key and credible authentication of the presented image is based on its successful verification against the template saved in the database. During enrolment a voice print is stored which is later used to verify the authenticity of an individual requiring certain access which should match the one

granted the voice producer (Shankar, Udupi and Gavas, 2016). Any mismatch results in denial of access for the member who could not be positively verified.

#### **2.7.2.8 Signature**

This technique belongs to the behavioural category of biometrics (Jain, Nandakumar and Ross, 2016). Signature is an acceptable form of biometric in legal, government and business undertakings, being recognised as an individual's unique identifier (Shankar, Udupi and Gavas, 2016). Notwithstanding its uniqueness, conditions such as emotions and the physical landscape of an individual affects the signature.

#### **2.7.2.9 Facial thermography**

This biometric technique is based on the heat radiated by human face and is captured through the use of an infrared camera (Bakshi et al., 2014). According to Buciu and Gacsadi (2016), this technique is affected by environments with low lighting. There are, however, readily available solutions to improve recognitions performance though they produce noise laden output. The other side-effect this technique suffers is its negative response to changes related to medical conditions such as flu (Jain, Nandakumar and Ross, 2016).

#### **2.7.2.10 Summarised deficiencies of biometric**

Deficiencies of biometrics have their root causes in what Jain, Nandakumar and Ross (2016:3) called "intra-subject changes". They segmented the intra-subject changes into sensory limitations, intrinsic aging variations in user interactions, changes in environment and other factors. In fact, Jain, Nandakumar and Ross (2016) suggested that iris, face and voice biometrics' deficiencies are somehow affected by the same intra-subject changes. Table 2.4 consolidates the effects the intra subject variation has on biometric traits.

Origin of intra-subject changes	Fingerprint	Face	Iris	Voice
<b>Sensor limitations</b>	Resolution, signal to noise ratio, sensor cleanliness	Spatial resolution, frame rate, acquisition spectrum (visible vs. infrared), distance from camera, 2D vs. 3D	Acquisition spectrum (visible vs. near infra-red), distance from sensor	Signal to noise ratio
<b>Intrinsic aging</b>	Variations in ridge thickness & height due to changes in skin elasticity & sebaceous gland activity	Geometric changes during childhood & adolescence, wrinkles and saggy skin in old age	Myotic pupil (pupil constricts)	Voice changes during childhood & adolescence, pitch changes, voice shakiness in old age
<b>Changes in user interaction</b>	Rotation, translation, finger pressure	Pose, expression	Pupil dilation, partially closed eyes (blinking), gaze angle	Speed, intensity, accent variations
<b>Environment variations</b>	Indoor vs. outdoor	Illumination, background scene	Illumination	Background noise
<b>Other factors</b>	Cut, worn-out finger, dry/wet fingers	Make-up, accessories, occlusion	Eye diseases, influence of alcohol	Common cold

**Table 2.4:** The summary of different origins of intra-subject changes in the signals

**Source:** Adapted from Jain, Nandakumar and Ross (2016)

### **2.7.3 Most Employed Techniques**

Compared to the legacy instruments of managing attendance, biometrics are the best in terms of reliability (Bakshi et al., 2014). This reliability, however, comes at a higher cost as biometrics devices are more expensive than legacy instruments. The comparison extends to all available biometrics as a decision has to be taken on which biometric to use. Having gone through all nine techniques, suffice it to say that Terblanche (2011) identified fingerprint, palm vein and face metrics as the preferred techniques. He attributed their preference to their accuracy, fair prices and their ease of usage. Jain et al. (2016) concurred with Terblanche (2011) on the two preferred techniques except the palm vein. Jain, Nandakumar and Ross (2016) three most used biometric included the iris. These authors, however, had different reasons for popularity of fingerprint, face and iris biometric traits. Fingerprint and face is popularised as a result of the vast availability and accessibility of historical databases which the law enforcement and relevant state entities, worldwide, would have collected. Unlike face and fingerprint, iris recognition is according to Jain, Nandakumar and Ross (2016), popularised by its accuracy. Another reason for the choice of the three by Jain is the periodic evaluations of these technologies which are done by National Institute of Standards and Technology (NIST) in America.

It is worth noting the views of Terblanche (2011) and Jain, Nandakumar and Ross (2016) in terms of their device popularity that they are from two different parts of the world. Terblanche (2011) is in South Africa while Jain, Nandakumar and Ross (2016) was based in the United States of America and therefore the evaluation by NIST may not be applicable in South Africa.

### **2.7.4 Fundamentals for biometric mass acceptance**

Since the technology is meant to be administered within the employees' environment, it is envisaged that it must meet their general expectations of the technology before its adoption as an acceptable tool. Shankar, Udipi and Gavas. (2016) mentioned permanence, circumvention, uniqueness, collectability, measurability, universality and acceptability as the criteria for biometric acceptance. Buciu and Gacsadi (2016) had three additional attributes over and above those identified by Shankar, Udipi and Gavas (2016) which they listed as scalability, simplicity and cost-efficiency. The brief explanation of each term as given by Shankar, Udipi and Gavas (2016) and Buciu and Gacsadi (2016) is as per the following:

**Permanence:** it relates to the firmness of the trait regardless of time or over reasonably long periods of time.

**Circumvention** relates to the system's ability to discriminate between legitimate and illegitimate users.

**Uniqueness:** a trait or feature that is found only in one individual person.

**Collectability:** the solution must have the ability to collect features for assessment and measuring purpose should not be complex.

**Measurability:** this is about the use of fit for purpose devices in acquiring and digitizing biometric features in a manner that does not inconvenience anyone.

**Universality:** the features used as the basis for monitoring should be found on all who are meant to use the system.

**Resilience:** it refers to the system's ability to deal with exceptions.

**Cost efficiency:** the solution's implementation has to come with cost benefits to the organisation. This is an appealing feature which is more attractive to shareholders.

**Simplicity:** the solution should be simpler to use.

**Scalability:** the solution should be able accommodate large number of users without losing its accuracy.

**Acceptability:** this relates to the system being accepted by the users

Of the above listed attributes, some will be more appealing to the employer while some will be of interest to the user of the technology.

Ami-Narh, Aziale and Akanferi (2014), however, presented the acceptance of technology in a model as shown in Figure 2.1. Noticeable in the figure is that behaviour is the end result which will determine acceptance or rejection of technology. Such acceptance would have been based on items as listed by Buciu and Gacsadi (2016) and Shankar, Udipi and Gavvas (2016) in the preceding text.

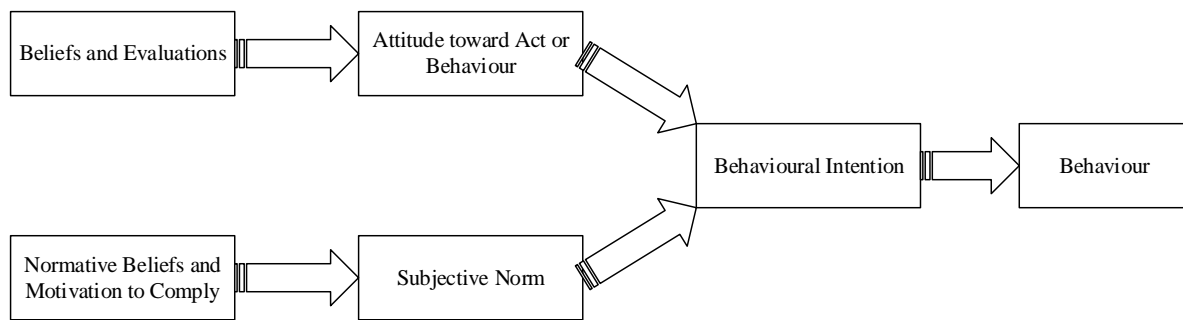


Figure 2.1 Theory of reasoned Action

Source: Ami-narh, Aziale and Akanferi (2014)

### 2.7.5 Legality around the usage of fingerprint biometric

The legality of usage of the fingerprint is investigated as it is the one that the study focuses on. This is further necessitated by the recent introduction of Protection of Personal Information (POPI) act (POPI, 2013). Personal information and data is defined by the POPI legislation as information that makes possible for the user to identify the data subject (De Bruyn, 2014). De Bruyn (2014) further listed the aspects of information the POPI act covers as inclusive of information about race, marital status, health, gender, sex, pregnancy, ethnic origin, religion, disability and belief of the subject. It is understood that in the UK, Data Protection Act of 1998 authorized schools to take children’s fingerprint biometrics without the parents’ consents (Terblanche, 2011). Terblanche (2011) also articulated personal information collection prohibition as spelt out in section 25 of South Africa’s POPI act. In South Africa context, personal information can only be collected when consented to, in writing, by an individual whose information is sought. While the introduction of POPI may seem to be a potential hindrance to achieving the fingerprint-based attendance management, section 84 (a) of Labour Relations Act promotes consultation to happen between an employer and labour on issues of the introduction of new technology (Labour\_Relations\_Act, 1995). Since fingerprint-based attendance management is a technological advancement, its implementation demands employers to adhere to legislative requirements of prior consulting with staff prior to adoption of the technology.

### 2.7.6 Biometric Risks

There are risks associated with the usage of biometrics. Buciu and Gacsadi (2016) highlighted the two main risks as false accept rate (FAR) and false reject rate (FRR). False accept rate relates to wrongly accepting an unauthorized person while false reject relates to

wrongly rejecting an authorized person. Ideally false reject and false accept rates should each be equal to zero, Buciu and Gacsadi acknowledged non-existence of such. Akinduyite et al. (2013) gave the following mathematical formulae for calculating FAR and FRR respectively:

$FAR = \frac{FA}{N}(100)$  and  $FRR = \frac{FR}{N}(100)$  where FA denotes the number of falsely accepted entries, FR denoting the number of falsely rejected entries while N represents the total number of verified entries in both instances.

## **2.8 Illusions of the use of fingerprint biometric**

The literature revealed hygiene and possible theft of fingerprint from the device as concerns people sometimes have about the use of fingerprint biometric (Walia and Jain, 2016). These concerns were however dismissed as baseless as Walia and Jain (2016) argued that the fingerprint clock zone is not conducive for accommodating germs as it lacks heat, a trait that germs enjoy. On the question of theft Walia and Jain (2016) reiterated, its secureness which is one of the fingerprint features expressed by Adewole et al. (2014). This cleared the fingerprint-based attendance management of those shortcomings levelled against it.

