John Waithaka

assignment 2 (IoT)

ICT In africa

## 1. CITATION/REFERENCE:

A. Mwangi, E. Ndashimye, B. Karikumutima, and S. K. Ray, ‘An IoT-alert System for Chronic Asthma Patients’, in \*2020 11th IEEE Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON)\*, Nov. 2020, pp. 0012–0019. doi: [10.1109/IEMCON51383.2020.9284816](https://doi.org/10.1109/IEMCON51383.2020.9284816).

## 2. AUTHORS:

The authors of the paper are Agrippina Mwangi, Emmanuel Ndashimye, Bonaventure Karikumutima and Sayan Kumar Ray.

Agrippina Mwangi, at the time of the paper’s publication, was a Master of Science in Electrical and Computer Engineering student at Carnegie Mellon University, majoring in network technologies. She is now a PhD student at Utrecht University, Netherlands in the Energy & Resources Group at Copernicus Institute of Sustainable Development. Her research focuses on IoT, among other things.

Emmanuel Ndashimye is an Assistant Teaching Professor at Carnegie Mellon University - Africa. He has a PhD degree in Computer Science from Auckland University of Technology, New Zealand. He has about 20 publications (according to Google Scholar) and his research interests are in IoT and computer networks.

Bonaventure Karikumutima has a Master of Information Technology from Carnegie Mellon University. He has served for 6 years as Senior IT Security Engineer at the Rwanda Information Society Authority, a public institution under Rwanda’s Ministry of ICT. He has also served as a teaching assistant in the Wireless Systems Lab at Carnegie Mellon University - Africa.

Sayan Kumar Ray is a Professor of Computer Science at Taylor’s University, Malaysia. He has 85 publications (according to Google Scholar) and his research focus is IoT and computer networks.

All the authors have significant experience in IoT and computer networks.

## 3. FUNDING AND CONFLICTS OF INTEREST:

The authors do not report on the research’s funding. Also, no conflict of interest is reported, nor was any identified.

## 4. PUBLISHER:

The publisher of the article is the Institute of Electrical and Electronics Engineers (IEEE), which is a selective publisher. The article is a peer-reviewed conference paper. It was presented at the selective 2020 11th IEEE Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON).

## 5. PURPOSE:

This paper is an original research paper attempting to answer the question, ”How effective is a home-based manually triggered IoT-based alerting system at enabling rapid response to sudden asthma attacks in Rwanda?”

## 6. RESEARCH METHODS:

The research methodology in the article involved deploying a prototype IoT alert system in a university hostel. This system included a wall-mounted manually triggered alert device, designed to send alerts to five registered emergency contacts. These contacts included immediate neighbours and medical personnel. The alerts were sent via SMS. The system was also designed to emit a loud alarm to alert nearby individuals.

The university hostel environment was selected to simulate the 'Umudugudu' social setup in Rwanda, which is the system’s intended deployment environment. Data collection occurred over 10 weeks and involved 15 university student participants selected through convenience sampling. The participants were asked to trigger alerts at random times and the university medical team was asked to react to the alerts. Feedback was collected from these volunteers after they received help.

A key assumption made is that the experiment setup sufficiently represented the real-world environment the proposed system was meant for. For example, it assumes the university setting, where the system was deployed, accurately represents the real-world Umudugudu social setting for which it was designed. Also, it assumes the student volunteers used the system as a person experiencing a severe asthma attack would.

## 7. MOST IMPORTANT FINDINGS:

The research paper presented three significant findings. Firstly, the proposed IoT alert system, according to the researchers’ analysis, produced a substantial reduction in emergency response times. Compared to the traditional health emergency and ambulance services in Rwanda, which the paper claims take about 25 minutes to respond, the proposed system had response times ranging from 1 to 6 minutes.

Secondly, among the alert mechanisms utilized in the system, the sound buzzer was the most efficient. It had an average response time of about 2.7 minutes. In contrast, response times for SMS alerts and alerts to neighbour units had response times averaging at 6.4 minutes and 4.5 minutes respectively.

Lastly, the research found that the system had a very low rate of false alarms. In a total of 150 tests conducted, only 2.5% were false alarms.

## 8. WEAKNESSES:

The solution presented in the paper has significant design problems that make it almost impossible to use in its intended context. The most glaring design flaw of the system is that the alert trigger is wall-mounted and therefore, not portable. Since asthma attacks are sudden, the wall-mounted trigger requires the asthma patient to never move too far from it for it to be useful. This is likely impractical in most cases.

Another limitation of the research is that, in my opinion, the experiment setup used in the analysis of the system does not sufficiently represent the system’s intended context. I feel that had the researchers simulated how a user under a severe asthma attack would use the system, they would have obtained significantly different but more correct findings.

## 9. BROADER IMPLICATIONS:

This paper highlights the need for ICT solutions to be not only functionally effective but also user-friendly and contextually appropriate. The specific needs, environment, and constraints of the intended users should be considered to ensure that solutions are practical and useable in their intended contexts.

Furthermore, this paper shows us that research that propose technological solutions (similar to the one presented in this paper) would contribute better insight and more accurate findings if, in addition to analysing functional performance, they also assessed usability and contextual fit.