Exploring emerging technologies and their impact to information management and organization growth

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***Abstract*—There are many emerging technologies in the 21st century as far as technology is concerned. These emerging ICTs provide the most profound impacts on information management and organizational growth. This paper is an attempt to generate research to create a comprehensive understanding its role and impact on organizations. The emerging technologies identified are those that have a high level of generality with a significant possibility of having an effect on the way humans interact with the world. This shall be achieved by identifying the state of the art emerging ICTs and establishing its impact on information management and organization growth. The desktop review shall be used on a global perspective.**

***Index Terms*—Emerging Technologies, ICTs, Information Management**

I. INTRODUCTION

There has been a revolutionary wave of innovations in the past decades in the scientific and technological fields. The change has been driven by Information Communication Technologies (ICTs). The driving force of the emerging technologies revolve around computer hardware, computer software, communications and information services. As a result, several emerging technologies in the 21st century have been realized. These emerging ICTs provide the most profound impacts on information management and organizational growth. Information management (IM) concerns a cycle of organizational activity, the acquisition of information from one or more sources, the custodianship and the distribution of that information to those who need it, and its ultimate disposition through archiving or deletion.

II. PURPOSE

The overall aim of the paper is to identify emerging ICTs and its impact to information management and organizational growth. The specific objectives include:

i. Identify the emerging ICTs
ii. Analyze the emerging ICTs
iii. Establish the impact of emerging ICTs to information management and organization growth.

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III. METHODOLOGY

This will be accomplished by content analysis design that will involve collecting data from existing resources. This is because it is a low cost technique and time friendly as compared to field research whose main cost involved is enormous. It is very effective, cheap, and quick and most of the basic information will be fetched and be used as benchmark in the research process.

IV. STATE OF ART EMERGING TECHNOLOGIES

There are several emerging technologies as stipulated in the ETICA Project Emerging technologies report [1]. This report identifies emerging ICTs deemed to be of create importance and likely areas of application. These includes affective computing, ambient Intelligence, Artificial Intelligence, Future Internet, Neuroelectronics, Bioelectronics among others.

A. Affective computing

Affective computing (also referred to as emotional computing or emotion-oriented computing) is the ability of computers to acquire, express and recognize affect, emotions [2]. This involves the use of ICT for perceiving, interpreting or expressing emotions or other affective phenomena and the simulation or realization of emotional cognition. This is achieved through speech, posture, facial expression. MIT media lab defines Affective Computing as a computing that relates to, arises from, or deliberately influences emotion or other affective phenomena [3].

According to [4] Affective computing is where computers tries to emulate human-like capabilities of observation, interpretation and generation of affect features. It is a key field for the harmonious human-computer interaction, by increasing the quality of human computer communication and improving the intelligence of the computer.

He also asserts that affective computing builds an "affect model" based on the various sensors-captured information, and builds a personalized computing system with the capability of perception, interpretation to human's feeling as well as giving intelligent, sensitive and friendly responses. Affective computing technology impact positively to information management as well as the organizational growth. The study of affective computing and application to relevant fields are enormous in information management and organization growth.

The automatic perception to people's affect features (such people's moods) in information gadgets, household appliances, and intelligent instruments to provide better services to both novice and expert users. This will improve the information management curve towards service delivery to a greater margin. Availability, security, and integrity of information is crucial in any setup. The affect concept analysis in computer retrieval system can be used to improve the accuracy and efficiency of information retrieval.

Consequently, education sector has been a cornerstone to the development of human capital hence the addition of affect factors in the remote education platforms may intensify the education effects. This goes a long way in the utilization of a platform in form of a model of affective features that provide an interaction technology in virtual reality application to build intelligent systems closer to real life. The attempt improves socio-economic growth of institutions with different cadres.

Today's world encompass games and entertainment as a tenet to social upbringing and affective intelligence may also be applied in digital entertainment, robots and intelligent toys to realize more personalized style and to build strong applications.

Other areas closely related to affective computing, include the ubiquitous computing and wearable computing, have achieved the pervasive attention of scientists. These technologies are the necessary ingredients of mobile computing technology and human-computer interaction. These aspects individualize computers and in terms of design it becomes part and parcel of our daily life. All these bring great conveniences to the real time capture of affect information as well as provide a perfect platform for affective computing. By means of the organic integration with affective computing, a colorful world of computing technology will be built with a great impact for information management and organizational growth.

