Visión Electrónica

Más que un estado sólido

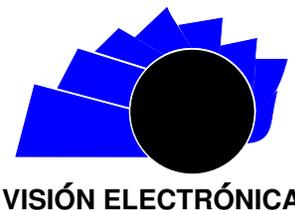http: revistas.udistrital.edu.co/ojs/index.php/visele/index

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

VISIÓN ELECTRÓNICA

A A CASE-STUDY VISION VISION

State of the art in M-Powering: social capital constructor

Estado de arte en M-Powering: constructor de capital social

Jhon Edison Pinedo.[1]*, Giovanny Mancilla.*[2]*, Mario Maniewicz.*[3]

ABSTRACT

The M-Powering is an initiative of the International Telecommunication Union ITU (for its acronym) which harmonizes developments that have taken the information technology and mobile telecommunications (M-ICT) with new forms of social interaction. This article makes a review of experiences and M-Powering applications and their derivations: M-Learning, M-Health, M-Agriculture and M-Government. From this perspective are observed social ICT applications as a form of access to social capital, and the contribution to the improvement of living conditions in the regions where they have implemented. For the above it uses ITU references; IEEE Explorer database; publications in academic spaces and governmental and non-governmental organizations (NGOs). In perspective, research updates of the potential applications of these technologies in time after peace accords as is the case in Colombia.

RESUMEN

El M-Powering es una Iniciativa de La Unión Internacional de Telecomunicaciones (UIT) que armoniza los desarrollos que ha tenido con la evolución que han tenido las tecnologías de la información y telecomunicaciones móviles (M-TIC) con las nuevas formas de interacción social. El presente artículo realiza una revisión exhaustiva en la década de 2006 al 2016 de las aplicaciones M-powering y su Taxonomía. Para observar cómo las aplicaciones TIC sociales desde la perspectiva de capital social han contribuido a la mejora de las condiciones de vida en las regiones donde se han implementado, y como un referente para su aplicación en otras regiones. Para lo anterior se utiliza las referencias de la ITU, bases de datos en línea, publicaciones en espacios académicos y páginas gubernamentales

[1] Atento Colombia S.A. Telefonica campaign. Bogotá, Colombia. Email: jhonpinrojas@gmail.com
[2] ATH analist, Bogotá, Colombia. E-mail: jmvargasv @correo.udistrital.edu.co.
[3] Deputy Director of the Radiocommunication Bureau of the International Telecommunication Union (ITU), Bogotá, Colombia. Email: mario.maniewicz@itu.int

1. Introduction

During the last decade the approach of ICT applications in the social field has allowed developing countries, especially in Africa, to improve in the areas of health, education, governance and agriculture. But these experiences have been relegated to a local level and have not had enough circulation to qualify as global application.

Therefore, the M-Powering initiative seeks to globalize the advances in applications adding mobile technology, along with appropriate regulation and monitoring. It also seeks to increase awareness between governments about the potential of their initiatives through active participation of all ministries, particularly telecommunications, education, finance, infrastructure and trade sectors, business and institutional allies.

From the normative point of view, M-powering considered include citizens with problems of affordability or technical availability, well as political sectors, regulators and the private sector, to have a global vision and a practical understanding of the instruments of regulation required to achieve social and economic development in the presence of technology.

On the other hand, these objectives M-Powering coincide with the synergistic approach and networks vision assumed by the paradigm of social capital, since the generation of such capital emerges from the synergy between government and citizen action. The network perspective, aims to increase and give importance to relations between small organizations (community groups) and large organizations such as companies or the government itself [1].

In technological terms the conclusion of the M-Powering and generating social capital have proportional relationship to the increase in equipment and mobile lines in the last decade worldwide. This has increased from 41 per 100 people in 2006; to 97 per 100 people in 2014 [2]., Consequently, since the generic cell phones to smartphones they have become tools for project applications in the social field in Android[4] e iOS[5] platforms, given their access and open source development. Precisely, due to this increase in mobile subscribers is that they have been

extended M-powering applications in the areas of health, government, education and agriculture of vulnerable regions worldwide.

Therefore, studies that generate prospects and applied areas of M-Powering are required. This article goes in this direction and is structured as follows: first defined M-Powering and its derivations, as well as materials and methods for conducting the review; after a brief knowledge framework describes; subsequently an approach to the state of art in the Asian and African regions is made; after a review in the Americas Region; and finally, perspectives and conclusions.

2. Materials and methods

The sources that are going to be in use for the review in the decade from 2006 to 2016 are, between others, the base of knowledge of the ITU in the initiative M-Powering; the academic articles about the topic published in indexed magazines; databases of innovations in health as "health Market innovations"; World Bank data on its website online; and online newspapers.

Also IEEE Explorer database is used to choose the particular applications . For the validity and relevance of the sources have been used to guarantee the research group GIDENUTAS[6].

In the frame of knowledge the acronym is described "E-" as electronic, and the "M-" as mobile prepended to each one of the study areas of Health, Learning, Government and Agriculture to differentiate methodologically that one is the predecessor of the other and, transmission means in which are applied (e- for computers) and (M-, for mobile).

Are also described, experiences in Africa and Asia; since both of these are those that have the highest poverty rates: 42.7 % Africa and southern Asia at 18.8 % according t o World Bank data [3]. They are further performed tables applications regions for each M-Powering topic constitutive.

---

[4]Android: OS based on the Linux kernel. It was designed primarily for touch screen mobile devices such as smartphones, tablets or tabléfonos.

[5]iOS: a mobile operating system of the multinational Apple Inc. Originally developed for the iPhone (iPhone OS) after it has been used in devices like the iPod touch and iPad.

