



# Fingerprint Biometric Authentication for Enhancing Staff Attendance System

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## ABSTRACT

Biometric technology that involves the identification and verification of individuals by analyzing the human body characteristics has been widely used in various aspect of life for different purposes, most importantly as regards this study the issue of staff attendance. Despite the numerous advantages of the biometric system and its impact to various work sectors across the globe, most biometric technology users face the issue of defining the right and accurate biometric technology system that will be cost effective in solving particular problems in specific environment.

In this paper, a study was conducted using a telecommunication company in the South West region of Nigeria, in order to determine the specific biometric identifier that can be used to enhance their traditional staff attendance system which presently affects the productivity of the organization. The study was conducted using a quantitative approach by designing a questionnaire as the data collection instrument based on different biometric technologies. The survey involved 37 employees based on stratified random sampling technique. The results however show that fingerprint biometric identifier was found suitable for the staff attendance management system of the organization. It therefore, implies that attention should be paid to several factors before recommending biometric technology as a means of improving the productivity of an organization business processes.

## General Terms

Biometrics, Staff Attendance, Authentication.

## Keywords

Biometric, verification, staff attendance, telecommunication, productivity.

## 1. INTRODUCTION

Today, many industries are experiencing technological advancement and changes in the mode in which they carry out their business processes. With the rise of globalization, it is becoming essential to find an easier and more effective system to help an organization or company improve their employee's productivity. In spite of this matter, there are still business establishments that use the old-fashioned way i.e the manual process of recording employee's attendance [7].

Staff attendance management system is an easy way to keep track of attendance of staffs within an organization. It covers the requirements of the personnel department in terms of day to day monitoring of staffs, calculation of overtime and transfer of relevant information to the payroll system and manpower analysis. Hence, staff attendance is an important issue every kind of organization must take into consideration in order to be productive [8]. Also, a report from the Shropshire council

stated that staff productivity is greatly affected by the attendance of staffs [9].

According to [10] as stated in Human Resource Magazine (2011) that, company staffs succeed in stealing the company's productivity without the management even noticing through absenteeism and buddy punching. The use of the traditional methods for staff attendance, for example staffs signing on attendance sheet on entering the organization also contribute to the poor performance of the company's productivity, though the impact of staff absentee and staff running late vary differently amongst different market sectors. It was further stated that "employee absence and buddy punching directly cost the UK economy nearly 17 billion pounds which equates to 27 million working days. This demonstrates the negative effect of buddy punching and staff absenteeism on a company's productivity which can be solved by the introduction of a biometric technology system.

## 1.1 RESEARCH OBJECTIVES

The main objective of this research is to critically analyze various forms of biometric technology systems and how they have been used in the past till the present time, especially on the issue of staff attendance system in various organizations. Also, the study highlights various factors that are to be considered when implementing a biometric system for a particular purpose.

## 1.2 SCOPE OF THE STUDY

This research covers the preferences of the respondents on which biometric technology system should be used for the purpose of staff attendance in the company situated at the South West region of Nigeria. The six biometric technologies included in this study as options are the fingerprint, hand geometry, iris recognition, voice recognition, face recognition and signature verification. The respondents, who participated in the self-administer questionnaire, are employees of the company who use the traditional way of recording staff attendance. Furthermore, the study used the descriptive research method that subsequently uses a survey instrument in form of a questionnaire. Meanwhile, the sampling design used to select the respondents is through the pure random sampling.

## 2. BIOMETRIC TECHNOLOGIES

The various forms of biometric technology have been in existence for several centuries for the purpose of identification. One of the oldest forms of biometrics is the recognition of the human face because facial characteristics are matched within our memory. Civilization became larger and other methods arose, such as documenting images in portraiture, for example, in 1434 the Arnolfini marriage was painted by Jan Van Eyke for the purpose of marriage certificate [11]. According to [22], in the mid 1960s, the face recognition



system as a relatively new concept was developed. An administrator was required to point out certain body features like eyes, ears, nose and mouth on photographs before the distance and ratio are calculated to a common reference point which is then compared to a reference data. [22] further stated that the lip thickness and hair were used as specific subjective markers by Goldstein and Lesk in the 1970s to automate recognition. The problem that the solution faced was that measurements and locations were manually computed. Biometric technologies include fingerprint, iris, hand geometry, handwriting signatory, voice recognition, facial scan, palmprint, keystroke and gait recognition.