## **2.9 The Reliability of Fingerprint Base Biometric**

. The reliability of fingerprint based biometric as a tool for attendance management is in its ability be dependent on unique human feature minutia. . As traditional types have already been covered under section 2.6.3, biometric's reliability is discussed by way of focusing on its architecture components.

### **2.9.1 The fingerprint biometric**

Whereas the traditional attendance management systems have their shortcomings, the biometric types have numerous advantages. Of the physiological biometric techniques which as have been dealt with in the preceding text, this section focuses on the fingerprint one. All biometric categories base people verification and authentication on the physiological or behavioural characteristics which are unique to each individual (CHAUDHARI et al., 2014; Bakshi et al., 2014; Krishnamurthi et al., 2015). It is however, reported that fingerprint recognition has as its advantages ease of usage and its low cost (Josphineleela and Ramakrishnan, 2012). Furthermore they rated fingerprint biometric as the one with highest performance and distinctiveness outstripping others such as face recognition, signature and voice recognition.

Patel and Asrodia (2012) maintained that minutia points of fingerprint identification is the simplest and easiest means of verification. They further identified ridge ending, bifurcation and short ridge (or dot) as three major minutia features of fingerprint ridges.

In order to put the minutia features into use, thereby realising the benefits of fingerprint biometric, Shoewu and Idowu (2012) presented the architecture of how the process works as shown in Figure 2.2 below. The three notable modules of critical importance, which will be briefly discussed, are enrolment, authentication and database.

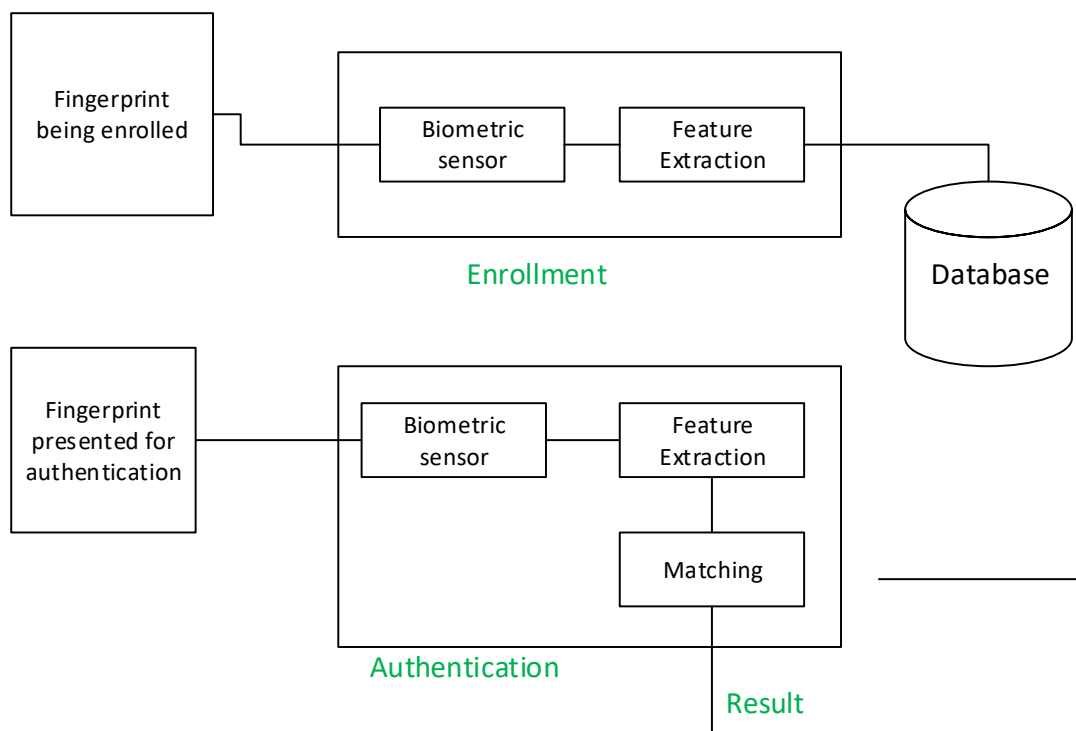


Figure 2.2: General Architecture of a biometric System

Source: Shoewu and Idowu (2012)

### 2.9.1.1 Enrolment module

The module enrolls the fingerprint by way of presenting each finger to be used during authentication to the sensor of the biometric enrolment as shown in Figure 2.2. From the biometric sensor, the minutiae features are extracted and passed on to the database for storage purposes. Of note is that features are stored against the details (name, incumbent position, service number, access levels, etc.) of the individual concerned (Akinduyite et al., 2013).

Minutiae are defined as the uniqueness of fingerprint patterns which eliminates chances of impersonation where they are used (Adewole et al., 2014). Patel and Asrodia (2012) maintained that fingerprints are unique unchanging features that people possess. Unique means that no more than one person has the same features. The said uniqueness is a vital aspect in rating the fingerprint as a reliable feature to be used for people authentication (Adeniji, Scott and Phumzile, 2016).

While enrolment is meant to be a smooth process, it is not always the case as some fingerprints may be hard to enrol with others being impossible to enrol. The phenomenon is termed fail to enrol (FTE) and is attributed to age in the case of senior citizens and use of hands in harsh environments in the case of labourers (Akinduyite et al., 2013). FTE is calculated mathematically using the below formula as advocated in the work of Akinduyite et al. (2013):

$FTE = \frac{FE}{N}(100)$ , where FE denotes the total number of failed enrolment while N denotes entire number of verifications. FTE is estimated to be in the region of 4% of population.

### **2.9.1.2 Authentication module**

The captured information for each individual gets stored in the database during this authentication phase (Adewole et al., 2014).

Josphineleela and Ramakrishnan (2012) revealed that though minutiae fingerprint matching is the most commonly used, grayscale image, phase image and skeleton image can also be used. During authentication, the fingerprint that was enrolled gets placed on the biometric sensor where feature extraction takes place. Once that has taken place, the extracted features get compared with the stored template located in the database server and the result will either be rejection or acceptance of the presented fingerprint, depending on whether there is a match between the fingerprint on the database and the fingerprint being presented.

### **2.9.1.3 System database module**

This is the storage place of all records of enrolled individuals which Shoewu and Idowu (2012) and Akinduyite et al. (2013) agreed is kept in the form of tables. Each record contains the minutiae template which matches that of an individual authorised to access a particular area.

## **2.10 The advantages and disadvantages of a Fingerprint System**

The literature revealed that the implementation of the fingerprint-based attendance management can face challenges especially where it is used to replace traditional systems (Cupido, 2011). This could be caused by the user's familiarity with the traditional systems and its loopholes.

Cupido (2011:84-85) pointed to the benefits and drawbacks of the biometric systems which are best captured in Table 2.5 below.

Benefits		Drawbacks	
What	Reason	What	Reason
Precision	System's precision was not questionable.	<b>Electricity</b>	In the absence of mains the biometric system works on standby battery.
Accuracy	Accuracy of data took place with no conflicts due to malfunction	<b>Human intervention</b>	The system's report gets its meaning from human interpretation.
Modification	System reconfiguration can only be done by an authorised person.	<b>Service delivery gap</b>	The system keeps records of transactions executed without tracking employee productivity.
Consistency	System's stability was observed	<b>Presence and absence at work</b>	System operates independently and susceptible to manipulation by those who may choose to clock in and then leave the work premises only to come for clocking out. Cupido (2012:85) acknowledges the importance of supervisors to supervise.

**Table 2.5:** Benefits and Drawbacks of fingerprint biometrics system (Continues to next page)

**Source:** Extracted from Cupido (2011:84-85)

Benefits		Drawbacks	
What	Reason	What	Reason
Reports have multiple uses with set target hours per week	Reports display tendencies of the employee on specific days of the week in the analysis of clock times		
Access available 24 hours per day	The clocks are easily accessible as they are located at building's entrance doors.		
Time consumption minimised	No reports of authentication being slow were received.		
Function	The device operates at the speed expected by the users		
Precision of operation has been established	No reports of employee(s) mistaken for another in any transactions done		
Independent functioning without remembering any clock times	Responsibility to clock resides with the employee – without the intervention of a second person.		

**Table 2.5:** Benefits and Drawbacks of fingerprint biometrics system

**Source:** Extracted from Cupido (2011:84-85)

## 2.11 Traditional Functionality Compared to Fingerprint

The literature studied showed the roles that traditional and biometric systems play in the area of attendance management (Shoewu and Idowu, 2012). Evidence from the literature suggests that attendance management was used for different purposes by different users. Notable though, was the use of traditional methods of attendance management by some organisations in spite of the latest technologies being available to render improved productive levels. Table 2.6 gives an overview of functionality of traditional attendance management while Table 2.7 addresses fingerprint biometric attendance management.

<b>Traditional attendance</b>	<b>How they work</b>	<b>Limitations/gaps</b>	<b>Risk associated with their use</b>
<b>Time clock, clock card machine, punch clock time recorder</b>	An individual inserts card on arrival, lunch breaks and on departure.	Fixed at a specific point	Individuals may swap cards
<b>Manual register</b>	Gets circulated for signature in meetings.	Office based	Can be stolen or lost
	At workplace, it gets located in an accessible place	Located at fixed place	Individuals can sign for one another.
<b>Access control (proximity)</b>	An individual presents the card to the reader which is normally mounted on a wall.	Fixed at a specific point	Impersonation

**Table 2.6:** A brief overview of traditional attendance management tools

**Source:** Adapted from Soewu and Idowu (2012) and Akinduyite et al. (2013)

Biometric	How they work	Limitations/gaps	Risk associated with their use
Fingerprint	An individual presents his or her finger to a biometric reader  Authentication of transaction render the system reliability	Its dependency on mains	Unavailability of attendance management tool during power outages

**Table 2.7:** A brief overview of biometric attendance management tools

**Source:** Adapted from Cupido (2011)

Most of the literature studied did not address the issue of resistance to change which could lead to the rejection of the solution. But Cupido (2011) addressed it in terms of change management. His approach was however, limited to change where resistance could be justifiably based on the unknown future state. This may not be so with the introduction of the biometrics based attendance management as people may be opposed to it based on fear that it will expose their unjust behaviours. Such resistance may be a real challenge to deal with. Cupido (2011) also pointed that the system keeps records of transactions executed without tracking the employee productivity, which is a setback. True as it may be, an however be argued whether the system was or is meant to do anything beyond providing a synergy.