[6]GIDENUTAS classified in the Colciencias System, 2015 type B.

[7]ITU o UIT: International Telecommunication Union is the specialized agency for telecommunications of the United Nations (UN), charge of regulating telecommunications at international level between the different administrations and operators.

3. Knowledge framework

3.1. M-Powering

The ITU[7] initiative called M-Powering aims to extend the benefits of mobile technology to all stratus of society in order to build a truly inclusive society of information, with special attention to rural and vulnerable areas. This in search of GDP growth and creation of employment opportunities in these areas.

This initiative, launched in 2012 [4] by Brahima Sanou, director of ITU Telecommunications Development bureau during the ITU TELECOM World event was to approach: the use of mobile networks in Government M- (Government), health (M-health), education (M-Learning) , agriculture (M-agriculture), banking, commerce, sports, and other fields that promote sustainable development well as increased use of mobile services and applications in daily life in order to improve economic activity; optimize the use of telematics resources and the establishment of public-private partnerships as well as promotion of large-scale projects in the area of telecommunications of social application; as it is shown in Figure 1.

Figure 1: M-Powering taxonomic Picture
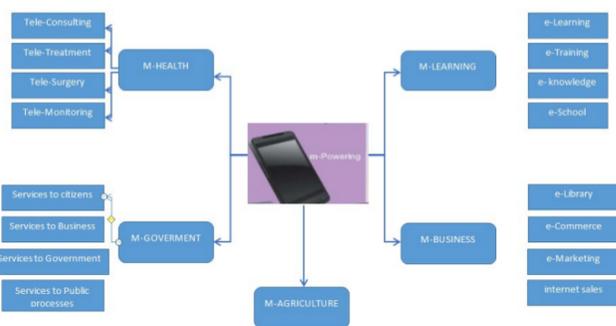
Source: M-Powering.

Here shall be defined each of these components except M-Business that will not be discussed in this article due to purely commercial approach.

3.2. E/M-learning

The English expression E-Learning corresponded to a learning system through electronic media management-based on the use of computers, electronic devices, among others; where it provides, through these, educational material to a student for learning. Its origins date back to 1986; the first modules of what were known as çomputer assisted instruction", (CAI) [5].

Later, with the rise of mobile, in early 2005 [6], the M-Learning began to be a recognized term of e-learning.

M-Learning [7] means the opportunity from the mobile learning, to overcome the barriers of traditional learning as accessibility and the cost to users. It uses fixed infrastructure and limited distribution, using mobile devices such as mobile phones, PDA[8], tablet, iPod and all handheld device that has some form of wireless connectivity[9]. They have been documented pedagogical advantages over other educational models such as the presential and E- Learning [8]. These include the ability to provide personalized learning at any time and place; the possibility of learning adapted to the learning style of each student; and dynamism with which the content is presented to students.

3.3. E/M-Health

The term E-Health defined as the use of Internet in health care dates back at least to 1999 [9]. Thereafter the term M-Health was coined by Robert Istepanian as the use of mobile communications and network technologies for the emerging health [10]. A definition used in the Mobile Health Summit 2010 of the Foundation for the National Institutes of Health (FNIH) was "the delivery of health care services through mobile communication devices"[11]. It also seeks to improve the flow of information using electronic means to support the provision of health services and management of their partners through strategies such as the collection of data from various diseases, epidemics and symptoms, control treatments pharmaceutical systems, improving the response of emergency medical systems, support tools for health workers and health financing, among others.

It is worth noting that in order to exploit the full potential of the M-Health to stimulate the expansion of such services in the world is essential to put the individual and/or patient at the center of the design, development and implementation of solutions of the regulatory frameworks that surround health processes. The development initiative M-Powering can play a key role through:

- Encouragement and facilitation collaboration

---

[8]PDA (personal digital assistant), handheld computer, personal organizer or PDA.

[9]wireless connectivity: provided by wireless networks (WLAN), also called WiFi- networks using the 802.11 family of protocols defined by the IEEE.

between health, telecommunications and finance ministries both globally and nationally.

- Promoting the development of policies, and where appropriate regulation, stimulating innovative business models allowing for funding and reimbursement of m-Health services, by means of identifying and facilitating sharing of good practices/case studies.

- Supporting initiatives/projects aiming to develop and roll out m-Health education and training programs/campaigns for healthcare professionals and patients.

3.4. E/M-Agriculture

E-agriculture was a term first used around 2006, seeking to describe an emerging field focused on improving agricultural and rural development through information and communication processes. Specifically it is focusing on e-agriculture which involves the conceptualization, design, development, evaluation and application of innovative ways to use information and communications technology (ICT) in rural areas focused on agriculture [12].

It had as objective population to helping small farmers, seeking to increase their profits, reduce the cost of transactions and logistics costs, and by providing traceability and quality standards for buyers as well as new opportunities to access financial institutions.

M-agriculture aims to increase the scope that had its predecessor since farmers around the world are using mobile technologies in their daily lives so much so that 96 of every 100 have mobile [13]. This M-Powering initiative can play a key role:

- Providing opportune information that helps understand and analyze market prices facilitating trade and informing business decisions.

- Reducing transaction time, travel and costs by shortening distances and allow more effective use of time.

- Reinforcing communications that promote social networks and levels of community participation, facilitating a process of informed decision making in segregated populations such as rural women.

- Allowing perform monitoring of crops and the variables that can affect it; including weather, temperature, soil type, water, nutritional needs, fertigation, pH, moisture, among many others.