## 2.1 Review of Existing Biometric Technology and Its Usefulness in Various Sectors

The origin of biometrics has been in the public sector; however biometrics is used for the identification and verification of criminals [18]. Other sectors where biometrics has also thrived are the Banking, Education and Health sectors. For example, emerging application markets include biometrically enabled transactional payment solutions and biometrically enables wireless for business use. Some European banks use the 3D facial recognition of employees into bank buildings, thereby eliminating the issue of keys been lost, stolen or misused [19]. Furthermore, biometric application has been useful in various other sectors which include the Government using it for the purpose of stopping terrorist attacks and fighting crimes. After the 9/11 incident, the Yeager Airport in Charleston introduced the biometrics system, which is used to secure access to its control tower [20]. Also, the biometrics system has been very useful in the Education sector where it has assisted students in the borrowing and returning of books out and into the library respectively. The positive impact of biometrics to the health sector cannot be left out as it has helped in stopping fraud where some healthcare bill for services they never performed. A palm scanner which reads a patient's unique vein pattern was implemented in Sharp Healthcare in San Diego for the purpose of stopping patient identity theft, the system was known to be very secure and performed efficiently well for its purpose [23]. Furthermore, biometrics can be integrated with other systems for it to carry out its purpose of identification. Various homeland security databases require the use a card access system integrated with a biometric technology to gain access [24].

## 2.2 Biometric and Staff Attendance

Biometrics is the detailed measurements of the human body. Biometrics deals with automated methods of identifying a person or verifying the identity of a person based on physiological or behavioural characteristics [12]. Fingerprints are graphical flow-like ridges present on human fingers; their formations depend on the initial conditions of the embryonic mesoderm from which they develop [13].

With fingerprint authentication technology, it is easier to track employee's time and attendance with the touch of a finger. Biometric fingerprint authentication is the most accurate way to collect employee's time and attendance information. It verifies an employee's identity based on the characteristics of their fingerprint [14].

The American Payroll Association (APA) estimates that time theft, tardy arrivals, buddy punching, lollygagging (wasting time getting to the work area), extended breaks and early

departures costs businesses 1.5 to 5 percent of gross payroll, amounting to hundreds of billions of dollars every year. Industry studies support these estimates and in recent APA surveys, employees were reported to be stealing an average of 4.5 hours each week, equivalent to a six-week paid vacation per year. According to a Nucleus Research study, buddy punching is experienced by 74 percent of organizations [15].

However, technological advances in biometrics have now made this surprisingly affordable and popular. The Biometric Fingerprint reading sensor scans any fingerprint in under 1 second; this in turn will make clocking in and out much faster for your employees and at the same time saving your company time and money by paying your employees for the exact time they work. Your company will also reduce costly payroll and data entry errors caused by the old time card system [14].

## 3. RESEARCH METHODOLOGY

### 3.1 Research Design

Research design is the plan on how the researcher goes about finding an accurate answer to the research question. The research design plan contain clear objectives, derived from research question(s), specify the sources from which data are to be collected, and consider the constraints that may arise, such as access to data, time, location and money as well as discussing ethical issues [16]. This study employed the use of quantitative research method as the study involves data being obtained to be analyzed and processed before it can be of meaning. However, quantitative techniques such as graphs, charts and statistics allows for this, making data obtained by the researcher to be useful and turn them to information [17].

### 3.2 Research Questions

Many organisations have dwell into the implementation of biometric technology systems to solve the issue of staff attendance. In most cases, the biometric systems chosen do not serve its purpose effectively because biometric technology characteristics such as cost effectiveness, reliability, and the need for the technology itself are not taking into consideration [5]. Hence, the following research questions were considered:

- i. What type of biometric technology system are you familiar with?
- ii. Does your company need to enhance the recording of attendance of employees?
- iii. Do you prefer your company should use a biometric system to enhance staff attendance?
- iv. What type of biometric technology do you preferred your company to use?

