

UNIVERSITY OF DAR ES SALAAM



COLLEGE OF INFORMATION AND COMMUNICATION TECHNOLOGIES (CoICT)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING PRACTICAL TRAINING REPORT

**REPORT TITLE: THE EVOLUTION OF TECHNOLOGY IN
AGRICULTURE**

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DECLARATION

I declare that this report has been prepared by me, to fulfill the circular requirement for Bachelor of Computer Engineering and Information Technology offered by the College of Information and Communication Technology(CoiCT) at the University of Dar es Salaam.

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Industrial supervisor

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ABSTRACT

It is a field in which students are required to implement practically the theories they have assimilated in the classes. At the end of the practical training session, every student is supposed to fill up a practical training logbook as well as to write a report of the training he/she has done. The report incorporates tasks and duties performed at the Sokoine University of Agriculture IT department.

The Sokoine University of Agriculture is a university located in Morogoro, Tanzania. It provides different courses including Agricultural courses, IT courses and the like and it has been performing amongst the in ensuring that the educational services are been provided at maximum potency and effectiveness.

A report consists of three different chapters which are chapter one for Introduction, chapter two for work done and lessons learned, and chapter three for making conclusions and recommendations of practical training. The weekly report gives a brief explanation of the different skills that I have acquired within the field period.

Department of information and communication technology dealing with all computer and office machines such as repairing, troubleshooting, network system, software installation, computer maintenance, and computer services and explanation of how a computer communicates and its maintenance, management of Local network to the computer, installation of Microsoft software, installation of drivers, upgrading of all windows, hardware installation and updating and installation of Microsoft antiviruses.

Therefore, it is very valid that practical training is the best way of ensuring that a student or an individual gets to attain the skills in the field of specialization.

ACKNOWLEDGEMENT

Firstly, I would like to give my special thanks to the Almighty God for unconditional love, strength, and ability all the days I have been preparing this Practical Training work report.

Secondly, I would like to pass my thanks to my family and colleagues for their great support and heroism during the time I needed their help

Thirdly, I thank the practical training supervisor and members of the Center of Information and Communication Technology (CICT) at Sokoine University of Agriculture (SUA) for their guidelines during practical training and in writing practical training work reports especially Sir Masimba, Prof. Joel Mtebe.

Lastly, much thanks to the management of the Center of Information and Communication Technology for their great support in providing me with the knowledge and understanding of the field I am pursuing. It is such a great honor to have you all as my coaches.

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LIST OF ABBREVIATION

SUA	SOKOINE UNIVERSITY OF AGRICULTURE
CICT	CENTRE FOR INFORMATION AND COMMUNICATION TECHNOLOGY
PT	PRACTICAL TRAINING
IC	INTEGRATED CIRCUIT
PC	PERSONAL COMPUTER
IT	INFORMATION AND TECHNOLOGY
AI	ARTIFICIAL INTELLIGENCE
ML	MACHINE LANGUAGE
MV	MACHINE VISIONING

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1. ORGANIZATION PROFILE

1.0 INTRODUCTION AND ORGANIZATION CHART

Within this academic year, I have done my field Practical Training (PT) at an organization called SUA-CICT (Sokoine University of Agriculture-Centre of Information and Communication Technology). The PT went very well and successfully.

Within this organization (SUA), there are different departments (including CICT) having different organization charts. This is very important because it plays a vital role in ensuring the allocation of different activities for more effective and efficient working conditions within an organization. Below is an organizational chart of CICT.

