SCIENCE, TECHNOLOGY AND SOCIETY



A Publication of the Directorate of General Studies, Kwara State College of Education Ilorin.

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CHAPTER TWO

SCIENCE AND TECHNOLOGY AS IT AFFECTS AGRICULTURE, HEALTHCARE, TRANSPORT AND COMMUNICATION

BY

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African indigenous technology was well expressed in the local system before the colonial experience. Pre-colonial Africa has made remarkable scientific and technological innovations in tradition iron, wood, cloth weaving, pottery and indigenous drug development.

The traditional science and technology lay much emphasis on the quality of life and standard of living, which is achieved by equipping everyone with the basic knowledge of how essential task of life are carried out. This is as a result of the fact that human survival depends on his ability to rationally solve problems within his environment and harness his resources to improve his standard of living.

Modern technologies are the outcomes of the advancement of the traditional technologies. As the time

passes, the new innovations replaced the older ones based on the existing concept of knowledge and ideas. Modern technologies are the new innovation to the old technologies. In this way, modern technologies are not applicable if traditional technologies didn't exist.

Science and technology has impacted in economic areas, such as poverty reduction, brought about healthier and more productive lives, rapid improvement in agriculture and economic growth.

The applications of scientific knowledge to technological inventions include:

- The early man discovery of fire by striking two stone is today applied in the production of lighter
- The law of floatation and up-thrust discovered by Archimedes is applied in the designing and building of ships and submarines
- Newton's law of motion is applied in the manufacture of automobiles
- The knowledge of projectiles is utilized in launching missiles, bullets, rockets and in sports

Agriculture

Scientific and technological advancements have greatly helped agricultural industry. Early farmers

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improved their crop production by inventing hoes and cutlasses, while modern farmers improve crop production through the use of global positioning systems (GPS). Science and technology has played a vital role in addressing the concern related to food availability, access to food, utilization and use of food and food stability. Farmers no longer have to apply water, fertilizers, and pesticides uniformly across entire fields. Instead, they can use the minimum quantities required and target very specific areas, or even treat individual plants differently.

Benefits of science and technology in agriculture include:

- Higher crop productivity
- Decreased use of water, fertilizer, and pesticide which in turn keeps food prices low
- Reduced impact on natural resources
- Less runoff of chemicals into rivers and groundwater
- Increased worker safety

In addition, robotic technologies enable more reliable monitoring and management of natural resources, such as air and water quality. It also gives producers great control over plant and animal production, processing, distribution, and storage, which results in: (i) Great efficiencies and lower prices (ii) safer growing condition

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and safer foods and (iii) reduced environmental and ecological impact.

Agriculture provides us basic essentials for living, the food we eat, the clothes we wear, the materials inside of our homes and it also provides many people with incomes. Without agriculture we would have none of these, matter of fact we wouldn't be able to survive.

Integrated pest management tools would help increase yield production whilst also ensuring that the correct amount of pesticide is used. Drought resistant crops would guarantee sustainable growth, no matter what the weather.

In livestock, the introduction of artificial insemination has helped increase dairy and food production in recent years. It has been critically acclaimed for years as being one of the most effective scientific and technological innovations available to cattle producers in order to improve the productivity and profitability of their businesses. This has the potential to totally change the way in which producers think about breeding, and it will also lead to massive increases in beef and dairy production.

Science and technology has been a vital component of dairy production and improving productivity for almost 100 years. Robotic milking systems are now more

advanced than ever before. The Astronaut A4 is a ne milking system that does not require any huma intervention during the milking process. Robotic milke not only free up farmers' time, they have also be proven to increase milk production by up to 10%.

Genetic modification of plant varieties can be used f nutrient fortification, tolerance to drought, herbicide diseases or pests, and for higher yields. Earlier forms genetic modification in agriculture have involv conventional cross-breeding approaches.

Transgenic modification confers a number of benef including tolerance to biotics tresses (insects and diseas abiotic stresses (drought), improved nutrition, taste a appearance, herbicide tolerance and reduced use synthetic fertilizers.

