

# Transforming African Education Systems through the Application of IOT

Nikodemus Angula

*Department of Management, Namibia University of science and technology, Windhoek, Namibia*  
*E-mail: [chcangula@gmail.com](mailto:chcangula@gmail.com); [nangula@nust.na](mailto:nangula@nust.na)*

**Abstract.** The project sought to provide a paradigm for improving African education systems through the use of the Internet of Things (IoT). The created IoT model for Africa will enable African countries, notably Namibia, to exchange educational content and resources with other African countries. The objective behind the IoT paradigm in Africa's education sector is to provide open access to knowledge and information. The study revealed that there are no recognized platforms in African education systems that are utilized by African governments to interact, communicate, and share educational materials directly with African institutions. As a result, the current research developed a model for transforming African education systems using the IoT in the Namibian context, which will serve as a centralized online platform for self-study, new skill acquisition, and self-improvement using materials provided by African institutions of higher learning. Everyone is welcome to use the platform, including students, instructors, and members of the general public.

## INTRODUCTION

Smartness and object interactivity are the two key components of the Internet of Things (IoT) in traditional elearning (Bayani, Leiton). IoT is a word that refers to a large platform that may supply learners and instructors with a range of remote learning devices and objects (Bayani et al., 2018). High interaction between virtual and real things, according to Soava, Sitnikova, and Danculescu (2014), can develop a large number of collaborative settings. Furthermore, according to Economy & Report (2016), IoT approaches envisage a world in which structural problems in a bridge are discovered before it falls. In addition, the IoT enables customized solutions in all industries, both in terms of manufacturing and services. Furthermore, the IoT may empower individuals in ways that would not be feasible otherwise, such as providing freedom for people with impairments and special needs in areas like transportation. Firms and government agencies may use the IoT to achieve their goals in new and inventive ways.

For the purposes of this research, a model for transforming African education systems through the application of the IoT in the Namibian context is developed, which will serve as a centralized online platform for self-study, acquisition of new skills, and self-improvement using materials

provided by African institutions of education and higher learning.

## PROBLEM STATEMENT

In today's world, IoT has played a significant role as a building block of modern society. IoT is challenging in today's operations and implementation since most entities cannot afford to have the capacity and capability of implementing it because of its complex and technical issues (Soava et al., 2014). In developing countries, the IoT remains a concern because most of the remote areas do not have electricity. In developed countries, IoT works perfectly because they have access to electricity every day. Therefore, IoT plays a fundamental role in economic and social development in ways that would have been challenging across the globe (Nilsson, Andersson, Andersson, & Nilsson, n.d.). Moreover, IoT is defined by Nilsson, Andersson, Andersson, & Nilsson (n.d.) as an ecosystem in which applications as services are driven by data collected from devices that sense and interface with the physical world. Much literature indicates that IoT is important in all sectors such as health, education, agriculture, transportation, manufacturing, electric grids, and many more.

## Aim and Objectives

The primary goal of this research was to provide a paradigm for reforming African education systems through the use of the IoT.

## Objectives

- To determine the usage of IoT in the African education systems
- To establish the level of access and usage of IoT in the African education systems
- To identify the challenges facing Africa in accessing and using IoT

## LITERATURE REVIEW

This section discusses the scientific and general overview of the usage of IoT in the African education systems; the level of access and usage of IoT in the African education systems; and the challenges facing Africa in accessing and using IoT.

### The usage of IOT in the African education systems

IoT is a relatively new idea that has the ability to improve learning and teaching (Nesnelern et al., 2019). Although IoT is evolving and becoming more popular in today's educational environments, there is still a need to educate instructors and students about the nature of it and how it may be used for teaching and learning. According to Abdel-Basset et al. (2018), the IoT has the potential to alter education by transforming how schools, colleges, and universities acquire data, interact with users, and automate operations. IoT is described as the networking of physical things through the use of embedded sensors (Brief, n.d.). IoT has played a significant role in connecting and educating students on how information can be sent from one device to another (Abdel-basset et al., 2018). Furthermore, the IoT has a significant impact on schooling.

### The level of access and usage of IOT in the African education systems

In the African setting, IoT is a novel idea that has recently become more accessible to the rest of the globe as a result of the proliferation of mobile devices, entrenched and pervasive connectivity, cloud computing, and data analytics (Abdel-basset et al., 2018). In terms of information technology, IoT is one of the buzzwords. IoT has the power to convert anything in the real world into a sentient object. Furthermore, the IoT gives us control over the items around us while also keeping us informed of their status. IoT creates ideal service systems by combining network, sensor, big data, and artificial intelligence technologies; thus, it is classified as an automation and analytics system.

Furthermore, the IoT improves the cleanliness, performance, and control of any system.

