BIOMETRIC TECHNOLOGIES AND DEVELOPMENTAL AND INFORMATION SECURITY ISSUES RELATED TO THEIR GROWTH IN AFRICA

A BIOMETRIKUS TECHNOLÓGIÁK ÉS AZ ELTERJEDÉSÜKHÖZ KAPCSOLÓDÓ FEJLESZTÉSI ÉS INFORMÁCIÓBIZTONSÁGI KÉRDÉSEK AFRIKÁBAN

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Abstract

Closing the technology gap is a very difficult and fragile process for many regions of the world, in particular in Africa and sub-Saharan Africa, which will be explained below. There is growing evidence of successful technological development in the region. It especially affects information and communication technology, but also agriculture and other sectors. Both university research and co-funded technology development projects are important sources of technology development in the economy. This paper on certain questions relating to biometric technologies focuses on the analysis of key sectors and actors in these processes, and in addition to detailing the difficulties posed by development gaps suggests the possibility for faster technological development 'leaps'.

Keywords

Biometrics, development gap, Sub-Saharan Africa, technology development, 4G

Absztrakt

A technológiai rés megszüntetése nagyon nehéz és törékeny folyamat a világ számos régiójában, Afrikában és különösen Afrika Szaharától délre fekvő részén, amely e cikkben kerül kifejtésre. Egyre több a bizonyíték a térségben a sikeres technológiai fejlődésre, amely leginkább az információs és kommunikációs technológiák terén figyelhető meg, de érinti a mezőgazdaságot, és más szektorokat is. Mind az egyetemi kutatás, mind a társfinanszírozású technológiai fejlesztési projektek fontos fejlesztési források a gazdaságban. Ez a biometrikus technológiákhoz kapcsolódó egyes kérdéseket vizsgáló cikk az e folyamatok által érintett kulcsfontosságú ágazatok és szereplőik elemzésére összpontosít, és a fejlesztési hiányosságok által okozott nehézségek részletezése mellett felveti a gyorsabb, fejlődési „ugrások" lehetőségét.

Kulcsszavak

Biometria, fejlettségi rés, szub-szaharai Afrika, technológiai fejlődés, 4G

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INTRODUCTION

Technological development as well as technology transfer from abroad depend on a number of socio-economic factors and require a specific environment. These include factors such as existing infrastructure, human capital development and education, the legal framework, in particular intellectual property rights, informal institutions, research and development opportunities, and access to education.

This process can be of utmost importance again related to the process of knowledge transfer of technology and resulting application, innovation and development in the field of biometric technologies. Technologies based on biometric identification have been evolving and spreading at a very quick pace in a wide range of applications in recent years. And this process, combined with proper attention and data protection regulations, may create a positive impact.

The European Commission has drawn up a proposal containing minimum requirements in the field of security policy, including the requirements for a passport with biometric identifier. In Brussels, two years before the United States, a visa-free travel with biometric passport conditional had been made, and passports with two biometric identifiers were agreed on. The Commission mentioned the fingerprint as an option that was at the discretion of the Member States. At the same time, it proposed the creation of a central database containing the fingerprints of all European citizens, i.e. no less than 450 million EU citizens [1].

Consequently, many African governments are developing science and technology policies, establishing ministries of science and universities of engineering, devoting more resources to targeted science development programs, and stepping up international cooperation with organizations such as the World Bank, ADB, IDB, DFID, CIDA, UNCTAD, UNESCO that develops science and technology capacity building programs [2]. At the same time, a number of local-level projects are underway in Africa and consist of a bottom-up position on the technology development agenda. It is noteworthy that there are areas of research and technological development in some sectors of African economies, most of which are not related to the markets of the region [3]. Moreover, these markets have great potential and will become increasingly important in the global economy.

And while biometric technologies can be considered secure in general, and are more difficult to compromise as well, we must not ignore that these systems have also weaknesses. This paper cannot cover the technological aspects and full spectrum of the dangers of biometric identification technologies, but will mention some of the fundamental concerns especially in connection with African applications specifically.