3.5. E/M-Government

Electronic government or E-Government essentially refers to "The utilization of Information and Communication Technologies (ICT's), and other web-based telecommunication technologies to improve and/or enhance on the efficiency and effectiveness of service delivery in the public sector." e-Government promotes and improves broad stakeholders contribution to national and community development, as well as deepen the governance process. This service to citizens is performed using a large scale, telephone systems and/or fax, surveillance, radio frequency identification, fingerprint recognition, face recognition and even television and radio [14].

On the other hand, with the advancement of Mobile technology is significantly expanding the capacity of government to deliver citizen- and business-centric services; as well as to impact positively overall economic growth. Consequently, the most notable progress will be in developing countries, which historically have been limited by poor telecommunications infrastructure that, in turn, constrains economic development and social improvements.

By enabling the development of a whole new set of G2C[10], G2G[11], G2B[12] y G2E[13]; m-government affords, for instance, a powerful and transformational capacity to extend access to existing services, to expand the delivery of new services, to increase active citizen participation in government operations and to change the way of working within the public sector.

The main uses of M-Powering in this area can play a key role in the efficiency of services such as:

- Alert (information services, birth and death registration, emergency alerts).

- Interactive (learning services, graduation results, interaction between agencies, between governments and employees, between governments and businesses).

---

[10]G2C: Government to Citizens: eGovernment category that focuses on the interactions between government and citizens

[11]G2G: Government to Government: the electronic exchange of data and / or information systems among government agencies, departments or organizations.

[12]G2B: Government to Business: the electronic exchange of data and / or information systems among government agencies and businesses and nonprofits.

[13]G2E: Government to employees: interactions between government employees and government.

- Management (call center, data update, daily grievance statistics).

- Utility (SMS-based transaction).

4. State of the art

Here M-powering experiences at continental level are described and several explanatory tables for M-Health, M-Learning, M-Agriculture and M-Government are made.

4.1. M-health

As defined in paragraph 2.3, Table 1 lists the applications in the African Region in the last decade.

Tabla 1: M-health African Region

	2006-2008	2009-2011	2012-2014	2015-2016	Detalles tecnicos
GENERAL	D-tree international: application guide for health workers (Tanzania)	Mobile Baby (Tanzania, Nigeria).	Health e-villages (Kenia) supply of health services	Sharing surgical skills. (Sierra Leona)	Made on IOS and Android with acces to Big data, databases and health worldwide.
PARTICULAR	Telemedicine in Tunisia: links with European, Arab and African countries (Tunez)	Challenges in mobile bio-sensor based mHealth development (Sudafrica)	An e-Health tele-media application for patient management (Uganda)	An integrate ICT platform for eHealth (Sudafrica)	Technologies such as voice recognition and biometric sensors and databases used Big data

Source: own.

The following describes each one of the applications:

D-tree international, [15], seeks to provide focus in maternal care, child care and treatment of chronic and infectious diseases. Meanwhile, *Mobile Baby*, [16], midwives advice seeks to ensure safer pregnancy and childbirth, providing remote monitoring[14] to ensure good performance in pregnancy and reporting signs of danger. Likewise *Health e-Villages*, [17], Seeks to promote health professionals in Lwala through mobile devices. It provides the ultimate in clinical decision support, technology and medical referrals. In this line, a *Sharing Surgical skill*, [18], aims to help in the training of surgeons in Sierra Leone, providing training and information on surgical procedures.

On the other hand, for the particular experiences they were verified sources - study articles of M-Health in Africa:

In the first place, *Telemedicine in Tunisia: links with European, Arab and African countries,* [19], This

article makes a review of how telemedicine has been developed steadily in Tunisia despite management problems and how to resolve them under the program M-Health, in addition to the association with several foreign institutions in Europe, Maghreb and other African countries. Meanwhile, *challenges in mobile bio-sensor based mHealth development* [20], addresses bio-sensors signal processing to collect health relevant multimedia Information and improve the quality of remote diagnostics for both ambulatory and continuous monitoring of chronic diseases. In this order, *An integrative ICT platform for eHealth* [21]: presents the design of an integrated ICT platform eHealth that seeks to accelerate the adoption of solutions for mobile health support model of primary health care and redesigned to facilitate the integration of solutions eHealth and mHealth existing in a level of service and information. Likewise, *An e-Health tele-media application for patient management,* [22]: makes a review on the need for the deployment technologies such as IVR (voice recognition), SMS and web applications in the health sector to provide patients with real-time management of diseases, monitoring and access to a doctor.

Regarding the Asia Region, Table 2 indicates the global experiences and individuals.

Tabla 2: M-health in South Asia Region

	2006-2008	2009-2011	2012-2014	2015-2016	Detalles tecnicos
GENERAL	Piramal E-swasthya (India). HealthLine (Pakistan)	Vodafine's Ask a Doctor (India): application for medical consultations.	RingMD (Singapur).	AlemHealth (Afganistan)	Made on IOS and Android with acces to Big data sensors in addition to voice recognition and SMS messages.
PARTICULAR	Towards a sustainable e-health deployment An integrated medical information system for Sri Lankan case (Sri Lanka)	FBG sensor for physiologic monitoring in M-Health application	A functional specification for mobile eHealth (mHealth) Systems	Mhealth for the control of TB/HIV in developing countries (Australia)	Technologies such as biometric sensors (temperature, cardio, and breathing) and databases Big data are used.

Source: own.

The following describes each one of the applications:

Vodafone's Ask a Doctor [23]], It is used for health-related consultations, allows users to browse through information about disease management, myths, curiosities and general remedies. While, *RingMD* [24], it is an Android app designed to connect Singapore patients with doctors anywhere in the world through a chat system on any mobile device (phone, PDA, laptop, etc.). So too, *Piramal E-swasthya* [25], is a consultation app for local illiterate women who act as communication link between the patient and the doctor, by tele-clinical[15] application in their own homes. In this sense, *HealthLine:*

---

[14]Remote Monitoring: Monitoring of different factors performed remotely via mobile device.

