BIOMETRICS IN THE QURAN PERSPECTIVE: DEFINITION, HISTORY, AND TYPE

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Abstract: The Qur'an is the holy book which is inexhaustibly studied by many people. It has inspired a lot of thoughts, research and studies. The discussions of human in the Qur'an are numerous, ranging from the creation, life, naming, relationships of one another, and etc.. The Qur'an mentions that man is created in the perfect form, which is given advantages over other creatures. With his intellectual power, human tries to explore knowledge about him and understand his nature as a creature of God. Biometrics views human as a unique being. Biometrics sees that parts of the human body can be used as a security device because each human has his special uniqueness different from one another. Because of this specificity, human invents devices that refer to all materials, types of equipment, labours, and man-made systems to replicate the existing systems in nature. At present, the scientific community really needs such a device, especially in the field of nanotechnology, robot technology, artificial intelligence, medicine and military. Biometric normally used in the form of authentification, including Introduction to Fingerprint, Face Recognition, Recognition Retina or Iris, Geometry Arm, Geometry Finger, introduction of Palms, Voice Recognition, Introduction to Signatures, DNA (Deoxyribonucleic Acid), Thermal Imaging (Body Temperature), Shape Ear, Body Odor, Body Movement. On some types of biometric authentication on top of the al-Qur'an gives a signal on Surah Fuṣṣilat [41]: 20-22.

Keywords: The Qur'an, Biometrics, Sains Integration.

Introduction

The relationship between religion and science is always a warm conversation from time to time. It's not a new business there, already since the first attempt to integrate both be relentless effort. No wonder that later we heard a scientist quantum physics and relativity of time. Albert Einstein said: *Knowledge without religion is blind and religion without knowledge is lame*.[1]

It's just a different relationship between the two things that this continues to be a long debate religion and science experts since they are the two sides are not the same; science is relative, absolute religion. Nowadays many scientists are trying to seek justification for the findings of science with the verses of the Al-Qur'an, as is done by Harun Yahya or Agus Mustofa in Indonesia, it's just, in my opinion, is not necessarily the case. Because not all were found to science will always be in harmony with what was revealed in the Qur'an, he might be something totally different or not contained in the Qur'an.

Actually, the proof of science with scripture ever undertaken by the West when on medieval science at that time said that the earth was the centre of the solar system, then the clergy Christian justification of science with the Bible, many people are more confident with the way they choose. Only when science has evolved, and stated that the centre of the solar system is the sun, and reinforced by Columbus who sailed around the world and also the calculation of John Kepler then reinforced by Galileo Galilei is watching with binoculars, then it all (read: theory heliocentric) undermine previous theories which believed that the earth was the centre of the solar system (geocentric theory). This is the forerunner to the emergence of the ideology of secularism in the West.

Actually, there are several typologies possible link between religion and science, as discussed by Ian Barbour in his book "When Science Meets Religion", according to the model or the typology of the relationship between religion and science are as follows: First, Model Conflict, which this model opinionated that religion and science are two things that are not just different but entirely contradictory. Second, the Independent Model, this model holds that religion and science have a problem, the area, and the different methods, and each has its own truth so that there should be no

[1] Read: Wisnu Arya Wardana, *Melacak Teori Einstein dalam Al-Qur'an: Penjelasan Ilmiah tentang Teori Einstein dalam al-Qur'an* (Yogyakarta: Pustaka Pelajar, 2006).

relationship, cooperation or conflict between the two. Third, Model Dialog (Contact), this model intends to look for similarities or comparisons methodically and conceptually between religion and science, so I found the similarities and differences between the two. Fourth, the model of integration (confirmation), this model seeks to find the meeting point on the problems that are considered contradicting between the two.

Therefore, we should really wise to address the relationship between science and religion or scripture. We certainly know and believe that the Quran is not a book of science (read: Science), but the inspiration of the Al-Qur'an in the form of verses about the science and the universe is now reinforced by scientific discoveries in this modern age. Quran as the greatest miracle given to the Prophet Muhammad, of course, it is different from the miracle earlier Prophets. According to the Quraish Shihab, the miracle of the previous Prophet was categorized into impermanent sensing material, so it only occurred at a limited time and place. This is different from the Qur'an that he is categorized into immaterial that can prevail and prove his greatness all the time. Still according to him, this at least for two reasons. First, the prophets before Prophet Muhammad are assigned to the public and a certain period is different from the Prophet Muhammad, who was sent to all mankind until the end of time. Second, humans have evolved in his thinking. As he quotes from Auguste Comte's theory that the human mind has three phases:

First, the religious phase where it returns interpretation of all the symptoms that occur to the supernatural power created by the mind.

Second, the metaphysic phase in which he interpreted the phenomenon exists by returning to the principles which constitute the initial source or foundation. No human being first, as well as trees, animals, etc.