BIOMETRICS AND BIOMETRIC TECHNOLOGY

Biometrics uses some characteristics and markers of the person that are unique and easy to digitize. These biometric features are for example the fingerprint, the voice, the vascular network of the cornea, or the shape of the face [4]. In addition to the immediate advantages of biometrics, it also has a number of disadvantages. Simpler solutions are easy to deceive, but more sophisticated products are very expensive. In many cases, there may

be hygiene or data protection issues (due to the possibility of covert surveillance). Nevertheless, biometric methods combined with biometrics are considered the most reliable solutions for user identification.

Although many methods can now be used for the biometric identification of users, methods based on fingerprint identification can be considered almost dominant. The adoption and widespread use of alternative methods is certainly yet to be seen. The primary explanation for this is (despite its relative inaccuracy) the fact that due to its low feasibility and user-friendliness, fingerprint-based identification is currently the most popular biometric technology. However, for the sake of a more complete picture, it is advisable to look in other directions as well.

There are many sources about biometrics as an identification procedure, but almost no systematic material has yet appeared on its control side.

- Biometrics [Greek] can be defined as biostatistical, quantitative analysis and statistical comparison and scientific processing of living organisms, their body parts and their life processes [5].
- Biometrics is the identification of a person with measurable physical and biological characteristics [6].
- Biometrics (ancient Greek: bios = "life", metron = "measure") is the identification of a person based on the measurement of one or more unique physical or behavioral characteristics. The use of biometric data through automated methods to establish identity based on measurable physiological (physical) and behavioral (behavioral) traits such as fingerprint or voice [7].
- Biometric identification is a type of personal identification, an identification procedure based on different, measurable biological traits, physiological or behavioral characteristics of a person (biometrics) [8].

Advantages of biometric identification:

- The method actually identifies the person himself/herself, and does not check for indirect characteristics such as a password or key that can be stolen or decrypted.
- Using the right tool or technology, it is possible to make sure that the sampling comes from a real living person; consequently it significantly reduces the possibility of deception.
- A silent alarm may be possible if, for example, another finger is used to read a fingerprint or another password is used for voice recognition.

Disadvantages of biometric identification:

- Most methods require special hardware that is still quite expensive.
- For people with disabilities, the method may not be applicable.
- From a hygienic point of view, solutions that require physical contact may cause problems.
- The examined characteristics can vary in time as a result of illness or injury.
- The results of the readings are never exactly the same, so the sensitive point of these systems is the degree of fault tolerance, as this can degrade the reliability of identification in terms of both false acceptance and false rejection.

- Repetitive deception is possible in several cases, such as voice-based authentication, whose attack mode may not be defensible in all cases and its prevention is quite expensive.
- The computer may not be able to verify the authenticity of the scanner hardware, so it may be the target of attacks.

Legal or privacy issues may be raised in case of the scan that is performed remotely without the person's consent (such as facial identification). These and wider problematic areas lead directly towards the questions of both theoretical and practical application.

THEORETICAL AND PRACTICAL DILEMMAS OF APPLICATION AND APPLICABILITY

From the point of view of this paper, three areas of application deserve special attention.

Travel control.

For a variety of reasons, there is an increasing requirement to let people travel via planes, ferries, and even trains to be individually registered, with interim checks at multiple locations. Today these requirements are mostly being driven by security concerns, visa regulations and other such reasons. And, because the amount of people traveling is already large and is predicted to increase at significant rates, all organizations involved in the management and control of mass transportation industries are very interested in the rationalization and automation of necessary procedures. This is especially the case in the activity of the International Civil Aviation Organization. The pressure caused by the growing number of passengers is surely one of the most significant reasons for the introduction of biometric passports, visas and other controls/documents. This organization recommends very clearly, that "*Contracting States should incorporate biometric data in their machine readable passports, visas and other official travel documents, using one or more optional data storage technologies to supplement the machine readable zone, as specified in Doc 9303*" [9].

Financial and other transactions requiring authorization.

