A PhD Project Proposal Presented by:

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<u>Department / Course of choice</u>: Computer Science (Data Communication and Networks)

(A). <u>TOPIC</u>:

DATA-MINING IN THE **"INTERNET OF EVERYTHING",** USING A SMART-CLASSROOM APARATUS.

(B). <u>BRIEF BACKGROUND OF THE STUDY</u>

In this course, reviews of the following terms will be conducted: connectivity, sensors, actuators, interoperability, RFID, controllers, data analysis, IOT, IOE. The transitioning of the internet from the "Internet of Things (IOT)" to the "Internet of Everything (IOE)" will be studied. This will however be preceded by the earlier phases of the internet. Cisco (2014, pg 1.1.1.2) described four phases of the internet as follows:

Phase 1: Connectivity

The internet started with the connectivity phase in the military, with digitizing access to information through emails, web-browser and search.

Phase 2: Networked Economy

The second phase started in the late 1990s and was the "Networked Economy" phase. This was the birth of e-commerce and digitally connected supply chains. It changed the way we shopped and how companies reached new markets.

Phase 3: Collaborative Experience

The third phase started in the early 2000s and is known as the "Collaborative Experiences" phase. This phase is dominated by widespread use of social media, mobility, video, and Cloud computing. This phase completely transformed the world of work.

Phase 4: Internet of Things -> Internet of Everything (IOT -> IOE)

The current phase is called the "Internet of Everything (IoE)". This phase connects people, processes, data, and things, turning information into actions that create new capabilities, richer experiences, and unprecedented opportunities.

Meanwhile, Edewede et al, (2015) described IOT - Internet of Things as Internet of any physical or logical object. Whereas Cisco (2014, pg 2.1.3.5) described IOT as a way of connecting the unconnected to the internet. It neither involves connecting people nor data, rather connecting '**things alone**' like books, pen, chalk, coffee-maker, jugs, etc. to the internet and allowing them to communicate within one another. In contrast however, Edewede et al described 'IOE'-Internet of Everything as an expansion of the 'IOT'. Cisco however, further expanded IOE as a connection and communication between 'People', 'Data', 'Processes' and 'Things'. An illustration of IOT process will also be discussed as studied, showing communication between a soil moisture sensor and hydraulic actuator. Warnett (2014) described an 'actuator' as a device that produces linear or rotatory motion from a source of power under the action of a source of control, like a sensor. Also according to Wang (2012), 'Sensors' monitors a system or things. Cisco (2014, pg 2.1.3.2) described that sensors helps collect data from non-computers as it helps get them online for 'interoperability' with computers and with other IP-enabled devices. They use Radio Frequency Identification (RFID) to communicate and track what they are embedded into.

They are programmed to take measurements, translate the data into signals and send the data into a main device called 'controllers'. These controllers are responsible for collecting data from sensors through a process, provide an internet connection, may have power to make immediate decisions and may send data to a more powerful computer for 'data analysis' which may be on the same LAN with the computer. Thus, data analysis of **data** collected by **things** undergoing **processes** is conducted by '**people**' after 'Data Mining', thus expanding IOT into IOE.

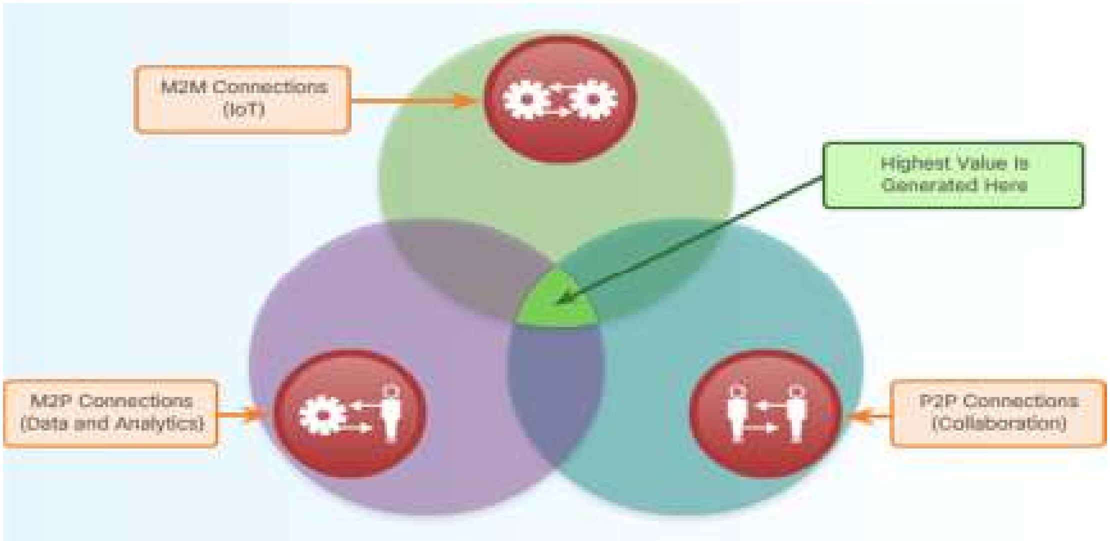

Fig : IOT as just a section of IOE

Source: Cisco (2014)

From the above figure, it is seen that IOT is a connection between 'Things' alone (**M2M** connections), in other words, *'Machine-to-Machine'* connections. Furthermore, **M2P** – *Machine-to-People* connections and **P2P** – *People-to-People* connections will be reviewed, as all combines to form the IOE.

In summary, **IOT** = M2M… whereas, **IOE** = M2M + M2P + P2P

In conclusion, data analytical tools will be reviewed necessary to facilitate feedback loops.

(C). Aims and Objectives/Purpose: The study is aimed towards achieving the following:

- Modelling, prototyping and implementing a smart-classroom
- Analysing data in a real-time smart-classroom
- Using these analysed data in making informed judgements

(D). METHODOLOGY

The proposed methodology will involve a modelled, prototyped and implemented smart-classroom dedicated for ICT trainings. An e-attendance feature supported by a biometric sensor device will send structured data into a database containing students' and instructors' thumb-print to mac-address mappings. The proposed system will run an application that will help tag any student that comes for training after the instructor had come as a late comer and thus will not be allowed to throw questions to the Smart-board during classes. The instructor can as well monitor students' activities from one end. This proposed method will also allow the biometric sensor device to trigger actuators that will wake the smart-classroom thus: automatically turn-on the smart-board, the projectors and the rest of the electrical sockets using Dual Tone Multi-frequency (DTMF), but this will be upon the sensing of the instructor's thumb print on the device, as he enters the class. The reverse (switching-off) will then occur when the instructor electronically signs off after class. Thus the summary of the proposed smart-classroom:

- Electronic attendance solution
- Smart Tutorials
- Late management solution
- Smart-Classroom Power-Up using DTMF

(E). <u>POSSIBLE OUTCOMES</u>

The following outcomes are expected from data analysis:

- Reduction in rate of late-coming of the students to classes
- A better tutorial experience with unexpected and unplanned increase in tutorial hours
- Increased students' participation and throwing of questions

(F). <u>REFERENCES</u>:

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