Noted also in the literature studied was the lack of South African based studies focusing on the subject of biometric based attendance management. Of about nineteen of consulted literature, only two were South African and were by Adeniji, Scott and Phumzile (2016) and Cupido (2011).

## 2.12 Summary

The literature indicated the importance of punctuality in the day-to-day running of any organisation whether private or public. Such importance requires due attention even within council settings like Information Management Unit. The role of perception in decision making has been clarified. The literature study revealed that perception is a step in the right direction to devise alignment strategies or enhance the current attendance management status.

A sense of consensus prevailed among all experts pointing to the shortcomings of traditional attendance management systems where impersonation and buddy punching was echoed as their overarching weaknesses. On the contrary and without a doubt, the literature review almost indicated no negatives about the biometrics' usefulness in the area of people verification, identification and authentication. It was indicated that the fear factor which decelerates decision making as being pro-implementation of the biometric attendance management tool. Succumbing to fear raises the question of cost effectiveness in decisions made by institutions where technologies that have greater potential, if well utilised, of bringing value to organisations are allowed to operate far below their value realisation levels. It was an interesting discovery to know that other companies have taken it upon themselves to implement biometrics as a form of attendance management. The consulted literature is going to be put to use by way of employing the methodology discussed in the next section in studying the IMU employee perception about fingerprint based attendance management systems and its effect on punctuality.

The following chapter gives an insight into the methodology used to collect the primary data in this study.

### **2.13 Conclusion**

This chapter dealt with literature review whereby it covered the following main sections: the reasons for existence of organisations, the meaning of punctuality, fingerprint-based attendance management, the perception, and the attendance management, the understanding of the concept of biometric and traditional attendance compared to fingerprint-based attendance management. The next chapter elaborates on the research methodology used in this study.

## **CHAPTER THREE**

### **Research Methodology**

#### **3.1 Introduction**

The preceding chapter reviewed literature around this study. This chapter outlined the methodology employed to fulfil the study. Such establishment was achieved by using a mixed methodology as encapsulated in the following sections of this chapter. The mixed method was viewed as consistent with the purposes of the study.

#### **3.2 Aim and Objectives of the Study**

The aim of the study was to establish the employee perceptions of the fingerprint based attendance management system and its effect on punctuality at eThekweni Municipality. In achieving the aim of the study four objectives were formulated as listed below:

- To establish the perception of employees on a fingerprint-based time management system.
- To establish the reasons of for late coming at eThekweni Municipality.
- To explore strategies to put in place to curb late coming.
- To establish the relationship between fingerprint-based time management system and punctuality.

The research questions used in achieving the objectives are listed below:

- What are employee perceptions on a fingerprint-based time management system?
- What are the reasons for employee late-coming at EThekweni Municipality?
- What is the relationship between a fingerprint-based time management system and punctuality?
- What strategies have been put in place to curb late coming?

#### **3.3 Participants and Location of the Study**

The participants of the study were sampled from the target population which were the employees of IMU Unit of eThekweni Municipality. The Unit has 300 employees who occupy different levels of employment. The levels were, for the purposes of the study,

summarised as employees and management where managers are referred to those who occupy middle management positions and upwards. An employee who is not a manager is referred to as staff. The study was based in Durban.

### **3.3.1 Sampling Techniques**

In keeping with ethical codes, participation was on a voluntary basis for participants of both the quantitative and qualitative methods of data collection. Simple random and purposive sampling methods were used for quantitative and qualitative methods respectively.

#### **3.3.1.1 Simple Random Sampling**

For the quantitative method, 120 participants were randomly selected from the total population of about 300. Ten respondents were used for pre-testing the tool and the 5 managers were selected for a qualitative study. This sampling method was chosen over stratified random and cluster sampling methods because it allows all possible sample equal chance of being selected thereby making generalization of results fair (Gerald, 2009).

Stratified random sampling separates the population into strata which could be age, gender, height, occupation and many more. Cluster sampling is used where using other two would be too costly or complicated to compile a list of population members.

#### **3.3.1.2 Purposive Sampling**

For the qualitative study, 5 managers were purposively selected based on the number of years spent with the company which were not less than 2 years. This period was chosen based on the assumption that it would be enough time for the manager to have ample experience of the work environment. An overarching requirement was that the participant manager be the one whose duties involved managing human resources as it was expected of them to have an intimate knowledge of the issues of punctuality and attendance management.

### **3.4 Recruitment of Study Participants**

Since the study employed the mixed methodology approach, recruitment of participants was slightly different. Those invited to participate in the quantitative survey were invited via email which had all the necessary information about the study including the informed consent form. The biographical details of participants encompassed employees from all races and employment levels regardless of educational level. This was necessary as all employees are subjected to the same attendance management system. A link to the questionnaire was also included in the email. Those recruited for interviews were telephonically invited and on their

acceptance, interview dates were set and agreed upon. Since management staff was on the premises, all interviews were scheduled in their respective offices at a time convenient to them for 15 to 30 minutes over the period of two and a half weeks as it was difficult to get them to comply with fixed interview schedules.

### **3.5 Data Collection Strategies**

Of the six major methods (Direct Observation, Self-Administered Survey, Telephone Interview, Experiments, Personal Interview and Surveys) of data collection as articulated by Gerald (2009) self-administered survey and personal interviews were employed for this study. Self-administered survey were chosen because while they afford the participant needed time and comfort they also eliminate bias that can come from the researcher (Fowler Jr, 2013). The interview was chosen as it affords an interviewer an opportunity to probe an interviewee with the aim of sourcing maximum information (Fowler Jr, 2013).

Since the study employed the mixed methodology approach, which is qualitative and the quantitative in nature, data collection was two-fold. The Unit had 300 employees which formed the total population and 15 of whom were in management.

#### **3.5.1 Quantitative Method**

The data collection strategy used was the questionnaire which was created on Google form. An internet link, where the questionnaire would be found, was emailed to the participants together with the consent form telling them about the study and their voluntary right of participating.

#### **3.5.2 Qualitative method**

Face to face interviews were conducted as telephonic ones tend to cause the interviewee to give less information as they are not confident that their information is understood (Irvine et al., 2013).

### **3.5 Research Design and Methods**

#### **3.5.1 Description and Purpose**

This section elaborates on the mixed methodology used.

### 3.5.1.1 Quantitative

As an acknowledgement of work already done, an objectivism epistemology approach was implemented in attempting to understand the reality that exists in the environment of fingerprint-based attendance management. Positivism theoretical perspective was employed as it is inseparable from objectivism (Gray, 2009). Such theoretical perspective, as displayed in Figure 3.1, was viewed critical as the study aimed to pursue a scientific process which had to be rigorous in investigating employee perceptions about the fingerprint-based attendance management system. The quantitative research was deemed ideal for this research especially for addressing the issue pertaining to employee perceptions. This approach supported by Kirk and Miller (1989) who considered quantitative as being a measure of the degree of presence of features under study. Since employees are the users of the technology, it was therefore considered the appropriate decision to investigate their perceptions on fingerprint-based attendance management system. It was, however, understood as suggested by Cupido (2011) that failure to approach perception related issue in a decent way stood a chance of creating withdrawal attitudes within the participants.. This meant the need to remove any reluctance to participate by explaining the purpose of research and alerting them of the voluntary nature to participate in the study. Such may be the researcher’s biasness which the quantitative research removes by keeping a distance between the participants and the researcher (Cresswell, 1994). Whilst the quantitative research may be directed to a specific research objective, it allows generalisations about the topic being studied. It is anticipated that the research questions directed at employees will, through the use of a quantitative method, yield results which can be replicated and possibly be viable for use in other studies of this nature.

In realising positivism, a survey research methodology was adopted as a means of collecting information from the users of fingerprint-based attendance management system. The survey was administered to a sample of the population who had to complete an online questionnaire.

<b>Epistemology</b>	<b>Theoretical perspective</b>	<b>Research Approach</b>	<b>Methodology</b>	<b>Methods</b>
<b>Objectivism</b>	Positivism	Deductive	Survey research (Quantitative)	<ul style="list-style-type: none"> <li>• Sampling</li> <li>• Questionnaire</li> </ul>

Figure 3.1: Elements of quantitative research

Source: Adapted from Gray (2009)

### 3.5.1.2 Qualitative

As one of the research’s objectives sought to explore the strategies put in place for curbing lateness, an interpretivism theoretical perspective was adopted which is what informed a qualitative approach for the task (Gray, 2009). This is necessary as a qualitative method eliminates any confinement of information from the participants (Schostak, 2006). On the contrary, it allows them to open up in answering questions, thereby providing a deeper insight of the subject under study (Schostak, 2006). This information concurred with the views of Hewitt-Taylor (2001) that the reason behind qualitative research as a means of revealing reality about the subject being studied to increase understanding is necessary for better decision making.

Engaging participants in the study using qualitative approach created what Kirk and Miller (1989) termed as necessary and continuous interaction with them. A set of 5 questions were directed to management in the form of interviews.

<b>Epistemology</b>	<b>Theoretical perspective</b>	<b>Research Approach</b>	<b>Methodology</b>	<b>Methods</b>
<b>Subjectivism</b>	Interpretivism	Inductive	Qualitative	Interview

Figure 3.2: Elements of quantitative research

Source: Adapted from Gray (2009)

#### 3.5.1.1 Construction of the Instruments

The instrument was constructed from the four research questions whereby each question was developed into five statements. The break down resulted in a total of 20 statements. As the study employed the mixed methodology, of the 20 statements, 15 were for quantitative survey while the balance was for the qualitative approach.