Science and Technology has also changed the way which farmers operate their machinery. Telematics instance allows communication between the farmer a his machinery. If a breakdown happens to occur instance, the farmer can simply access the on-boa diagnostic system of the tractor and the system can find solution to the problem.

Other practices and technologies such as fertilizer pesticides and irrigation system have been around f

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many years in helping increase yields and food production. However the key difference is that now they are more efficient, as well as being a lot more user and environmentally friendly. Science and technology is heavily relied upon to conduct intensive research into everything from new seed varieties, drought resistant crops to new more efficient farming practices.

A key aspect of accessing food is minimizing food losses during production, storage and transport, and waste of food by retailers and consumers. Such agricultural losses are attributable to a number of factors, including lack of access to ready markets, adequate storage facilities, affordable refrigeration and local crop-processing facilities. Therefore, a number of post-harvest-loss technologies that are useful for storage, handling, refrigeration, transport and processing have been developed over the years.

Many farmers worldwide are now using the electronic, print and social media as an adequate way of advertising their products and know about new innovations.

The application of science and technology in agriculture has played a vital role in increasing food production as well as removing any concerns nursed by farmers relating

to improved yield and economic benefit and also to th consumers relating to scarcity of food.

The recent advancement in the application of scienc and technology in agriculture such as crop sensors, irrigation systems, fertilizer, pesticide and herbicide, have helped to improve crop yield. It can be concluded that all these advances in the application of science and technology to agriculture have resulted in fewer farmers working on bigger farms.

HEALTHCARE AND DELIVERY SYSTEM

Traditional medicine refers to healthcare practices and beliefs that are prevalent in the community, while incorporating plant, animal and mineral based medicines, spiritual therapies, manual techniques and exercises, applied singularly or in combination to treat, diagnose and prevent illnesses or maintain well-being. African traditional medicine is a form of holistic health care system organized into three levels of specialty, namely divination, spiritualism, and herbalism. Illness is regarded as having both natural and supernatural causes and thus must be treated by both physical and spiritual means, using divination, incantations, animal sacrifice, exorcism, and herbs.

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Healthcare comprises directing and controlling a group of one or more people for the purpose of coordinating and harmonizing the group towards accomplishing a goal. It often encompasses the deployment and manipulation of many resources such human, financial, technological, and natural resources.

Healthcare is being overtaken, however, by colossal changes in the environment in which it delivers its services and in the knowledgebase of science and technology upon which medical reasoning and health care decisions are made.

Health care is an information-intensive activity. From a business-process viewpoint, the health care industry performs only two kinds of actions: medical procedures to support diagnosis, therapy, or disease prevention; and the acquisition, use, communication, and storage of information. Thus, it would be reasonable to assume that changes in the availability and ubiquity of information and information technologies such as computers and the Internet would have disproportionately large effects on health care operations.

Science and technology offers the opportunity for tremendous innovation in healthcare. Technological developments in healthcare have save large number of

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patients and are helping in improving quality of life, b having impact on all processes and practices healthcare delivery.

The use of sophisticated instruments such as X-ra magnetic resonance imaging (MRI) scan, Computerize tomography (CT) scan e.t.c which are used to produc computerized images of internal body bones and tissue has helped us to easily access to the healthcare systems

Example of some medical instruments and their uses

1. Sphygmomanometer. Used to measure bloc pressure
2. Stethoscope; is used to detect sound from th movement within the body system (e.g. heart beat intestinal movement, breath sound, e.t.c
3. Suction device; used to suck up blood or secretion
4. Thermometer; used to measure body temperature
5. Dialyser; used to remove toxic materials (that a generally removed by the kidney) from the blood
6. Endoscope; used to look inside the gastrointestin track
7. Nebulizer; used to produce aerosol of drugs to b administered by respiratory route
8. Ventilator; used to assist or carry out mechanical a of inspiration and expiration of a non-respirin

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patient. It was widely used during the corona virus pandemic

9. Electrocardiogram (ECG); is used to record electrical activity of the heart over a period of time
10. X-ray, MRI and CT Scan; are used to monitor diagnose, or detect abnormalities in the organ or other parts of the body.