Third, the scientific phase in which humans interpret the phenomena based on observations carefully and experiments to obtain the natural laws that govern the phenomenon.[2]

Many cues contained in the verses of the Qur'an were later revealed by scientists to talk about the values of science, which are about the creation of man (QS. Al-Mu'minūn [23]: 12-16), about the

[2] For exploration, see: M. Quraish Shihab, *Mukjizat Al-Qur'an: Ditinjau Dari Aspek Kebahasaan, Isyarat Ilmiah Dan Pemberitaan Gaib* (Bandung: Mizan, 2003), 36–38.

origin of life (QS. al-Anbiyā' [21]: 30), of the universe (QS. al-Ḥajar [15]: 85, QS. Ṭāha [20]: 6, QS. al-Anbiyā' [21]: 16 QS. al-Mulk [67]: 3-4, etc.), about the greatness of the universe sky (Q.S. al-Dzāriyāt [51]: 47), about the end of the universe has also been predicted by modern physics (Q.S. al-Anbiyā' [21]: 104, al-Zumar [39]: 67), differences in the structure of forming stars, moon and sun (Q.S. al-Naba' [78]: 12-13), about the planet's rotation and orbit (QS . al-Ṭarīq [86]: 11, al-Dzāriyāt [51]: 7), the orbit of the moon and sun (Q.S. Yāsīn [36]: 39-40) or on the mountains as pegs for the earth (QS. al-Naml [27]: 88).[3]

In addition to the things mentioned above, many scientists were then able to uncover the secrets of the Qur'an. Among about Biometrics and Genetics that in this millennium a lot to help people in developing advanced technologies such as computers, the internet, mobile phones, fingerprint-which has helped police uncover criminal-action, password-both by numbers and by face or by retinal—and many other. All of it is a new miracle that the al-Qur'an really comes from God, not the word or words of Muhammad, it has denied the charges people who say that the al-Qur'an is a bouquet of Muhammad, So, what God says in the Qur'an. Q.S. al-Najm is strengthened by the scientific discoveries today that it is written in the Qur'an that has been around since the 14 centuries ago. In this paper, the author will explain the relationship of science with the Qur'an.

Definition and History of Biometrics

Biometric comes from the Greek bios = life and metron = measure, a measure of the introduction of the living creatures based on a unique body. Biometric becomes a new branch of science that seeks to imitate living things. Biometrics refers to all the material, equipment, labour, and man-made system to imitate the systems that already exist in nature. At present, the scientific community is in dire need of such equipment, especially in the fields of nanotechnology, robot technology, artificial intelligence, medicine, and military. Science was first put forward by Janine M. Benyus, a writer and

[3] Harun Yahya, *Allah's Miracle in The Qur'an* (New Delhi: Goodwords Book, 2005). See also Agus Mulyono and Ahmad Abtokhi, *Fisika Dalam Al-Qur'an* (Malang: UIN Malang Press, 2006). You can also find another information on Hakim Muda Harahap, *Rahasia Al-Qur'an: Menguak Alam Semesta, Malaikat, Dan Keruntuhan Alam* (Yogyakarta: Ar-Ruzz Media, 2007).

scientific observer from Montana.[4] Biometrics are more commonly used as an authentication tool by analyzing the characteristics of the human body used, such as fingerprints, the retina of the eye, the shape of the face, handprints, sound and others.

Biometric is a unique human identity, but biometrics is not something that can be easily Concealed. We are difficult to hide the biometrics that we have. Biometric also unable to correct errors that have occurred, once we biometric is stolen, there is no way to secure it back. It is an impossible man to change his fingerprints, because his fingerprints had been stolen and used to commit crimes, for example.

Biometrics are very difficult to counterfeit, requiring special skills and costs that are not minimal to fake a person's biometric. It is difficult and expensive to fabricate retinal eyes, fingerprints or any other body parts. But some biometrics can be easily stolen. This action is much cheaper and easier than counterfeit. Suppose a thief has taken a person's fingerprint image to trick the system so that when the fingerprint image is scanned by a fingerprint reader, the system thinks it is the correct fingerprint. But in fact, to trick fingerprints is not easy.[5]

We can use biometrics for various purposes commonly, for example, to open the door, as a means of attendance, or to turn machine. But biometrics cannot be used for things that are Secret. Although biometric very nice and useful but it is not a key, because it is not can be hidden, it cannot be done randomization and cannot be enhanced or destroyed as well as password. We should not use a password to lock two different things, also should not be encoded by the same key on two different applications. It can easily be imagined how insecure the use of biometrics for things like that.

It can be concluded that biometrics will function properly only when the system can check two things: first, that the biometric came from the right people, and secondly, that it fits with the biometric, biometric database contained in the system. Biometric very good as a replacement PIN (personal identity number) or substitute for the signature. But the need to keep in mind that biometrics cannot be kept secret. Nevertheless, he has the characteristics, namely:

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[4] Suhartono Suhartono and Totok Chamidy, *Rahasia Al-Qur'an Dalam Biometrik* (Malang: UIN Malang Press, 2007), 23–30.