**Quantitative:** Participants were expected to select one answer from those possible given ones. Provided answers were structured such that views which could be associated to positive, negative or neutral perceptions were accommodated. Since the study employed a mixed methodology, this questionnaire addressed the quantitative method.

**Qualitative:** The qualitative questions for a one-on-one interview were structured such that the participants were not confined to producing certain specific answers. They questions posed were discussed and deliberated upon.

### **3.5.2 Pretesting and Validation**

The pre-testing of the questionnaire was with 10 randomly selected employees within IMU of eThekweni Municipality. This was meant to ascertain the reliability of the questionnaire as a tool that was to be used for the collection of data. Data was meant to be collected over a period of one week. This time period of pre-testing was considered sufficient for finalizing the pilot study. It turned out that the time was more than enough as all participants for this phase responded within two days. The pilot study revealed reliability of the tool as the Cronbach's Alpha score set at 0.8. Such score meant the tool was credible since the closer the score is to 1 the more reliable the tool is (Tavakol and Dennick, 2011).

### **3.5.3 Administration of the Questionnaire**

For the quantitative survey, the participants were emailed a linked which allowed them to access the questionnaire and answer online. The data collection, however, took longer than it was anticipated due to a number of reasons. Some participants admitted to have been very busy and could not immediately attend to the questionnaire while others initially had internet access problems which were later resolved through the help of IT support staff.

The qualitative portion of the study was administered through a one-on-one interview which lasted for a maximum of fifteen minutes. This process took about two and half weeks as some of the participants' schedules could not accommodate an interview. The data collected through interviews was not validated since constant comparison method used for analysing it had been modified to analyse non-validated data (Leech and Onwuegbuzie, 2007).

The response rate for the survey was 65% while that for the qualitative was 100%.

## **3.6 Analysis of the Data**

The data analysis was done for both quantitative and qualitative studies

### **3.6.1 Quantitative analysis**

The quantitative data collected was exported from Google forms to Microsoft Excel and subsequently analysed using the Intercooled Stata version 13. Descriptive statistics such as frequencies and percentages were used to summarise statistics relating to the responses obtained from survey questionnaire addressing the three research questions as were directed to employee of Information Management Unit of eThekweni Municipality. Aggregate scores indicating employees' perspective with regards to fingerprint-based attendance management

system, were calculated by summing an individual's scores for each domain. The distribution of scores was presented using Box and Whiskers plot. Kruskal-Wallis was used to test if there was a relationship between the perception scores and the perceived reasons for late-coming. The level of significance was set at 0.05.

### 3.6.2 Qualitative analysis

Qualitative data was collected through interviews conducted which were recorded and later transcribed. Of the seven analysis tools as described by Leech and Onwuegbuzie (2007), the constant comparison method was used. These authors influenced the choice of constant comparison method for this study as that they portrayed it as the most used one for qualitative of all seven. They also pointed out to its modification which allows it to analyze data collected in one round without the need to validate it by way of going back to the respondents for verification of findings as Hewitt-Taylor (2001) did in his study. This method which allows no validation was therefore thought to be appropriate for this study due to time constraints it had to be done within.

### 3.7 Ethical Consideration

A clearance certificate was obtained from the UKZN ethics committee prior to the data collection process. Permission was further requested from the participants. Participants were guaranteed confidentiality and the purpose of the study was explained. The participants were also made aware that their participation in the study was not an obligation and thus they had the right not to answer any question they felt uncomfortable in responding to (see Appendix 2: Ethical Clearance Certificate)

The following key issues were discussed with the participants prior to their participation in the study:

- The participants were made aware that the study includes observation and thus their reactions would be observed.
- Participants were advised that they could withdraw from the study at any time without giving a reason.
- Participants could request a copy of the study from the researcher upon completion.
- Participants were briefed before and after their participation about the full study and the value of their contribution.

### **3.8 Summary**

It was anticipated that the aim of the study as well as the objectives would be better met through the use of mixed methodology. The reliability of the tool as per Cronbach Alpha's pre-test result was one significant evidence towards guaranteeing the credibility of data collected through the use of the questionnaire. Since the methodology approach was mixed, the envisaged sample size for the quantitative study which was initially aimed at 120 randomly selected participants while the qualitative was administered to 5 participants. The quantitative survey, however, ended up attracting only 78 respondents (65%) whereas the qualitative study interviewed all respondents. The recruitment of participants was done via email and through telephonic discussion for quantitative and qualitative approaches respectively. The data analysis for the quantitative survey was analysed using Intercooled Stata version 13. Constant comparison analysis was employed for the qualitative part of the study.

### **3.9 Conclusion**

The chapter elaborated on the research methodology employed in the study. It accomplished that through addressing the following sections: Aim and Objectives of the study, Participants and location of the study, sampling techniques used, recruitment of participants, data collection strategies, research design and methods, analysis of the data and ethical clearance consideration.

The results and the discussion of the study are presented in the following chapter.

## **CHAPTER FOUR**

### **Results and Discussion**

#### **4.1 Introduction**

In an effort to establish employee perceptions on the importance of a fingerprint-based attendance management system and its effect on punctuality at IMU of eThekweni Municipality, tools were devised for data collection which was done in the previous chapter. This chapter delivers and discusses the results. Before presenting the results and discussing them, the response rate is briefly discussed. The last section deals with the summary of the results.

#### **4.2 Response Rate**

As the population was estimated at 300 with the sample size for the quantitative survey set at 120 and the qualitative study aimed at interviewing five managers, the number of intended participants did not respond. The quantitative survey successfully recruited 78 respondents which formed (65%) of the sample while the qualitative study attracted all participants. Based on responses from individuals who were verbally reminded to participate, the reasons for not achieving 100% response on the quantitative survey could be attributed to various factors ranging from internet access issues, busy work schedules and to people exercising their rights not to participate.

#### **4.3 Results and Discussions**

The results and discussions revealed the reasons for lateness, the perception employees have about fingerprint-based attendance management system and the findings established the relationship between fingerprint-based attendance management and punctuality. The results also revealed different strategies available for curbing not only lateness but also ensuring employees attend work the required number of hours each day. These results are based on the responses received from respondents who participated in the study.

The results and discussions of each approach are delivered under appropriate heading below.

### 4.3.1 Quantitative Approach

The questionnaire was answered using a Likert scale where 1-Strongly Disagree, 2- Disagree, 3- Not Sure, 4- Agree and 5- Strongly Agree. Below are the statements and responses that were recorded as shown in Tables 4.1, 4.2 and 4.3.

No	Statements	No. of Participants in agreement	No. of Participants not sure	No. of Participants in agreement
1	Fingerprint-based time management system is a good management tool.	53, (67.95%)	12, (15.38%)	13 (16.67%)
2	Fingerprint-based time management is a good replacement for physical register.	60, (76.92%)	11 (14.1%)	7 (8.97%)
3	Fingerprint-based time management is not a good tool for government environment.	15, (19.23%)	16 (20.51%)	47 (60.26)
4	Fingerprint-based time management is good as it may exonerate an employee who is falsely accused of accessing an area they did no.	64, (82.21%)	6 (7.69%)	8 (10.26%)
5	Fingerprint-based time attendance management is one example of technological advances that need to be exploited.	58, (74.36%)	15 (19.23%)	5 (6.41%)

**Table 4.1:** Employee perceptions on fingerprint-based time management system

**Source:** Author

On the first question, 67.9% of the participants agreed that fingerprint-based attendance management system was a good management tool. The 15.4% were not sure if it was a good management tool. The remaining 16.7% rejected the fingerprint-based management system as a good management tool. From this statement, it is clear that the overwhelming majority favoured fingerprint-based attendance management system. It is anticipated that employees would probably have given different reasons for agreeing to the claim, if they were subjected to a qualitative study since it allows asking of follow up questions. This finding supports the studies of Adewole et al.(2014) and Akinduyite et al. (2013) who stressed the necessity of such a system to improve staff discipline, and subsequently performance and productivity.

The second statement showed that 76.9% of participants agreed that fingerprint-based time management is a good replacement for the physical register, thereby corroborating the evidence in the literature study (Ami-Narh, Aziale and Akanferi, 2014), (Akinduyite et al., 2013) and (Buciu and Gacsadi, 2016). These authors reach consensus declaring the fingerprint based attendance management as a reliable replacement for conventional attendance management tools. Ami-Narh, Aziale and Akanferi (2014) concluded that technological methods of time and attendance management were suitable replacement for traditional ones.

On the third statement which suggested a fingerprint-based time management was not a good tool for government environment, 19.2% of participants agreed while 60.3% disagreed. This meant that 60.3% of the participants perceived it as a good tool. The majority's view supported the general one as articulated by Akinduyite et al. (2013) where they endorsed fingerprint as appropriate not only for recording in and out of students but also for workers. Adewole et al. (2014) further pinpointed the ubiquity of the fingerprint biometrics in all sectors including government and education sectors where it is used for different reasons.

The fourth statement attracted 82.1% of respondents who agreed that fingerprint-based attendance management is good as it may exonerate an employee who is falsely accused of accessing the area they did not access. This overwhelming positive response showed a superior trust that employees have about the system's accuracy. Their understanding was not deviant from what the literature revealed. The finding is supported by Karthikaeshwaran and Sivaramakrishna (2013) who viewed fingerprint biometric as unique and attributed its stability as the reason it has been the most used one for more than a century..

The fifth statement saw 74.4% of participants that agreeing to fingerprint-based attendance management system as one example of technological advances that need to be exploited. That response showed an indication of participants' willingness to adopt it which concurred with reviewed literature. Reviewed literature (Oloyede et al., 2013) reiterated the reliability of fingerprint biometrics which is complimented by the majority of the respondents who thought in favour of organizations to use them. This view concurs with the call by Walia and Jain (2016) to replace all traditional methods of managing attendance with fingerprint biometric.

An aggregate score reflecting participants' perceptions of fingerprint-based attendance management system was calculated by summing up all responses in Table 4.1. The score was then calculated such that the higher the score, the better the perception and the range was found to be from 6 to 25. Figure 4.1 below shows the distribution of the perception score.

