

Career opportunities in ICT

Table of Contents:

Carriers	1
Computer Operator	1
Computer Technicians	2
System Analyst.....	3
Programmers	4
Software Engineers.....	5
Computer Hardware Engineers	6
Information Systems Manager	6
Database Administrators (DBA).....	6
Computer Trainers.....	7
Webmasters/ Web administrator.....	7
Network Administrators	8
System Administrator	8
Graphics designer and typesetters	9
Computer Scientist	9
Web Designers.....	9
Computer sales representatives	9
Self-employment	9
Further educational opportunities in ICT.....	10
Universities	10
Polytechnics	11
Colleges.....	12

Carrier Opportunities in ICT

Carriers

Information processing is an important activity in any organization of any size. A separate IT department usually has the responsibility of dealing with the IT related issues or it may be outsourced.

Some of the issues that an IT department would be responsible for are:

1. IT procurement (Hardware, Software, Networking)
2. Installation and maintenance of IT equipment
3. Network installation and maintenance
4. Identification of user requirements (systems analysis)
5. Design and development of IT solutions (programming)
6. Database administration (database backup, performance, tuning e.t.c)
7. Web site design, development and maintenance
8. IT training

There are software houses also that specialize in developing software applications. These would have teams of analysts, software engineers, programmers, system testers e.t.c

The manufacturing of microprocessors, computers, networking equipment and so on needs specialist skills as well, such as computer engineers, computer scientists e.t.c

To provide skilled people to perform the above tasks, there has been a tremendous growth in IT training providers.

ICT has created new job titles like computer operators, computer technician, system analysts, computer programmers, software engineers, computer engineers, information systems manager, data base administrator, computer trainer, web administrator, computer graphics designers and network administrators. All these are IT professionals called *IT workers*.

Computer Operator

The computer operators oversee the operation of computer hardware systems, ensuring that they are used as efficiently as possible. They may work with mainframes, minicomputers, or networks of personal computers. They must anticipate problems and take preventive actions, as well as solve problems that occur during operations. The duties of computer operators vary with the size of the installation, the type of equipment used, and the policies of the employer.

Generally, operators control the console of either a mainframe computer or a group of minicomputers. Working from operating instructions prepared by the programmers, users, or operations managers, computer operators set controls on the computer and on peripheral devices required to run a particular job.

Computer operators load equipment with tapes, disks, and paper, as needed. While the computer is running- which may be 24 hours a day for large installations- computer operators monitor the control console and respond to operating and computer messages. Messages indicate the individual specifications of each job being run. If an error message occurs, operators must locate and solve the problem or terminate the program

ICT opportunities in market today with their functions

Operators also maintain the log books or operating records, listing each job that is run and events, such as machine malfunctions, that occur during their shift. In addition, computer operators may help programmers and systems analysts test and debug new programs.

As the trend toward networking computers accelerates, a growing number of computer operators are working on personal computers (PCs) and minicomputers. In many offices, factories and other work settings, PCs and minicomputers are connected in networks, often referred to as Local Area Networks (LANs) or multi-user systems. Whereas users in the area operate some of these computers, many require the services of full-time operators. The task performed on PCs and minicomputers are very similar to those performed on large computers.

As organizations continue to look for opportunities to increase productivity, automation is expanding into additional areas of computer operations. Sophisticated software, coupled with robotics, enables a computer to perform many routine tasks formerly done by computer operators. Scheduling, loading and downloading programs, mounting tapes, re-routing messages, and running periodic reports can be done without the invention of an operator. Consequently, those improvements will change what computer operators do in the future. As technology advances, the responsibilities of many computer operators are shifting to areas such as network operations, user support, and database maintenance.

Duties of a computer operator are:

1. Oversee the operations of a computer hardware systems
2. anticipate problems that occur during operations
3. control the console of either a mainframe computer or a group of minicomputers
4. work from the operating instructions prepared by the programmers, users and operations managers
5. set controls on the computer and peripheral devices required to run specific job
6. load equipment with tapes, disks, and paper as needed
7. monitor control console and respond to operating and computer messages
8. maintain log books or operating records, listing each job that is run and events
9. help programmers and system analysts test and debug new programs
10. working on personal computers and minicomputers

Computer Technicians

Computer systems consist of several components such as remote PCs, terminals, tapes and disk storage units, printers and so on. Systems vary in size from desktop systems consisting of a microcomputer, disk drive, and printer to large mainframe systems that occupy entire floors of office buildings and may have terminals in locations miles from the computer. Keeping all the equipment in good working order is the job of a computer technician (sometime called field engineers or customer engineers).