[5] Hadi Wibowo, "Biometrik: Penggunaannya Dalam Pengamanan," Wordpress Online, October 29, 2017, http://herry3n2.wordpress.com/2017/10/29/biometrik.

First, unique. Biometrics is unique because there is not any human being that has the same biometric feature. No man who has a fingerprint, retina, ear, face the same shape.

Man is created by Allah with the most good. He is a creature with many advantages compared to other living beings. QS Word of God. al-Ṭīn [95]: 4: "Indeed We have created man with the best forms (of creation)". He is different from other creatures, this difference in terms of physiological, morphological, and linguists. The most distinguishes humans from other creatures is his ability to think and analyze. In addition, the language (elements of sound, not sound) also becomes very distinguishes man from other creatures of God's creation.

Second, permanent. Biometrics cling to every human being permanently until he dies. Although with a specific case could occur biometric damage in humans, such as burning, soiled or injured. This damage is earthly because it is actually a very capable and powerful God to restore it in the hereafter. Allah says in surah al-Fuṣṣilat [41]: 19-22:

> يوم يحشر أعداء الله إلى النار فهم يوزعون (19) حتى إذا ما جاؤوها شهد عليهم سمعهم وأبصارهم وجلودهم بما كانو يكسبون (20) وقالوا لجلودهم لم شهدتم علينا قالوا أنطقنا الله الذي أنطق كل شيء وهو خلقكم أول مرة وإليه ترجعون (21) وما كنتم تسترون أن يشهد عليكم سمعكم ولا أبصاركم ولاجلودكم ولكن ظننتم أن الله لا يعلم كثيرا مما تعملون (22)
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> It means: "And (remember) the day (when) the enemies of Allah are herded into the Fire, they collected (everything). So that when they get to hell, hearing, sight, and their skins bear witness against them as to what they had done. And they say to their skins, "Why did you bear witness against us?" Their skin replied, "God makes all things good at saying has made us smarter (also) say, and He created you the first time and only to- Him you shall be returned ". And you cannot hide from the testimony hearing, sight, and skin to you even you thought that Allah did not know most of what you do ".

Third, universal. Biometric possessed by every human being by God created the remarkable creation, a human in "lend" God with biometric outstanding. The types of identification used in biometrics have God designed with universally applicable form, differences possessed by humans, as well as the universality of the biometrics that can be used by people everywhere with any skin colour.

The development of biometric normally is used in the areas of security which is personal. Because, the biometric technology has

advantages relative nature cannot be eliminated, forgotten, or transferred from one person to another.

Biometrics is actually not a new technology because before biometrics in use for the digital manual was used with their own biometric signature using a thumbprint in antiquity after the biometrics developed using computerized, the Result is developing rapidly.

In the era after World War II, military research American find biometric voice recognition is used to recognize the sound of fighter pilots at that time in 1960 the Federal Birou Intelligence (USA) Find a method of fingerprint recognition Automate Fingerprint Identification System (AFIS) to identify and analyze fingerprints finger without using sensors. At that time, biometric technology is still expensive and not used by many people, after the discovery of biometric sensors began in 1999 the biometric equipment to be cheap and allows to use a lot of people like to use for the fingerprint attendance system fingerprint as the key.[6]

Once the biometric sensor technology found then the biometric very rapid development that originally could only be identified by physical characteristics and voice, after the price-cost biometric sensor developed at the sensor gait, the introduction of the eye's retina, iris, and until the introduction of DNA. This means that biometric technology can identify the man until PDA smallest level of DNA.[7]

Types of Biometrics

There are at least 13 types of biometric systems that now available and still very possible will continue to find new things about science, because science is currently still being developed. Biometric system si exists to identify something with what they have on the human body. Even some types of biometric identification are used as evidence in proving criminal behaviour.

As for within the system Biometik that have been found are:

1. The introduction Fingerprint

The biometric fingerprint system has been started since 1901 by E. Henry by centralizing fingers and toes by dipping into the ink system and put it on a media that can be identified as a distinct ridge

[6] Suhartono and Chamidy, *Rahasia Al-Qur'an Dalam Biometrik*, 33–34.
[7] Ibid., 32.

on each individual. Now, the system already includes device scanner hardware (scanners) and software. Devices that record the specific characteristics of the fingerprint, storing data each user to a template.

When the user tries again strengthen access, the software compares the data stored in the template and reading fingerprints from the fingerprint scanner. The system very accurate, but can be influenced by changes in the fingerprint, such as burns, scars, and dirt.[8]

Every person, even though identical twins are born, they see themselves actually never really the same. They have individual characteristics, such as fingerprints difference. In other words, away identifiers to distinguish them can be seen as the tip of their fingers. If one of them did crime and police frantically looking for the perpetrators, the police could trace their fingerprint. Even in the afterlife, when Yaumul reckoning, God will not ask for the testimony of our oral, but the fingertips will be a testimony by the gods, saying,

أيحسب الإنسان ألن نجمع عظامه (3) بلى قادرين على أن نسوي بنانه (4) (سورة القيامة [75]: 3-4)

Meaning: "Does man think that We will not collect (back) his bones? Yes, even we were able to draw up (back) his fingertips perfectly. "(Q.S. al-Qiyāmah [75]: 3-4).

