

Web application for field accident reporting: A case study of Land Surveyors in Ghana

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SUMMARY

There are a lot of accident reporting software and applications mostly focusing on the Mining, Construction, Processing Companies and the Oil and Gas Industry. These Institutions regard Health and Safety (HSE) as a core value in their businesses operations and as such have mostly HSE officers seeing to that [3]. Their mode of accident reporting usually focuses on their working environment alone. This study seeks to design a web application for Field Accident Reporting for Staff of the Lands Commission using Geospatial Technology. Firstly, this study talks about the works of Lands Surveyors and their important role in the socio-economic development of the country. For developmental projects, Land Surveyors are first to visit project site and last to leave the suite. Most of the works are carried out on the filed. secondly, there has been several cases of unidentified person or groups attacking Land Surveyors whenever they go to the field to work. These persons drive land owners away from their lands, destroyed buildings, beat and kill people in their bid to secure the supposed properties of their pay masters. The activities of above named persons render so many people homeless and drive away potential investors.

The problems Land Surveyors face on the field of work are discussed and most safety guidelines on the field is given. Subsequently the importance of accident reporting on real time basis is also discussed briefly and Geospatial Technology tool that has been used to design the application for field accident

reporting.

This web application has been designed in an easy and user friendly way which will give the user some convenience and control over the application. Real-Time reporting answers the following questions: What is trending on site, why and how? It allows appropriate authorities to quickly respond to and actively manage disorganized and dangerous situations on a minute-by-minute basis

Keywords: Accident reporting, Land Surveyors, Safety

1. INTRODUCTION

There are a lot of accident reporting software and applications mostly focusing on the Mining, Construction, Processing Companies and the Oil and Gas Industry. These Institutions regard Health and Safety (HSE) as a core value in their businesses operations and as such have mostly HSE officers seeing to that [6]. Their mode of accident reporting usually focuses on their working environment alone. This study seeks to design a web application for Field Accident Reporting for Staff of the Lands Commission using Geospatial Technology. The surveyor is a practical pragmatic professional person who is skilled in spatial measurement, able to represent, interpret and analyse spatial information, highly knowledgeable in the administration and governance of rights to the land and sea, and capable of planning for the development and use of land resources [2].

1.1 Problem Statement

Accidents do happen in us day in and day out and many of these accidents go unreported due to certain factors such as, lack of reporting procedures, no knowledge on how to report these accidents and no further actions when accidents are reported. Although in certain industries accidents are reported and details of these accidents are available, there is no system to analyze these in a systematic manner. As a result, effective measures to prevent further accidents are not laid down and sensitive or hot spot zones for the various accidents happening cannot be determined easily

1.2 Main Objectives

The main objective of this paper is to develop a web app showing the types of accidents that happen during field survey works

1.3 Specific objectives

The objective is to Develop Web Application in order to;

- (1) . To know the exact locations of these accidents and to get response/help on time.
- (2) To help all Land Surveyors to report all accidents that happen to them on a common platform so as to take better decisions before and during work

1.4 Significance of the study

This study will go a long way to help the Land Surveyors to manage field accidents effectively and safely. It will also help create an awareness of the various accidents and give warning to the Land Surveyors going to work in a particular area thereby knowing the risk involved in working at that area and their risk level. This will reduce the time and effort for locating various accident areas during field survey works and to how to tackle the accidents at a particular time.

2. HISTORY OF LAND SURVEYING

Land surveying is a lucrative occupation and rewarding for those who can handle these and other issues. Anyone entering the profession or wishing to advance their career should understand the problems modern land surveyors face as well as solutions available to avoid or mitigate them[7].

Surveying had its origins from ancient Egypt. The Great Pyramid of Khufu at Giza was built c. 2700 BC, 755 feet long and 480 feet high. Its nearly perfect squareness and north-south orientation affirm the ancient Egyptians' command of surveying. Evidence of some form of boundary surveying as early as 1400 BC has been found in the fertile valleys and plains of the Tigris, Euphrates, and Nile rivers.