Automatic patient monitoring (e.g. computerized physician order entry (CPOE), electronic medical records (EMR), patient clinical information systems (PCIS), has also help to improve the quality of healthcare delivery system.

INFORMATION TECHNOLOGY TOOLS USED IN HEALTHCARE

The health information technology tools were developed to support stakeholders in health sector and were used to specific areas and promote better, more efficient, healthcare through the use of modern technology. The widely used tools are:

1. **Electronic Medical Record (EMR)**. This is used to provide a Doctor or other health workers with real-time access to patient information, such as medical condition, visit to the hospital, reports of diagnostic

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procedures, schedule of services, allergies, contact information and a complete record of caregiver. The EMR is used in decision making, and also to update clinical and other information about the patient as at when due.

2. **Clinical Decision Support (CDS)**. The CDS is used as a computerized alert and reminders to care providers and patient, clinical guidelines, condition-focused order set etc to enhance decision making and improve clinical workflow. It is used to provide health workers and patients with knowledge and patient-specific information presented as requested to improve healthcare delivery
3. **Computerized Physician Order Entry (CPOE)**. Is used by the healthcare providers for ordering medications, orders for X-rays procedures, referrals, discharge and transfer.
4. **Electronic Prescribing (E-prescribing)**.E-prescribing is the transmission, using electronic media of prescription between a prescriber, dispenser, pharmacy manager, either directly or through an intermediary, including an e-prescribing network. E-prescribing includes, two-way transmissions between the point of care and the dispenser.

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5. **Health Information Exchange.** It is the electronic connectivity via internet and other networks that enables health care providers to exchange patient health information.
6. **Personal Health Record (PHR).** PHR is an electronic application through which individuals can maintain and manage their health information in a private, secure, and confidential environment.
7. **Remote Monitoring.** Remote monitoring is the electronic transmission of health care data either entered directly by a patient (or his/her caregiver) or through a medical device to a clinician's Electronic Health Record (EHR) or a Patient's Personal Health Record (PHR).
8. **Telehealth/Telemedicine.** Is the use of telecommunication technologies to deliver health-related services and information that support patient care, administrative activities, health education, health services and information over distances.

TRANSPORTATION

From the beginning of history, human sensitivity has revealed an urge for mobility leading to a measure of Society's progress. Transport can be defined as the

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movement of people and goods from one place t another.

The traditional means of transportation are means transport used on land and water by the community Transportation is an important part of human activity, an it forms the basis of social and economic interactions Therefore, lack of transport facilities often hinder socioeconomic development. Transport links differen factors affecting economic growth and developmen together.

The transport of people and materials is one of the greatest needs that have to be adequately satisfied in any society if any meaningfull level of social interaction, co operation, production activities, economic and other type of development and the enhancement of human welfare to be achieved. In order to achieve this, two element (**infrastructure and equipment**) are very essential fo transportation of people and goods

Technological improvements over the centuries hav yielded cheaper, faster, and better(less polluting, quiete safer, more reliable) means of transportatio Development in transportation has pushed older mod aside and supported sweeping social and econom changes. Innovation and technology development a

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everyday events in transportation as individuals work out how and where to travel and firms and other organizations arrange passenger travel and freight movement. Suppliers seek better materials and fuels, traffic engineers investigate improved methods for timing traffic lights, and warehouse managers balance inventory versus out-of-stock and shipment costs. Technologists search for stronger yet lighter vehicles and safety experts test new and existing technologies. These everyday activities lead to a variety of perceptions of processes, the relations among them, and their relative importance.

The connection and interaction functions of transportation create a wide range of opportunities, leading to extension of services to new users or increase the variety of services offered and open opportunity for new modes of production and consumption, as well as socialization and cultural activities. Transportation technologies played roles in the great waves of progress associated with the printing press, sailing ships, canals, banking, emergence of the merchant classes, railroads, lights, mail and telegraph services, industrialization, urbanization, the trolley, automobile, truck, and telephone.