M. Quraish Shihab associate this verse with the preceding paragraph about the inevitability of the Day of Judgment being challenged by people who do not believe it. According to this verse into the argument about the certainty of the resurrection, despite the differences of opinion in words *najma'a*, there are understood the meaning essentially that what is collected is parts of bones and body of the man who had been mixed with other material and then God collects again. Those that understand in the sense of creating, so God created the new bones, similar to what was once owned by a person in his world.

He also explained the word banana is the plural of bananas. He is small bones located at the tip of the toes and hands-with quote the opinion of Imam al-Biqa'i. He went on to quote the opinion of a priest at-Tabatabaei that specifically mention banan is due to indicate how amazing its creation. Because in that finger there are a variety of image and characterize the preparation and number-the number is that result in benefits almost countless such as grasping, opening,

[8] Ibid., 51.

take, refuse and various movements are very smooth and detailed, as well as shapes and lines that until now still revealed the secrets contained secret for the sake of it.[9]

2. Facial Recognition

The introduction of the shape and position of a person's facial features is a task that complex. The first camera captures an image of a face, then the software sorts out patterns and then compares the information with the user template.

Besides being used in biometric identification, the most common functions of the face are to differentiate between one another. So that we can get to know one another. Allah says in Surah al-Ḥujurāt: 13.

3. Introduction of Retina or Iris

Perhaps of all the safest and layers of retinal vessels behind the eye's retina. Elusive picture and during data collection, users need to focus on a point and defending it. So, the camera can capture images properly.

Determination of blood but vessel pattern when the pattern is unique to each person, identification becomes more accurate. The system is based on two parts of the eye, the iris and the retina, it is considered to offer the best security level.[10] Allah created eyes serves not only to see but more than that, God created it as an advanced security system that can be used to open the most secret thing even if the password used is the retina owners. Eyes become an extraordinary grace, which we must always be grateful to have it. The Word of God:

والله أخرجكم من بطون أمهاتكم لا تعلمون شيئا وجعل لكم السمع والأبصار والأفئدة للعلكم تشكرون (سورة النحل: 78)

4. Geometry Sleeve

With this system, users straighten the arm according to the instructions on the hardware pins arm readers (reader), capturing three-dimensional images of the fingers and bones, then store the data in a template. Geometry arm has been used a few years and used for security systems at the Olympics 1996.

5. Finger geometry

The equipment is similar to systems of geometry. Users place one or two fingers under a camera that captures the shape and length

[9] M. Quraish Shihab, *Tafsir Al-Misbah* (Jakarta: Lentera Hati, 2004), 624–26.
[10] Suhartono and Chamidy, *Rahasia Al-Qur'an Dalam Biometrik*, 71–90.

of the finger area as well as the bones. The system captures three-dimensional images and matching the data with the stored template to determine the identity.[11]

Geometry radius used by humans as soon Biometric system will also be used by God as the testament of the system:

أيحسب الإنسان ألن نجمع عظامه (3) بلى قادرين على أن نسوي بنانه (4) (سورة القيامة [75]: 3-4)

6. Introduction of Palms

Same with fingerprint recognition, biometric palm focus on the several arrangements. Such as parts and worthless edges found on the palms.

7. Voice Recognition

The method of capturing sound from the speakers according to the properties of the main use. The Use of the application-based security that can be affected by telephone. The accusations are noise and the effect of illness or fatigue in the sound.

One real problem with the voice recognition system can be fooled by this is the sound of someone's voice tape. For that reason, an advanced sound system must be able to expand or extend the verification process by giving the words the more difficult and lengthy, read aloud, or ask for a different word that is read every time.

8. The Introduction of Signature

The signature verification system requires one main thing, namely the acceptance of the general public. In every respect of the declaration of independence to slip a credit card, people tend to accept a signature as proof of identity.

No matter how simple a signature, necessary equipment to measure, both traits that distinguish signatures and distinguishing features of the process of writing the signature. Characteristics include pen pressure, speed, and points when the pen is lifted from the paper. The patterns were captured through a specially designed pen or tablet (it could be both) and compared with the template patterns.

9. DNA (Deoxyribonucleic Acid)

The use of DNA in biometrics technology closely related to the forensic activity. Its use is not the same as other biometrics, which with a relatively short time can give a decision. Therefore, the DNA biometrics must be done in a laboratory by a special expert staff, then matches, and only then can give a decision on the DNA examined.

[11] Harun Yahya, *Miracle In The Eye* (Istanbul: Global Publishing, 2009).

DNA fingerprint identification system biometric still the most accurate, because the truth can almost reach 100%.[12] Allah says:

سنريهم آياتنا في الآفاق وفي أنفسهم حتى يتبين لهم أنه الحق أولم يكف بربك أنه على كل شيء شهيد (سورة فصلت [41]: 53)

> "We will show them the signs (of power) We are in all regions of the world and in themselves, until clear to them that the Al-Qur'an is true. Seest enough that your Lord is witness over everything? ". (QS. Fushshilat [41]: 53).