When computer equipment breaks down, technicians locate the cause of failures by running special diagnostic programs that pinpoint malfunctions. Fixing the equipment may take just a few minutes because most repairs merely involve the replacement of malfunctioning components. To correct an electronic problem, for example the technician would replace the circuit board indicated as faulty by the diagnostic program.

Computer technicians also install new equipment. They lay cables, hook up electrical connections between machines, thoroughly test the new equipment, and correct any problems before the customer uses the machine.

ICT opportunities in market today with their functions

At regular intervals, computer technicians service the equipment according to the manufacturer's recommended maintenance schedule. For example, they routinely adjust oil and clean mechanical parts of printers and sorters.

There are also specialized computer technicians who maintain particular brand or type of equipment or system, or in doing a certain type of repair. For example there are the Compaq/HP certified engineers, Microsoft Certified Professionals e.t.c

Duties summary:

1. Keeping all the equipment in good working order
2. Troubleshooting computer hardware and their components.
3. Install new equipment.
4. Upgrading computers and their components.
5. Specialized technicians help hardware engineers in designing and creating some computer components.

System Analyst

Systems analysts solve computer problems and enable computer technology to meet individual needs of an organization. They help an organization to realize the maximum benefit from its investment in equipment, personnel, and business processes. This process may include planning and developing new computer systems or devising ways to apply existing systems' resources to additional operations. They may design new systems, including both hardware and software, or add a new software application to harness more of the computer's power. Most systems analysts work with a specific type system that varies with the type of organization they work for, for example, business, accounting or financial systems, or scientific and engineering system. Some analysts also are referred to as *systems developers* or *systems architects*.

Analysts begin an assignment by discussing the systems problem with the managers and users to determine its exact nature. They define the goals of the system and divide the solutions into individual steps and separate procedures. Analysts use techniques such as structured analysis, data modeling, information engineering, mathematical model building, sampling and so on. They specify the inputs to be accessed by the system; design the processing steps, format the output to meet the user's needs. They also may prepare cost-benefit and return-on-investment analyses to help management decide whether implementing the proposed system will be financially feasible.

Attributes of a good system analyst include:

1. Has a good problem solving skills and creativity
2. Has a good communication skill: able to communicate clearly and precisely both in writing and in speech.
3. Must have business knowledge: he must clearly understand the environment for which the system is being developed.
4. Technical knowledge: must be well trained I relevant fields of computer science.

Duties of a system analyst:

1. They collect, record and analyze details of existing procedures and systems.
2. Develop ideas for a computerized system superior to the existing method in use –*improve system performance*
3. Design system input, file and output requirements
4. Specify checks and controls to be incorporated in conjunction with audit staff.

ICT opportunities in market today with their functions

5. Define actions required to deal with various conditions arising in the system by means of decision tables
6. Specify the structure of computer runs
7. Specify the most appropriate processing techniques for the prevailing circumstances
8. Estimate run timings
9. Prepare computer operating instructions
10. define error messages to be incorporated in the system
11. specify test data to be used for proving programs in conjunction with audit staff and programmers
12. arrange or test runs in conjunction with programming staff
13. document all aspects of the system in a system specification
14. implement parallel operation of old and new systems
15. monitor results
16. maintain system to accord to changing circumstances
17. Communicate with user department, systems staff and programmers as appropriate.

Programmers

Computer programmers write, test and maintain the detailed instructions called programs that computers must follow to perform their functions. They also conceive, design and test logical structures for solving problems by computer. Programs vary widely depending upon the type of information to be accessed or generated. For example, the instructions involved in updating financial records are very different from those required to duplicate conditions on board an aircraft for pilots training in a flight simulator. Although simple programs can be written in a few hours, programs that use complex mathematical formulas, whose solutions can only be approximated, or that draw data from many existing systems, may require years of work. In most cases, several programmers work together as a team under a senior programmer's supervision.

Programmers write programs according to the specifications determined primarily by computer software engineers and system analysts. After the design process is complete, it is the job of the programmer to convert that design into a logical series of instructions that the computer can follow. They then code these instructions in a conventional programming language, such as COBOL; an artificial intelligence language, such as Prolog; or one of the most advanced object-oriented languages such as Java, C++, or Smalltalk. Different programming languages are used depending on the purpose of the program. Programmers generally know more than one programming language; and since many languages are similar, they often can learn new languages relatively easily. In practice, programmers often are referred to by the language they know, such as Java programmers, or the type of function they perform or environment in which they work, such as database programmers, mainframe programmers or Internet programmers.