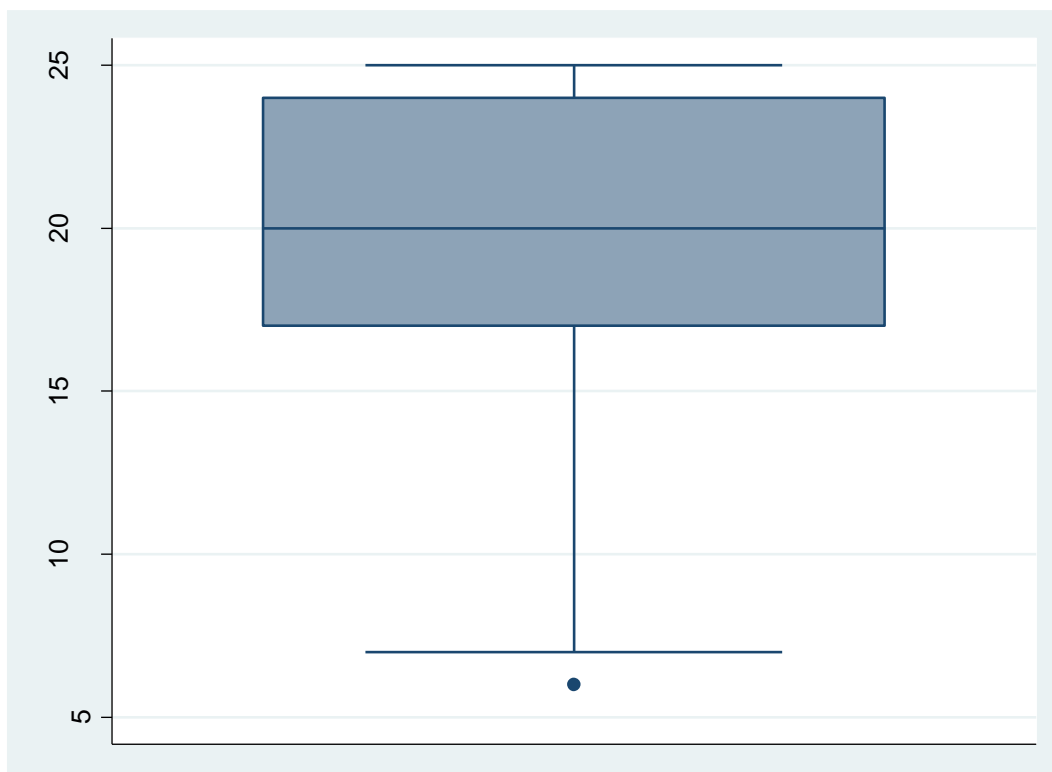


Figure 4.1: Whisker and Box Plot of perception

Source: Author

The overall finding of this research question indicated that at least 50% of the participants perceived the fingerprint-based attendance management system as a valuable management tool as displayed in Figure 4.2. In terms of mass acceptance principle as outlined by Buciu and Gacsadi (2016) and Shankar, Udipi and Gavas (2016), conditions in Figure 4.2 must

have been met. Apparent though with the conditions is that not all may be relevant for employees' acceptance of technology. It was, however, assumed that those relevant to employees would have been met for them to accept the fingerprint biometric. In considering the technology acceptance model as articulated by Ami-Narh, Aziale and Akanferi (2014), the overall acceptance would have been informed by beliefs and evaluations plus normative beliefs and motivation to comply which would result in a behavior which in this case is acceptance.

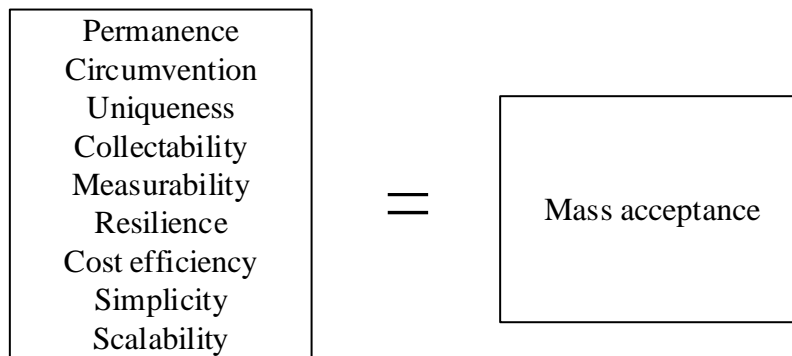


Figure 4.2 Mass acceptance criterion for biometric

Source: Adapted from Baciú and Gacsadi (2016) and Shankar, Udipi and Gavas (2016)

No	Statements	No. of Participants in agreement	No. of Participants not sure	No. of Participants in disagreement
1	Employees come late due to lack of interest on their jobs.	11 (14.1%)	21 (26.9%)	46 (58.97%)
2	Employees come late because of lack of controls.	25 (32.1%)	19 (24.4%)	34 (43.59%)
3	Employees' late coming relates to heavy traffic.	40 (51.3%)	18 (23.1%)	20 (25.64%)
4	Employees come late for no reasons.	10 (12.8%)	18 (23.1%)	50 (64.1%)
5	Employees do not come late.	8 (10.3%)	17 (21.8%)	52 (67.95%)

**Table 4.2:** Reasons for employee late coming at IMU of EThekwini Municipality

**Source:** Author

The findings of the first statement showed that 14.1% of the participants agreed that employees come late due to lack of interest in their jobs while 24.4% were unsure. The majority (58.9%) disagreed with the statement suggesting interest being the cause of lateness. This contrasted Loong, Van Lierop and El-Geneidy (2016) who advocated that there is a relationship between lateness and worker enthusiasm. This contrasting result may be suggestive of the prevailing worker enthusiasm at IMU of EThekwini. The lateness in the presence of enthusiasm could be caused by factors which were beyond the scope of this study.

In the second statement those who favoured the view that employees come late because of lack of controls came to 32.1% while those who were not sure ones sat at 24.4%. The majority, at 43.5%, viewed the control for ensuring punctuality as being there. This was a cause for concern as availability of controls should have been something known to all

participants. This provoked the question of whether policies, governing attendance at work are being communicated from the highest hierarchy of the organization as Jensen (1993) proposed they must if successful adherence is to be achieved. Participants' ignorance of the controls could also be associated to their unpreparedness to familiarize themselves with the policies.

The finding of the third statement suggested heavy traffic as the cause of employees' lateness, attracted 51.3% of participants who agreed while 23.1% were not sure. Since the study did not investigate the mode of transport the late comers use, it could not be confirmed if lateness is prevalent to public transport users, those using their private transport or to all. Reviewed literature based on the study by Fourie (1987) found long, tedious and complicated routes to work as the major reason for lateness. Fourie (1987:1) study was, however, narrowed his study to what he termed "black commuters" who lived in townships. Loong, Van Lierop and El-Geneidy (2016) also found transport to be linked to employee lateness. Unlike the study by Fourie (1987), this research was based on a random sample which comprised of participants from all IMU employees without any form of discriminating them. It did not consider how far they lived from their workplaces. Another relevant observation was the time gap between 1987 and 2016 which could have seen economic changes resulting in changes on the social life and the geographic location of the working class (Swasa, 2016) Having said the findings by Fourie (1987) may still have some valid since Loong, Van Lierop and El-Geneidy (2016) also found transport as well as weather being contributors not only on employee enthusiasm but also on punctuality.

The fourth statement saw a total of 12.8% of the participants agreeing that employees come late for no reasons whereas the 23.1% of them were not sure. The majority of the participants (64.1%) disagreed with the line of thinking which suggests that employees come late without reasons. The majority of the participants supported the reviewed literature in that there are reasons behind lateness. Mageni and Slabbert (2014) pointed to an increase in life's demanding roles for employees outside their work life as a competitor for their employers though not citing it as reason for lateness. On the other hand Fourie (1987) and Loong, Van Lierop and El-Geneidy (2016) did not only acknowledge the presence of reasons causing lateness but went as far as naming them.

The findings for the fifth statement recorded 10.3% of the participants who agreed that employees do not come late. A total of 67.9%, however, disagreed with the statement that

rejected non-existence of lateness; this could form the basis for further investigation. This study could be necessary for socio-economic development and growth, more especially if punctuality is viewed as one of the drivers (Swasa, 2016).

An aggregate score reflecting agreement levels on issues of punctuality was calculated by summing up all responses in Table 4.2. The responses for statements 1, 2, 4 and 5 were reversed as participants should disagree on these statements to show agreement on punctuality issues. Thus, the higher the aggregate score, the higher the level of agreement on punctuality issues. Figure 4.3 below shows the distribution of the agreement on punctuality issues.

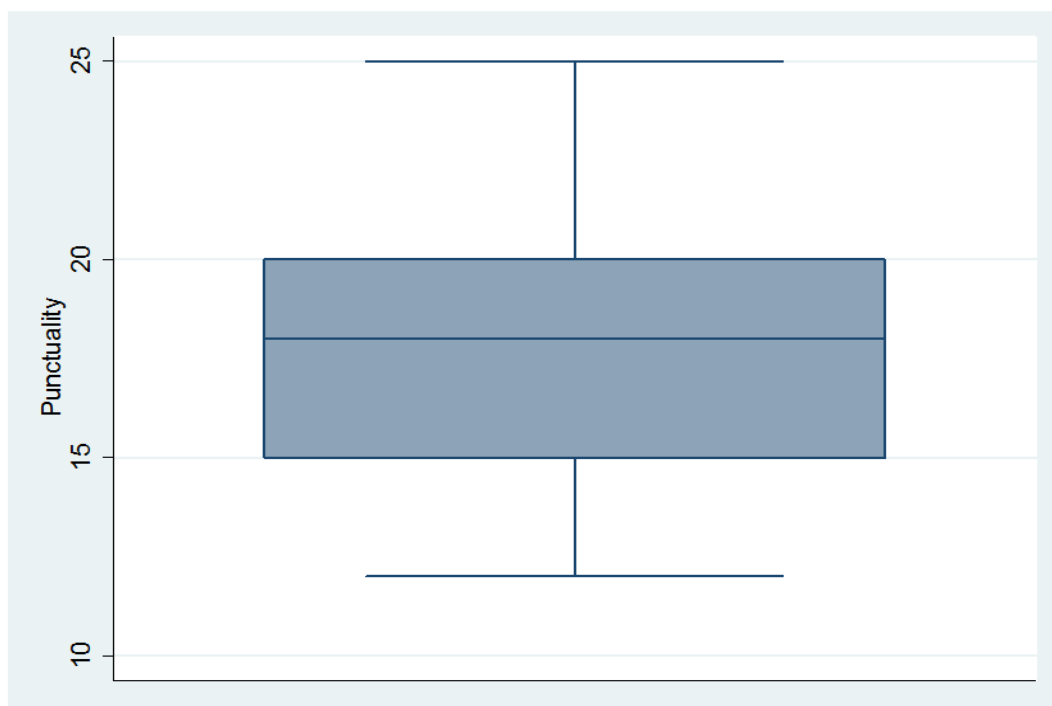


Figure 4.3: Whisker and box plot regarding punctuality issues

Source: Author

The score reflecting agreement on punctuality issues ranges from 12 to 25, reflecting that none of the participants strongly disagreed in all questions against the issue of punctuality.