### 3.3 Sample Population and Sample Size

The amount of data needed to be collected by acquiring data from only a subgroup rather than an entire population is made possible by the use of sampling techniques that provides a range of methods to achieve this [16]. The sample population of this study involves the total number of staffs in the company in which there is a total number of about 250 staffs and 6 departments, each department in the company has its own supervisor and divisional heads. Though, this study involves all the staffs of the company where the proposed biometric technology system is to be implemented to solve the problem of staff attendance, however the time involved in sampling the whole population may affect the completion of this research.



Hence, a sample of the staff population shown in table 1 has been targeted for the success of this study.

Table 1: Sample size

STATUS	GENDER		FREQUENCY
	MALE	FEMALE	
SUPERVISORS	3	1	4
STAFF	22	18	40
TOTAL	25	19	44

According to [16], there are different situations where sampling is necessary, such as: when it is impracticable for a researcher to survey the whole population; when time constraints prevent the researcher to survey the whole population and also budget which can prevent the researcher to survey the whole population.

The population eventually targeted as a sample population for this study is the staffs of the Human Resource department of the company, i.e.1 out of the 6 departments of the company. The department consists of a head of department, 3 divisional heads and 40 staffs.

### 3.4 Sampling Procedure and Sampling Selection

Due to the limited time involved in carrying out this research, it was not possible to carry out the survey on the total population of staffs in the company. However, a sample out of the total population was used. Sampling which is mostly used by researchers using the quantitative research method is a process where a representative sample or a small collection of population from a larger population is drawn, such that the sample information enables the researcher to study the smaller group and produce accurate generalization about the larger group [21]. Furthermore, [21] stated that researchers have two motivations for using the random sampling; the first motivation being that it saves time and cost i.e. instead of gathering data from 250 employees of the company, the researcher will draw a sample of 44 employees. However, the data from the 44 employees will be equal to the data from all the 250 employees of the company. Secondly, the purpose for using the random sampling is accuracy i.e. a well designed and executed sampling can produce accurate results than trying to acquire data from all employees within the company. Hence, the respondents of this survey are the employees of the company that remains using the traditional system of monitoring the attendance records of the employees. The researcher has predetermined the total population of 250 and arrived to having the sample population size of 44 employees as respondents for the survey. Thus, 37 respondents eventually participated in the survey. In order to confirm the participation of the sample size, the researcher liaised with the Head of Human Resources Department of the company who made sure the questionnaire gets to the right number of staffs. Following the pure random sampling, which was the actual conduct of the survey, the respondents were sent the link to the survey via the Head of Human Resources Department by the researcher.

## 4. RESULTS AND DISCUSSION

The analysis of the results obtained based on the questionnaire filled by the respondents who are the employees of the organization which a biometric system is to be proposed, that will sustainably solve the present issue of staff attendance within the company is therefore presented in this section.

### 4.1 Demographic profile of the employees

The findings of the survey with reference to the demographic profile of the respondents in terms of age and status/position in the company are tabulated as shown in tables 2 and 3 respectively. Table 2 shows that 12 employees or 32.43 % of the total participants composed the largest size of the respondents who belong to the age bracket of 30 to 39 at the time they participated in the survey. By a mere difference of 1 employee or 2.7 %, the largest percentage is followed by 11 employees or 29.73% who belong to the age bracket of 18 to 29. It is then followed by 9 employees or 24.32% who belong to the age bracket of 40 to 49; and lastly, 5 employees or 13.51% who belong to the age bracket of 50 and above. The researcher deemed it necessary to know the age of the respondents who are the employees of the company in which a biometric technology system is to be proposed to sustainably solve the issue of staff attendance, this is because age that reflects on biometric technology systems such as fingerprint technology and voice recognition changes. Several factors that might affect this biological identification to change are as follows: occupation, age, skin dryness, trauma, illness, injury, or trauma to hand [3]. [3] further stated that "when a biological identification of a person degrades, re-enrolments of such biometric features are necessary".

Table 2: Distribution of Respondents by Age

Age	Frequency Distribution	Percentage %
18 to 29	11	29.73
30 to 39	12	32.43
40 to 49	9	24.32
50 and above	5	13.51
Total	37	100

In addition, table 3 shows the distribution of respondents according to position/status in the company. 33 employees or 89.19% hold the staff status, while the remaining 4 employees or 10.81% hold the supervisory status. This demography was deemed essential for inclusion in this research by the researchers. It is believed that the number of respondents who hold the staff status is very significant for they are the main people who use the traditional way of attendance recording and monitoring. Since all of the respondents are the "users" of the traditional method, it is necessary that this research employ their views on which biometric system is useful to them. Furthermore, the inclusion of respondents who hold the supervisory status is also important as their views will help the researchers to know if a biometric technology system is needed in the company. However, this research paper recognizes that the decision making power on whether to

incorporate a biometric system in monitoring staff attendance in the company and which biometric technology system best fits the company budget lies in the management of the organization.

