Presentation Title: Internet of Things (IoTs) and Road Safety: Challenges and Opportunities for Africa

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INTRODUCTION

❖ The 4ᵗʰ Industrial Revolution triggers the concept of the Internet of Things (IoT).

❖ The term IoT was postulated by Kevin Ashton in 1999 in the context of supply chain management.

❖ It refers to the use of intelligently connected devices and systems to harness data gathered by embedded sensors and actuators in machines and other physical objects.

❖ Today the term IoT has evolved as a key word of modern technology.

❖ The imminent wave of connected devices, appliances, sensors and countless other "things" represent the next generation of a hyper-connected world, called the IoT.
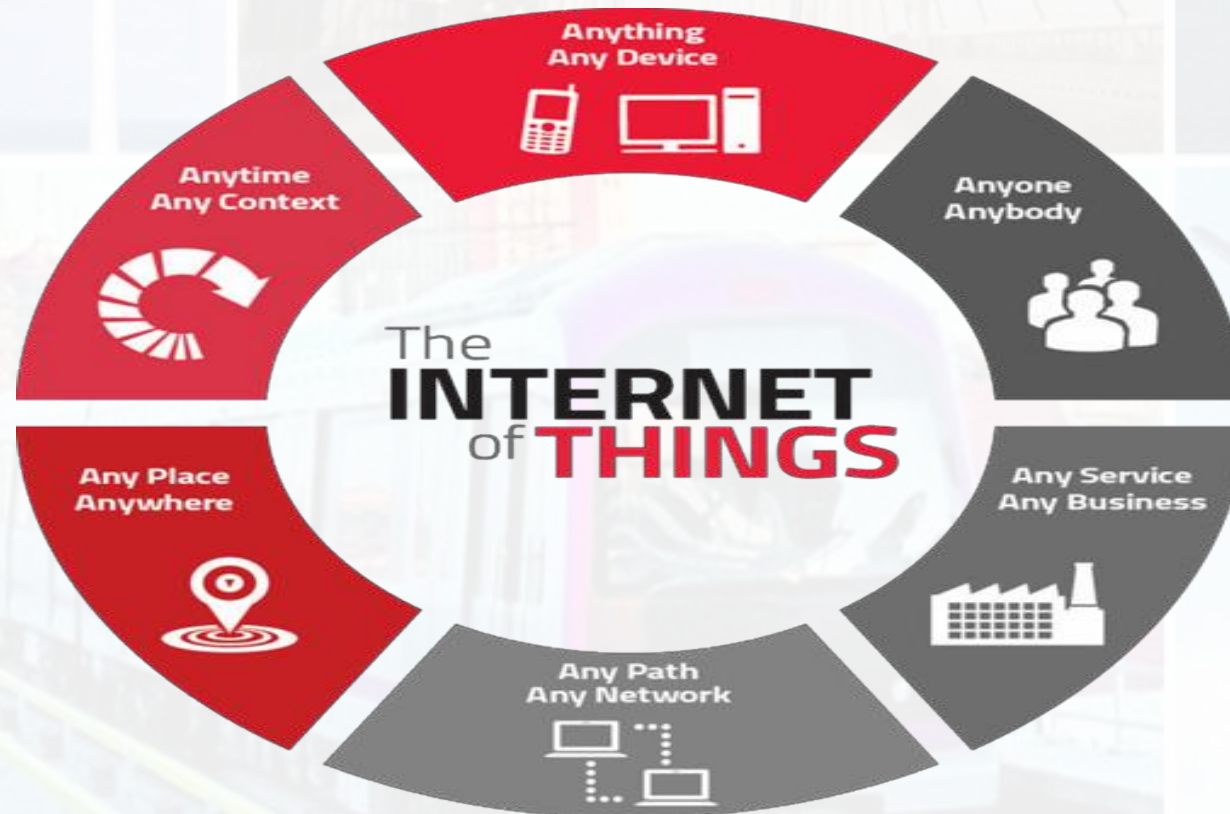
INTRODUCTION