[15]Medical term used to indicate remote delivery of medical services. ICT technologies for implementation are used, and using HL7 and DICOM standards. Ensuring the integrity and legibility of information

[26], is a medical consultation app based on voice recognition and focused on community health workers semiliterate. *AlemHealth* [27], telemedicine services seeks to provide high quality at reasonable prices to deal with the shortage of health workers.

On the other hand, for particular experiences were verified M-Health fonts - study articles - in Asia:

FBG sensor for physiologic monitoring in M-health application [28], in this paper, a wearable physiologic monitoring system using FBG[16] sensors is investigated. With the temperature, movement and physiological breath detection capability, for telemonitoring. Furthermore, *towards a sustainable e-health deployment an integrated medical information system for Sri Lankan case* [29], propose a methodology that deploys a fully functional dedicated system, Integrated Medical Information System (IMIS), with the collaborative effort of system designers, medical practitioners and the government.

On a *functional specification for mobile eHealth (mHealth) Systems*, [30], propose using a modified version of a music video game, "dance dance revolution" (DDR) used for physical rehabilitation therapies in older people. Designing a mobile surveillance[17] system that allows the health professional to monitor patient progress it is also presented. Finally, *mHealth for the control of TB/HIV in developing countries* [31], illustrates how a mobile health application based on SMS, simple and inexpensive, can be used to facilitate the treatment of TB / HIV patient monitoring allowing.

4.2. M-Learning

As defined in paragraph 2.2, Table **3** indicates the applications in Africa Region in the last decade.

Tabla 3: M-learning African Region

	2006-2008	2009-2011	2012-2014	2015-2016	Detalles tecnicos
G E N E R A L	BridgeIT (Tanzania)	Nokia momaths (Sudafrica)	Road to Reading Program (PHARE) (Mali)	M4Lit mobile phones for literacy (Sudafrica)	Made on IOS and Android through SMS interactive and multimedia applications.
P A R T I C U L A R	Organizational E-learning Strategies for Technical and Vocational Education and Training (TVET) in Sub-Sahara Africa	A Motivation for "Ubuntu" to e-Learning Social Network Services in South Africa	Audiovision for training teachers of Nigerian nomadic children	Using TV White Spaces and e-Learning in South African rural schools	SMS technologies databases Big data, Audiovisual and online evaluation methods are used.

Source: own.

The following describes each one of the applications:

Nokia momaths [32], is an app that aims to improve math skills of students and also gives teachers the ability to better to understand the competencies and improvement areas of their students. While, *BridgeIT* [33], this application uses mobile device to support teachers and students in math and science through educational videos. *Mali Road to Reading Program (PHARE)* [34], is a support app to the Ministry of Education of Mali that focuses on enhancing school evaluation systems, particularly around reading and writing, with teacher training and supervisory practices. In this sense, *m4Lit*, [35] it is focused on exploring the use of mobile phones to support reading and writing of young people through an interactive application.

On the other hand, for particular experiences were verified fonts - study articles of M-Health in Africa:

In first place, *Organizational E-learning Strategies for Technical and Vocational Education and Training (TVET) in Sub-Sahara Africa* [36], exhibits the implementation of this vocational training system based on the infrastructure availability and free access to information and that these kinds of practices can perform an essential role in promoting economic growth and socio-economic development. On the other hand, *A Motivation for Übuntu"to e-Learning Social Network Services in South Africa* [37] describes the recognition of teaching and learning through Social Networking Services (SNS) in Higher Education and its development, particularly the cultural context of South Africa. Also, *Audiovision for training teachers of Nigerian nomadic children*, [38]: reviews the experiences in the use of recordings and videos (MP4, AVI) to improve learning of teachers and children. Finally: *Using TV White Spaces and e-Learning in South African rural schools* [39], This paper shows the results on a socio- economic based on study example of the television white space (TVWS[18]) in South Africa to consider the benefits of this technology and enabling environment E-Learning and bring to students and teachers.

As defined in paragraph 2.2, Table **4** shows the applications in Asian Region.

---

[16]Fiber Bragg grating; FBG optical fiber sensors for structural health monitoring.

[17]Carried out by amid software on mid-range mobile equipment and sensors placed on the patient.

[18]TVWS (TV White Spaces): are reserved frequencies for unlicensed use in places where the spectrum is not being used for services authorized .

Tabla 4: M-Learning in Asian Region

	2006-2008	2009-2011	2012-2014	2015-2016	Detalles tecnicos
G E N E R A L	Agastya Mobile Labs (India)	Mobile-Based Post Literacy Programmed (Pakistan)	BBC Janala: Mobile (Bangladesh)	Text2Teach (Filipinas)	Made in IOS and Android using multimedia and SMS and friendly graphical environment
P A R T I C U L A R	Mobile learning with Bluetooth -based e-learning system (CHINA)	Towards mobile based e-learning in Bangladesh: A framework (Bangladesh)	Mobile Learning (M-Learning) Apply to Physical Education in Colleges	Low cost low bandwith real-time virtual classroom system for distance learning	Big data databases and Audiovisual used

Source: own.

