

**Data Pipeline for Digitizing Perioperative Flowsheets for Low-Middle Income Countries**  
(Technical Paper)

**The Sociotechnical Effects of Social Media, Telecommunication Technology, and the  
Egyptian Revolution**  
(STS Paper)

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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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## Prospectus

### Introduction

With over 49% of deaths occurring in the postoperative recovery room in Rwanda, most of which are from operations deemed as low risk such as C-sections, the need exists for better management of patients post operation (Kim et al., 2016). After observations of the Rwandan health system by previous researchers, it was determined that the root cause of the high post-operative mortality rate is a shortage of nurses (Durieux, 2021). Nurses are provided with many patients to care for resulting in reduced attention time for each individual patient (KM, 2016). Seeing the importance of reducing the post-operative mortality and complication rate, the University of Virginia partnered with the University Teaching Hospital in Kigali to develop a system that uses peri-operative flowsheets to predict the post-operative complication risk. Peri-operative flowsheets are flowsheets containing the data collected during the surgery and is usually hand-written. Hence, the flowsheets must be digitized and then analyzed to determine the post-operative risk of the patient. The final technical deliverable of the capstone will be a mobile application that digitizes the flowsheets and sends reminders to nurses to check on the patients deemed as high risk.

Digitization and mobile devices not only have the power to save lives, but also to topple governments. In 2011, the Arab Spring was born through the trends produced by a man setting himself on fire in Tunisia to advocate against governmental injustice. From Tunisia, the protests then spread to Libya, Egypt, Yemen, Syria, and Bahrain where either the ruler was deposed or major uprisings and social violence occurred. Without the existence of social media to help organize events, broadcast the events, and globalize them, the Arab Spring, but more specifically the Egyptian revolution, would not have been as successful as it was (Mesawa, 2016). The effects of social media, telecommunication technology, and the Egyptian revolution on each

other will be further explored throughout the paper and related to the STS theory of technological momentum. The research will shed insights on the way social media and telecommunication technology has been shaped and will also shed insights on how to effectively use technology to further just causes and improve the quality of life around the world. The final STS deliverable will be a paper analyzing the effect of social media and telecommunication companies on the society, specifically the Middle East, and the Middle East's effect on technology using the STS theory of technological momentum as a tool for analysis.

### **Digitization of Surgical Flowsheets for Rwanda**

Although a large scale of improvement has been observed, healthcare in Rwanda is still considered poorer quality in comparison to the healthcare of the United States (Evans, 2014). Through the recent improvements and aid from governments like the United States, Rwanda currently operates a universal healthcare system and are now considered to have one of the higher quality health systems in Africa. Hence, hospitals are growing and being built at a rapid rate which often results in understaffed nurses and doctors (Durieux, 2021). In addition, the current Rwandan healthcare system still uses handwritten sheets to record medical records rather than migrating to a digital system (Durieux, 2021). Since the medical professionals in the Rwandan hospital network have more patients than they can reasonably handle, 5-10 million patients die every year because of post-procedure complications, specifically procedures that are usually deemed low-risk (KM, 2016). The most common example of a low-risk procedure that has a high post-operative mortality rate is Cesarean sections. After analysis and observation of the Rwandan healthcare system by researchers, the high post-operative mortality rate was attributed to a shortage of nurses which results in reduced attention and care to patients (Durieux,

2021). The goal of the capstone project is to create a solution to reduce the post-operative mortality rate without increasing human resources.

Without changing hospital policies and procedures, the most effective solution to reducing the post-operative mortality rate is to identify patients with high risk of post-operative mortality and reminding the nurses to care and visit those patients. Identifying high risk patients can be determined through the information provided in the peri-operative flowsheets (the flowsheets used to record the data during the surgery) (Durieux, 2021). Hence, the goal of the project and the capstone team is to provide a system where doctors and nurses can upload their surgical sheets and almost instantaneously receive feedback about the patient's risk for post-operative medical issues. The feedback will then be used to prioritize the order of patients the nurses visit which should reduce the post-operative mortality rate.