Figure 1

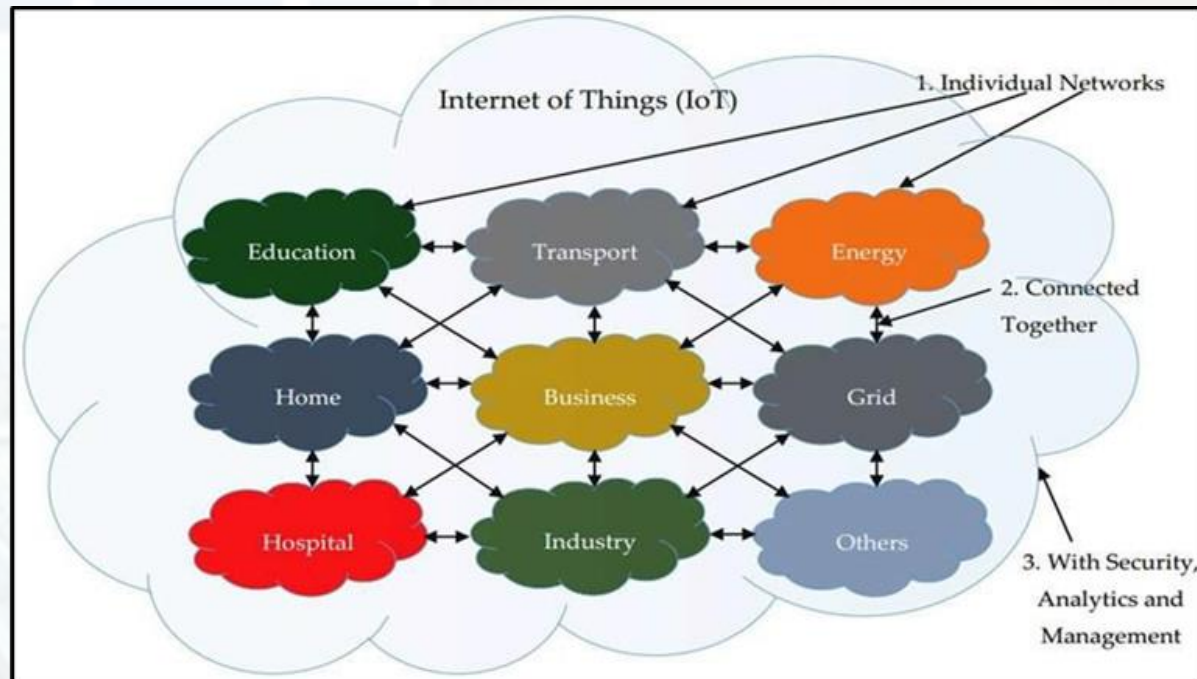Internet of Things

INTRODUCTION

Figure 2:

INTRODUCTION

❖IoT can also be viewed as a network of networks as shown in figure 3 below:

Figure 3

INTRODUCTION

Objectives of the Study:

❖To identify areas where IoT can be applied in the domain of transport in Africa;

❖To identify IoT challenges for Africa;

❖To showcase the potential role that IoT can contribute to transport management

METHODOLOGY

❖A Traditional Literature Review (TLR), a "traditional" way of reviewing literature, which basically involves gathering together a volume of literature in a specific subject area and synthesizing it (Cronin et al., 2008); was conducted through making use of four electronic scholarly databases, namely, IEEE Xplore, ScienceDirect, Web of Science as well as the Directory of Open Access Journals (DOAJ).

❖TLR can also be viewed as a comprehensive, critical and objective analysis of the current knowledge on a topic (Baker, 2016).

❖TLR is well known for being skewed towards a qualitative rather than a quantitative interpretation of prior knowledge (Sylvester et al., 2013).

METHODOLOGY

❖This study followed the four basic TLR steps, namely, choosing a review topic, literature search and screening, data extraction and analysis and writing the literature review (Levy & Ellis, 2006).

❖In order to provide clear answers to research questions posed in this study, an initial literature search was conducted on the above mentioned scholarly databases as well as the Google Scholar search engine.

❖The second stage involved direct content search from African countries' governments and industry databases, and this was used to find content relevant to IoT challenges and opportunities in the context of road safety in Africa. The literature search was conducted using key words, such as; IoT solutions in road safety, IoT application in road safety, IoTs in Africa, IoTs in developing countries, IoTs, IoT Challenges, as well as IoT Opportunities.

METHODOLOGY

❖Inclusion criterion included that studies must have been published in English, within the last two decades, must be original and must be open access while the exclusion criterion was that the studies were not peer-reviewed, and are reviews.

❖A number of articles were accessed from various sources already mentioned.

❖The researchers relied upon convenience sampling to select a sample size of fifteen articles amongst the previous studies to be reviewed.