The following describes each one of the applications:

Text2Teach [40], this is an application that features a learning package using mobile technology to download educational videos for 5th grade and 6th grade of Elementary school in the subjects of English, Math's, Science and Values Education. While, *Agastya Mobile Labs* [41], provides a graphical environment at which children can create, play, and search multimedia solutions form to a variety math and scientific problems; *BBC Janala Mobile* [42], encourages the study of the English language as a tool for literacy seniors through video (MP4, AVI) and predefined texts (SMS) that allow interaction and improve self-learning. Finally: *Mobile-Based Post Literacy Programmed*, [43]: application which aims to support literacy for girls and women in Pakistan through text messages SMS.

On the other hand, for the particular experiences were verified fonts - study articles - M- learning in Asia:

Mobile-Learning (M-Learning) Apply to Physical Education in Colleges [44], describes a preliminary analysis of the application of M-Learning in the field of physical education, and different routines are analyzed to broaden their study in schools. *Towards mobile based e- learning in Bangladesh: A framework* [45], It shows a framework of M-Learning for Bangladesh to contribute significantly in educational development and thereby having long- term effect on poverty alleviation. On the other hand *Mobile learning with Bluetooth-based e- learning system* [46], This paper introduces a Bluetooth-based e-learning system, which enables mobile learning from anywhere using a variety of devices, including cell phones, PDAs, and laptops. Different from current e-learning systems does not require internet connection and can establish a wireless network on

the spot in an ad hoc fashion, *low cost low bandwidth real-time virtual classroom system for distance learning* [47], proposes an internet based solution for transmission of visual aids through an application that uses low bandwidth where only voice is streamed over the network using UDP protocol and a TCP connection to transfer the visual aid properly coded solution, this is ideal for slow connections.

4.3. M-Agriculture

As defined in paragraph 2.4, Table 5 shows the applications in Africa and Asia region in the last decade.

Tabla 5: M-Agriculture in Asia and Africa Region

	2006-2008	2009-2011	2012-2014	2015-2016	Detalles tecnicos
G E N E R A L	Reuters Market Light (India)	Nokia Life Tools (India)	Jamaica's Agriculture Market Information System (JAMIS)	Senekela (Mali)	Made in IOS and Android used in addition SMS and big data bases and online markets
P A R T I C U L A R	A Building and e-Agriculture Business Integration Platform with Web Services Composition (China)	Development of agricultural monitoring application as media for social integration social (Japon)	ICT solution architecture for agriculture (Kenia)	Energy mobile vision system for plant leaf disease identification (India)	Used Big data databases and monitoring systems with temperature sensors, light, and market information online

Source: own.

The following describes each one of the applications:

Reuters Marquet Light [48], is an application that provides farmers with customized agricultural information market prices, weather and advisory services via SMS[19] on their mobile and in several local languages. *Nokia Life Tools* [49]: provides tips, techniques, news about New Agriculture services, market prices and weather information and also can be used in low-end phones[20]. Likewise, *JAMIS* [50], it is intended to establish the first electronic market[21] focused on the publication of weekly prices at the farmgate, in the municipal markets, retail and wholesale, on the other hand. *Senekela*, [51], It is an application that provides agricultural information that provides farmers with access to updated information and agricultural advice, prices of products, product availability, weather forecast, temperatures, among other.

On the other hand, for the particular experiences were verified fonts - study articles - M-Agriculture in African and Asian Region:

---

[19]SMS: Short Message Service or simple message service.

[20]Cell phone category that brings together smart phones platforms that don't support many utilities their screens are small size and resolution, little RAM (512Mb 125Mb-) and minimum internal storage capacity (500MB to 2GB).

[21]Consists of the purchase and sale of products or services through electronic means, such as the Internet can be through pages or applications that publish the products and prices

Energy efficient mobile vision system for plant leaf disease identification [52], this paper presents a scheme using mobile phones and images (JPEG, BMP) in real time in the field of diseased plants, followed by the diagnosis of diseases by analyzing visual phenotypes used a simple algorithm suitable for devices Android-based phones. *ICT solution architecture for agriculture* [53], illustrates the contribution of ICT to sustainable agriculture in developing countries; it provides farmers with agricultural information required (pre- and post-harvest information, prices, weather conditions, etc.) can increase agricultural productivity. *Development of agricultural monitoring application as media for social interaction* [54], describes the application software for monitoring agricultural data and monitoring system that automatically collects HD images whose objective was the construction of agricultural knowledge files and activation of social interaction among farmers, consumers and residents.

Finally, the paper: *A Building an e-Agriculture Business Integration Platform with Web Services Composition* [55], a Web service composition framework (WSCF) is presented to offer the effective business integration for agriculture marketing. It models various business processes as Web services and the process-based Web services composition can be carried out a complete business process spanned across various existing business applications.

4.4. M-Government

As defined in paragraph 2.4, Table **6** shows the applications in the African and Asian region In the last decade.

M-Government Service India [56], It is an application that seeks to facilitate access to public services through mobile devices (PDA, tablets, mobile phones etc.) using communication channels such as SMS, USSD[22], IVRS[23], LBS[24], IVRS and mobile payment services.

DubaiNow [57], seeks to multiple government services available to citizens: they can pay most bills and rate information: public transport, security and justice, health, car driving, visas, education services, Islam Service, business, Housing and Utilities. *Id Track and Trace* [58], performs tracking ID card for renewal, replacement or new application via SMS. *NWSC* [59], it allows consumers to pay water bills through virtual

payment via MTN Mobile money[25] as well service information, tips for water conservation, coverage maps and rates.