## Analytic Statistics

The Kruskal-Wallis test was used to test whether there is any relationship between participants' perception and believed reasons for late coming and the results are displayed in Table 4.2.1

No.	Statements	p-value
1	Employees come late due to lack of interest on their jobs.	0.53
2	Employees come late because of lack of controls.	0.10
3	Employees' late coming relates to heavy traffic.	0.81
4	Employees come late for no reason.	0.03
5	Employees do not come late.	0.32

**Table 4.2.1:** Kruskal-Wallis test

**Source:** Author

Notably, participants who believe that employees come late for no reason have a different perspective about fingerprint-based management system (FBMS) than those who disagree with that and the results are statistically significant with a p-value of 0.03. The median values of participant's perspectives according to their belief that employees come late for no reasons is tabulated below:

<b>Employees come late for no reasons.</b>	<b>Perception on FBMS Score</b>
<b>Strongly Disagree</b>	21
<b>Agree</b>	20
<b>Not sure</b>	20
<b>Agree</b>	14
<b>Strongly agree</b>	17

**Table 4.2.2:** Participants perceptions

**Source:** Author

Overall, participants who do not believe that employees come late for no reason have a better perception with regards to FBMS. This mean that of the participants who believe there is a reason for employees' lateness are not against the implementation of fingerprint-based management system.

No	Statements	No of Participants in agreement	No of Participants not sure	No of Participants in disagreement
1	Implementation of fingerprint-based attendance management system is a good step towards curbing lateness problems.	41 (52.6%)	20 (25.64%)	17 (21.79%)
2	Fingerprint-based attendance management system will exonerate employees who are falsely implicated for late coming.	59 (75.6%)	11 (14.1%)	8 (10.26%)
3	Fingerprint-based attendance management system encourages punctuality.	55 (70.5%)	12 (15.4%)	11 (14.1%)
4	Organizations should consider using fingerprint-based attendance management.	55 (70.5%)	11 (14.1%)	12 (15.38%)
5	Fingerprint-based time management system is a tool that can reliably records attendance times	43 (55.13)	16 (20.51%)	19 (24.36%)

**Table 4.3:** Relationship between fingerprint-based time management system and punctuality

**Source:** Author

On the first statement 52.6% of the participants perceived the implementation of fingerprint-based attendance management system as a good step towards curbing lateness problems and thereby confirmed their positive attitude towards the tool. The findings are supported by the reviewed literature which encouraged usage of biometric for enhancement of attendance as it

was viewed as a worldwide ICT strategy (Verma and Khan, 2016). The 25.64% was not sure if the implementation of fingerprint based attendance management system is the good step towards curbing lateness problems. The 21.79% disagreed that lateness can be curbed by implementation.

On the second statement the majority of participants, at 75.6% agreed that fingerprint-based attendance management system would exonerate employees who are falsely implicated for late coming. A sense of employee trust towards the technology ability was clearly articulated by the participants. This finding supports the views asserted by Walia and Jain (2016) and Akinduyite et al. (2013) that fingerprint biometric is unique and reliable. Such coherence between the participants revealed the system to be a potential enhancement of industrial relations, in that its implementation is likely to ensure that good employment relations are maintained when it comes to issues of attendance management. This is supported by Akinduyite et al. (2013) who advocate that fingerprint eliminates disputes which arise as a result of the use of unreliable attendance management tools.

On the third statement that fingerprint-based attendance management system encourages punctuality, 70.5% agreed while 15.4% were not sure. The 14.1% did not agree with biometric has a chance of encouraging punctuality. This finding around the 70.5% is contrary to the one by Back, Schmukle and Egloff (2006) which portrayed that personality counts more than any other situational factors that can be blamed when it comes to matters of punctuality. These pointed to two groups of people (neuroticism and conscientiousness) who they argued would do everything possible to ensure that they are punctual though for different reasons. Back, Schmukle and Egloff (2006) further argued that self-organization and self-discipline are what help conscientious persons keep time while neurotic are driven by fear of being ridiculed. The argument could be that the introduction of fingerprint based attendance could be beneficial to neurotic persons as the expectation is that the conscience of the conscientious is keeping them compliant whether the system is in place or not. The neurotic behaviour is supported by Ariely, Bracha and Meier (2009) who advocated that human beings have that built-in element that demands social acceptance. This could be the reason that people would be willing to exchange bad habit for the good so as to earn themselves social acceptance. On the other hand the findings of the study are supported by (Nwoye, 2016) and (Oloyede et al., 2013) in that they agree that fingerprint attendance management system encourages punctuality and eliminates impersonation.

On the fourth statement 70.5% of the participants agreed that organizations should consider using fingerprint-based attendance management which pointed to the credibility of the technology in their minds. This is supported by a number of authors (Verma and Khan, 2016), (Nwoye, 2016), (Oloyede et al., 2013) and (Walia and Jain, 2016) ) who corroborated on the usage of fingerprint based attendance management as the way to go.

The fifth statement showed that 55.13% of all the participants agreed that fingerprint-based time management system is a tool that can reveal the depth of punctuality issues. This is supported by Adeniji, Scott and Phumzile (2016) who called fingerprint-based attendance management a good tool for managing and monitoring punctuality. Those who disagreed to fingerprint being a tool with the ability to reveal the depth of punctuality issues formed 24.36% while those were not sure totalled 20.51%.

The overall assumed effect of FBMS on punctuality was calculated by summing up all scores and the distribution of the score is presented in Figure 4.4.

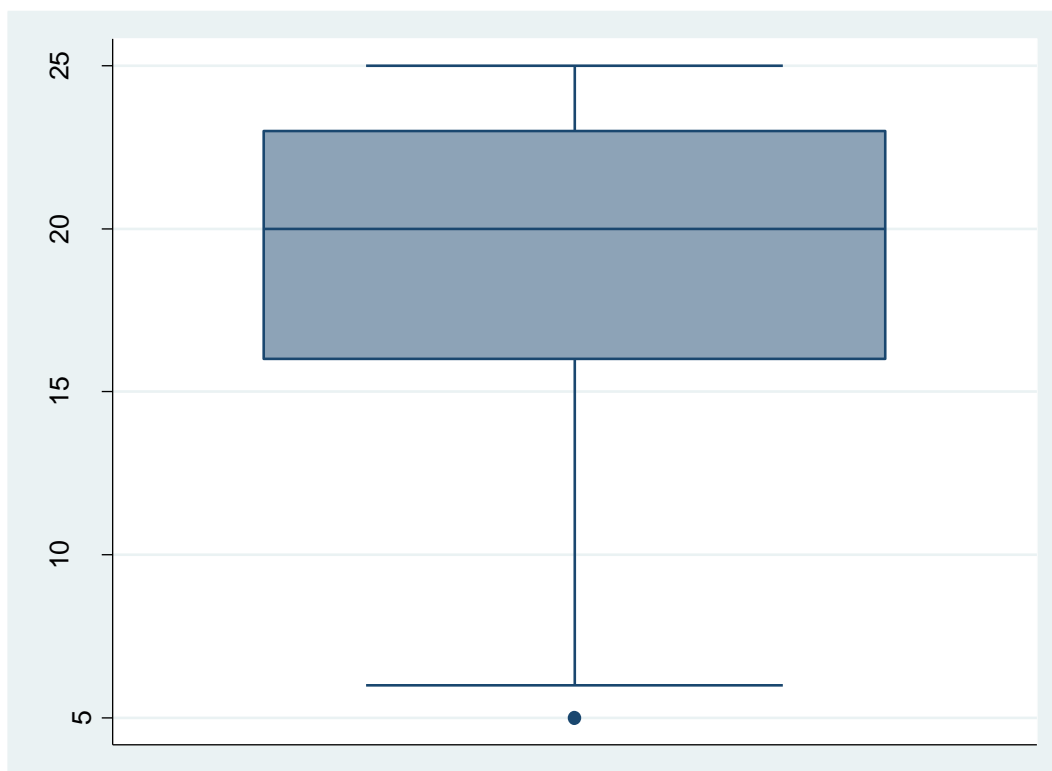


Figure 4.4: Distribution of impact of assumed effect of FBMS on punctuality

Source: Author

Results show that some participants believe that FBMS does not have impact on punctuality, reflected by a minimum score of 5. At least 50% of participants believe that FBMS will have a positive effect on punctuality.

Perhaps the figures are indicative of the importance of monitoring in general, as the fingerprint biometrics is more like a monitoring tool. The findings are suggestive of the deviant norm which is likely to be perpetuated in an environment where no one takes responsibility to monitor attendance. Lateness could exist due to employees thinking they are not seen or them thinking that nobody cares. This could be true considering the neurotic effect as articulated in the findings by Back, Schmukle and Egloff (2006) which suggests that neuroticism encourages earliness. The findings attribute earliness behaviour to fear of being criticised or of attracting people attention.