Science and technology, most especially informatio and communication technology (ICT) is essential in th management and operation of modern transportatio The applications of ICT include

- Traffic data information collection and disseminatic system
- Network control and traffic management strategies
- Vehicle control and driver assistance
- Systems for fee collection
- Freight resources management
- Flight information and customer management
- Terminal and port information and communicatic systems
- Freight and vehicle tracking and tracing, and logisti systems

The following factors are considered as principal motive in the adoption of ICT in transportation

- Adoption in controlling transportation fleet
- Consideration of energy consumption ar environmental conservation
- Optimization of traffic system and safety transportation

COMMUNICATION

COMMUNICATION

Communication is the process of using words, sounds, signs or behavior to express or pass across information. It involves different forms which include the intra-personal and interpersonal group or mass communication. Communication involves different forms which includes the intrapersonal, interpersonal, group, public, mass communication etc. All these are different ways through which we interact, associate, communicate, relate, share ideas, views, opinion, information, norms and values with ourselves and others. It involves contacting, relaying and transferring of ideas, news, secrets, messages, orders and information from people, groups and communities to others. Communication in general terms can be described as the act of sending and receiving messages from a source through a medium. Communication is regarded as the life blood of human existence which rapidly enhances unity that leads to the development of our society at large.

Traditional media of communication is the means by which people passing information to themselves. The traditional media include the town crier, oral tradition, talking drum, smoke signals, ivory horn and long brass, the open markets. The aspects of communication both traditional and modern means has promoted peaceful co-

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existence, understanding and self-awareness among human-beings. They have certain common elements that together help define communication process.

Traditionally, passing information across to people living in long distances takes days if not months. Scientific and technological development has made it easy to pass information in seconds between people separated by thousands of kilometers, which makes communication faster and efficient. Technological innovation has produced several means of communication such as telegraph, telephone, radio, television and newspapers.

Electronic communication was introduced in the 20th century, which coincide with the development of principle of motion picture. The development of electromagnetic calculator during the 2nd world war enhanced the invention of modern communication technology. The development of guidelines for a communication network among computers formed another interesting phase of ICT adoption in the world. The present internet access can be traced to this particular inter-computer connectivity; which most educational institutions across the globe use for dissemination of information.

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Initially, IC development in Nigeria was based on print and electronic media, due to lack of emphasis in the existing policy on ICT development. The era of wireless, mobile phones which was initially big and bulky and with little functions (texting messages and call), and was later transformed into small phones with so many functions (text messages, radio broadcast, pictures, movies, music, live streaming, e.t.c) following the discovery of android and IOS phones.

ICT is a tool that can be used to enhance sustainable economic and social development. The integration of ICT into community development programme and citizen participation and sharing of information, can become an enabling force for sustainable development. The introduction of internet allows every users to participate fully in a global sphere, especially in the era of social media, such as facebook, whatsapp, instagram, telegram, viber, IMO. (i.e. every user is a sender, receiver, narrow caster and broadcaster).

It is recommended that scientists and technologists should play the following roles in the society and governance:

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- Promote multidisciplinary approaches to research, encourage cooperation between the social and natural sciences, and draw lessons from the humanities, local knowledge systems and aboriginal wisdom.
- Encourage a holistic approach to problem solving that takes into account a realistic range of socioeconomic conditions and effects, as well as multiple time and space scales, where appropriate.
- Explain the implications and the inherent limitations of their research findings to the public.
- Create an avenue to fully exploit the predictive power of science to serve social needs with candid awareness of the limitations of scientific predictions.
- Promote the inclusion of scientists from resource-poor countries in international cooperative projects and maximize their access to information and technology.
- Encourage the creation of science-coordination mechanisms at the highest level involving the governments of different countries, as a way to promote integrated responses to global problems.

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