M. Quraish Shihab interprets this verse that this verse is a continuation of the previous verses which criticized the mutineers, who deny the Qur'an while inviting them to think and ponder about the Qur'an. This verse promises relief for those who want to think objectively. He succeeds that at the time of the prophet "verses" promised by these verses which include events that occurred at that time, such as war security achieved by the Prophet and his companions. Can also be understood passages in all horizons and themselves are the secrets of nature and the wonders of His creation in human beings is revealed through observation and research scientists, all of whom prove oneness and His power, Sayyid Qutub chose this opinion.

10. Thermal Imaging (Body temperature)

This is related to body temperature. Systems that use thermal imaging has the same process by firing beam into the body. Then, the computer captures a person's body heat and verify compliance with the requirements.

11. Ear shape

The shape of the ear is one special human feature. If it is seen at a glance, every human ear does similar. But when measured certainly have differences.

12. Body odour

Body odour is developed into a biometric system technology in accordance with the fact that humans have a special body odour. But appears some obstacles, because the person's body odour relative change depending on the situation of a person's body after exercise Physiology. The smell is different from taking a bath. That is after one problem. The validation stage of the system tends to be low, almost like a signature and voice recognition.

[12] Suhartono and Chamidy, *Rahasia Al-Qur'an Dalam Biometrik*, 91–108.

Now, the use of biometric identification devices with an increasingly comprehensive system in the community. Introduction The biometrics system is very important for people to use appropriately in accordance with the situation and the current conditions.

13. Body Movement

Movement of the human body when walking everyone is unique. By studying them, we may be making a room security system and identify the person from the pattern he runs, with artificial intelligence (AI) course.

On some types of biometric authentication on top of the al-Qur'an gives a signal with the following paragraph (QS. Fuṣṣilat [41]: 20-22):

> حتى إذا ما جاءوها شهد عليهم سمعهم وأبصارهم وجلودهم بما كانوا يعملون (20) وقالوا لجلودهم لم شهدتم علينا قالوا أنطقنا الله الذي أنطق كل شيء وهو خلقكم أول مرة وإليه ترجعون (21) وما كنتم تستترون أن يشهد عليكم سمعكم ولا أبصاركم ولا جلودكم ولكن ظننتم أن الله لا يعلم كثيرا مما تعملون (22)
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> "So when they get to hell, hearing, sight, and their skins bear witness against them as to what they used to do (20). And they say to their skins: "Why did you bear witness against us?" Their skin replied: "God, who makes all things clever say has made us smarter (also) say, and He is the One who created you the first time, and to Him, you shall be returned (21). You occasionally cannot hide testimony hearing, eyes and skin you suppose that God did not know most of what you do (22).[13]

Biometric Benefits in Human Life

Biometrics are a person's characteristics, such as fingerprints, irises or faces. Biometrics is considered as a potential solution to security problems because it can provide strong identification or more precisely, in many cases is a strong verification of someone's identity, namely that those they say, or that their identity documents present truly belong to them.[14]

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[13] For further information, read Muhammad Kamal Abdul Aziz, *Ensiklopedia Keajaiban Tubuh Manusia Berdasarkan Al-Qur'an Dan Sains*, trans. Imam Rosyidi (Yogyakarta: Citra Risalah, 2008).

[14] Zain Fathoni, "Penggunaan Autentifikasi Sidik Jari Untuk Pengamanan Transakasi ATM Automated Teller Machine," in *Kriptografi Institut Teknologi Bandung*

In the use of ATM machines, the biometric method requires the owner to interact with the device in front of the ATM machine. The use of biometrics has been proposed in the literature for the past ten years, such as research by Rozeha A in 2008 on security systems using biometric technology (International Conference on Computer and Communication Engineering) in Kuala Lumpur, Malaysia. Other studies are used to manage airports. The implementation of the biometric authentication system is declared feasible to be used in banking organizations, especially for a large bank in China. Biometric security technology is considered as an alternative control in accounting information systems because it has advantages compared to other technologies.[15]

Biometrics has various functions in daily life. In general, biometrics are used for the purpose of securing everything that is confidential. Daily activities in the financial sector, especially banking transactions will not be separated from the use of ATMs (Automatic Teller Machines). At ATMs, money withdrawals, transfers, bill payments (such as credit cards, telephone and electricity) and even voucher purchases. To be able to do this transaction, the ATM is equipped with a PIN (Personal Identification Number) as authentication for the owner of the ATM card. However, in the case of ATM card misuse due to improper PIN usage, biometric authentication is an option. Biometrics is the identification of a person by using characteristics in humans such as fingerprints, irises, or faces.