Clay tablets of the Sumerians show records of land measurement and plans of cities and nearby agricultural areas. Boundary stones marking land plots have been preserved. There is a representation of land measurement on the wall of a tomb at Thebes in Egypt (1400 BC) showing head and rear chain-men measuring a grain field with what appears to be a rope with knots or marks at uniform intervals [11].

3. EARLY ACCIDENT REPORTING

Every year people are killed or injured either at workplace (office) or on the field. Over 40 million working days are lost annually through work-related accidents and illnesses. Recent figures show that an average of 250 employees and self-employed people are killed each year as a result of accidents in the workplace. A further 150 000 sustain major injuries or injuries that mean they are absent from work for more than three days. Over 2.3 million cases of ill health are caused or made worse by work. The same accidents happen again and again, causing suffering and distress to an ever-widening circle of workers and their families when these accidents are not reported and either controlled or eliminated [10].

Reporting certain incidents is a legal requirement that informs the enforcing authorities (HSE, local authorities about deaths, injuries, occupational diseases and dangerous occurrences, so they can identify where and how risks arise, and whether they need to be investigated. This Health and Safety Executive Reporting accidents and incidents at work allows the enforcing authorities to target their work and provide advice about how to avoid work-related deaths, injuries, ill health and accidental loss [3].

4. CHALLENGES LAND SURVEYORS FACE ON THE FIELD

Surveying is not a hazardous occupation, but care should be taken in order to avoid some predictable

pitfalls. Accidents occur even to careful people. For those who are not careful, not prepared or not educated to the risks, accidents occur more often, and can be extremely dangerous or fatal [4]. Surveyors face a lot of challenges during field work, some resulting in various degrees of accidents and injuries.

Every job has its challenges; land surveying is no different. Every day brings different issues to resolve that don't always respond to quick fixes. However, there are a few challenges that are quite common to the profession, and here are an overview for special consideration [12];

4.1 Seizure of survey instrument

There have been many occasions whereby many surveyors have gone to the field to work and all their instruments have been seized. Sometimes they asked to come to the palace to explain what the nature of work they were doing on site [5].

4.2 Stoppage of work by litigants

[9] Land litigation cases in Ghana are alarming. Research conducted at the High Court Registry in Accra showed that there were 60,000 land cases in the superior courts alone and as for the lower courts, they were so overwhelmed with cases that the courts were unable to give the statistical data pertaining to the land matters pending before them.

The main causes of land litigation in Ghana are:

1. Buying land from unauthorized persons;
2. Failing to comply with rules on land sale;
3. Failing to do a thorough due diligence on land and land documents;
4. Failing to register one's interest in land.

4.3 Assault by unidentified persons and squatters

Where property rights are unclear and people have left their land for a long time, land grabbing and abusive building practices can happen where there are not suitable norms to avoid it. All these effects can severely impact peoples' livelihoods if the security of the use and property of the land is affected [10]. One person was shot dead during a shootout involving land surveyors and some unidentified persons in Dodowa, according to report. The clashes erupted as a result of a land dispute. There were four surveyors working on the land when they got attacked by unidentified men. According to them, after surveying the land, they went ahead to set their tripod "when all of a sudden they heard a shot and then they all scattered. "Three persons were seriously injured in the attack [2]

4.4 Attack by wild animals

Wildlife species can create problems. Some species trigger problems for human activities, but many others need humans to save them and to continue to exist [1]. Surveyors are often attacked on the field of work by various kinds of animals. Bears have been said to attack some surveyors during field work in the United States of America.(Larry Mueller, n.d.). Workers who don't have the prescribed personal Protective Equipment are at higher risk of having snake bites. In other for Land Surveyors to be safe, all animals are potentially assumed to be dangerous [11].

4.5 Motor accident

Most Surveyors are at a high risk when working around highways and busy roads. There have been instances whereby some have had near misses and others too couldn't survive the accident. A 47-year-old land surveyor died after being struck by a passenger vehicle as he walked along the road. The victim was walking back to the company truck after having completed surveying tasks for the day. They were

approaching a blind hill with no emergency lanes. A young driver crested the hill in a passenger car, saw the pedestrians and quickly applied the brake, losing control of the vehicle. The victim ran down an embankment in an effort to escape the oncoming vehicle but couldn't make it [11].