B. Ambient Intelligence

Ambient intelligence (AmI) is where technologies interact in a seamlessly manner and adapt to the needs of human kind unobtrusively [1]. The philosophy of AmI is that electronic gadgets in our homes, offices, hospitals, cars and public spaces are embedded, interconnected, adaptive, personalized, anticipatory and context-aware with a consideration that not all features are equally present in all AmI systems.

Ambient Intelligence could provide a basis for integrating intelligent health care technology into an individual's personal surroundings. Computers in your environ and on/in your body could monitor the health status at all times and alert the caretaker when the need arise or attend to it immediately to boost the healthcare. For people living with disabilities, a personal communication device can be worn or fitted to a wheelchair or a blind person's cane. These gadgets can be programmed to communicate with barriers, ticket machines or gates to allow access or more response time. Smart tags, embedded in a floor, can receive and send information that will guide a person to a destination. A person with low-vision could hear guidance signals' [5].

In the industrial processes, intelligent and autonomous networked sensor systems provide possible uses in a precise, low cost control of chemical plant processes, in monitoring and linking machines, in tracking and management of security related objects, in registering ambient conditions and in testing product quality of the condition of building fabric.

C. Artificial intelligence

According to [6], defines intelligence as a measure of an agent's ability to achieve goals in a wide range of environments. The logical implication is the ability to learn, adapt and understand or infer. The general anticipation for technology is intelligence since the expectation is that computers ought to think like humans to attain human intelligence.

The AI technology has been applied in many areas such as the use of Software agents, Artificial brains, Artificial Intelligence chips, Control system for robots, and Expert Systems among other emerging areas.

D. Future Internet

Future Internet (also referred to as Internet of Things) is an emerging technology defined as a network of networks that includes advances in the current Internet technologies with more trending attention to performance, reliability, scalability, security and high mobility among other factors. The attempt also extends the Internet to the physical world in a different direction that has not been possible before. Adding semantics also enable better ways to the current organization, access, and using information in the networks which will add to the usability of Internet of Things as deemed important by the world.

There are two main concepts that distinguish the Internet of Things from the current Internet i.e. the Internet of Things and Semantic Web. The things have identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social, environmental, and user contexts.

This implies that components whose computing aspects are not so obvious are also connected to the Internet and to other things. As a result, IoT is a connection of numerous different entities among them PCs, humans, PCs to humans, human to things and things to things. A network configured in this manner is too challenging, complex, and dynamic than the current Internet.

The Internet of Things (IoT), sometimes is also referred to as the Internet of Objects, changes most sectors to larger scale. For instance, the impact the Internet has had on education, communication, business, science, government, and humanity is unbelievable. Clearly, the Internet is one of the most important and powerful creations in all of human history [7]. Now consider that Internet of Things represents the next evolution of the Internet, taking a huge leap in its ability to gather, analyze, and distribute data that we can turn into information, knowledge, and, ultimately, wisdom. In this context, Internet of Things becomes immensely important.

Already, Internet of Things projects are under way that promise to close the gap between poor and rich, improve distribution of the world's resources to those who need them most, and help us understand our planet so we can be more proactive and less reactive. Even so, several barriers exist that threaten to slow Internet of Things development,

including the transition to IPv6, having a common set of standards, and developing energy sources for millions even billions of minute sensors.

In the UK and other countries, cities and municipalities face the conflicting challenges of promoting economic growth and ensuring sustainable development [8]. The IoT is widely seen as playing a major part in achieving these efficiency gains, by promoting growth and achieving environmental goals though curbing emissions, discouraging environmentally harmful behaviors, and encouraging energy saving. Several UK cities are currently aiming to be centres of this revolution by developing IoT infrastructures to digitize existing physical infrastructures for energy, water and transport. These city-wide IoT initiatives are often driven by government funding in effect we're seeing the emergence of digital business ecosystems centered around cities. We're also seeing the potential for city-wide technology systems to bring about behavioral change. These new infrastructures embed specific values. They support a normative system for promoting and enforcing sustainable behaviors through information feedback loops, behavior modification and 'gamification' strategies. They have punish and reward mechanisms to 'nudge' citizens towards the behavioral outcomes desired by those who commission the systems.

