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Information Communication Technology (ICT) on Networking Tools

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Abstract: My experience with the Student Industrial Work Experience Scheme (SIWES) was well-explained in this report. The report is based on information communication technology (ICT) and covers a variety of topics including local area networks (LANs), satellite communication, satellite communication advantages and disadvantages, and a brief history and description of my place of business.

CHAPTER ONE

INTROUCTION

When science and technology education first began in Nigeria, students were leaving their individual schools without any technical training or prior work experience. Students enrolled in scientific and technology-related courses were required to participate in the Student Industrial Work Experience Scheme (SIWES) at various institutions because of this belief. in an effort to broaden their horizons and provide them with technical expertise or real-world work experience prior to their graduation from various institutions.

The Industrial Training Fund (ITF) established the Student Industrial Work Experience Scheme (SIWES) in 1973 to give tertiary students a foundational understanding of industrial work based on their course of study before they graduate from their respective institutions.

The significance of SIWES lies in the fact that it covers all science and technology-focused students at Nigerian universities, polytechnics, and monotechnics. This results in a large student body that is manageable due to the participation of both public and private enterprises in the program. In their field of study, SIWES facilitate industrial know-how, especially in technology-based courses.

Additionally, it allows students to see how theoretical information is applied to solve problems in the actual world.

ORGANIZATIONS TAKING PART IN THE MANAGEMENT OF SIWE

The Federal Government Industrial Fund (ITF) is one of the organizations involved. The National Universities Commission (NUC), the National Board of Technical Education (NBTE), and the Nation Council for College of Education (NCCE) are other monitoring agencies. The following are among the roles played by the aforementioned agencies:

- Make sure the plan is adequately founded.
- Verify SIWES and certify the SIWES unit at the authorized establishment.
- Establish policies and procedures, designate a SIWES coordinator and support staff, and apply to participating bodies and institutions.
- Keep an eye on students at their attachment site and sign their ITF forms and logbooks.
- Verify that student and supervisor allowances are paid; • Vet and process the student logbook and transmit it to the same ITF Area office.

Thus, the effectiveness of the Ministries, ITF, Institutions, Labor Employers, and the General Public engaged in the articulation and management program will determine if the SIWES is a success or not. Therefore, it is essential to assess SIWES in tertiary institutions in order to meet the program's establishment needs.

History In 1947, the Nigerian tertiary education curriculum introduced the Student Industrial Work Experience Scheme (SIWES) as one of the programs to be implemented by the Industrial Training Foundation (ITF).The Industrial Training Foundation (ITF) was founded in accordance with the October

8, 1971, decree number. 47. By 1947, the Federal Government ordered this body to ensure that industries were tightly related to technical education and, in turn, to policy making.
Under the direction of Yakubu Gowon Rtd, the Federal Government of Nigeria established SIWES to oversee student training for the purpose of developing manpower for the industrial sector in preparation for the country's drive toward industrialization. In Nigeria, SIWES lasts anywhere from three months to a year, depending on the specific institution and course of study.

OBJECTIVES OF SIWES

The following are the goals of the Student Industrial Work Experience Scheme, which was created by the Industries Training Foundry in 1973:

- To give students at higher education institutions a way to gain experience and industrial skills while they are enrolled in classes.
- Get students ready for the industrial work station they'll probably encounter after graduation.
- Show students how to use tools and machinery that they might not have access to in their different institutions.
- Give students the chance to put their knowledge to use in authentic settings, closing the knowledge gap between theory and practice.
- To provide a forum for social interaction among various student demographics
- To get students ready for upcoming obstacles.

CHAPTER TWO

The establishment's description (GALAXY BACKBONE PLC)Established in 2006, Galaxy Bone is a federal public enterprise tasked with creating and managing a centralized information and communication technology (ICT) formation platform to meet the connectivity and other technical needs of the federal government's Ministries, Department Agencies (MDA). running a backbone network across the country to assist rural communities in achieving their objectives.Galaxy is dedicated to operating as a commercial organization by utilizing its current assets to expand its product and service offering into the market in order to fully accomplish its purpose and business objectives.
High-quality services created to address the issues that the Nigerian economy's many public and private sectors are now confronting.

VISION

Our goal is to be the primary facilitator of the Nigerian economy's digital inclusion.