### The challenges facing Africa in accessing and using of IOT

Many African countries continue to face difficulties in implementing IoT as a relatively new concept. These difficulties include compatibility issues with various IoT systems, authentication and identification issues in IoT, integration of IoT points with IoT software, IoT data storage challenges, and connectivity and power management. Difficulties with IoT also include unstructured data processing and inaccurate data collection (Barakabitze et al., 2019).

## METHODOLOGY

This section describes the data collection methods and procedures that will be used in the project, as well as the types of data that will be gathered and how the data will be evaluated. The purpose of the project, which is to build a model for improving African education systems via the application of IoT, affected the selection of approaches and techniques. A simple random selection procedure was applied to pick the 53 African nations. The data collected was primarily secondary data. A quantitative approach using a survey research design was used. For proof of concept, a prototype to enable IoT among institutions was developed in Namibia to enable sharing of resources.

## BUSINESS BENEFITS

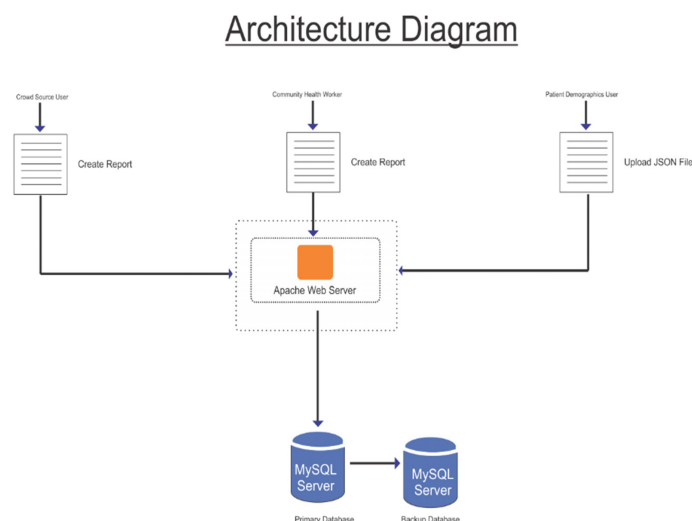
In the context of education, IoT is one of the technologies used to help teachers keep track of their pupils and utilize student performance data to continuously analyze effective teaching and take a more informed instructional approach. Students may utilize IoT to interact with their professors and receive learning instructions and feedback even while they are physically present in the class. For example, a sick student does not have to miss essential courses or acquire assignments from their peers.

## DISCUSSION OF RESULTS

In today's world, IoT is regarded as the key to information access and dissemination as it provides communication and collaboration among physical and virtual objects in various sectors. There are many benefits offered by IoT, such as ease of access to information in real time or in a timely manner, as well as monitoring of data, adapting to new standards, and also automation and control.

## IOT MODEL—A NAMIBIAN CONTEXT

This is a centralized online platform for self-study, new skill development, and self-improvement that uses resources offered by African educational and higher learning institutions. Everyone, including students, instructors, and members of the general public, can use the platform.



**Figure 1.** Prototype African educational content sharing framework.

## CONCLUSIONS

In today's world, IoT plays a significant role in ensuring that it has gadgets that self-report in real-time, enhancing

efficiency and bringing crucial information to the surface faster than a system that relies on human interaction. Furthermore, IoT allows for connectivity amongst smart objects, allowing for conversation at any time, from anywhere, and with anybody.

## REFERENCES

- Abdel-basset, M., Manogaran, G., Mohamed, M., & Rushdy, E. (2018). The decision-making process Internet of things in smart education environment?: Supportive framework in the decision-making process (May). <https://doi.org/10.1002/cpe.4515>.
- Barakabitze, A. A., Lazaro, A. W., Ainea, N., Mkwizu, M. H., Maziku, H., Matofali, A. X., ... Sanga, C. (2019). Transforming African Education Systems in Science, Technology, Engineering, and Mathematics (STEM) Using ICTs?: Challenges and Opportunities, 2019.
- Bayani, M., Leiton, K., Loaiza, M., & Automation, I. L. (2018). Internet of Things (IoT) Advantages on e-Learning in the Smart Original Research Article Internet of Things (IoT) Advantages on e-Learning in (January).
- Brief, S. (n.d.). The Internet of Things in Education Improve learning and teaching experiences by leveraging IoT on a secure foundation IoT fundamentally changes the education equation.
- NesnelerIn, E., Krltlk, I., & Bakış, B. İ. R. (2019). A Critical Overview of Internet of Things in Education (January).
- Nilsson, E., Andersson, D., Andersson, D., & Nilsson, E. (n.d.). Internet of Things A survey about thoughts and knowledge.
- The, M. O. N., Economy, D., & Report, B. (2016). The Internet of Things 2016 Ministerial Meeting on The Digital Economy (252).