Based on research conducted by Pratiwi with a descriptive data analysis approach 59 respondents representing IKPIA Perbanas Jakarta academia obtained the results of the ease of using a biometric system (Perceived Ease of Use) and are confident of the security of a biometric system (Perception of Biometric Security) for the purpose of using transactions ATM. This affects the user's attitude (Attitude

(Kriptografi Institut Teknologi Bandung, Bandung: Institut Teknologi Bandung, 2010), 1–6.

[15] Josua Tarigan, "Biometric Security: Alternatif Pengendalian Dalam Sistem Informasi Akuntansi Terkomputerisasi," *Jurnal Akuntansi Dan Keuangan* 6, no. 2 (2004): 90–105, https://doi.org/10.9744/jak.6.2.pp.%2090-105.

Toward Using) and there will be an interest (Intention to Use) on respondents to use it in transactions at ATMs.[16]

The development of information and communication technology now offers convenience to users in various aspects of life. One technology that is being developed is the technology of smart home or commonly known as a smart home. The smart home is a term commonly used to specify a residence that has the equipment, lighting, heating, air conditioning, TV, computers, audio and video entertainment systems, security, and camera systems that are able to communicate with each other and can be controlled remotely with specific time schedules, from every room in the house, as well as remotely from any location in the world via telephone or internet. Meanwhile, according to Demiris and Hensel, smart homes are homes that provide comfort, safety, energy efficiency for the home, comfort and efficiency at all times, regardless of whether there is anyone in the house.[17]

There are several categories in the focus of smart home development, including those in the fields of access control and authentication, security, property surveillance and protection, environmental control and energy-saving products, entertainment and audio distribution, home control, lighting and appliance control. Security is a major concern in our daily lives, and digital locks have become an important part of this security system. There are many types of security systems available to secure homes. Some examples are RFID-based Security Systems, Digital Lock Systems, biometric systems, Electronic Code Locks.

At present, the biometric system is the choice for the authentication system. Biometric authentication comes from the Greek language, which is bios, which means life and metron, which means measuring, it can be interpreted as a study of automatic methods for recognizing humans based on one or more parts of the human body or the behaviour of humans themselves who are unique. In the world of information technology, biometrics is relevant to the

[16] Pratiwi Pratiwi, "Penerapan Sistem Biometrik Pada Nasabah Pengguna ATM (Studi Kasus IKPIA Perbanas Jakarta)," *Justisi: Jurna; Ilmiah Teknik Informatika Dan Sistem Informasi* 5, no. 2 (2016): 1042–47.

[17] G. Demiris and Brian K. Hensel, "Technologies for an Aging Society: A Systematic Review of 'Smart Home' Applications," *Yearbook of Medical Informatics* 17, no. 01 (2008): 33–40, https://doi.org/10.1055/s-0038-1638580.

technology used to analyze physical and human behaviour for authentication.

For example in the physical recognition of humans, namely the recognition of fingerprints, retina, iris, facial patterns, facial signatures (signature) and how to type (keystroke). Among the unique registered human body parts, fingerprints are the part most often used for authentication. This is implemented through fingerprint recognition technology (FRT) which compares human fingerprint patterns to identify a person. In the context of a home security system, fingerprints can be used by residents to authorize access to the house and open doors or other main entrances. Because fingerprints are unique, access to the house will only be allowed to the authorities. This mechanism protects residents and homes from being accessed by strangers.[18]

Arduino is an open-source electronics platform based on easy-to-use hardware and software. The Arduino board can read inputs, turn on sensors, recap the fingerprint data on a button, and turn it into output. Then it can also activate the motor, turn on the LED, publishing something online. Arduino can send a set of instructions to the microcontroller on the electronic board. To do this, Arduino is supported by the Arduino programming language, commonly known as the Arduino IDE. Furthermore, fingerprints are considered as one of the safest keys to lock or open any system because it can recognize someone uniquely and cannot be easily copied.[19] Fingerprints are used for the authentication process, where only users registered in the database are allowed to enter the house legally.

The use of smart home concepts in the field of security has increased quite significantly lately. One area of concern is the use of fingerprint biometric technology for authentication systems, such as authentication for entry into homes. This paper aims to explain a new prototype for home door automation and security that combines fingerprint and Arduino biometric technology. It is hoped that this system will help improve the safety and comfort of residents with

[18] Apri Siswanto, Norliza Katuk, and Ku Ruhana Ku-Mahamud, "Biometric Fingerprint Architecture for Home Security System," in *Proceedings of the 3rd Innovation and Analytics Conference & Exhibition (IACE)*, vol. 3 (Innovation and Analytics Conference & Exhibition (IACE), Kedah: Universiti Utara Malaysia, 2016), 137–41.