Programmers are often grouped into two broad types:

- ***Applications programmers*** write programs to handle a specific job, such as a program to track inventory, within an organization. They may also revise existing packaged software.
- ***Systems programmers***, on the other hand, write programs to maintain and control computer systems software, such as operating systems, networking systems, and database systems. These workers make changes in the sets of instructions that determine how the network, workstations, and central processing unit of the system handle the various jobs they have been given and how they communicate with peripheral

ICT opportunities in market today with their functions

equipment, such as terminals, printers, and disk drives. Because of their knowledge of the entire computer system, systems programmers often help applications programmers determine the source of problems that may occur with their programs.

In some small organizations, workers commonly known as ***programmer-analysts*** are responsible for both the systems analysis and the actual programming work.

Duties of a computer programmer are:

1. Write, test and maintain detailed instructions (Develop in-house application programs)
2. Customize commercial application packages to suite the organisations needs.
3. They install, test, debug and maintain programs developed or customized for the organisation.

Software Engineers

Computer software engineers often work as part of a team that designs new hardware, software, and systems. A core team may comprise of engineering, marketing, manufacturing and design people who work together until the product is released. Computer engineers apply the principles and techniques of computer science, engineering, and mathematical analysis to the design, development, testing, and evaluation of the software and systems that enable computers to perform their many applications.

Software engineers can be involved in the design and development of many types of software including software for operating systems, network distribution, and compilers, which convert programs for faster processing. Software engineers must possess strong programming skills, but are more concerned with developing algorithms, analyzing and solving programming problems than with actually writing code.

Computer applications software engineers analyze users' needs and design, create, and modify general computer applications software or specialized utility programs. Different programming languages are used depending on the purpose of the program. The programming languages most often used are Visual Basic, C, C++, and Java, with FORTRAN and COBOL used less commonly. Some software engineers develop both packaged systems and systems software or create customized applications.

Computer systems software engineers co-ordinate the construction and maintenance of a company's computer systems, and plan their future growth. Working with a company, they co-ordinate each department's computer needs, for example, ordering, inventory, billing, and payroll record keeping, and make suggestions about its technical direction. They also might set up the company's intranets, networks that link computers within the organization and ease communication.

Systems software engineers work for companies that configure, implement and install complete computer systems. They may be members of the marketing or sales staff, where they serve as the primary technical resource for sales workers and customers. They also may be involved in product sales and providing their customers with continuing technical support.

Duties summary:

1. They develop system and application software.
2. They develop user and technical documentations for the new software.
3. Maintain and update the software to meet day-to-day requirements while overcoming challenges.

Computer Hardware Engineers

Computer hardware engineers' research, design, develops, and test computer hardware and supervises its manufacture and installation. Hardware refers to computer chips, circuit boards, computer systems, and related equipment such as keyboards, modems, and printers. The work of computer hardware engineers is very similar to that of electronics engineer, but unlike electronics engineer, computer hardware engineer work with computers and computer related equipment exclusively.

In addition to design and development, computer hardware engineers may supervise the manufacturing and installation of computers and computer related equipment. The rapid advances in computer technology are largely a result of the research, development and design efforts of computer hardware engineers.

Growth in embedded systems, a technology that uses computers to control other devices such as appliances or cell phones, increases the demand for computer hardware engineers.

Duties summary:

1. Design and Develop computer components such as storage devices, motherboards and other electronic components.
2. Determine electrical power requirement of each computer component.
3. Re-engineer computer components to enhance its functionality and efficiency.
4. Design and develop engineering and manufacturing computer controlled devices such as robots.

Information Systems Manager

Information systems and data processing managers' plan, staffs, organize, directs, controls and monitors the activities of computerized information systems and electronic data processing departments. Some of the tasks that Information systems managers perform are:

1. Develop and implement policies and procedures for electronic data processing and computer systems operations and development.
2. Meet with clients to discuss data processing or system requirements and specification
3. Analyze information system requirement and performance, and develop and implement new and modified systems
4. Control the budget and expenditures of the department or company
5. Recruit and supervise computer analysts, programmers and other personnel, and oversee their professional development and training.
6. Keeping the department's inventory records up-to-date.
7. Purchase of hardware and other facilities and their management.
8. Assess and evaluate staff performance.
9. In charge of data flow within the department

Database Administrators (DBA)

Database administrators work with database management systems software and determine ways to organize and store data. They determine user requirements, set up computer databases, test and co-ordinate changes. It is the responsibility of an organization's database administrator to ensure performance, understand the platform the

ICT opportunities in market today with their functions

database runs on, and add new users. Because they may also design and implement system security, database administrators often plan and co-ordinate security measures. With the volume of sensitive data generated every second growing rapidly, data integrity, backup and keeping database secure have become an increasingly important aspect of the job for database administrators.