#### **4.3.2 Qualitative Approach**

The qualitative portion of the study focused on establishing existence of strategies for curbing lateness. Such an approach was based on the assumption that punctuality is, as the reviewed literature suggested, key to IMU just as it was found to be in all organisations. The main research question was broken into several statements about the rate of late coming, criticality of punctuality, devised strategies for curbing lateness, effectiveness of strategies and possibly long-term strategies for ensuring that punctuality is upheld: were asked during the interview sessions to stimulate discussion. Coding based on the responses received is reflected in Table 4.4 below.

Chunks	Code of each chunk
<b>We have a high rate of lateness of employees in terms of municipal stipulation</b>	High rate
<b>Attendance is reasonably satisfactory</b>	Satisfactory punctuality
<b>Staff is between 5 to 10 minutes late on regular basis</b>	Lateness is regular
<b>I do not have much issues of employee lateness</b>	Lateness is seldom
<b>Take advantage of flexitime</b>	Working flexitime
<b>The levels of lateness are not high</b>	Not high
<b>My environment does not have much problems with lateness</b>	Lateness is seldom
<b>Well in my environment, I will say it is not critical</b>	Punctuality is not critical
<b>What is critical is that we deliver</b>	Task oriented approach
<b>Shift cannot go home until the next one has arrived</b>	Punctuality is critical
<b>It is not an issue on my side</b>	Punctuality is not critical
<b>You have to monitor more on the task that is assigned</b>	Task oriented approach
<b>It is critical in that we service people who are here as early as 8</b>	Very critical
<b>Punctuality is not that critical</b>	Punctuality is not critical
<b>Punctuality at meetings is critical</b>	Punctuality at meetings is critical
<b>Although we have flexible hours between 9h00 and 16h00 every one is here</b>	Working flexi time
<b>Biometric systems are assisting us in verifying</b>	Fingerprint biometric
<b>I do not think the manual registers will work</b>	Manual registers not appropriate

**Table 4.4:** Emergent Codes from Constant Comparison Analysis (continues to next page)

**Source:** Author

Chunks	Code of each chunk
<b>We reach agreement with staff to reduce the person's overtime</b>	Overtime reduction
<b>Overtime is regularly paid every weekend</b>	Overtime guaranteed
<b>We want to monitor access control system</b>	Use of tags
<b>I request access control report from the building admin</b>	Fingerprint biometric
<b>Have a protocol that if someone cannot make it he contacts the supervisor</b>	Working arrangement
<b>I think they are very effective</b>	effective
<b>You only hit the guy once</b>	effective
<b>They are quite effective in my environment</b>	effective
<b>The report is accurate</b>	effective
<b>It is dirty but it works</b>	Effective
<b>Biometric is the one that can give you precise information</b>	Biometric strategy
<b>Is to put people on time management courses</b>	Training strategy
<b>Monitoring our calls and time it takes to respond</b>	Task oriented

**Table 4.4:** Emergent Codes from Constant Comparison Analysis

**Source:** Author

#### 4.3.2.1 Lateness.

The levels of lateness were reported to range from nonexistence, regular (where regular meant that staff were 5 to 10 minutes late every second to third day), to seldom (where it was understood that it had happened twice in 5 years), not high and very high.

**Non-existence:** The non-existence of lateness is realised as a result of arrangements where an individual is assigned to be at work at the start of the shift as is known to customers. Staff

takes turns in doing this, so as to ensure attendance to customer needs which are raised before the arrival of the rest of the staff without violating service level agreements.

**Regular:** When asked about the level of lateness, one participant said “*at this stage attendance is reasonably satisfactory as we have staff which is between 5 to 10 minutes late on regular basis*”. The five to ten minutes late every second day does not seem much but would amount to 55 to 150 minutes per individual per month for a five-day worker who works, on average, a total of 22 days a month. The breakdown of man-hour loss if 1, 25 or 50 people were to be late every second day is indicated in Table 4.5 while Table 4.6 reflects the loss in salary for employees who are paid an hourly rate of R1 000 .

Duration	Man-hour loss					
	1 Person		25 People		50 People	
	5 min	10 min	5 min	10 min	5 min	10 min
<b>Month</b>	55	110	1375	2750	2750	5500
<b>Year</b>	660	1320	16500	33000	33000	66000

**Table 4.5:** Man-hour loss

**Source:** Author

Duration	Loss in salary					
	1 Person		25 People		50 People	
	5 min	10 min	5 min	10 min	5 min	10 min
<b>Month</b>	R917	R1 834	R22 917	R45 833	R45 833	R91 667
<b>Year</b>	R11 004	R22 008	R275 000	R550 000	R550 000	R1 100 000

**Table 4.6:** Loss in Salary

**Source:** Author

Considering the annual cost incurred in terms of Table 4.5, could be the reason that caused the UK to incur an estimated nine billion-pound annual loss in employee lateness (Coleman, 2013).

**Not High:** Where lateness was described as not high, the need for punctuality is emphasised to staff as a form of adherence to their contractual obligation as regulated by the act (Basic\_Conditions\_of\_Employment\_Act, 1997). This participant reported that moderate lateness was “*due to people preferring to leave work at four*” which then motivated them to come as early as 7h00. The participant further stated that incidents of lateness were not the only focus, as early leaving also is observed and corrected. It was also reported that flexi-time, which is the working of set number of hours with starting and finishing times chosen within agreed limit by the employee, is taken advantage of by some employees.

**High rate:** One participant agreed to levels lateness be “very *high*”. Such lateness was understood to be within the context of the nature of the job which does not demand individuals to respond to customer needs within regulated times stipulated in service level agreements (SLAs). The staff is measured on task achievement as opposed to times of arrival and departure. This was a unique observation as this emulated a self-governing environment though it showed no neglect of the core of employment relations which is mutual benefit between the employee and the employer. It was articulated that the situation accommodates employee choice of arriving and leaving at times deemed conducive for producing peak performance on their work. This of course does not hold if there are meetings to be held as punctuality in meetings is not negotiable.

#### 4.3.2.2 Punctuality

While punctuality was rated critical by all participants, it was, however, noted that its relevance varied in different contexts. Some participants viewed punctuality as necessary from the point of arriving at work at a specific agreed time while others expected it within a range of times e.g. from 7h15 and 9h00 and only viewed it as critical for meeting purposes. This was captured as in this statement by one of the participants “*Punctuality in not critical, but there are core working hours when everyone has to be here*”.

The criticality of punctuality was, to some operations, not an overarching phenomenon as they required one individual to be at work at specific times so as to attend to early reported customer requests thereby ensuring adherence to service level agreements (SLA). This arrangement seemed dominant suggesting a shift away from the traditional norm. Some participants favoured task completion over traditional punctuality based on arriving at a specific time set for all. Perhaps this is corroborative of the assertion that nowadays’ employees aspire for, among other things, less supervision as they feel it affords them job

satisfaction (Aithal and Kumar, 2016). HR-Specialist (2015), however, maintained that punctuality is still important even in today's context. On the contrary, Mageni and Slabbert (2014) proposed a work-life balance model in South Africa in an attempt to help the workforce juggle a range of roles they fulfil in their lives.

Possible tension among employees where punctuality is not observed was recorded thereby pointing to the criticality of punctuality. This was seen to be possible among shift workers where the outgoing shift would not be expected to leave before a hand over was done. Not giving punctuality the critical role it demands would result in robbing employees of the social cordial relationship which Aithal and Kumar (2016) believed is the pivotal for peer psychological support. (HR-Specialist, 2015) agrees with the view of Aithal and Kumar (2016) particularly for those jobs where punctuality really matters.

Few participants valued punctuality as it showed compliance to the working hours as defined in the employment contract. This was further influenced by the realization of the importance of customer satisfaction which can be achieved by being there for them whenever they call for help. This theme revives the relevancy of the act that emphasises the importance of not only regulating working hours but emphasises the need to do in full cognition of employees' responsibilities they owe their families.

#### 4.3.2.3 Strategies

Respondents concurred on the existence of strategies which they all perceived to be effective. Notable was that not all were meant for curbing lateness. Three strategies identified were the fingerprint biometric, proximity access control and overtime.

- One respondent said "*fingerprint biometric is the best because you cannot take the finger of another person as it can happen with tags*". Fingerprint biometric was chosen for its accuracy which earns it the reliability over other solutions like proximity access control and traditional attendance management tools. This finding is supported by Nwoye (2016) who described none biometric attendance management systems as incompetent in areas of eliminating and combating among other things hours falsification and impersonation. Nwoye (2016) further pointed at the technological ability derived from the fingerprint biometric which assists not only in curbing lateness but also in exposing absenteeism; thereby ensuring proper calculation of wages and salaries.

- Proximity access control was cited as a strategy because fingerprint biometric was mainly used for certain areas housing critical equipment. In supporting monitoring of attendance the respondent said “*we encourage people to come on time*”. Considering the reviewed literature, the use of proximity access control stands to promote impersonation as is prevalent in the traditional system (Adewole et al., 2014). The other disadvantage of the proximity system is loss of tags which cannot be eradicated. In emphasising the interest they have on time keeping the respondent further said “*we also have weekly meetings where we discuss these issues as well*”
- Overtime as an entirely unique strategy came up as a working one where employees who fail to adhere to punctuality requirements would be deprived of it. Overtime strategy seemed an unsustainable one considering that overtime should only be implemented under special demanding situations. In justifying the strategy the respondent said, “*What we do if the person is continuously late, we reached an agreement with staff that we reduce the person’s overtime*”. Even when the effectiveness of this strategy was questioned on the basis that overtime was not a routine occurrence; the respondent insisted it was effective. He cited what he called the “*legacy as in the history where we moved to 24 hour operations and the people started working slowly but surely*”. By that he meant that the attempt to restructure shift work did not work as people protested against it so they could retain the overtime. Since overtime is not meant to be primary operation, turning it into a strategy is somewhat a concern. The expectation is that of devising a strategy to confront the legacy issues to a point where overtime could be eradicated or reduced to a point where it would not be available, on monthly guaranteed basis, to all employees operating within a particular environment. Though the amount of guaranteed overtime per employee a month (estimated at about 35 hours) does not violate Section 10 of the act (Basic\_Conditions\_of\_Employment\_Act, 1997) which disapproves working of overtime in excess of ten hours a week, it could lead to substantive debate considering the level of unemployment in the country. This strategy may not be sustainable and as such may require revisiting.