Major Surveyors are falling victim to equipment theft more than ever before. The criminal world is taking a serious interest in what they do and the equipment they use; it's expensive kit. Multiple thefts are happening every month in the UK. You see a new one reported every few days, and they're just the ones being posted on social media. Total Station is the most appealing item of all to steal because of its high value but also many engineers and surveyors will use it robotically, meaning they could be stand away from the instrument itself. This increases the risk of the instrument to be stolen.

5. GIS FOR ACCIDENT REPORTING

There are multiple location-based services (LBSs) and mobile GIS available for a wide range of applications. Usually such applications are developed to solve a restricted task within a restricted environment. The focus on a particular task is strong, and therefore, such applications can usually not be used in multiple environments [8].

In recent years an extended form of GIS has emerged, mobile GIS, with which users can access the spatial, attribute and temporal data without any location limitation. Spatial analysis is no longer limited to a fixed environment, and it can be carried out at any place in any time. Representation of real world in GIS has already increased from two- to three- and four-dimension. In the same time, size of the geo-database in GIS has been increased drastically. For all mobile GIS applications or services, providing fast response and accurate information are two of the main goals. As a mobile client, he/she wants to get the corrected result by using the least time. However, the huge-sized database and the limited bandwidth in wireless communication have the negative effect to achieve the goal. This relates to the issue of response time. There has been a lot of research on the handling of the spatial-temporal data model, efficiency of data

storage and data access and data query [12].

5.1 Software and tools used for the study

The GeoForm was designed and published on the ArcGIS Online platform where the source codes were downloaded. The source codes were edited and integrated into the web application that was created. The Web Application was published to the web server and selected users were allowed to go to the field to collect a few hazard data to test the application and give a feedback on the application.

ArcGIS Survey123 is a complete, form-centric solution for creating, sharing, and analyzing surveys. Use it to create forms with skip logic, defaults, and support for multiple languages. Collect data using web or mobile devices, even when disconnected from the internet

5.2 Production of Web Maps and Apps.

The figure below is the Field Accident Reporter application. The user is allowed to select from a drop down menu, a particular type of accident that has happened and give a brief description of the accident. The application has the tendency to be used everywhere in the world by all Surveyors and other users. Users will be able to select the type of harm caused by the accident. The reporter is expected to input the name and Department and attach a picture of the accident being reported, so as to help the authorities assess the accident and have a fair idea about the decisions to make

5.3 GeoForm design and Publishing

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5.4 The Field accident reporter