The capstone project was initiated two years ago as a collaboration between doctors in Rwanda and the University of Virginia Anesthesiology department. The team, consisting of three members, will use the existing documentation provided from previous years to further improve the mobile application for scanning the peri-operative flowsheets and digitizing them. In the previous years, the capstone groups have developed a physical system to aid the Rwandan doctors and nurses to scan the flowsheets in a consistent manner. In addition, the previous capstone group has started the development of a mobile application that will scan the flowsheets and return some analytics. The team this year will establish the pipeline for the digitization of the peri-operative flowsheets. The task will be approached through four steps. The first step is software testing of the current mobile application and web application. The second step is integration between the mobile application and the analytics system that will digitize the peri-operative flowsheets. The third step is user testing. The team will meet with doctors and nurses

in Rwanda to receive valuable feedback on the practicality, effectiveness, and ease-of-use of the mobile application. The fourth and final step is adding a risk-based notification functionality. The notification functionality will provide the reminder notification to nurses and doctors to check on various patients deemed high-risk. The final deliverable will be a fully functioning mobile application that allows the user to take a picture of the peri-operative flowsheet and receive a notification regarding the post-operative risk of the patient. The goal of the mobile application is to reduce the post-operative mortality rate in Rwanda.

### **The Effect of Social Media, Telecommunication Technology, and the Egyptian Revolution on Each Other**

The phrase that was abuzz on social media in the Middle East, specifically in Egypt, in January 2011 was the tweet “The answer is Tunisia.” The tweet referenced the protests and change in regime occurring in Tunisia in 2011. Tunisia and Egypt were two of the most prominent countries participating in the Arab Spring (a series of anti-government protests, uprisings, and armed rebellions that spread across much of the Arab world in the early 2010s). Political unrest was present for many years in the Middle East, yet no official protests were successfully planned in Egypt until January 25, 2011 (Hussein, 2021). Through the use of social media in Egypt, which is the subject of analysis in the STS research paper, Egypt was able to overthrow the 29-year regime of Hosni Mubarak (Howard et al., 2015). On National Police Day (January 25, 2011), there were rare calls on Facebook for protests against police brutality and poor living standards in Egypt (Rosen, 2011; Todras-Whitehill, 2020). The authorities did not expect much of a response because of the strict emergency laws prohibiting most mass gatherings. To their surprise, thousands of demonstrators demanding political and economic reforms poured into the streets of Cairo. Young men and women from all walks of life crowded the heart of the capital chanting the same thing: “The people want the fall of the regime.” To

many Egyptians, the shouts and protests for democracy and freedom seemed like an unachievable dream, yet regardless of religion, age, gender, or social status, the Egyptian people united and marched the streets of Cairo demanding change (Todras-Whitehill,2020). Finally on February 11, 2011, Hosni Mubarak, the Egyptian president of almost 30 years, stepped down and the citizens rejoiced (Gire, 2014).

Without the use of social media to spread the news regarding historical events and upcoming protests, the Arab Spring would not have had the success it did (Brown et al., 2019; O'Donnell, 2011). Scholar's analysis of the usage of social media and telecommunication companies, interviews conducted during and after the Arab Spring, and the STS framework of technological momentum will be used to provide the proof and reasoning as to why and how social media and technology both impacted and was impacted by the Arab Spring, specifically in Egypt. Technological momentum is defined as the STS theory in which society simultaneously shapes and is shaped by technology. In other words, technological momentum is time dependent (Hughes, 1994). The Arab Spring proves that social media and telecommunication technology change over time depending on the circumstances of the society, making them a time dependent technology. Technological momentum is present and is adequately displayed when analyzing the Arab Spring as social media and telecommunication technologies both affected and were affected by the Arab Spring. A deep analysis regarding the effect of social media on politics and the effect of politics on social media and telecommunication technology, using technological momentum as the STS framework, will lead to new insights regarding the role of social media and technology in politics/the government (Sharaf, 2021). Understanding the Arab Spring with the perspective of technological momentum will aid in the fight for equality and justice as it will explain the relationship between technology and society with regards to politics.