Table 3: Distribution of Respondents by Position/Status

Position/Status	Frequency Distribution	Percentage %
Staff	33	89.19
Supervisory	4	10.81
Total	37	100

## 4.2 Biometric technology system the employees are familiar with

Figure 1 represents the responses to the research question (i). Most of the respondents are familiar with the fingerprint biometric technology system with 17 or 45.95%. The second biometric system the respondents are familiar with is the hand geometry technology where 6 respondents or 16.22% had chosen it. The third system the respondents are familiar with is the iris recognition biometric technology system with 5 respondents or 13.51%. Comes next according to their ranking are voice recognition biometric technology system, chosen by 4 employees or 10.81%; face recognition biometric technology system, chosen by 3 or 8.11%; and signature verification biometric technology system with 2 respondents or 5.41%. None of the respondents chose that they are not familiar with any of the options.

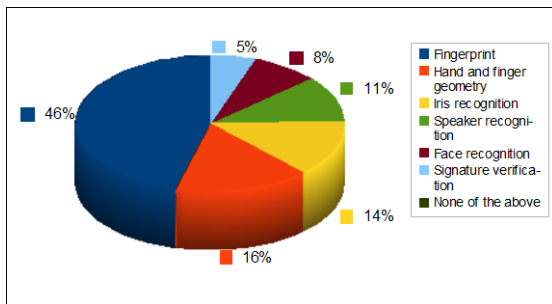


Figure 1: Showing the biometric technology system respondents are familiar with

This research paper recognizes that indeed most individuals are more familiar with the fingerprint biometric technology since it is among the oldest biometric technologies and as popular as face recognition [2],[6].

## 4.3 The need for enhancing the traditional staff attendance system

With reference to research question (ii), the respondents were requested to scale their responses from the options Strongly Disagree, Disagree, Undecided, Agree, and Strongly Agree. Figure 2 presents the responses according to the scaling. It indicates that most of the respondents, 29 or 78% chose the option strongly agree while the remaining 8 respondents or 22% chose the Agree option. None of the respondents chose

the option strongly disagree, Disagree, nor Undecided. This is supported with a research conducted by InfoTronics, Inc., which suggests that an advantage of a biometric system in an industry is that it prevents attempts of time fraud [4]. Another advantage of using a biometric system, which is actually related to the first one, is that it helps the company management in recording the working hours of the employees and automated report and time sheet generation [1].

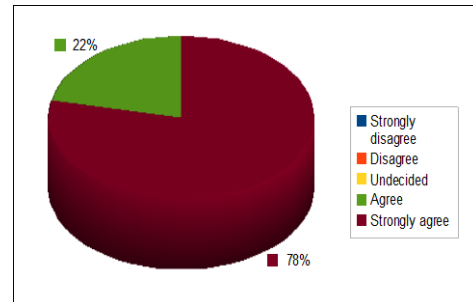


Figure 2: Showing respondents' views on the issue of staff attendance enhancement

## 4.4 The need for a biometric system to enhance staff attendance in the company

Since most of the respondents chose strongly agree that the company where they work needs to enhance the recording and monitoring of staff attendance as shown in figure 3. Hence, all the 37 respondents or 100% chose the “yes” to the research question (iii).