GOAL

Our goal is to promote national development by giving public institutions, underserved communities, and other stakeholders ubiquitous ICT infrastructure and services

VALUES

Accountability and integrity; passion and dedication to achieving great results; customer centricity; teamwork

SERVICES

Most organizations have found it challenging to obtain dependable internet service at affordable rates. Low-cost service providers have provided subpar service in terms of connection quality and responsiveness to client concerns. Securing more than a portion of the needed internet bandwidth has become unfeasible due to the high cost of higher grade service providers. usually not more than 512k in the case of a big capacity.Because of this, GALAXYBACKBONE Plc. is able to provide the following

services in a sufficient amount and at a reasonable cost: • High-quality internet services for the public and private sectors.
Mail service, web hosting, interactive remote learning, video conferencing, etc.
The establishment's location and brief history
Crescent, Wuse 2, Nigeria, Abuja.
A member of the federal executive council noticed in 2004 that there was an increasing amount of wasteful IT work and assets being used by federal government MDAs. As a result, the council decided to harmonize the IT infrastructure initiative in an attempt to streamline this effort. Following the proposal of federal executive council committee on republic of Nigeria recommended that a business be founded to consolidate and integrate all the different existing government owned network into single government wide network based on the presidential orders. Galaxy backbone was a public limited liability business. Even though the federal government of Nigeria owns 100% of the corporation, it must function as a commercial organization in order to fulfill its mandate and fully accomplish its goal.

THE GOALS OF THE GALAXY BBONE
The goals of Galaxy Backbone Plc are as follows:
- Encourage the achievement of universal digital inclusion by supplying connectivity to the nation's underprivileged and rural communities.
- Prevent resource duplication to save money and maximize the utilization of what is already available.
- Establishing the necessary ITC infrastructure platform to back the reform initiative for the government.

THE FUNCTIONS OF THE ESTABLISHMENT'S SEVERAL DEPARTMENTS
The following departments make up the Galaxy Backbone, and their roles include NETWORK OPERATING CENTER (NOC) and
- They keep an eye on network traffic and ensure that it is always up.
- They diagnose issues and remotely rectify them, reporting fault incidents or commissioning issues to the NOC manager if they cannot be resolved in an hour.
- They assist in setting up and commissioning sites for VSAT customers. • They perform weekly backups of hub components.
- Assistance in allocating bandwidth to clients in accordance with their requests.

IP IMPLEMENTATION
- They assist in allocating an IP address to each and every client.
- Assisting clients with IP phone configuration
- Assistance with setting up a router for Vsat clients

FIELD SUPPORT
- They visited the location and assisted with the VSat installation for the VSat clients.
- They support the configuration of a contemporary satellite
- When a consumer has a problem, they assist in resolving it.

DATA CENTER
- They address security-related concerns
- They draft emails to all employees of Galaxy.
- They assist in resolving internal issues that arise inside the business.

CHAPTER THREE
SMATTERNIGHT COMMUNITY

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An electronic device with specialized wireless receiver and transmitter is called a communication satellite. receiving radio waves from one spot and sending them to an other site that is orbiting the planet after being launched by a rocket.Depending on how they orbit the planet, satellites can be classified into several types. The low earth is what we have (LEO). The geostationary orbit (GEO) and medium earth orbit (MEO). Since 1993, the LEO satellites have been categorized based on their weight, making them roughly the size of an automobile.

Dimensions Weight (kg)

Less than 1 Pico sat, 1-10 Nano sat, 10-100 Micro sat

Small sat: 100–1000; Standard sat: 1000 or more

Although different types of satellites serve distinct purposes in various contexts, they always include a sizable amount of electronics. For communication, geostationary earth orbit satellites are utilized.

SATELLITE RECEIVER

The transponder is the most crucial component of a telecom satellite. Transponder is a composite term made up of responder and transmitter. This component of the satellite's electrical machinery functions as a microwave repeater, receiving, amplifying, and retransmitting the incoming signal back to Earth within its own footprint. Small chunks of the satellite's overall operational frequency bandwidth, or the space segment, are supported by each transponder. The 36MHz and 54MHz transponder bandwidths are typical.

DOWNLINK AND UPLINK

There must be a transmission from the earth station to the satellite and a transmission from the satellite to the earth station before you may communicate with a satellite.

Uplink refers to transmission from the earth station to the satellite, and downlink refers to communication from the satellite to the earth station.