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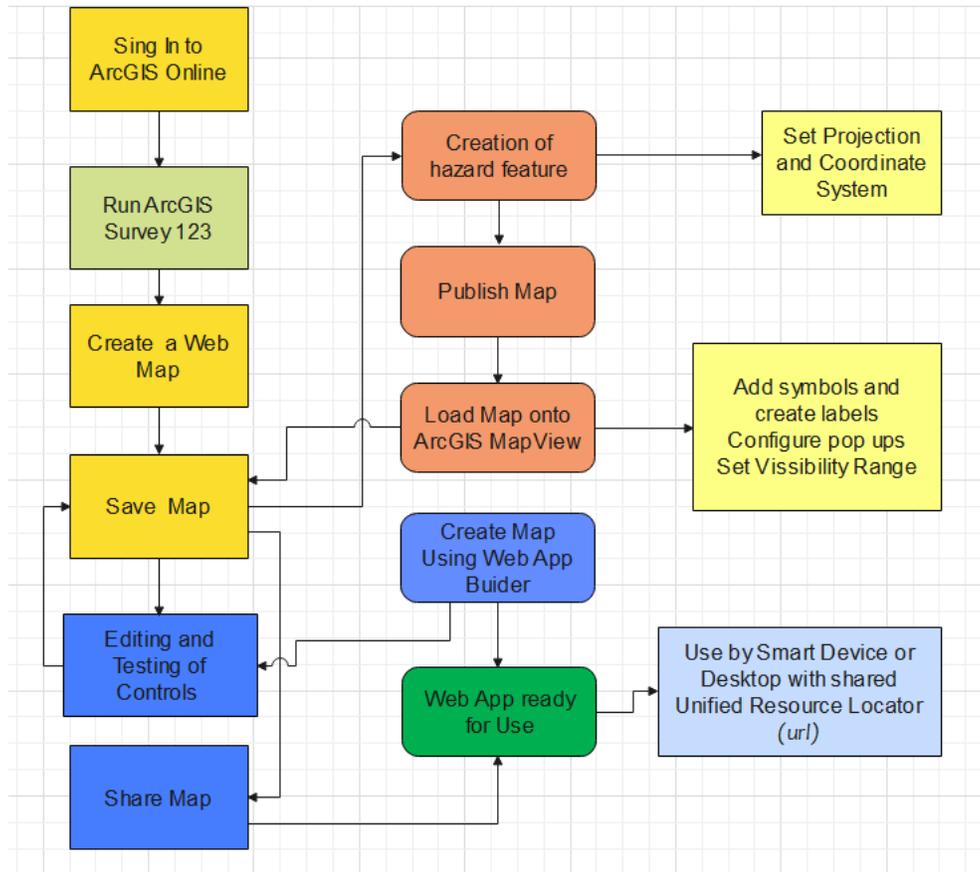


Figure 1:Flow chart of the production of the Web Application

5.4.1 Location of accident

The location of the various accidents will appear on this particular map interface below. The Application will automatically point your location when you have an internet connection and your GPS is on for those who will view the application on a smart phone. If your location is not accurately known, be sure to get a clear view of the sky and hit the “locate me” button to view your present location. That is the exact position the accident with details be collected this is described in figure 3 and final incident locations can be seen on a national map as shown in figure 4.

5.4.2 The directional widgets

Finding your location on the map has been made so easy using the directional widget. This widget gives you directions to a particular location on the map. It can also be used when you want a direction to a particular accident scene. This is one of the objectives of the study.

5.4.3 The field accident reporter manager

After the creation of the application and the series of analyses done the objective of this Study was achieved. The application was designed to report all accidents that happen to staff of Land Commission and give warnings to people close to such accident zones. The application has a user friendly interface for easy interactivity which will direct authorities to the various locations of accident scenes to help and save victims on time to create a safer working environment. The application will furthermore be the tool for reporting all accidents in the various industries. This application was created using ArcGIS online, GeoForm Builder (Survey 123) and the Web App builder as shown in figure 2. All these tools or software's that have a user friendly interface for easy interactivity for the user. The Web App has been configured with different types of widget which can be used by anyone who has no knowledge in coding. The zoom in and zoom out button on the map has the ability to provide the user with map details relating to routing. The legend buttons show the various items on the application with their respective symbology.

Realtime Field Incident/Accident Report Form

This App is for Land Surveyors to report incidents/accidents while on the field.

Name of Land Surveyor*
Please provide your full name

Surveyor*

-Please select-

Identifier*
Provide the Number or ID that is applicable

Phone Number

Locality*

Region*

-Please select-

Incident Type*

-Please select-

Harm/Potential*

-Please select-

Brief Description
Optional

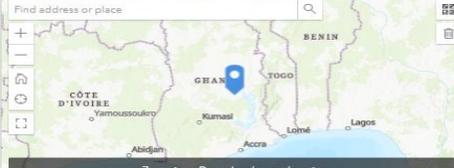
1000

Upload Fotos Here
Optional

Drop image here or select image

My Location*
Press the map and press the "Find My Location" Icon on the map to zoom into your exact location.