Tabla 6: M-Government in Asia and Africa Region

	2006-2008	2009-2011	2012-2014	2015-2016	Detalles tecnicos
GENERAL	M-Government service in India	NWSC national water and sewerage corps payments (Uganda)	Dubai Now (Dubai)	Id track and trace: (Eurafrica)	Made in IOS and Android and SMS used in addition and government databases
PARTICULAR	E-Government Information Security in the Web Environment Based on Role Based Access Control Technology (China)	A proposed e-Government Archtitecture based on Open Source components in Federation of Bosnia and Herzegovina	A comparative study of e-Government successful implementation between Nigeria and Republic of Korea		Used government big data databases and eGovernment systems

Source: own.

On the other hand, for the particular experiences were verified sources study articles M-Government in Africa and Asia:

E-Government Information Security in the Web Environment Based on Role Based Access Control Technology [60], it presents a framework of role based access control model on the base of E-government construction situation analysis. The framework will provide helpful advice and information for E-government information security plan and its subsequent mobile application, from elsewhere. *A comparative study of e-Government successful implementation between Nigeria and Republic of Korea* [61], it provides the results from research on the position given by the United Nations (UN) about E/M-Government in Nigeria and compares it with that of South Korea. For that it uses the e-Government survey reports carried out by the UN for the period covering 2008 to 2014 in order that Nigeria take steps to improve her ranking in the periodic review, Finally, *a proposed eGovernment Architecture based on Open Source components in Federation of Bosnia and Herzegovina* [62] describes an eGovernment system architecture solution to provide this service in the Federation of Bosnia and Herzegovina (FBH). According to current standards and recommendations of eGovernment, this architecture is based primarily on the use of open source components.

5. M-Powering in American Region

In Colombia, the list of social problems that beset urban and rural population generates an enabling environment for the development of applications and

---

[22]USSD: Unstructured Supplementary Data Service.
[23]IVRS: Interactive Voice Response
[24]LBS: Location Based Services
[25]MTN Mobile money : electronic payment platform allows payments and transfers.

services through technology, providing massive solutions in health, education or justice, among others. It is known that 29 % of the population lives in poverty; unemployment affects more than 14 % of young people between 14 and 28; and access to higher education in the country is not enough to shelter two out of ten people, [63].

Therefore, from the year 2010, projects related to appropriation of ICT in Colombia were visualized. Colnodo[26] initially addressed strategic programs such as digital inclusion and strategic use of (ICT) for development. For example, the project *strengthening for women in the use of ICTs to combat violence against women and girls* achieved two feminist conducting exchanges, in which they were trained of direct form in the use of technologies to eliminate violence against women and girls. Similarly, *the National ownership ICT project through telecentres and other ICT Access* local *centers* was developed; that is, led to meeting places, learning and communication in the use of ICT as a means of strengthening and management of initiatives aimed at improving the living conditions of vulnerable communities such as indigenous or African descent at national and departmental level.

In late 2012, Colombia Digital Corporation (CCD) created ICT centers of public access. These centers are positioned as sites that make it possible, at the local level, the participation of people in the use of the Web, but also in the transit of knowledge and expertise in various ways [64].

Furthermore, the project under the Government Program Bogotá Humana, the ICT for Digital Government Program emerges, Smart City and Knowledge Society and Entrepreneurship [65]. It appears so, the Bogotá project: ICTs, dynamizing of knowledge and entrepreneurship; whose aim was to promote the use and appropriation of information and communications technology providing the population greater opportunities for access to knowledge and entertainment, to economic and social development through entrepreneurship. It has helped to overcome social exclusion and to close the gaps between the various citizens. To achieve this objective, the High Council District of ICT gave life to the project *Digital City Ciudad Bolivar*. Finally, in recent years there have been projects focused on the inclusion of ICT in the most vulnerable population, it is exemplified by Apps.co community that already has more than 71,000 entrepreneurs and working on initiatives to identify the

main needs of the most vulnerable population and that this supplies allows developers to create services to the measure of each problem.

Of previous initiatives, it has emerged framed applications within the M-powering as Glye and 1Doc3 seeking to improve relations between health professionals and their patients, providing answers on various diseases at no charge, to improve the quality of services: Kindery, which seeks to stimulate the brains of children by creating stories, and it allows them to increase their vocabulary and have a first approach to literature; or the "Library for the Blind" that enables apprenticeship to people with this type of disability; and tools ÇomproAgro.ªnd Çultivating Future" that through their web or mobile application responsible for connecting via electronic market supply and demand for agricultural products, as well as technical advice.

The above showed that the country has potential for creating such applications and subsequent expansion to other regions.

6.   Perspectives and Conclusions

Apparently, in social applications made in Colombia by Apps.co and Government Online, a good prospect for the future is glimpsed as it is a challenge to the ability of engineers and Colombian technologists to create ICT applications that provide solutions to pressing problems. These types of applications would be focused on providing solutions in Peace preliminary agreement in the fields of education, health and agriculture. For example: control of illicit crops; health consultation applications in remote locations; comprehensive training for demobilized combatants or victims of the conflict - skills certification and virtual qualification; applications or maps for preventing access to mined sites; mapping and cadastral survey for land restitution, among others that can be derived from reading agreements [66].

In the field of health (M-Health), the examples cited in this article clearly show that these solutions are not only focus on prevention, diagnosis, treatment and monitoring of diseases, but they also contribute to strengthening systems health through improvements in emergency response, professional support health and health care.

As an example of this can be seen the case of Tanzania in the last decade with the implementation of ICT applications in health their system has positively

---

[26]Organization whose main objective is to facilitate communications, exchange of information and experiences among Colombian organizations at local, national and international levels through low-cost electronic networks

impacted presenting a decrease in maternal mortality: from 717 to 413 cases per year since 2006; and an increase in life expectancy of 57 to 63 years [67].

In the field of education (M-learning), Though not is easily assess the impact of such initiatives, it is recognized that it is a great supplement that can improve education, especially in developing countries, since their diverse applications can used to support communities where there are few teachers and lack of infrastructure.