Duties of a Database Administrator are:

1. Determine ways to organize and store data
2. Determine user requirements
3. Set up computer databases
4. Test and co-ordinate changes
5. Plan and co-ordinate security measures.
6. Ensure data integrity, backup, and database security
7. Ensure performance, understand the platform the database is running on
8. Add new users

Computer Trainers

The people who provide training to end-users are generally referred to as computer trainers. Usually computer trainers will be employed by IT training providers who offer training in various application packages.

Most schools provide computer training as part of their curriculum. Universities and colleges also provide numerous degree courses in information technology. However, to acquire training in specific areas such as UNIX administration, Oracle database administration, Microsoft Windows networking, Dreamweaver for web designing and so on, individuals go for short courses. Computer trainers who provide such training are usually people who have worked in the industry and have in-depth knowledge of the product.

There are also institutions that provide basic training on word-processing, spreadsheets and database management using packages such as MS-Office, Lotus SmartSuite e.t.c. Trainers who provide this type of training do not require specialized skills, but need to be well versed with the packages.

Large organizations which have in-house developed applications may also have IT trainers who are responsible for training end-users and writing user documentation.

Duties summary:

1. Train the people on how to use a computer and various application programs.
2. Develop training reference materials.
3. Guide learners on how to acquire knowledge through carrying out research.
4. Advising the learners on the best career opportunities in the field of ICT.
5. Preparing learners for ICT examinations.

Webmasters/ Web administrator

Webmasters are responsible for all technical aspects of a web site, including performance issues such as speed of access, and for approving site content. The webmasters must ensure that the web site is available at all times. They also need to provide statistics on the web site, such as how often the site is accessed, the most frequently visited

ICT opportunities in market today with their functions

pages, keywords used to search the sites, and so on. They would deal with registering the site with search engines to increase the hit rate (number of times a site is visited).

Duties summary:

1. Develop and test websites
2. Maintain, updating and modifying information on the website to meet new demands by users.
3. Monitor the access and use of internet connection by enforcing the security measures.
4. Downloading the information needed by an organisation or institution from the internet websites.
5. Registering the websites with the search engines to increase the hit rate.

Network Administrators

Network administrators are vital to the continued efficiency of computer workstation, network servers, and desktop computers within organizations. In small scale organizations, system managers may also function as local area network (LAN) administrators. In companies with a large organizational structure, and hence a large computer network, the functions of a network manager and the LAN administrator may be designated to different personnel who are both part of management information's systems department.

Among the designated tasks of LAN administrators are the installation of new file servers and workstations, LAN troubleshooting, periodic backups for the servers and the workstations, upgrade of existing software, administration of file and network security and management of electronic mail.

Duties of a Network administrator are:

1. Setup a computer network.
2. Installation of new file servers and workstations
3. LAN troubleshooting
4. Periodic backups for the servers and the workstations
5. Upgrade of existing software
6. Administration of file and network security
7. Management of electronic mail
8. Monitor the use of network resources.

System Administrator

Systems administrators manage the effectiveness of information technology systems, and arrange system maintenance and enhancements to meet user requirements. Some of the tasks that a systems administrator would be responsible for are:

1. Consult with managerial, administrative and technical staff to determine information needs, data flows and system definitions
2. Establish and control system access and security
3. Monitor systems to optimize performance, perform backup and initiate recovery system updates
4. Co-ordinate system updates

ICT opportunities in market today with their functions

5. Provide assistance in testing new equipment and systems
6. Co-ordinate support work and training in system use and access

Graphics designer and typesetters

They design graphical objects and professional publications.

Computer Scientist

Computer scientists work as theorists, researchers, or inventors. Their jobs are distinguished by the higher level of theoretical expertise and innovation they apply to complex problems and the creation or application of new technology. Those employed by the academic institutions work in areas ranging from complexity theory, to hardware, to programming language design. Some work on multidisciplinary projects, such as developing and advancing uses of virtual reality, in human-computer interaction, or in robotics. Their counterparts in private industry work in areas such as applying theory, developing specialized languages or information technologies, or designing programming tools, knowledge-based systems, or even computer games.