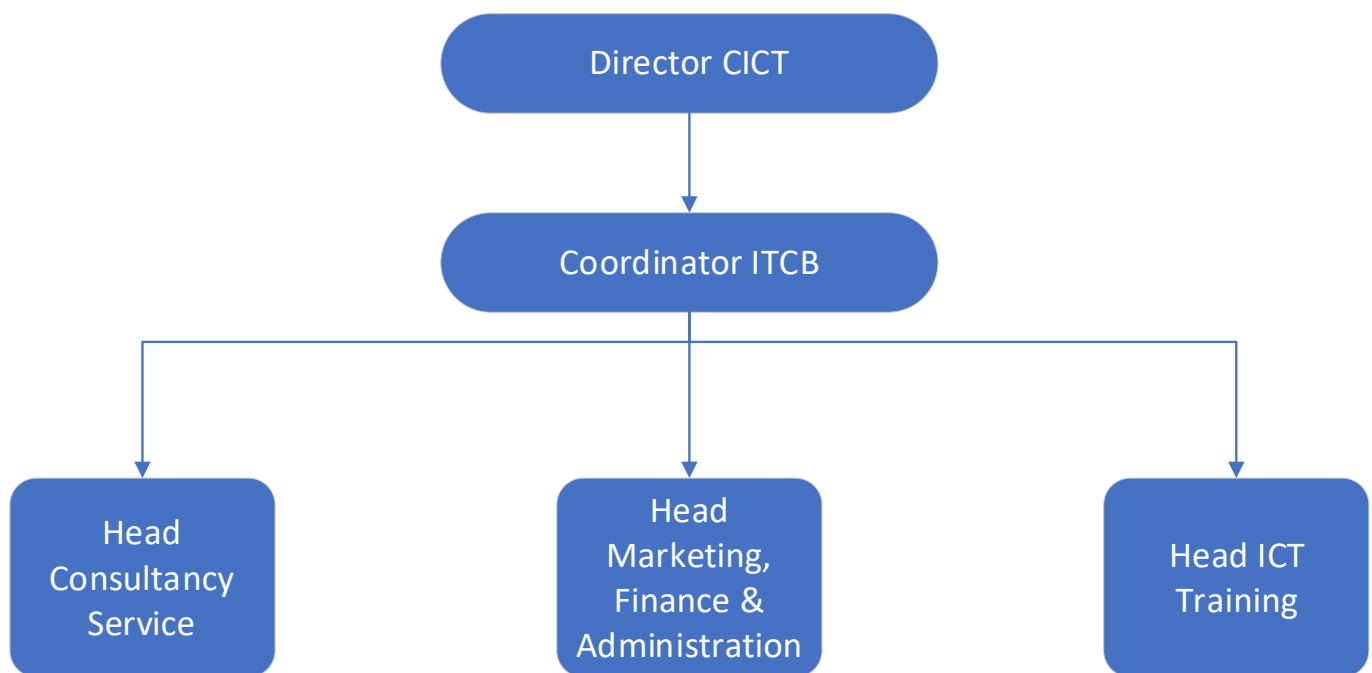


Figure 1: ORGANIZATION CHART OF CICT

1.1 SAFETY REGULATIONS AND GENERAL WELFARE

Within this organization of SUA-CICT, there has been minimal practice for safety regulation and the general welfare because there is little use of some of the safety tools that might help an individual at work to protect himself or herself from the possible harm that might occur on the process. Some of the referred safety tools include safety boots, gloves, safety goggles, and the like.

Despite the above, we had initial steps of the introduction of the safety rules and regulations in the different processes during work. One of them is keeping individuals' noses, eyes, and skin during soldering to avoid contact with the lead (which is very harmful and fatal to human beings).

1.2 JOB DESCRIPTION BASED ON PROFESSIONALISM

Within this field of Computer Engineering and Information Communication Technology (CEIT), there are a lot of valuable and demanding jobs, and it can be employed or self-employed.

Some of these job descriptions based on professionalism include the following; IT specialist, AI Engineer, Software Engineer, Lecturer, and the like. So, generally, there is a lot within this field. We need a strong commitment to ensuring that we get to specialize and understand in detail our field of professionalism.

1.3 RECRUITMENT AND TRAINING POLICY

Within the SUA-CICT, there are some of the policies guiding the training program. They include the following;

- i. Trainees should ensure they come each day (except weekends) unless he or she has a special activity or emergency.
- ii. Trainees should come as early as possible since the starting time was 8 am to 5 pm.
- iii. Trainees should ensure maximum co-operation with the trainer and the environment within the period of Practical Training.
- iv. Trainees should ensure that he or she takes safety precautions during any process taking place.
- v. Trainees should have respect for the properties within the field.
- vi. Trainees should not steal any item within an organization.

Therefore, these were the guiding policy and principles during my Practical Training period.

2. TECHNOLOGY AND AGRICULTURE.

What is a Technology?

It is the branch of knowledge dealing with innovation and the invention of useful tools that help to solve different problems facing society/community.

What is Agriculture?

Agriculture is the science that involves the practice of cultivating soil, growing crops, and keeping animals.

How can technology and agriculture be related together?

Technology and agriculture can be very precisely related together because technology helps in the production of great yields within the agricultural sector by enhancing precise prediction of the market (through the use of Artificial Intelligence), and most important is reducing the much effort that the farmers get to face during their activities and the like.

What are some technologies used within the agricultural sector termed to be very helpful?

A few of the technologies that have been termed quite useful include Artificial Intelligence (AI), Machine Learning (ML), Machine Visioning (MV), and the like. These few technologies are extremely of great importance mainly because they have promoted **Smart farming**.

What is Smart Farming?