❖For each downloaded article, or source document, the title and abstract were read and judged for either inclusion or exclusion based on study objectives.

RESULTS: IOT OPPORTUNITIES FOR AFRICA

Ubiquitous Wireless network

❖Wireless networks such as Wi-Fi have become more affordable and more accessible (Ndubuaku & Okereafor, 2015).

❖There has been a general decline in average broadband data prices across Africa. Countries with the lowest internet prices include Sudan, where a gig of broadband data costs $0.9, followed by Egypt $1.30, Morocco $2, Rwanda $2.10, and Cameroon $2.20. It costs $2.30 in Algeria, $3.28 in Senegal and $4.80 in Cote dIvoire (Benhaddou, 2021).

❖Unfortunately, in Zimbabwe, eight gigabytes of private internet data generally costs around $18 (Moyo, 2021).

RESULTS: IOT OPPORTUNITIES FOR AFRICA

Alternative energy and ultralow power technologies

❖ Countries such as Egypt, Ethiopia, Kenya, Morocco and South Africa have shown firm commitment towards accelerated use of modern renewable energy or the socalled green energy, and are leading energy transition efforts, while some of the continent's countries such as Cape Verde, Djibouti, Rwanda and Swaziland have also set ambitious renewable energy targets.

❖ Other countries such as Zimbabwe are following suit, and renewable energy is on the rise across the continent.

RESULTS: IOT OPPORTUNITIES FOR AFRICA

Widespread use of Smartphone

❖Over the past few years, smartphone use has really increased across the world.

❖Slowly but surely, mobile phone penetration in Africa is improving. There are 747 million SIM connections in sub-Saharan Africa, representing 75% of the population (Roxana, 2019).

❖Smartphones have become a remote control or interface for most applications ranging from healthcare to automobile.

❖Also, the number of smartphone users has increased since the past years.

❖The affordability of the smartphone has also aided its spread in Africa (Ndubuaku & Okereafor, 2015).

RESULTS: IOT OPPORTUNITIES FOR AFRICA

Road Network Management

❖ IoT sensors and the so-called smart cement, that is, cement equipped with sensors; can monitor the structural status of roads and bridges under dynamic conditions and alert relevant authorities about deficiencies before they de-generate into catastrophes.

❖ In this regard, IoT road sensors can provide concerned authorities with real-time information about traffic and road conditions in the IoT-equipped regions.

RESULTS: IOT OPPORTUNITIES FOR AFRICA

Road Safety Management

❖Pedestrian visibility;

❖Safety Awareness Education;

❖Law Enforcement on the Roads;

❖Tyre pressure monitoring;

❖Speed control;

❖Response to emergency;

❖Car maintenance.

RESULTS: IOT OPPORTUNITIES FOR AFRICA

Road Traffic Management

❖Accident investigation and recording;

❖Road network policing;

❖Education and training.

Cross-border transport management

❖Fleet management

Population Growth

❖Africa has the youngest population in the world, making it easier for IoT adoption;

❖Also an opportunity for IoT grassroots transformation.

RESULTS: IOT CHALLENGES FOR AFRICA

❖ Low internet penetration rate;

❖ Lack of political will;

❖ Fear of change;

❖ Outdated (and rigid) government policies;

❖ Security, Privacy and Trust Issues;

❖ Illiteracy (technological illiteracy especially in rural areas);

❖ Vandalism;

❖ Poor infrastructure, especially in rural areas;

❖ Lack of and or low levels of expertise;

❖ Africa is the largest market for second hand vehicles in the world (Odhiambo, 2021), which do not use IoTs;

❖ Additionally, there is a lack of legislation on importation of cars that support Vehicle-to-Vehicle communication;

❖ Power Supply;

❖ Financial Challenges;

❖ High Poverty Rate;

❖ Weather/ Climatic problem.

RECOMMENDATIONS

❖There is need for adoption of effective alternative sources of power such as Wind and Solar, or the so-called green energy.

❖There is need for African governments to train Engineers and scientists on IoT application in road safety.

❖African countries ought to increase investment in IoT for road safety;

❖There is need for African governments to increasingly engage in Private-Public-Partnerships (PPPs) in speeding up the adoption and implementation of IoT for road safety projects;

❖There is need to build trust in IoT devices for road safety;

❖African governments, should train drivers in IoT and how this can be harnessed to improve road safety and save lives;

❖There is need for reducing poverty across the continent.

THE END

Acknowledgement

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THANK YOU!!!