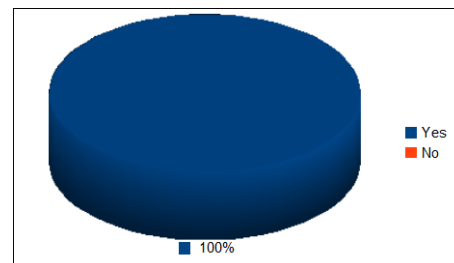


Figure 3: Preference of the respondents to whether their company should use a biometric system or not

## 4.5 The preferred biometric technology for staff attendance system in the company

After the respondents were asked whether the company where they work needs a biometric system for enhancing staff attendance, they were then requested as stated in the research question (iv) to select from the options, fingerprint biometric, hand geometry, iris recognition, voice recognition and signature verification, their preferred biometric system for their organization. Figure 4 shows that fingerprint biometric system is the most preferred by the respondents having 15 employees or 41%. The second most preferred biometric system is the iris recognition having 8 respondents or 22%. The third most preferred system are the hand geometry biometric system and face recognition having equally selected by 5 respondents or 14%. The least preferred is the voice recognition biometric technology system being selected by 4 respondents or 11%.

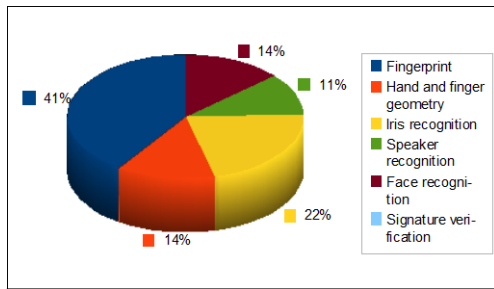


Figure 4: Showing the most preferred biometric technology system to be used by the company

Furthermore, the following discussion and analyses represented by figure 5 to 8 are focused on the findings of the survey as to the preferred biometric technology system based on qualities or features such as affordability, sustainability and acceptability. Using the likert scale (1 to 3, where 1 indicates agree, 2 indicates disagree and 3 indicates respondents who are neutral). Hence, the respondents were requested to scale each quality per type of biometric technology system.

#### 4.6 Affordability

Figure 5 with reference to the affordability quality shows that fingerprint biometric system is the most preferred system. 21 respondents or 56.76% chose that they agree that the fingerprint biometric system is the most affordable among other biometric systems. Hand geometry is the second most preferred system selected by 20 respondents or 54.05%. Placed as the third most preferred is the voice recognition selected by 19 respondents or 51.35%. The second to the least preferred are the iris recognition and face recognition equally selected by 18 respondents or 48.65%. The least preferred is the signature verification, which is selected by only 15 respondents or 40.54%.

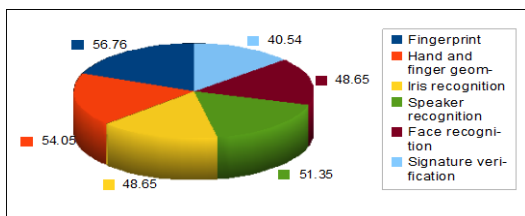


Figure 5: Most preferred biometric system in terms of affordability

#### 4.7 Sustainability

The preferences of the respondents according to sustainability quality as shown in figure 6 indicate that all of the biometric systems are most likely sustainable. There is a small difference between the numbers of respondents who selected each biometric system. However, the fingerprint biometric system remains the most preferred. 20 respondents or 54.05% chose that they “agree” that it is the most sustainable. Hand geometry, iris recognition, and signature verification are each selected by 19 respondents or 51.35% as the second most preferred system. The least preferred systems are the voice recognition and face recognition each selected by 18 respondents or 48.65%.

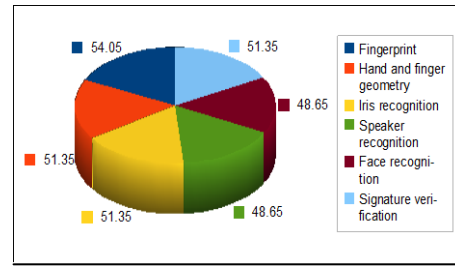


Figure 6: Most preferred biometric system in terms of sustainability

#### 4.8 Acceptability

Figure 7 presents the preferences of the respondents on the biometric systems based on the acceptability feature. The most preferred system is the fingerprint selected by 22 respondents or 59.46%. These respondents chose that the fingerprint biometric system has the acceptability feature among others. It is followed by four systems namely hand geometry, voice recognition, face recognition, and signature verification as the second most preferred. Each of these is selected by 20 respondents or 54.05%. The least preferred is the iris recognition selected only by 18 respondents or 48.65%.