It is already apparent in finance-utility applications, that money in physical form (bank notes and coins) is being replaced more and more by the virtual forms of financial transactions – digital transactions via data base entry. Today this happens in the form of credit or bank cards, pocket electronic money, etc. However, it is clear that, in most cases, the physical card is not important, because money is directly connected to a person. The spread of biometric authentication in the economic sector (i.e. banking and trade) will decrease the need of physical objects, such as cards – since virtual money can be directly connected to a person (or to the legal person). This will result in a significant change both in the behavior of people, but also in the abilities that governmental organizations will have in their surveillance of money movements (financial transactions).

Remote voting (authorization).

Perhaps the most important change in society will be brought about by the creation of an entirely new market for biometric devices that I denominate as *remote authorization*. The merge of existing and future networking developments with biometric solutions will allow people to have the opportunity to authorize a wide range of transactions (e.g. voting,

purchasing, accessing, decision-making authorizations etc.) via the network, from remote locations.

It is interesting and characteristic that biometrics also played a role in the identification of soldiers in African peacekeeping operations [10].

In many ways, the following two examples of refugee camps or elections are at least as relevant:

A) The Yidai refugee camp: 80,000-100,000 refugees, a UNHCR pilot project for the biometric registration of the entire population of the camp, if successful, will be introduced amongst most refugee camps around the world.

- benefits:
  - cost efficient,
  - equal redistribution,
  - combined with digital maps, a wealth of information on diseases and logistics
- risks and unintended negative consequences:
  - data management and protection practices compliance,
  - complete lack of a complex legal background,
  - long-term consequences for individuals, reinforces the 'refugee is not a full-fledged person' mentality,
  - 'cheap image campaign opportunity' for technology companies while also providing testing ground for uncontrolled testing of new, less reliable technologies

B) Voter Registration in Kenya [11], 2013.

- An exponentially rising cost of the African elections (Congo $ 360 million, of which $ 58 million for biometric systems, Ghana 124/76, Kenya 293 / ~ 100),
- The Kenyan election cost $ 20 per vote (average European cost $ 1-3 / vote),
- Contracts, citing business interests are completely and non-transparently confidential.

On the basis of all this, we can draw a conclusion of this stage. The triple benefits of technology companies, which are separate from the public good, are as per below:

- Africa can be a source and field of innovational freedom, demand and opportunities,
- This could be a part of an image campaign and as such, its many costs can be accounted for, as aid or social contributions,
- Huge profits due to universal data entry practices (identity cards, refugee camps) and unclear legal situation, in most cases with very long-term and unilateral contracts.

A RESEARCH DIMENSION - DO DEVELOPMENT GAPS DYNAMIZE OR PARALYZE?

More efficient use of existing resources through the development of science and technology is crucial for economic development. As a worthy component of the concept of wider sustainability, it has become an important element of policy strategies at national and regional level in most countries [12].

However, in terms of science and technology, the gap between economically less developed regions around the world persists. Developed countries seek to finance innovation and new technologies to gain competitive advantage in global markets, while developing and emerging economies seek to catch up with the level of technological innovation achieved by the former group. African countries have shown interest in enhancing the region's technological potential since the 1980s, but the technology gap persists. It is often related to the lack of a specific policy that would define and guide their actions and the ineffectiveness of existing policies to guide policies. The proliferation of biometric technology examined in the following chapters could be a forerunner of African telecommunications. It is also a question of how this relationship can be operationalized and justified.

According to a survey by the Internet World Statistics, the proportion of Internet users in Africa was 28.6% in 2015, and has been growing dynamically year by year ever since [13]. It is important to note that the ratio is deceptive for sub-Saharan Africa. That is caused by the fact that people in countries like Egypt, Mauritius or Morocco often do not use internet at home leading to a significant difference between individual access and the overall level of access and usage.