The long-term strategies for ensuring adherence to punctuality exist and are defined by the manager of the day. Such was extracted from the responses of the different participants as elaborated on in the following paragraphs.

One participant viewed the use of fingerprint biometric is not only used as a short term but a long-term strategy for curbing lateness citing its preciseness and accuracy in capturing data; hence its reliability. This can in no equivocal terms be denied regarding the trust Adewole et al. (2014) put on the system as they believed security, reliability and efficiency are among the offerings it presents its users.

Interestingly, another participant had training his staff on time management as his long-term strategy. This strategy emanated from the thinking or belief that not arriving at work on time was nothing less than bad ethics which could be eradicated through training. This participant's view contradicted the survey's finding which indicated that the introduction of the fingerprint-based attendance management system can encourage punctuality. Whilst the finding of the survey is supported by Akinduyite et al. (2013), Bartlett (2001) affirmed that subjecting an individual to training does have the possibility of changing behavior.

Monitoring of calls and time taken to respond to them came up not only as a short term but also as a long-term strategy. In this instance the focus was on the importance of ensuring customer satisfaction which was viewed as achievable through full adherence to service level agreement timelines. This strategy partially supports Nwoye (2016) who maintained that both supervision and attendance management need to be done.

#### 4.3.2.4 Overall outcome

The overall outcome was that there is no specific strategy owned by the unit as a means of curbing lateness. This results in numerous strategies by different sections which may or may not have been communicated to the staff. This could be the reason why the quantitative findings of this study revealed that 32% of staff thought lateness was as a result of the absence of controls; if controls were communicated, then individuals would have been expected to know of them. The 24% who indicated they were not aware of whether the lateness resulted from the absence of controls could be interpreted as blatant indicators of not knowing about the so-called strategies.

### **4.4 Summary of Results**

The research questions revealed a great deal of information about factors contributing to upholding or neglecting punctuality. Clearly, there are issues and reasons around lateness which may extend beyond the ones suggested in the questionnaire. Heavy traffic on the roads,

as can be expected, is a contributing factor to employee lateness. Nevertheless, punctuality was convincingly accepted as a phenomenon requiring management and encouragement. Employees' perceptions of a fingerprint-based attendance management system proved to be positive. It was further articulated that a fingerprint-based attendance management system is expected to curb lateness.

On the issue of strategies to promote punctuality and curb lateness, a few of them were said to be in place though not for the same reasons. While fingerprint biometrics were used for either ensuring punctuality or to verify if the expected hours were put in by the right person, proximity access control was mainly used for confirming that a tag was presented to the reader with no emphasizes on authenticity of the transaction..

#### **4.5 Conclusion**

This chapter covered the results and discussion based on the responses for the circulated questionnaire and conducted interviews. Delivering the results and discussing them involved addressing the following sections: response rate of participants, results and discussion which reported the results and discussed them, and the summary of results. The following chapter presents conclusions and recommendations derived from the findings of the study.

## CHAPTER FIVE

### Conclusions and Recommendations

#### 5.1 Introduction

The previous chapter deliberated on the results and discussion of the study. This chapter pronounces on the conclusions and recommendation. It covers the following sections: summary of objectives, conclusions, recommendations, scope for further research and conclusion.

#### 5.2 Summary of objectives

The study on the employee perceptions on the importance of a fingerprint-based attendance management system and its effect on punctuality at IMU of eThekweni Municipality revolved around five objectives which are stated below.

- To establish the employee perceptions of fingerprint-based time management system.
- To establish the causes of late coming at IMU of EThekweni Municipality.
- To establish the relationship between a fingerprint-based attendance management system and punctuality as perceived by employees at IMU.
- To explore strategies put in place to curb lateness within the IMU.

#### 5.3 Conclusions

The four questions listed below were compiled to achieve the objectives of the study are:

- What are employee perceptions on a fingerprint-based time management system?
- What are the reasons for employee late-coming at EThekweni Municipality?
- What is the relationship between a fingerprint-based time management system and punctuality?
- What strategies have been put in place to curb late coming?

The following summary gives an overview of how the research questions assisted in meeting the objectives.

**Employee perception of fingerprint-based management systems:** Accompanying the discovery was that the tardiness problem is not without an approach which can be used to

reduce or eliminate it. This was based on the perceptions of participants was positive towards the implementation of fingerprint-based attendance management system. They perceived the system as a tool that could be tried as it has been successfully used in many organizations. All things constant, overall participants' feedback may be a good indication that the biometric system met acceptance of the majority of employees who participated in the study. The revealed perceptions need to be understood within the context of the questionnaire, since the questions did not directly enquire about its acceptance and implementation. It is, however, not inappropriate to consult and comply with all policies and regulations governing employment relations before attempting to implement the new system.

**Reasons for lateness:** This study revealed that lateness is a current reality at the IMU of eThekweni Municipality. It was further observed that reasons for lateness could vary and even extend beyond those that were provided in the questionnaire. Its severity was, however, not quantified as this could be better done by studying the system that stored employee arrival transactions which was not an objective of this study.

**Relationship between fingerprint-based attendance management and punctuality:** Judging by the findings regarding the relationship between fingerprint-based attendance management system and punctuality, it may be concluded that there is a positive relationship between fingerprint-based attendance management system and punctuality. The relationship is a positive one in that the implementation of biometric system increases the willingness to comply with the expected times of arrival thereby enhancing punctuality. Where punctuality is not forth-coming it will be quick to identify such, thereby enabling earlier identification which would possibly lead to timeous correction of deviant behaviour.

**Strategies:** On the question of the existence of strategies to curb lateness, a mixture of responses emerged. That was a clear indication that the traditional punctuality approach may not be a one-size-fits-all strategy, due to different operational requirements. Existing strategies are not always for curbing lateness, but in some operations they exist to ensure that employees work the required number of hours every day as dictated in their contract. The fundamental discovery was that in some sections within the Unit, punctuality is said not to be required of all employees in one go as they make arrangements to alternate in terms of their arrival times in order to accommodate needs of customers who are governed by traditional starting times. In as much as a fingerprint system is used for achieving punctuality and ensuring that an employee puts in the required hours, denying overtime to non-complying

individuals is a successful strategy for enforcing punctuality. In acknowledging that lateness is a behavioural problem, training of offending individuals was cited as a behavioural remedy.

#### **5.4 Recommendations**

It was noted that the overall perception of employees towards fingerprint-based attendance management was positive. It is therefore recommended that the technology be piloted within the unit.

It was further understood that though employees may be within the same Unit, punctuality may not be crucial to other sections because of the nature of their jobs and hence, flexi-time would be ideal for them. Since flexi-time has to be an agreed upon arrangement, it is recommended that it be formalised for better monitoring.

Since accomplishing late departure cannot be possible through the use of a manual or traditional register, the use of fingerprint biometric is recommended as a reliable tool.

In instances where granting overtime is used as a strategy to curb lateness, the recommendation is that an innovative means, based on identified root causes for lateness be developed and implemented in place of the overtime strategy.

#### **5.5 Scope for Further Research**

As this study was done within stringent confines of scope as a result of limited time within which it had to be concluded, there are areas which could add to the body of knowledge when researched. The brief outline of the topics which could be embarked upon is listed below.

**Relationship between lateness and early leaving:** The study is necessary as it can reveal the depth of lateness. Without this understanding lateness may be construed as a bad thing whereas latecomers might be honest to work late.

**Correlation between punctuality and performance:** This study may shed light in understanding if punctuality has any impact in enhancing performance. The same study could be expected to divulge the impact of lateness in arrival to performance especially if it is reciprocated by late departure.

**The readiness of workforce for working flexible hours:** As the concept of flexi-time leads to reduction of traditional supervision because the supervisor can only be at work during set working hours, readiness of workforce for flexi-time would make a good study.

## **5.6 Conclusion**

This chapter concludes and makes recommendations about the study. It accomplishes that by first giving an overview of the preceding chapter. It then summarises the objectives of the study. The conclusion shows how the objectives were met. The last two sections made recommendations and suggested scope for further research.

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## Appendix 1 Questionnaire

Employee Perception on the Importance of a Fingerprint Based Attendance Management System and Its Association with Punctuality at Information Management Unit (IMU) of EThekwini Municipality

You are requested to answer the following questions by way of ticking one answer from 1 to 5 where each number has the meaning as described in the following legends.

1-strongly disagree, 2- disagree, 3- not sure, 4- agree and 5- strongly agree. Please note that there is no right or wrong answers.

What are employee perceptions on fingerprint based time management system?

No	Statements	1	2	3	4	5
1	Fingerprint based time management system is a good management tool.					
2	Fingerprint based time management is a good replacement for physical register.					
3	Fingerprint based time management is not a good tool for government environment.					
4	Fingerprint based time management is good as it may exonerates an employee who is falsely accused for accessing the area he did no.					
5	Fingerprint based time attendance management is one example of technological advances that needs to be exploited.					

• What are the reasons for employee late coming at EThekwini Municipality?

No.	Questions	1	2	3	4	5
1	Employees come late due to lack of interest on their jobs.					
2	Employees come late because of lack of controls.					
3	Employees' late coming relates to heavy traffic.					
4	Employees come late for no reasons.					
5	Employees do not come late.					

• What is the relationship between fingerprint based time management system and punctuality?

No	Statements	1	2	3	4	5
1	Implementation of fingerprint based attendance management system is the good step towards curbing lateness problems.					
2	Fingerprint based attendance management system will exonerate employees who are falsely implicated for late coming.					
3	Fingerprint based attendance management system encourages punctuality.					
4	Organizations should consider using fingerprint based attendance management.					
5	Fingerprint based time management system is a tool that can reveal the depth of punctuality issues.					

Below is the research question that was addressed by a qualitative method through the use of one on one interview.

What strategies have been put in place to curb late coming?

No	Statements	Answers
1	How would you rate the levels of late coming?	
2	How critical is punctuality in your work environment?	
3	What strategies are in place for curbing late coming?	
4	How would rate the effectiveness of the strategies?	
5	What are long term strategies aimed at ensuring that punctuality is upheld?	