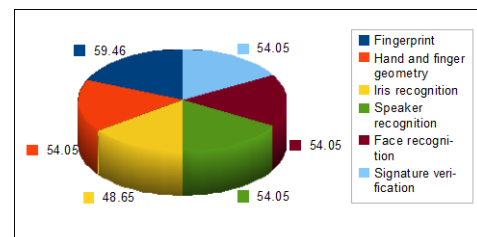


Figure 7: Most preferred biometric system in terms of acceptability feature.

### 5. CONCLUSION AND RECOMMENDATION

Since biometric technology will involve the employees of the proposed company using the behavioural or physiological part of their body for identification and verification, this however satisfies the fact that the system will be sustainable. Hence, biometric technology is surely a global ICT strategy that can be used to enhance staff attendance.

Therefore, this study has come to a conclusion that fingerprint is the best biometric technology system that can sustainably solve the lingering problem of staff attendance in the proposed organization. This will eliminate buddy punching and increase staff productivity. It is therefore, recommended that attention should be paid to several factors before recommending biometric technology as a means of improving the productivity of an organization business processes.

### 6. REFERENCES

[1] BioLink 2006. Time and attendance, Retrieved 11<sup>th</sup> December, 2011 from [http://www.m3biometrics.co.uk/Portals/2/downloads/BioTime\\_Time\\_and\\_Attendance.pdf](http://www.m3biometrics.co.uk/Portals/2/downloads/BioTime_Time_and_Attendance.pdf).