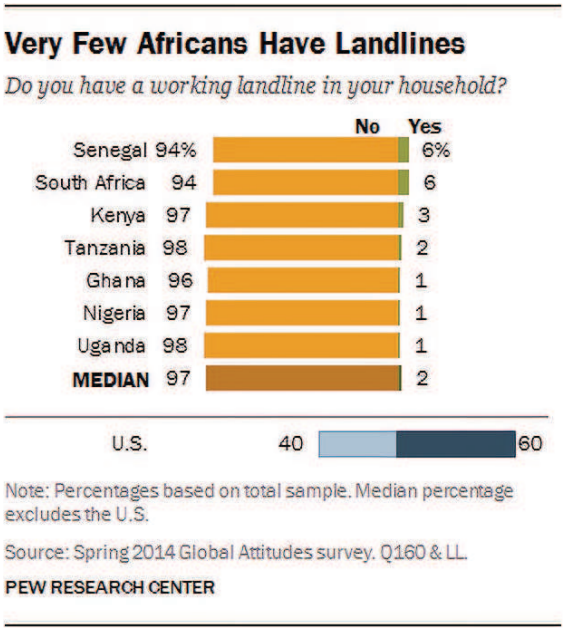

Figure 1 – Fixed line phone saturation in Africa

Mobile phone penetrations have grown at a much faster, remarkable rate. Taking the continent as a whole, the proportion of adults with a mobile phone increased from 1% to 54% between 2000 and 2013 (see Figure 2).

The digital revolution began in 1999 with the intrusion of telecommunications companies KenCell and Safaricom into the market. And in the years since, mobile communication devices have begun to play a very significant role in the African economy. In Kenya, for example, a banking service called M-Pesa made it possible to transfer money even to those who did not have a bank account. It was a huge change because before that, only 15%

of the population had had a bank account, but now everything from buying gasoline to paying wages or even tuitions can be arranged.

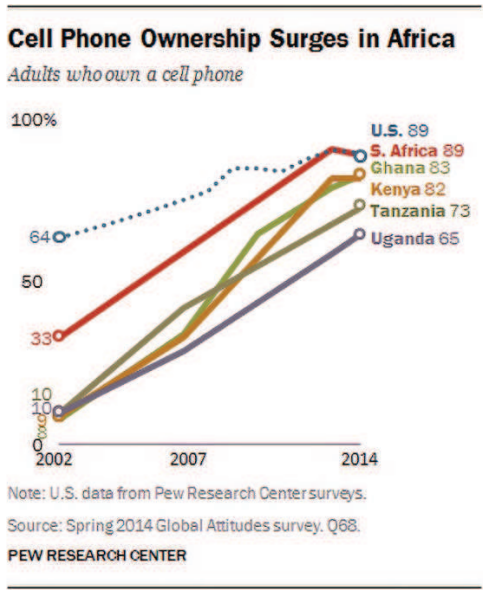

Figure 2 – Mobile phone ownership dynamics in Africa

Tens of millions of dollars move through M-Pesan every day, saving you time and money on travel, eliminating the dangers of transporting money, and boosting your cash flow. Similar systems have been developed in other countries.

And although the number of Internet users is growing rapidly, more than half of the world's population still does not have access to the Internet [14].

However, some phone operators are making increasing efforts to connect wider layers to the World Wide Web in the African market with smartphones tailored to local, rural needs.

The continent's two largest mobile operators, MTN Group in South Africa and Orange SA in France, have cut into the sale of simplified smartphones in recent years, which are being offered to the African population living in modest conditions for just $ 20. The devices have a smartphone "brain", while their appearance evokes the heroic age of handheld phones.

About 100 million units of phones with special software are planned to be sold this year, a 50 percent increase, making KaiOS one of the most dynamically growing mobile operating systems in the world.

Google also saw the potential in the company, with the techie investing $ 22 million in the software development company last year, which received another $ 50 million in support from investors in May this year. The rapid growth of the company exemplifies that even a mobile phone that can be purchased for a few thousand Forints can become an important innovation.

EXPERIENCES OF EARLIER TECHNOLOGICAL SHIFTS AND 4G REFLECTIONS AS 5G IS COMING

According to a statement issued by the ITU (International Telecommunications Union), there were already 3.3 billion mobile phone subscribers at the end of 2007, representing 49% of the world's population. Of course, it doesn't mean that every second person actually has a cell phone, as business customers in particular often have separate private and business numbers.