[19] A. A. Shankar et al., "Finger Print Based Door Locking System," *International Journal of Engineering and Computer Science* 4, no. 3 (2015): 10810–14.

easy installation and low cost. This system automatically controls (open or close) the door based on the user's fingerprint that has been registered in the database in the Arduino microcontroller. The main system consists of an Arduino microcontroller, fingerprint sensor and door lock system.[20]

Not only that, biometrics are also currently used in education. Education is a very important thing which is the primary requirement in these modern days of life. Without education and science, all people will continue to be eroded and shackled in stupidity and underdevelopment in many ways, so that makes them hard to do something and difficult for improving the quality of themselves, their families and for the environment that is around.[21]

Human capital is the most important aspect of the educational process. In reality and historical evidence has proven that public education in culture aims to direct people to certain ideas. Humans and education cannot be separated in their lives because basic knowledge is created and given by God to the human, via human's learning.[22] It could be said, in extended meaning, the educational process is meant to humanize humans.

Management education is inseparable from the human resources strategy that is focused on the specific organization, such as the need to be done and needs to be revamped. Issues of concern to this strategy include ensuring that the organization has what it takes people like training, motivation, rewards, flexibility, teamwork and employee relations are stable—decision human resources strategy derived from the strategic plan.

Today, educators are required to be professional in all aspects, both in terms of the learning process and in terms of educational administration itself. Current technological progress is forcing stakeholders at various parts in the world of education to be able to

[20] Apri Siswanto, Ana Yulianti, and Loneli Costaner, "Sistem Pengaman Pintu Rumah dengan Teknologi Biometrik Sidik Jari Berbasis Arduino," *Jurnal Penelitian Pos dan Informatika* 8, no. 2 (2018): 97–107, https://doi.org/10.19105/karsa.v14i2.117.

[21] Glenda Kruss et al., "Higher Education and Economic Development: The Importance of Building Technological Capabilities," *International Journal of Educational Development* 43 (2015): 22–31, https://doi.org/10.1016/j.ijedudev.2015.04.011.

[22] Richard Bailey et al., "Physical Activity: An Underestimated Investment in Human Capital?," *Journal of Physical Activity and Health* 10 (2013): 289–308, https://doi.org/10.1123/jpah.10.3.289.

follow it. Without exception, institutions and academic staff should contribute therein. That all existing activities in the world of education can be accessed with a good and up to date one of which must be taken is to use management information system in education especially in the administration of educational personnel.

Definition Management Strategy, according to according Wheelen, "management strategy is a series of on material decisions and activities that determine the success of the company in the long term. The activity consists of a formulation/strategy planning, execution/implementation, and evaluation." While strategic management by David is the art and science to formulating, implementing and evaluating cross-functional decisions that enable the group to achieve objectives, meanwhile, the management strategy according to Akdon, show understanding as a series of decisions and actions that are used to formulate and implement strategies that allow conformance very competitive between companies da environment so as to achieve the goal.[23] Strategy Management for educators is important to control the nature of professionalism which is owned by an educator or teacher.

In Indonesian education goals, a management strategy for educator's teachers is more directed to the construction and development of education in Indonesia, in order to achieve quality education, in order to establish a reliable human resource, productive, creative and accomplished. The Directorate of Teachers under the Directorate General of Quality Improvement and Education (PMPTK) is the institution that has the authority to regulate, manage educators.

Based on Erwin Muslimin's research, the implementation of the management strategy of technology-based Finger Print to improve the work ethic of teachers or workers can help the school as providers, managers and evaluators of education in schools in collecting data of teacher's presence computerized cornerstones measure assessing the level of discipline and professionalism are an educator or teacher when there is school. In other words, fingerprint technology turned out to be very effective as a management strategy to improve the work ethic teacher or educator, because with the fingerprint system, a teacher will be more disciplined. Besides of

[23] Akdon Akdon, *Manajemen Strategic: Manajemen Pendidikan* (Bandung: Alfabeta, 2006), 8.

school parties can obtain information up to date via finger print technology, the school was able to easily monitor, update and evaluate the work ethic and the level of professionalism and discipline an educator or a teacher in the school environment itself.[24]

Rapid technological advances in the era of globalization have a major effect on increasing business competition. This situation forces managers to increase organizational productivity.[25] Productivity is a comparison between the results achieved and the resources used. Besides that, employee productivity can also be seen by comparing work hours and quantity of work. The quality and quantity of work is a comparison of work results that can be used as a benchmark of productivity. In an effort to improve the quality and quantity of work, attendance plays an important role. The level of employee absenteeism is one indication to determine employee productivity. This was supported by Nawaz, Pervaiz, Korrani, and Azhar-ud-din who said that recording attendance data was important in maintaining and monitoring employee productivity.[26]

The process of recording attendance data can be done by a variety of methods, some use the attendance signature method, attendance cards (punch cards), bar codes, and fingerprints.[27] Of these methods the most popular and most widely used is the fingerprint method. The fingerprint attendance method has several benefits that are superior to manual attendance or other attendance tools. These benefits include: comfort, safety, and accurate, objective, and able to increase productivity.

The use of fingerprint attendance offers the benefits of comfort, safety and accuracy that can be a contribution to employee productivity so as to increase overall organizational productivity. Thus in implementing the use of fingerprint attendance as a tool to increase

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[24] Erwin Muslimin, "Implementation of Strategic Management Based on Finger Print Technology for Improving the Teachers Work Ethics," *International Journal of Nusantara Islam* 4, no. 2 (2016): 97–106, https://doi.org/10.15575/ijni.v4i2.1061.