For agriculture (M-agriculture) is a useful tool for small and large workers in the sector, while allowing greater knowledge of the market and the different factors of cultivation, also allowing greater participation by small producers who so far stayed away from the system, you can take as an example the case of Mali whose agricultural production step of US $ 1,705,051,960.18 in 2004 to US $ 4,264,474,829.90 to 2014 [68].

With M-Government citizen has access to existing but currently inaccessible services and the provision of new, as well as to increase their active participation in government operations representing a change in the way of efficient to the public sector.

To conclude, all the initiatives studied in this article have contributed to improving the quality of life of communities even in remote areas of Asia and Africa that is where resources and professionals are few- achieving inclusion of segregated communities that did not have access to goods and technology services, ie building social capital.

Acknowledgments

References

[1] Universidad de Deusto, "Memoria estado del arte del Capital social", available:http://oberri.bioef.org/LinkClick.aspx?file ticket=RtKHp53wNhY % 3D&tabid=213&mid=796 Nov 2003. [Online]

[2] The World Bank, "Mobile cellular subscriptions (per 100 people)", Jan 2015. [Online] available:http:/data.worldbank.org/indicator/IT.CEL. SETS.P2/countries?display=grap

[3] The World Bank, "Poverty & Equity Data", Jan 2015. [Online] available: http://data.worldbank.org/topic/poverty.

[4] "M-powering development International Telecommunication Union INITIATIVE", Jan 2015. [Online] available: http://www.itu.int/en/ITU-D/Initiatives/m-Powe-ring /Documents/m-moweringDevelopmentInitiative _Report2015.pdf

[5] S Ochoa, "Historia del E-Learning", Jan de 2007. [Online] available: http://ajincompu.blogspot.com.co/2007/01/historia-de-e-learning.html

[6] Routledge, "Handbook of mobile learning", Hoboken, p-98., Jun 2013.

[7] Fundación Wikimedia, "Aprendizaje electrónico móvil", mayo 2016. [Online] available: https://es.wikipedia.org/wiki/Aprendizaje_electroni co_movil

[8] Routledge, "Handbook of mobile learning", Hoboken, pp-96-101, Jun 2013.

[9] Della Mea, Vincenzo "What is e-Health (2): The death of telemedicine?. *Journal of Medical Internet Research* vol 3, no 2, e22, 2001.

[10] R. Istepanian, S. Laxminarayan, C. S. Pattichis, eds. "M-Health: Emerging Mobile Health Systems" Springer, 2005.

[11] C. Torgan "La Cumbre de Salud Móvil: local y global Converge"Nov 2009, [Online] available: http://www.Caroltorgan.com

[12] AgriDrupal community, "e-Agriculture Community of Practice", 2007. [Online]. Available: http://www.e-agriculture.org/e-agriculture

[13] The World Bank, Mobile cellular subscriptions (per 100 people), Jan 2016. [Online] available: http://www.worldbank.org/en/publication/wdr2016

[14] "M-Government: mobile technologies for responsive governments and connected societies", ITU. OECD, 2011.

[15] "D-tree International partnership, D-tree International Programs", 2016. [Online] available: http://www.d-tree.org/saving-lives/womens-lives/ma ternal-health/

[16] M-Powering development initiative advisory board, m-Powering Development Initiative, "Mobile Baby", ITU-D, pp 20, 2015.

[17] M-Powering development initiative advisory board, m-Powering Development Initiative, "Health e-Villages", ITU-D, pp 21, 2015.

[18] INCISION Group B.V., "Sharing Surgica Skills" 2016 [Online] available: https://www.incisionacademy.com/tour/our-content/

[19] Aziz El Matri, "Telemedicine in Tunisia: links with European, Arab and African countries", 2008, [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=4529927

[20] Mzomuhle T. Nkosi, "Challenges in mobile bio-sensor based mHealth development" 2011, [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=6 026750

[21] Ronell Alberts,"An integrative ICT platform for eHealth", May 2014, [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=6880650/

[22] Collins Mwesigwa, "An e-Health tele-media application for patient management", May 2013, [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number= 6701716/

[23] M-Powering development initiative advisory board, m-Powering Development Initiative, "Vodafone's Ask a Doctor", ITU-D, pp 105, 2015.

[24] MobiHealthNews Team, "Singapore mHealth",Nov 2014,[Online] available: http://mobihealthnews.com/tag/singapore-mhealth

[25] Center for Health Market Innovations, "Piramal E-swasthya", 2008. [Online] available: http://healthmarketinnovations.org/program/piramal -e-swasthya

[26] Center for Health Market Innovations, "Healtline", 2007. [Online] available: http://healthmarketinnovations.org/program/health line-pakistan

[27] Center for Health Market Innovations, "Alemhealth". 2014. [Online] available: http://healthmarketinnovations.org/program/alem-health

[28] C.C ling, K. Hung, "FBG sensor for physiologic monitoring in M-health application", Nov. 2011. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=6210878

[29] G. G. D. Y Nishantha, "Towards a sustainable e-health deployment an integrated medical information system for Sri Lankan case", April 2009. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=5191200

[30] Philipp Zuehlke, "A functional specification for mobile eHealth (mHealth) Systems", 2009. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=5406201

[31] Aishwarya Baksh, "mHealth for the control of TB/HIV in developing countries", 2011. [Online] available: //ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber =6026797

[32] LoveLife's Team, "Nokia launches momaths", 2016. [Online] http://www.lovelife.org.za/corporate/press/news/no kia-launches-momaths/.