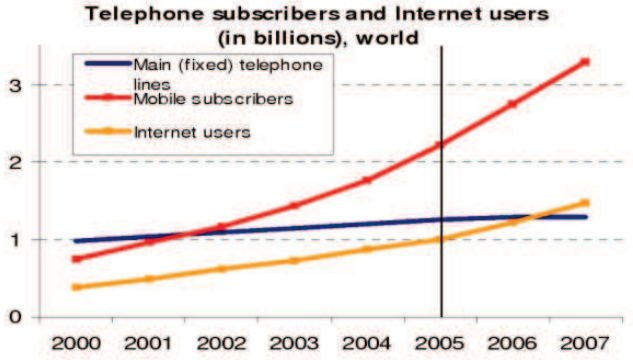

Figure 3 – Early regional dynamics of fixed-mobile shift, 2000-2007

The fastest growth is in Africa, where the number of subscribers increased by 39% between 2005 and 2007. Asia saw a 28% growth over the same period. India acquired 154, China 143 million new subscribers in the last two years. Landline subscriptions are constantly being pushed into the background, with only 10% of all subscriptions in Africa, for example, landline. The number of fixed line subscriptions worldwide was able to show a 1% increase. In many cases, new landline subscriptions are linked to growing internet subscriptions.

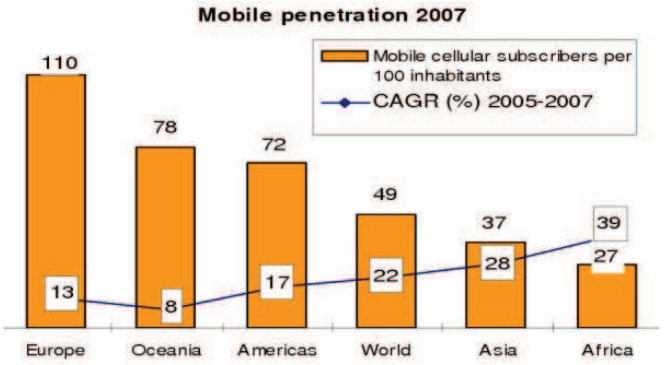

Figure 4 – Early regional dynamics of mobile penetration, 2005-2007

The introduction of 4G in Africa, on the other hand, has been characterized by insufficient start-up energy and investment for development. Due to the high cost of installation, implementation was initially slow. Without real coverage, consumers could not access a good 4G network, which allowed them to use the devices properly.

This has reduced consumer engagement / interest in high-speed technologies and, as a result, usage and acceptance have not even improved as coverage has increased (from 10% in 2014 to 46% in the third quarter of 2019).

With this in mind, it may be interesting to see how the fate of 5G technology is evolving in Africa. The other previous shifts were more successful by leaps and bounds, and even skipped further significant improvements to the fixed network itself, and it immediately switched to mobile in the field of telecommunications.

APPLICATIONS OF BIOMETRICS IN AFRICA

In Nigeria, initiatives related to national identification systems, exploration of payroll accounting, ensuring the integrity of student elections and secure retail payments in the country have been coupled with initiatives related to mobile services, elections and mobile banking. Airport identity systems have also played a prominent role in industry news, and a series of articles delving deep into the pressing issues of the biometric ecosystem continues to review facial recognition policy, focusing on possible U.S. regulations.

In a single Nigerian state, more than 17,000 employment-related frauds (such as bogus employment) and similar technology have been used for student elections and biometric-backed ID cards can be issued to the entire population. However, Tanzania's problems with SIM registration and Ghana's resistance to new voter registration illustrate the ongoing delays in digital ID projects in Africa. A separate story could be told of two banks in Nigeria and South Africa launching facial recognition services, the former for cardless retail payments and the latter for mobile app authentication.

One company integrated contactless fever detection with its facial recognition product, and another integrated fever detection and facial biometric terminals with payment technologies to deploy public transportation.

Singapore's national digital identification system is adding a facial recognition authentication service to kiosks at banks and government offices to remove service passwords. The government is also working to open the SingPass mobile app and provide facial recognition to elderly people in Singapore and overseas who may need the service but can't get to the kiosks.

AirAsia is transforming its brand with biometrics and big data by offering new experiences to its customers. The company operates separate iris-biometric experiments and a fast-track airport accounting experience system (FACES) developed by the partner to manage travelers.