The majority of the population in the world doesn't know a lot about smart farming and they have a common standing that involves local farming. Smart farming is the farming method that involves the use of digital technology, leading to what is called **the Third Green Revolution**. This includes using technologies such as vertical farming, irrigation system, smart monitoring technologies such as monitoring humidity, water, manure/fertilizer, and the like. Smart farming has a lot of advantages that include reduction of the labor cost, high yield, and huge profit. Despite its advantages, it is very expensive and hard to adopt.

2.0 PROBLEM IDENTIFICATION

Within the world of Agriculture, Farmers must meet the changing needs of our planet and the expectations of regulators, consumers, and food processors, and retail. In this year, the world population is estimated to be 7 billion. By the year 2050, the population is estimated to reach near 10 billion. Under close analysis, we examine that there is a huge increase of population with each individual requiring food to sustain well. The case is that the land is constant, it never increases or decreases. This rise the problem of food scarcity if no further measures are taken early. It has been quite challenging for the farmers to meet these demands due to some different variables striking them. Some of the problems include:

- i. Failure to meet the rising demand for more food of higher quality
- ii. Non-fulfillment of consumer's satisfaction and expectations
- iii. Failure to cope with climate change, soil erosion, and biodiversity loss
- iv. Insufficient investment in farm productivity
- v. Failure to attain a loan from a different institution such as a bank
- vi. Failure to adapt and learn new technologies
- vii. Staying resilient against global economic factors
- viii. Inspire young people to stay in rural areas and become future farmers
- ix. These are some of the problems facing the agricultural sector, and most of these problems require proper technology to solve them.

2.1 PROPOSED SOLUTION

After finishing the identification of the problem now it is time to come with a solution to these problems.

We came up with three possible solutions, they are:

- i. Provision of Artificial Intelligence Technology in the Agricultural Sector. It is vivid that AI technology has been seen to be of great significance within different sectors in this digital world. Hence there is the very significant importance of using AI technology within the agricultural sector to ensure that there is maximum productivity with minimum cost.
- ii. Provision of education to the farmers concerning the technologies used. There has to be the provision of education to the farmers concerning the implored technology, and smart farming methods. The farmers need to be provided with this knowledge because it gives them the foundation on how to use the technology, how to maintain it and how to increase their productivity.
- iii. Enhancing support to the farmers. There has to be initiation and enhancement of support to the farmers from government and Non-Government sectors. Through this process, it promotes the sense of confidence, hard work, self-esteem, and motivation to the farmers since they know they have a backhand and support they need to achieve their best in their agricultural activities.

2.2 JUSTIFICATION OF THE PROPOSED SOLUTION

Now, the proposed solution is to introduce Artificial Intelligence within the agricultural sector. AI in agriculture has emerged in three major categories, they are agricultural robotics, soil and crop monitoring, and predictive analytics. We can justify this solution as follows::

- i. Using AI for agricultural robotics. Nowadays, agricultural robotics has been growing at a large scale, technology has evolved to an extent that almost everything in agriculture can be controlled by robots. These robots are being implanted with Artificial Intelligence which helps them to understand each variable within the agricultural sector, such as image, composition, and the like. In Tanzania, there is a project done by Dr. Kadege of SUA (who is also the leader of my YEESI LAB) which involves the use of robotics to detect and cultivate cotton from cotton trees/plantations. It can be properly viewed from YouTube using <https://youtu.be/Pf93nKkPE9g> .



Figure 2: ROBOTIC TOMATO PLANTATION

- ii. Using AI for soil and crop monitoring. Artificial Intelligence has also been so important in soil and crop monitoring. This involves understanding the condition of the soil and the crop with the effective and proper suggestion of the appropriate solution to the observed condition. A good example is using E-tongue technology which uses AI technology to know the presence of water content and some nutrients in the crop. If there is an absence of some of the nutrients in it, it automatically activates the water system to water the crops to the accepted standard and automatically stops.