[33] S. Isaacs, "Mobile learning for teachers in africa middle east", Paris: UNESCO, pp. 15-16-24, 2012.

[34] Education development center Team, "Mali Road to Reading Program (PHARE)", 2011. [Online] available:http://idd.edc.org/resources/publications/ mali-road-reading-program-phare

[35] "Yoza Project", 2010. [Online] available: https://m4lit.wordpress.com/about-the-project/

[36] N. Athanase,"Organizational E-learning Strategies for Technical and Vocational Education and Training (TVET) in Sub-Sahara Africa", 2008. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=4722894

[37] M. Halse, "A Motivation for Übuntu"to e-Learning Social Network Services in South Africa", 2011. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=5992440

[38] K. Jack "Audiovision for training teachers of nigerian nomadic children", 2013. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=6820217

[39] T. Masonta, "Using TV White Spaces and e-Learning in South African rural schools", 2013. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=6820217

[40] T. Masonta, "Using TV White Spaces and e-Learning in South African rural schools", 2015. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=7190564

[41] Jhunjhunwala foundation y others, "Agastya Mobile Lab An instrument to revolutionize education", [Online] available: http://www.agastya.org/how/how-we-do-it/mobile -labs

[42] BBC Bengali Service, « Millions of Bangladeshis learn English with BBC janala » , 2012. [Online] available: http://www.bbc.co.uk/mediaaction/where-we-work /asia/bangladesh/bbc- janala

[43] Mr. Fakhar-ud-din, " Mobile-Based Post Literacy Programme », 2009. [Online] available: http://www.unesco.org/uil/litbase/?menu=4&pro gramme=125

[44] W. Zhang, "Mobile-Learning (M-Learning) Apply to Physical Education in Colleges", 2011. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=5990328

[45] A. Habib, "Towards mobile based e-learning in Bangladesh: A framework" , 2010. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=5723873

[46] Y. Zhang, "Mobile learning with Bluetooth-based e-learning system". 2005. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=1656702

[47] P. Mondal, "low cost low bandwidth real-time virtual classroom system for distance learning", 2013. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=6629892

[48] S.Prakash, «Reuters Market Light: Business Model Innovation for Growth», 2010. [Online] available: http://www.india.jbs.cam.ac.uk/opinion/pieces/down loads/2010/prakash_reuters.pdf

[49] "Nokia Life Tools", 2009. [Online] available: http://company.nokia.com/en/news/press-releases /2009/06/12/nokia-life-tools-launched-across -india

[50] "Jamaica Agriculture Market Information System", 2011 . [Online] available: http://www.ja-mis.com/Companionsite/home.aspx

[51] Mobile Market Design for Development, "Mobile agricultural information services in mali by sènèkèla", 2014 [Online] available: https://mmd4d.org/2014/05/04/mobile-agricultural-information-services-in-mali-by-senekela/

[52] S.Prasad, "Energy efficient mobile vision system for plant leaf disease identification", 2014. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=6953083

[53] F. Awuor, "ICT solution architecture for agriculture", 2013. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=6701752

[54] K. Kobayashi, "Development of agricultural monitoring application as media for social interaction", 2011 [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp? arnumber=6060311

[55] J. Hu, "A Building an e-Agriculture Business Integration Platform with Web Services Composition", 2008. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp? arnumber=4554110

[56] M-Powering development initiative advisory board, m-Powering Development Initiative, "*m- Governance in India*", ITU-D, pp.106, 2015.

[57] N. Desk, "Dubai Now Wins 'App Of The Year' At GOV Awards" , 2016, [Online] available: http://naradanews.com/2016/06/dubai-now-wins-app-of-the-year-at-gov-awards-2016/

[58] M-Powering development initiative advisory board, m-Powering Development Initiative, "Id Trac and Trace", ITU-D, Fig A11, pp. 107, 2015.

[59] National Water & Sewerage Corporation, "national water and sewerage corp payments", 2016. [Online] available: https://www.nwsc.co.ug/index.php/home-mobile/

[60] Z. Zeng, "E-Government Information Security in the Web Environment Based on Role Based Access Control Technology", 2008. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=5117466

[61] J. Oluranti "A comparative study of e-Government successful implementation between Nigeria and Republic of Korea", 2014. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=7053869

[62] H. Lučkin, "A proposed eGovernment Architecture based on Open Source components in Federation of Bosnia and Herzegovina", 2012. [Online] available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?ar number=6419167

[63] Redacción Tecnósfera, "Colombia quiere liderar revolución de las 'apps' sociales", El Tiempo, 23 de febrero de 2015.

[64] "Apropiación de TIC para la inclusión social, Corporación Colombia Digital", Octubre 1, 2012. [Online] available: http://colombiadigital.net/actualidad/articulos-infor mativos/item/3860- apropiacion-de-ticpara-la-inclu sion-social.html

[65] Ciudad bolivar, localidad digital, "Alta Consejería Distrital de TIC", Febrero 26 2013, [Online] available en:

http://tic.bogota.gov.co/index.php/tic-dinamizadoras -de-conocimiento- yemprendimiento/ciudad-bolivar-lo calidad-digital

[66] "Acuerdo general para la terminacion del conflicto", 2016. [Online] available: https://www.mesadeconversaciones.com.co/sites/de fault/files/AcuerdoGeneralTerminacion Conflicto.pdf

[67] The World Bank, "Life expectancy at birth", 2016. [Online] available: http://data.worldbank.org/indicator/SP.DYN.LE00. IN?locations=TZ

[68] The World Bank, "Agriculture & Rural Development", 2016. [Online] available: http://data.worldbank.org/topic/agriculture-and-ru ral-development?locations=ML