[25] S. J. Laoh, "Pengaruh Hubungan Utilisasi Perkerjaan Dan Pengetahuan Terhadap Keunggulan Kompetitif," *JBE (Journal of Business and Economics)* 9, no. 2 (2010): 143–50.

[26] T. Nawaz et al., "Development of Academic Attandace Monitoring System Using Fingerprint Identification," *IJCSNS: Interational Journal of Computer Science and Network Security* 9, no. 5 (2009): 164–68.

[27] C. Saraswat and A. Kumar, "An Efficient Automatic Attandance System Using Fingerprint Verification Technique," *IJCSE: International Journal on Computer Science and Engineering* 2, no. 2 (2010): 264–69.

employee productivity, management needs to consider the comfort factor because these factors have a significant effect on increasing employee work productivity. To develop the fingerprint attendance process can be done using more sophisticated devices so that the convenience of the attendance process can be felt more.[28]

In its current development, information and communication technology also provides innovation in electronic payments. Electronic payments that we know and already have in Indonesia today include phone banking, internet banking, credit cards, and debit /ATM cards. In addition, there are other electronic payment services known as Electronic Money (E-Money). One of them is the use of Electronic Money products in making Transjakarta payments.

Transjakarta emerged in 2001 and began operations on January 15, 2004. Transjakarta is a mainstay of transportation modes for the people of Jakarta. It has required its consumers to use Electronic Money as a condition of payment by using Electronic Money from banks that have cooperated with Transjakarta. Since 2013, Transjakarta has used prepaid cards issued by banks as a substitute for cash. The card can be purchased at prepaid card providers and counters at all Transjakarta stations for Rp. 40,000. Replenishing the balance can be done at the ATMs of the related banks.

But on the other hand, Electronic Money has a huge weakness in terms of security because transactions are carried out without going through the authentication process in the form of PIN or other transaction authentication. If the user loses the Electronic Money card, the card is stolen or other events that cause the card to change hands to another party that is not valid, then the card can still be used by other unauthorized parties, when this has been found in many authentications using biometrics that is using parts of our body that have unique uniqueness and are different from others, for example, fingerprints and retina of the eye. The advantage of biometrics is that it has quite high security because it cannot be transferred or even stolen because it uses parts of the body.

Utilization of Biometric Fingerprint as a payment medium based on electronic money can be used by utilizing a unique fingerprint pattern as a code to store electronic value stored on a bank

[28] Rinny Rantung, "Manfaat Dan Pengaruh Penggunaan Absensi Sidik Jari Terhadap Produktivitas Kerja Pegawai Di Universitas Klabat," *JBE (Journal of Business and Economics)* 12, no. 1 (2013): 1–10.

server. The use of Biometric Fingerprint as an Emoney-based payment media can also be used as an alternative electronic payment media besides the use of the current E-Money card on Transjakarta transportation. Based on this, the E-Money-based fingerprint also has the same potential to be developed for its use and utilization as other electronic payment media.

The use of fingerprint is also able to deal with weaknesses in the use of electronic money cards, one of which is the security aspect, because when a user uses the Fingerprint in the payment process, it is done by attaching the user's finger to the scan tool provided, in that process the authorization process will occur in the form of a fingerprint pattern. user's finger. Broadly speaking, the main stages of using Fingerprint payments are the same as using cards, through several stages, such as registration, top-up of balances, transactions, and transfer of funds, but what distinguishes the use of Fingerprint scanners is that the user does not need to purchase a card simply by registering and top-up, the user's fingerprint can be directly used to make payments.[29]

Conclusion

Biometrics refers to all the material, equipment, labour, and man-made system to replicate the system that already exists in nature. This science was first put forward by Janine M. Benyus, a writer and scientific observer from Montana. Biometric very good as a replacement PIN (personal identity number) or substitute for the signature. But the need to keep in mind that biometrics cannot be kept secret. Nevertheless, he has the characteristics, namely: Unique, Permanent and Universal.

Biometric normally used in the form of authentification, including Introduction to Fingerprint, Face Recognition, Recognition Retina or Iris, Geometry Arm, Geometry Finger, the introduction of Palms, Voice Recognition, Introduction to Signatures, DNA (Deoxyribonucleic Acid), Thermal Imaging (Body Temperature), Shape Ear, Body Odor, Body Movement. On some types of

[29] Ahmad Muhajir, Lia Ristiyanti, and Shabrina Utami Harsono, "Pemanfaatan Biometric Fingerprint Sebagai Media Pembayaran Transjakarta Berbasis Electronic Money," *IKRA-ITH INFORMATIKA: Jurnal Komputer Dan Informatika* 1, no. 1 (2017): 11–22.

biometric authentication on top of the Al-Qur'an gives a signal on Surah Fushshilat [41]: 20-22).

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