- [2] Graevenitz, G. A. 2003. Introduction to fingerprint technology. Retrieved 10<sup>th</sup> December, 2011 from <http://info.bioenabletech.com/training/fingerprint/Introduction%20to%20Fingerprint.pdf>.
- [3] Hashim, A. Y. 2011. An enduring relationship between biometric traits and security systems, International Journal of Research and Reviews in Information Security and Privacy, 1(1), pp. 1-6.
- [4] InfoTronics, Inc. 2008. Biometrics: Advantages for employee attendance verification, Michigan: Farmington Hills. Retrieved 11<sup>th</sup> November, 2011 from [www.mwtime.com/biometrics.pdf](http://www.mwtime.com/biometrics.pdf).
- [5] Lease, D. R. 2005. Factors Influencing the Adoption of Biometric Security Technologies. Information Technologies and Security Managers. Retrieved 15<sup>th</sup> August, 2011 from [http://drdavidlease.com/uploads/David\\_Lease\\_Dissertation.pdf](http://drdavidlease.com/uploads/David_Lease_Dissertation.pdf).
- [6] Sandhu, P. S, Kaur, I, Verma, A., Samriti, J. and Singh, S. 2009. Biometric methods and implementation of algorithms. International Journal of Electrical and Electronics Engineering, 3(8).
- [7] Yuihotakaishi, 2011. Attendance Monitoring System Using Biometrics for Security Staff, studymode Inspiring. Retrieved 9<sup>th</sup> June, 2012 from <http://www.studymode.com/essays/Attendance-Monitoring-System-Using-Biometrics-For-732262.html>.
- [8] Kadry, S. and Smaili, M. 2010. Wireless Attendance Management System Based on Iris Recognition. Scientific research essay. Retrieved 15<sup>th</sup> October, 2012 from <http://academicjournals.org/sre/PDF/pdf2010/18Jun/Kadry%20and%20Smaili.pdf>.
- [9] Mycroft, R. 2011. Performance and Strategy Scrutiny Committee. Staff productivity. Retrieved 16<sup>th</sup> November, 2012 from [http://www.shropshire.gov.uk/committee.nsf/0/5994B308D8ECC9B48025788C004A5A54/\\$file/Item%207%20-%20Staff%20Productivity.pdf](http://www.shropshire.gov.uk/committee.nsf/0/5994B308D8ECC9B48025788C004A5A54/$file/Item%207%20-%20Staff%20Productivity.pdf).
- [10] Clavereau, M. (2011). Absence: time to tackle the root causes. Retrieved 9<sup>th</sup> December, 2012 from
- [18] Jiexun L., Wang .A. and Chen H (2011). ‘Identity matching using personal and social identity features’; **13**: 101 – 113
- [19] Capoor S. (2006). ‘Biometrics as a Convenience Security’, *Business story* December 1, 48, 50. Retrieved 16<sup>th</sup> October, 2012 from <http://proquest.umi.com/pqdweb?index=0&did=1182578721&SrchMode=1&sid=7&Fmt=6&VInst=PROD&VTy pe=PQD&RQT=309&VName=PQD&TS=1304031215&clientId=13314>.
- [20] Dubin, C. (2011). ‘Biometrics: Hands Down’, *ID management. Security*, February 1, 52, 54. Retrieved 13<sup>th</sup> November 2011 from <http://proquest.umi.com/pqdweb?index=0&did=2277161341&SrchMode=1&sid=2&Fmt=6&VInst=PROD&VTy pe=PQD&RQT=309&VName=PQD&TS=1304030671&clientId=13314>.
- <http://www.hrmagazine.co.uk/hro/news/1018998/absence-tackle-root-causes>.
- [11] Tuller, M., Dhawan, A., Simon, B., Lee, K., and Ward, D. 2006. Biometrics: Strategic Technology Analysis Technology Foresight Dynamics Group 4 White Paper.
- [12] Bistarelli, S., Boffi, G., Rossi, F., 2003. Computer Algebra for Fingerprint Matching. Retrieved 11<sup>th</sup> July, 2012 from <http://dl.acm.org/citation.cfm?id=1764265>.
- [13] Jain, A., Hong, L., Pankanti, S., Bolle, R., 1997. An Identity Authentication System Using Fingerprints. Retrieved 10<sup>th</sup> June, 2012 from [http://biometrics.cse.msu.edu/Publications/Fingerprint/JainEtAlIdentityAuthUsingFp\\_ProcIEEE97.pdf](http://biometrics.cse.msu.edu/Publications/Fingerprint/JainEtAlIdentityAuthUsingFp_ProcIEEE97.pdf).
- [14] BioElectronix, Inc. 2012. Powerful & easy to use Time & Attendance Software. Retrieved 11<sup>th</sup> July, 2012 from [http://www.bioelectronix.com/ec\\_50.html](http://www.bioelectronix.com/ec_50.html).
- [15] Liz, P. 2012. Biometric Benefits; Fingerprint readers reduce inventory shrink and eliminate payroll fraud. Retrieved 12<sup>th</sup> December, 2012 from <http://www.stores.org/STORES%20Magazine%20April%202012/biometric-benefits#.UMpT1pG31d8>.
- [16] Saunders, M., Lewis, P., Thornhill, A. 2007. Research Methods for Business Students (4<sup>th</sup> ed.), Pitman publishing, ISBN: 978–0–273–7168670.
- [17] Stake, R. E. 2010. Qualitative Research, Studying how things work. Retrieved 24<sup>th</sup> July, 2012 from <http://books.google.co.uk/books?hl=en&lr=&id=wwwVpKNFoxEC&oi=fnd&pg=PR1&dq=Qualitative+Research+Studying+How+Things+Work+Robert+E.+Stake&ots=Ma eZGsfzTp&sig=CPnqbO2ns>.
- [21] Neuman, W. L. 2007. Basics of social Research, Qualitative and Quantitative Approaches, Publisher’s Design and Production Services, Pearson Education Inc. ISBN: 0-205-48-13.
- [22] NSTCS, 2006. Biometrics Technologies. National Science and Technology Council Subcommittee on Biometrics. Retrieved 2<sup>nd</sup> July, 2012 from <http://techbiometric.com/downloads/view-document-details/biometrics-foundation documents>
- [23] Kreimer .S. (2010). ‘Matching the Right Patient to the Right Record’. *Hospitals & Health Networks*, November 1, 12. Retrieved 17<sup>th</sup> December 2011 from <http://proquest.umi.com/pqdweb?index=0&did=2212480041&SrchMode=1&sid=1&Fmt=6&VInst=PROD&VTy pe=PQD&RQT=309&VName=PQD&TS=1304102414&clientId=13314>.
- [24] Zalud, B. (2010). ‘Poor Sister No More: Access Enters Spotlight Again’. *Journal of Access management Security*, August 1, 42,44-45. Retrieved 28<sup>th</sup> April 2011 from <http://proquest.umi.com/pqdweb?index=0&did=2114680931&SrchMode=1&sid=18&Fmt=6&VInst=PROD&VTy pe=PQD&RQT=309&VName=PQD&TS=1304034968&clientId=13314>