The Earth StationThe earth station acts as a communication satellite's link. It typically consists of an antenna or satellite dish with an electronic receiver, a downlink converter, and a low-noise amplifier. The antenna itself comes in a range of diameter, azimuth, elevation fixed, and tracking configurations. When repositioning the earth station, it is crucial for technicians to understand the theoretical side of antennas. Earth's galaxy backbone plc

Fig.1 Galaxy earth station

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EIRP AND FOOTPRINT

The geographic region that a satellite focuses its signal toward, or, conversely, the area from which the satellite is visible on Earth's surface, is known as its footprint. This footprint's Effective Isotopic Radiated Power (EIRP), expressed in decibels, serves as a gauge for signal strength.

It is significant to remember that the antenna diameter and the EIRP have an inverse connection; the smaller the needed dish, the higher the EIRP. When it comes to receiving signals, a station close to the footprint's center will have an edge than another beam.

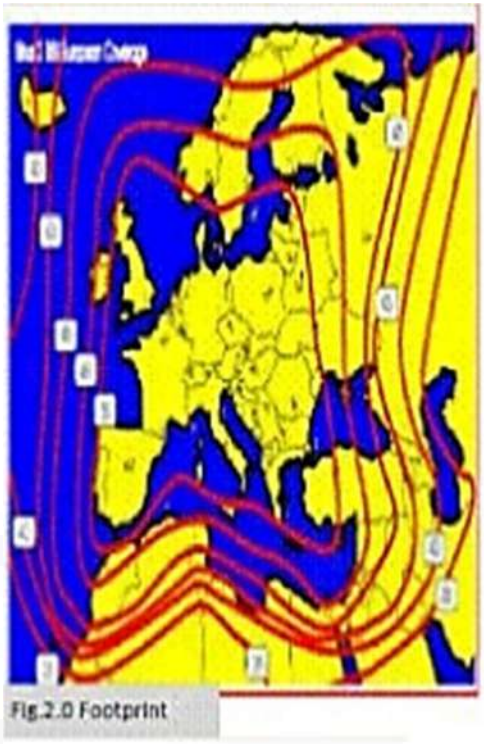

Fig.2.0 Footprint

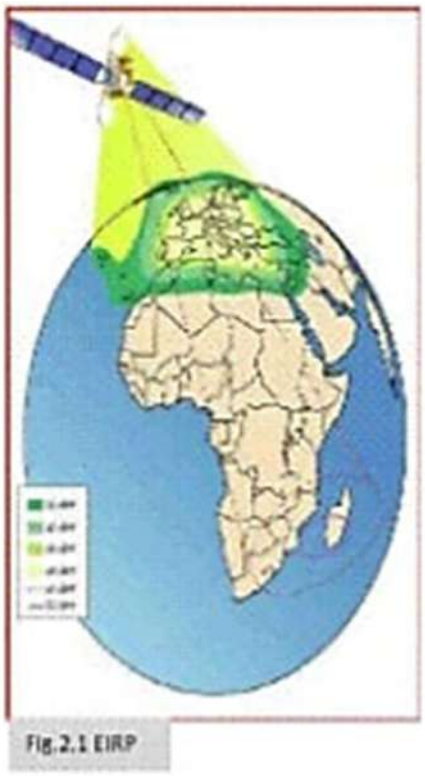

Fig.2.1 EIRP

Satellite: The diagram for footprint and EIRP are shown below

One method of network connectivity is via satellite. global positioning system, internet access, and weather forecasting. Using VSAT is one method of communication over a satellite network.

VSAT: A satellite transmission receiving equipment, also referred to as an earth station Very small aperture terminals, or VSATs for short, are receive-transmit terminals installed at dispersed sites. use a small dish to connect a satellite to a central hub. The main component of a VSAT station is the antenna, which is joined by a low-noise blocker (LNB) to receive satellite signals and a block up converter (BUC) to send signals. Together, these components make up the VSAT outdoor unit (ODU).

The interior unit (IDU), which is similar to a modern one and has receiver and transmitter boards as well as an interface to communicate with the user's existing in-home equipment, LAN services, PCs, TV kiosk, etc., is the second component of the VSAT earth station. Two cables are used to link the inside and outdoor units.