Find address or place



Zoom in to Room level to set location

Exit: USGS | Spatial Solutions & Services, Esri, HERE, Garmin, FAO, NOAA, USGS | Powered by E

Lat: 7.737966 Lon: -0.429184

Date and Time of Reporting

2/5/2023

12:37 PM

Submit Entry

Figure 2: Form for Field Accident Reporting

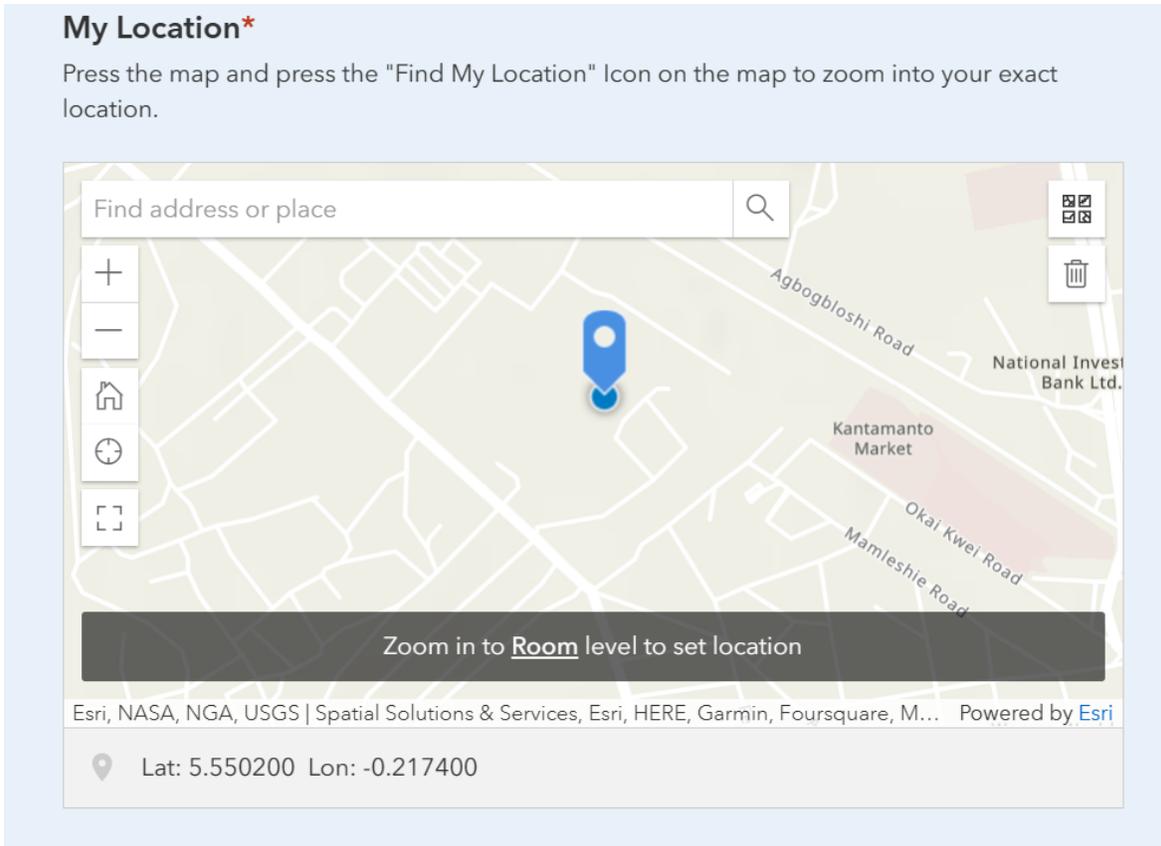


Figure 3: Location Section of the Application



Figure 4: Reported incidents location as shown on Ghana Map

6. CONCLUSION

The study shows the application of using Web GIS specifically ArcGIS Online platform for field accident reporting and warning. This application was created to satisfy the objectives of the study with various functional tools or widgets configured. This application will assist in locating, reporting accidents on the field and give warnings to the surveying fraternity to be safe to avoid any accidents which might occur at these locations.

This application will bring a relief to the Land Surveying fraternity who will want to know each other's welfare on the field. It will also pre-inform ~~land surveyors~~ *land surveyors* about the particular area they are going to work which will aid them to be very cautious and sensitive to the environment should anything happen to them.

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