## Methodologies

Research Question: To what extent did current technologies, such as Facebook, Twitter, and cell phones, aid Egypt along with the rest of the Middle East (which are known to be less developed countries), unite to organize multiple protests that resulted in the overthrow of several regimes, including Mubarak's regime of almost 30 years? And how did the usage of technology for the Arab Spring change the technological companies/industry?

To answer the question, technological momentum will be used to understand how social media and telecommunication technology was impacted and shaped by the Arab Spring, more specifically the Egyptian revolution. Technological momentum is a response to two different theories: technological determinism and social determinism. Technological determinism states that society itself is modified by the introduction of a new technology in an irreversible and irreparable way (Smith, 1994). Social determinism states that society itself controls how a technology is used and developed. Technological momentum merged the two theories by stating that society simultaneously shapes and is shaped by technology. Using the framework of technological momentum, the research paper will evaluate how social media, the technology, changed the society in Egypt, the United States, and the rest of the world. The usage of social media before 2011, specifically in Egypt, along with the concept of trends and retrieving news through social media will be explored to understand how social media shaped the society. Then, various ways in which the Arab Spring, in other words the society, changed social media and telecommunication companies will be observed. Facebook, Twitter, and other platforms were used to share live updates regarding the protests and were the main platform for communicating with the rest of the world the circumstances of the Middle East (Olukotun, 2016). Society added a new purpose, which is news reporting, to social media. In addition, the Arab Spring forced

many large companies and organizations, like Twitter, Facebook, and the United Nations, to take a stance on the suppressive governments, using the Middle East as an example. Through looking at examples similar to the aforementioned examples, the ways in which the Arab Spring shaped social media and telecommunication companies will be explored and further analyzed. The ways in which social media and telecommunication companies changed society during and after the Arab Spring will also be further analyzed. Key words and phrases such as “Facebook private groups”, “technological suppression”, “response”, and “phone usage” will be used to explore sources for the research paper. Hence, through using the STS framework of technological momentum, researching statistics, reading various articles including interviews conducted during and after the Egyptian revolution, the connection between social media, telecommunication companies, and political change will be demonstrated proving that these technologies had a major impact on the success of the Egyptian revolution and were also impacted by the actions of the Egyptians (Clarke & Koçak, 2019).

## **Conclusion**

The first part of the paper covers the process in which a mobile application will help improve the Rwandan healthcare system to reduce the post-operative mortality rate while the second part of the paper examines the impact of social media, telecommunication technology, and the Arab Spring, more specifically the Egyptian revolution, on each other. To aid in the improvement of the Rwandan healthcare system, the capstone team will create a mobile application that digitizes the peri-operative flowsheets, analyzes the digitized sheets, and returns a risk score indicating the likelihood of post-operative mortality or complications. Based on the risk scores, the mobile application will provide nurses with reminders to check on patients



who are deemed high risk. From the implementation of the mobile application, we expect to see a decrease in the post-operative mortality and complications rate.

Just as the Rwandan health care system will be advanced through the mobile applications, the STS portion of this paper explores the impact of social media mobile applications and telecommunication technology on the Egyptian revolution and the impact the Arab Spring had on social media and telecommunication technology. Having a troublesome relationship with the Egyptian government, the Egyptian people used social media as a way for their voices to be heard. Hence, the revolution was born in 2011. The research will focus on Facebook, Twitter, and telecommunication companies like Vodafone to determine how they played a crucial role in the Egyptian revolution and how the Arab Spring further shaped those companies. In addition, the paper will explore how the society in Egypt has drastically evolved as a result of the revolution and the presence of social media and is now better equipped to fight against injustice. Looking at Egypt and the Middle East as an example, the conclusions drawn from the research regarding social media's effect on politics and politics effect on social media can be applied to many other countries, especially oppressive countries, to aid in the fight against injustice.

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