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Fig.3.0 VSAT outdoor unit


Fig.3.1 VSAT indoor

When comparing a VSAT earth station to a standard terrestrial network connection, the main benefit is that VSATs are not constrained by the reach of buried wire.
Given that it has an unhindered view of the satellite, a VSAT earth station can be positioned wherever. No matter how far away they are from terrestrial switching offices and equipment, VSATs can send and receive any kind of speech, data, or video at the same fast speed.

VSAT ITEM
The outdoor unit and the inside unit are the two primary components of the VSAT, as was previously discussed.

OUTDOOR UNIT
As seen in the photo below, the outdoor unit consists of the dish and feed arm that house the transmitter and receiver, which constitute the active component.

- The dish is composed of fiber glass with wire mesh implanted in it. The dish, which varies in size and diameter, aids in reflecting the satellite signal to the LNB.
- Feed arms: these support the LNB and BUC, two of the VSAT's electrical components.
- LNBs act as receivers; they stand for low noise block converters. It is used to hide and amplify the frequency out of the signal that the antenna receives and then feeds it into the modem through the satellite connection.

BUC
This device doubles as a transmitter and stands for block up converter. Its function is to convert the modem's in-route signal's frequency and power amplifiers before sending them to the satellite.

INDOOR UNIT

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The modem that provides DC power to the BUC and LNB is the indoor unit. Additionally, it receives and transmits the out-of-route signal. Between the modem and external electronics, both the in-route (transmit) and out-of-route (received) signals function at L-band.

Fig.4.0 ku-band

Fig.4.1 C-band

How to install A VSATVSAT installation might be difficult if the installer lacks a great deal of experience doing the installation. The installer needs to find an excellent location with good topography.Depending on the function he wants the VSAT to fulfill, the installer can install a variety of dishes. Every dish has a distinct quality of its own.

BENEFITS AND DRAWBACKS

The C-band and Ku-band satellite dishes are currently the most widely utilized types of dishes. The schematics are displayed below

- **Compass:** this tool aids in determining the azimuth, or the direction in which the antenna will point.
- **Inclinometer:** these instruments assist in determining the elevation, or the angle, at which the antenna will point.
- Clamping tools are used to cut and construct LAN cables.
- **Spectrum Analyzer**: This instrument is used to adjust cross-polarization and determine the appropriate satellite peaking.

SCREWDRIVERS AND SPANNERS.SETUP GUIDE FOR A VSAT

Fig.5.0 Compass

Fig.5.1 Tool kit

Fig.5.2 Spectrum analyzer

Fig.5.3 Crimping tool

Choose a well-topological location for your dish installation. After that, put your VSAT together and check that the antenna is positioned in the middle of the dish.

The outside unit, which consists of the BUC and LNB, makes up the antenna.

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Spectrum analyzer (Fig. 5.2)Fig. 5.3 Tool for crimping Fig. 5.1 ToolboxFig. 5.0: Compass
One coaxial wire was linked to the outside unit's LNB (Rf in), and the other end was fixed to the inside unit's receiving port (sat in).
Additionally, another coaxial wire was attached to the outdoor unit's BUC (Rf out), and the other end was connected to the indoor unit's transmitting port (sat out).
Connect the opposite end of an Ethernet cable to the LAN port on your indoor unit.
your workstationAfter that, antenna tracking is done. With tracking, you can locate the correct satellitepeaking and modify your antenna to receive a strong signal.Be aware that in order to communicate via the internet, the indoor modem device must be properly configured.

SETTING UP A MODEM: THE INDOOR UNIT

The five indications on the indoor unit are as follows: LAN, transmit, receive, power, and system. When the modem is fully set up and operating correctly, all of the indications will be illuminated. The processes involved in configuring a modem are as follows:

Fig. 6: Modem

Turn on the modem and the computer, then attach the Ethernet cable so that one end is connected to the computer and the other to the modem.
Enter the default IP address, 192.268.0.1, into the web browser to log into the modem. These will direct you to the homepage of the modem, as displayed below.

Address of IP: 192.268.0.1

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On the left side of the screen, select Installation. Next, select Setup. Finally, select Manual Commission. This will bring up a page where you can enter the satellite, VSAT, LAN, and other parameters and hit Save. Your service provider will supply the parameters.

After some software has downloaded, your modem should have all of its indicators on by now.

Your modem has been successfully configured, and you are currently viewing the status page. A green button, as seen in the following page, must be indicated on the status page. After that, you can create your own local area network, which will be covered in the chapter after this one.

