

# **Thesis Portfolio**

## **Sociotechnical Philosophies in ICT Policy in Rwanda**

(STS Research Paper)

## **Digitization of Perioperative Surgical Flowsheets**

(Technical Report)

An Undergraduate Thesis Portfolio

Presented to the Faculty of the School of Engineering and Applied Sciences

University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Science in Systems Engineering

By

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2019-2020

On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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## **Sociotechnical Synthesis**

The proliferation of technology in developing countries is an interesting phenomenon. Many nations that have been literally in the dark for the past century have the opportunity now to develop because of foreign technology entering their country. Rwanda began the 21<sup>st</sup> century as one of these countries in the dark. The nation was recovering from a genocide that led to as many as 1 million deaths. However, it has recognized the potential of this technology and wholeheartedly embraced it. The nation has spent the last 20 years trying to transform from a small, landlocked country with sparse resources into a knowledge-based economy. It has developed into one of the most advanced economies in Africa.

My STS paper focuses on Rwanda's development of information and communications technology (ICT). I analyze decisions the government has with two STS theories: Technological Determinism and the Social Construction of Technology (SCOT). I discuss the benefits and drawbacks of both philosophies. I note that Rwanda was able to make world history and introduce many innovative foreign technologies to the country from a technologically deterministic lens, but simply introducing the technology is not enough to transform a society. I presented evidence that the implementation of the technology did not lead to structural change. Moreover, I determined that the best approach for the nation to experience profound development is to adopt SCOT. The main point of my paper was that it is incumbent upon the government and the policies it implements to ensure that the technology introduced to Rwandans is appropriate for the technological literacy and social circumstances of its users.

One important application of ICT technology is in surgery. In Low- and middle-income countries like Rwanda, surgical data is manually recorded on paper flowsheets. Data regarding events that occur during surgery is called perioperative data. Perioperative mortality rate

(POMR) is a widely used measure of quality of surgery. Hospitals are constantly striving to minimize the number of patients that die during surgery. Perioperative data is useful for analyzing trends and improving medical treatment, but when manually recorded, analysis is exceedingly difficult to perform. This difficulty leads to inaccuracies in POMR calculations and incorrect conclusions on how to improve. Doctors must spend hours looking through stacks of paper with scribbled handwriting to gain any insight on surgical trends. However, if digitized, this data can be aggregated into spreadsheets and databases that can be analyzed simply with programs like Microsoft Excel. My technical project was to create a method to digitize surgical data with a team of other undergraduate students. This method would scan the flowsheets using a simple phone camera and translate the information using backend software. We designed a wooden apparatus to standardize the placement of the flowsheets. Then, we used machine learning algorithms and image processing techniques to interpret the flowsheets without involvement from the Rwandans who would take the pictures. Finally, we created a database to store all the information so that it could be used to improve surgical practices in the future.

A critical tenet that we followed throughout the design was creating an intuitive user experience. Although the software that we developed was very complicated, we had to make operation simple for the user. Considering the typical digital literacy of Rwandans and the technology available there was integral to our project. All the user had to do was place the flowsheet on the platform inside the wooden apparatus and place their phone camera in position to take the photo, and later upload the photo to the database to be processed. Our emphasis on ease of use echoes SCOT principles. We designed the system with our users in mind instead of expecting the technology to improve the users' lives on its own. My thesis and technical project

are related because they are about ICT in Rwanda, but further, they are related because they both stress the importance of SCOT.