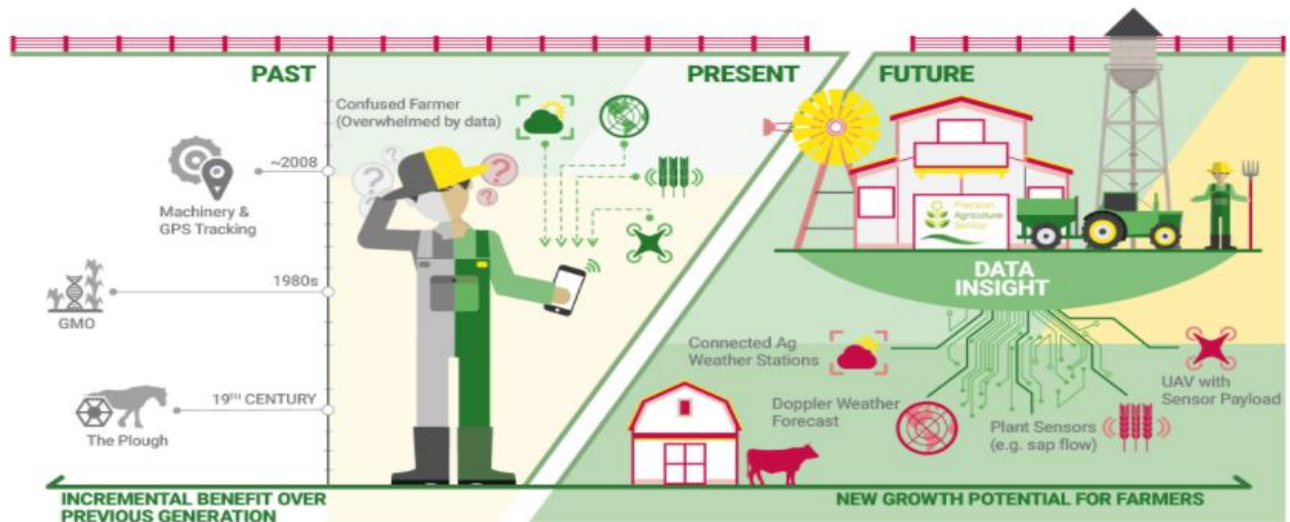


Figure 3: DIAGRAM SHOWING EVOLUTION OF AGRICULTURE TECHNOLOGY

- iii. Using AI for predictive analysis. AI has been quite useful in attaining a deeper understanding/insight into the data from the agricultural site. The predictive analysis involves the analysis of the historical data and the existing present data to get attain patterns and behaviors. Through this technology, it is possible to detect the percentage yield of the crop by determining different variables such as the condition of the environment (like if there would be heavy rain or null rain), provision of smart disbursal loan to the farmers, and the like.

Hence, AI has proved to be productive in the agricultural sector and has brought about modern digital farming (smart farming) with big data. Hence, it is very important for people (specific farmers) in different areas of the world including Tanzania to get to adapt and learn different technologies which will help them a lot with high percentage yield with low cost.

2.3 CHALLENGES

There are some of the challenges that I have been facing within the area of the site. Some of the challenges that I have been facing include the following:

- i. Inadequate tools within the working area. There has been a problem of inadequate tools to be used within the area of sites. This means that most of the knowledge concerning Artificial Intelligence was based more theoretical and not practical oriented, hence it is a big challenge because the students don't get detailed knowledge on how the tools get to operate in the real world.
- ii. Limited time. The time was so limited, so we had to stay with the pace and time we had. This led to the knowledge attained to be important but not at great depth.

Despite all the challenges I faced, thanks are to GOD and the entire team, since we made it go with great efficacy, consistency, and co-operation. Generally, it all went well.

3.0 CONCLUSION AND RECOMMENDATIONS.

3.1 CONCLUSION

Fieldwork has made many changes to the students including increased skills, knowledge, and how to behave in working areas and working manners. Practical training is very important for students because it is essential for knowledge and skills development. It also encourages students to apply those theories obtained from the class into practice.

In the end, SUA-CICT is a very good organization for students to take their training, though training time was limited I enjoyed a lot because you are participating directly as one of the company staff and you can integrate between theory and practice by getting knowledge and experience of doing work. I have got the opportunity to join their YEESI LAB team that aims in providing knowledge to people concerning AI (Artificial Intelligence), Machine Learning, Machine Visioning, and Mobile application development. Its main aim is to build the AI system which will help banks to provide loans to the farmers in the most efficient and effective way as possible (Smarter Loan Disbursal System)

All in all, field training is a very crucial thing (process) for each student to get access to the required knowledge needed in the market, hence it is very vital and an avoidable fact that every student has to attain the field practical training for his or her future benefit.

3.2 RECOMMENDATION

It is recommended that;

- i. Students should know different technologies such as Artificial Intelligence, Machine Learning, and Machine Visioning and their applications in the real world.
- ii. The company should rotate students in various IT departments and sections so that they will be aware of various activities performed by the company. It will help students to acquire different skills from them especially IT students.
- iii. The company should convert most of its activities from the manual way into computerized systems to avoid unnecessary error, redundancy, and time-consuming.
- iv. The company should train their staffs on how to use a computer to remove unnecessarily wasting of time during working hours.
- v. The company should provide sufficient and advanced tools for the work to be performed more effectively and efficiently without costing a lot of time.
- vi. Students of Computer Engineering and Information Technology going to SUA-CICT for PT must know about computer hardware and maintenance and know-how to troubleshoot any problem that may occur in the process.

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