Modem status page

CHAPTER FOUR

EXPERIMENTAL RESULT

HOW TO DESIGN A LOCAL AREA NETWORK (LAN)

A local area network, also known as a LAN, is a collection of linked computers that have the ability to exchange data. Ethernet cables are used to link each computer's installed Ethernet card to a hub switch or router while setting up a local area network (LAN). For all computers to be linked to the LAN, these joining devices must have enough ports for them to be plugged into. By definition, a LAN need not, but it may, offer internet connectivity.

REQUIREMENTS FOR A LAN

The following devices are required for the design of your Local Area Network:

- **Service Provider:** this is the business that gives you access to the internet by providing internet service.
- **Card Network:** An interface or extension board is what creates
- The internet is connected to your machine. Modern PCs typically include a network card where you plug in your LAN wire.
- **Router:** A router is a network device that forwards packets of data. A router is typically connected to two LANs or at least two other networks. Routers are found at gateways, which are the locations where two or more networks converge.

A network switch is a little piece of hardware that connects several PCs to a single local area network. Ethernet cables are used to link computers, switches, routers, and modems to other network devices. It typically comes with eight pins and uses an internet protocol to transport data.

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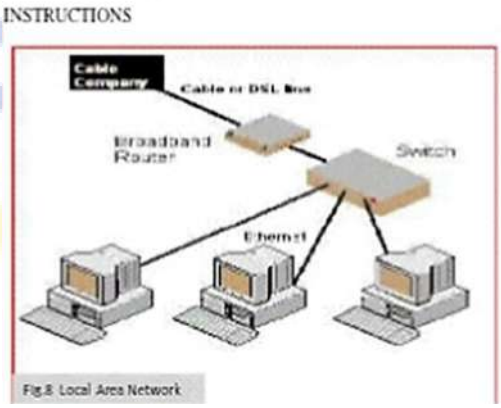
DIRECTIONS

Attach one Ethernet cable to your router from the wall jacket your service provider sent, and then attach another Ethernet cable to your switch from your router. Depending on how many computers you want to connect, you can attach an Ethernet cable to any one of the switch's numerous ports. After that, you can begin using your computer to browse. Be aware that before you can begin accessing the internet, your computer and router must be configured.



SETTING UP THE COMPUTER

After turning on each machine, launch the network wizard on each one. The network wizard can be accessed by going to the start menu, selecting "network" or "network connections," depending on whether Windows XP or Vista is installed on your computer. The buttons for sharing an internet connection and configuring a network should be located under "network connection," and clicking on them will launch the network wizard. The wizard will walk you through setting up the computer for networking, which is a rather basic process.

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SETTING UP THE ROUTER

Attach one end of the serial connector to the router's console port and connect the other end to your computer. Turn on your router.

watch for the screen to finish scrolling. It will prompt you with the notice below.Would you prefer to open the dialog box for first configuration? [yes/no] If you select the negative option, a dialog to end the automatic installation and manually configure the router will appear.

The first series of instructions is for setting the local internet interface's host name, password, and IP address.

Issue the following command at the prompt.

Router>activate Router#setup terminal

Enter the desired name for the router by typing router(config)#hostname.

Router(config)# secret is enabled Enter your password here.

config.router# fastethernet 0/0

Router (config-if)# Enter your IP address in the field.

#no shutdown for router(config)

Fast Ethernet 0/1 Router(config)#

WORKINGS OF A VSAT NETWORK

There are three parts to a VSAT network:

- An earth station, or central hub
- The main satellite

Countless VSAT earth stations spread throughout different locations.As previously said, the Vsat are the devices that are employed in various areas to give exact location information through the network hub. Usually, content starts in the hub. Additionally, the hardware and software needed to operate the satellite network are situated there.In the most basic setup, outgoing data (from the hub to the satellite) is sent to the transponders of communication satellites, which then receive, amplify, and beam the data back to Earth so that the distant satellites may receive it.Through the same satellite transponder, the remoteVsat transmits data inbound (from the satellite to the hub) to the hub station.

Figure 9: VSAT Network

TROUBLESHOOTING VSAT

Maintaining a satellite communication network is a difficult task; a great number of incredibly far-flung pieces of equipment must cooperate to satisfy customers who demand an exceptionally dependable end-to-end data link. But machinery can malfunction or be used inappropriately.