However, as businesses, governments, standards bodies, and academia work together to solve these challenges, Internet of Things has continued to progress as depicted in figure 1 below.\

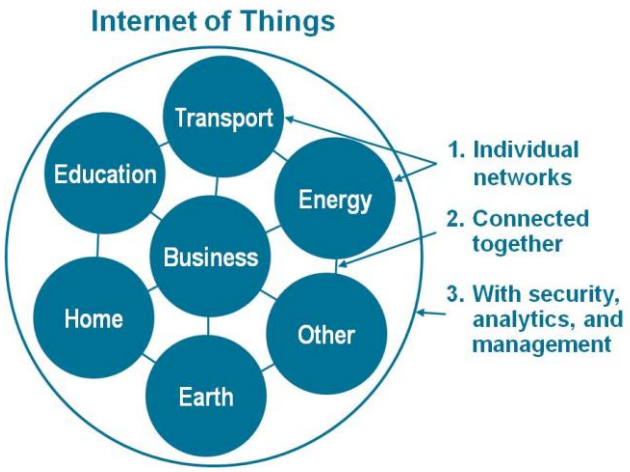

Figure 1: (Source [7])

This is a clear indication that the emerging IoT pause potentials, especially in the context of cities, which face the twin challenges of promoting economic growth while also ensuring sustainable development. In this context the IoT can be considered to be a novel public infrastructure that has the potential to serve the interests of citizens and commercial companies.

E. Neuroelectronics

Neuroelectronics is an emerging technology that provides a link between the human nervous system and electronic devices. It is multidisciplinary technology with expert input from computer science, cognitive science, neurosurgery and biomedical engineering.

According to [1], Neuroelectronics has roughly three related branches: (1) neuroimaging, (2) brain-computer interfaces (BCIs), and (3) electrical neural stimulation. Substantive efforts have been realized in the field by allowing researchers to directly monitor brain during experiments [9].

Neuroimaging technologies extract information from the brain to diagnose disorders or study brain structure or function. We are living in a complex modern society with a myriad of disorders and disabilities. The use of neuroimaging will enable the use of a wearable brain imaging tool that identifies children with learning disabilities and the degree of emotions. In addition, brain fingerprinting is an application of neuroimaging which can be used for lie detection in the human brain. BCIs extract information from the brain to control external devices such as wheelchairs, aircrafts, prosthesis or computers. Electrical neural stimulation devices stimulate parts of the brain so that symptoms like tremor, clinical depression or pain are reduced.

F. Bioelectronics

Bioelectronics is a multi-facet scientific and technological area that includes electronic (or optoelectronic) coupling of biomolecules, or their natural or artificial assemblies, with electronic or optoelectronic devices [10]. [11] asserts that bioelectronics aims at the direct coupling of biomolecular function units of high molecular weight and extremely complicated molecular structure with electronic or optical transducer devices. Alternative and new concepts are being developed for future information technologies to address, control, read and use information. This requires the development of structures for signal uptake, transduction, amplification, processing and conversion.

Of the five human senses, the sense of smell is least understood by scientists and engineers. Odors can be simply described as chemicals carried in the air. The scientific challenge is to develop a sensing system capable of detecting trace amounts of chemicals that are associated with a particular class of odor. The electronic NOSE (Natural Olfactory Sensor Emulator) platform project investigates the use of a sensing system along with an artificial neural network to distinguish specific chemicals from certain odors. An exciting application of the e-NOSE is to determine the physiological status of shock and trauma patients by monitoring their breath for volatile organic compounds. Experiments have been conducted on the e-NOSE to examine improving sensor performance through design and material selection, characterizing the sensing of various compounds, and developing a neural network that can identify the presence of specific chemicals by analyzing the electrical signals from the sensor array. This research on e-NOSE platform can have important applications in environmental monitoring and homeland security.

Consequently, biosensors for measuring human physical parameters implantable biosensor for monitoring lactate and glucose levels with wireless transmission capabilities. This creates a positive impact on medicine, healthcare and humans well-being in the society.

V. CONCLUSION

The gathered literature has demonstrated a multidisciplinary nature of emerging ICTs in relation to the information management and organization growth. Most of the emerging ICTs possess a thin line and therefore it requires careful delineation of all the disciplines and their constituents, a precise understanding of the interdisciplinary interactions among these technologies. The impact of these technologies are both positive and negative. However, the positive impacts outweigh the negative impacts. The potential impact includes improvement of social, political, economic development and organizational decision making process. Some of the critical aspects as a result of the technology include health issues, legal aspects, and ethical considerations.

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