Influence groups provided two guidelines for the use of biometrics and other AI systems this week. The five principles of the Pentagon and the Roman AI ethical call, which include a group operated by the Vatican, Microsoft, IBM, and others, have many things in common, starting with responsible and reliable requirements for systems.

In Morocco, the moratorium on the use of biometric facial recognition has been extended until the end of 2020, with a decision by the CNDP (National Commission for the Control of Personal Data Protection) leaving open the possible experiments and introduction of certain technologies in certain areas.

Experiments with facial recognition and other biometric data may be permitted on a case-by-case basis, and the CNDP is committed to exploring all solutions that could directly or indirectly contribute to reducing the health risks of the coronavirus pandemic emergency.

The CNDP notes in the announcement that it currently prioritizes addressing health risks and plans to include as a partner an assessment of the "proportionality of technologies to targets" that could contribute to tackling the crisis. It also makes recommendations on "the national architecture of identifiers and the establishment of a national third-party system for trustworthy biometric authentication mechanisms".

CNDP is committed to supporting the development of a data-centric economy with added benefits through data management. And (this is also one of the reasons for the ban) he expressed reservations about service providers, each with its own biometric database, which is often maintained outside the Commission's jurisdiction.

There is a need for a national decision on the use of a third-party database for authentication, whether in the public or private sector, and a reliable third-party system can be set up according to the technical specifications of the new version of the National Electricity Utility. More specifically, the CNDP notes that credentials and usage data should not be stored together and that special sector identifiers can be used to develop detailed data protection policies.

"The CNDP therefore proposes identifier architecture at the national level that takes into account constitutional, economic, social and technical requirements," the panel wrote in its discussion paper.

The CNDP also intended and intends to confirm the claims of manufacturers and service providers that their technology allows for consultation without biometric data storage, and will consult the DGSSI (Directorate General of System Security Information) on future national.

OPPORTUNITIES AND RISKS FOR THE FUTURE - SOME RELEVANT DIMENSIONS OF SECURITY AND AFRICAN MANIFESTATIONS OF DATA PROTECTION

The United Nations resolution of 14 December 1990, which sets out guidelines for the regulation of computerized personal data files, is not binding.

On a more global basis, therefore, legal reliance relies heavily on the broader provisions on personal data. However, such provisions are sometimes not able to fully interpret and manage biometric data.

In the EU, however, the General Data Protection Regulation (GDPR), the General Data Protection Regulation, is directly applicable in all 27 Member States of the European Union and the United Kingdom from May 2018. In this, biometric data is clearly defined and protected.

- Harmonized framework within the EU,
- The right to be forgotten,
- "Clear" and "affirmative" consent,
- Strict sanctions for non-compliance with these rules.

However, outside the European Union, the level of protection depends on the legislation in force. Assuming there is such legislation. An example of this is the United States, where three states (Illinois, Washington and Texas) protect biometric data and 47 do not.

A more activist example is the California Consumer Data Protection Act, which is a significant step forward for the country. It improves the data protection rights and consumer protection of California residents from January 1, 2020.

The CCPA could serve as an example elsewhere for shaping future legal frameworks.

African nations have also taken steps to align with the EU GDPR, with a specific focus on data protection in their unique environment.

The Mauritius Data Protection Act could almost serve as a roadmap in other parts of Africa by making the law accessible through examples and multilingual documents. Kenya's 2019 Data Protection Act was also important in securing local adjustments, which could provide significant control over the government usage of people's data.

Togo's legislation also goes beyond the GDPR in protecting people's data interconnection.

It can be said that African countries are adopting modern data protection laws that are related to the GDPR, but not copies of it. Moreover, the new African laws show their own way of thinking and approaches to today's most pressing and important data protection issues, tailored to the African situation.

As for innovation and development, many African governments have recognized their importance. Therefore, the government of Ghana not only ensures macroeconomic stability, but also aims to promote the construction of at least one factory in each district[2]. Ghana has also started to digitize public services. In future, every Ghanaian will receive a biometric ID in order to set up a database for services - for example in the health sector.

With adequate security and data protection measures biometrics can both be an enabler of political freedom, voting or healthcare and a source of innovation and economic growth.

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