The process of troubleshooting:

Troubleshooting satellite communication is comparable to troubleshooting in many other disciplines. It can break down as follows:

- **Fault detection:** recognizing that a portion of the network is malfunctioning (but not knowing what the issue is).

- Making a diagnosis involves looking into the issue to determine its root cause.
- **Proposed resolution:** Make sure the connection is tight. Modify the LNB.
- **Bad Signal Quality:** A bad signal in your network can result in a sluggish link. Most likely reasons The antenna does not point in a straight line Unfavorable weather Recommended remedy Orient your antenna in the proper way. Hold off till the weather clears.

SATELLITE COMMUNICATION ADVANTAGES

Once in orbit and in use, satellites offer remarkably excellent service quality that is significantly more dependable than terrestrial communications. The benefits of satellite communication are as follows.

- Great dependability—no need for dug-up cables
- Prices are fixed regardless of location or distance
- Direct service delivery to the user's location is possible.
- A large coverage area is easily accessible
- Customers can select the preferred network topology.
- Easy entry to underdeveloped areas
- It has a higher bandwidth, or data capacity.

PROBLEMS WITH SATELLITE COMMUNICATION

One of the drawbacks of satellite communication is the lack of experience with the technology.
Some of the technological drawbacks of satellite communication are listed below.

- **Losses breakdown:** There is no medium ground; every satellite launch results in either success or disaster.
- **In orbit failure:** following a successful launch or operation, there is a chance of losing contact or running into electrical or mechanical issues.
- The weather can have an impact on the signal.

BENEFITS AND FEATURES

- High-performance, scalable internet protocol IP system with large forward and return bandwidth
- Facilitate the use of broadband internet by utilizing the special benefits of point-to-point transmission offered by satellite-based networks.

- Information rate guaranteed for every network location
- Less expensive terminal due to the requirement for fewer hardware components.

CHAPTER FIVE

CONCLUSION, SUMMARY AND RECOMMENDATION

The main hub of the entire VSAT network is a satellite with an 11-meter-long antenna. The earth segment is one of the two segments that make up the VSAT arrangement. Equipment is present in both the central hub and the outlying locations in this segment. The space section is the other segment. The satellite is connected to and from the Vsat space segment. When a vsat sends information to a satellite section in the sky, the satellite receives it, amplifies it, and retransmits it on a higher frequency. This acts as a radio frequency repeater. Much of the work is being done on the ground, where the hub controls and regulates every aspect of the communication network's operation, while the information is being delivered.

In a virtual private network, a hub is made up of a network management system that gathers data, provides a system health check, and provides billing information. The geostationary orbit, which is typically 38,800 kilometres from the equator, is a relatively high altitude from the earth for a satellite network to function. A remote terminal that consists of two units—one outdoors that is directly connected to the satellite and the other indoors that is connected to user devices—must exist. The central hub for a VSAT network connection is situated either at the host computer's central location or close to the user's primary office. Normally, the hub permits all of the network's vsat terminals to connect via satellite and permits any further host-to-vsat communication.

DIFFICULTIES FACED

Throughout my six-month SIWES program, I have faced the following difficulties at my attachment site:

- There aren't as many staff members there, which keeps them too busy to help the IT students.
- I work too long hours, which prevents me from having personal time to partake in other hobbies. Work is assigned to the staff and coppers; IT students are not limited to any certain task.

RECOMMENDATIONS FOR SCHEME IMPROVEMENT

- The business has to hire additional people so that it can provide the IT students with the attention they need to advance their careers.
- Rather to just letting the IT student sit around doing nothing, the organization ought to at least train them for a specific task.

CONCLUSION

Because engineering is a practical discipline that primarily relies on experience, it is imperative that any student aspiring to become a professional engineer gain some work experience related to their course of study while enrolled in a school, preferably in a reputable engineering firm. The SIWES program has given me this opportunity and allowed me to apply what I've learned in the classroom to real-world situations.

SUGGESTIONS

Due to the challenges encountered during the six-month SIWES program, I would like to suggest making the following adjustment:

- The ITF should provide students with a monthly stipend in order to alleviate any financial strain that may stem from a transportation issue.
- In order for the program to start on schedule, the institution and ITF should assist the student in obtaining the place of attachment.

- The institution must verify that every student participates in the industrial training program by ensuring that they pay each student a visit before the program ends.

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