Web Designers

The growth of the internet and expansion of the World Wide Web (the geographical portion of the Internet) have generated a variety of occupations related to design, development and maintenance of the Web sites and their servers. Web designers, also called ***Internet developers*** or ***web developers***, are responsible for day-to-day site design and creation. Initially, web pages were static pages with hyperlinks, but as technology has developed, web sites are more interactive with graphics, animations and live links to databases. The increase in e-commerce also provides more challenges to web site creation. Depending on the type and scope of the web site, web designers need a variety of skills such as graphics design, programming and database knowledge.

Computer sales representatives

They need to have good knowledge in information and communication technology to help them analyze customer's needs and advice accordingly. Attributes of a good computer sales representative includes:

1. Has Self confident
2. Is persuasive
3. Is proficient in business communication

Self-employment

This is achieved by using a computer to start personal business like bureau services, internet services, consultancy services and computer hardware and software vendor business.

Further educational opportunities in ICT

Most computer related educational opportunities offered at post-secondary level are relatively new and dynamic in nature. This makes it difficult to update ICT curricula in order to accommodate the rapid changes. These changes also make it difficult for aspiring ICT professionals to identify the best career opportunities and training institutions to join.

ICT courses are offered in the following tertiary institutions:

1. Universities
2. Polytechnics
3. Middle level colleges

Universities

This is the highest institution in formal education. They are categorized into two as:

a. *Private universities*

These are self-sponsored universities that are set up by individuals, churches or any other organisation. They are privately run and student's enrollment depends on whether a student is capable of sponsoring him/herself. For them to operate they need to be registered or accredited by the commission of higher education or any other quality assurance body that is recognized worldwide.

Accreditation means the process of recognizing an institution as being able to offer degrees and diplomas. Examples of private universities include:

- i. Daystar university
- ii. Catholic university
- iii. Kabarak University
- iv. AUSI university
- v. Strathmore university
- vi. Mt. Kenya University
- vii. Baraton university

b. *Public universities*

These are universities established by the state and are run by a state appointed management team. The students are sponsored by the state. Examples of public universities include:

- i. Nairobi university
- ii. Kenyatta university (KU)
- iii. Egerton university
- iv. Jomo Kenyatta University of Agriculture and Technology (JKUAT)
- v. Maseno university
- vi. Masinde Muliro university (MMUST)
- vii. Moi University e.t.c

ICT opportunities in market today with their functions

Universities are authorized to offer approved diploma, undergraduate and post graduate programmes. Some of the ICT related degree programs offered at the university level include:

- i. BSc. Computer science
- ii. BSc. Information Technology
- iii. BSc Information Systems
- iv. BSc. Computer Engineering
- v. Bsc. Computer Networking
- vi. Bsc. Software engineering
- vii. Bsc. Business and Information Technology

ICT related masters programs include:

- i. Msc. Information Systems
- ii. Msc. Information Technology
- iii. Msc. Computer science
- iv. Msc. Hardware engineering

Polytechnics

They are institutions of higher learning that offer diplomas and certificate courses in technical fields such as ICT, mechanics, food production e.t.c. Some polytechnics can be accredited by a university or state to offer degree programmes.

Some of the courses offered by polytechnics include:

1. Diploma in computer studies
2. Diploma in computer repair and assembly
3. Diploma in computer operator
4. Diploma in management information system
5. Diploma in Networking
6. Diploma in Hardware Engineering.
7. Certificate in computer studies
8. Certificate in computer repair and assembly
9. Certificate in computer operator
10. Certificate in management information system

Examples of national polytechnics available include:

- i. Mombasa polytechnic
- ii. Kenya polytechnic
- iii. Kisumu polytechnic
- iv. Eldoret polytechnic

ICT opportunities in market today with their functions

Colleges

Like the polytechnics, they offer certificate, diploma and craft courses in many disciplines as technical, teacher training, business management e.t.c.

The most important consideration to make before joining any college for an ICT course is:

- i. Whether it offers ICT courses recognized both locally and internationally
- ii. The cost of training with such an institution.

Examples of colleges include:

- i. Rift valley of science and technology
- ii. Kaiboi Technical Training Institute
- iii. Thika Institute of science and Technology
- iv. Kiambu institute of science and Technology
- v. Kirinyaga Technical Training Institute
- vi. Nairobi Technical Training Institute
- vii. Kenya Technical Training Institute
- viii. Kenya Science Teachers College
- ix. Machakos Technical Training Institute

Examinations bodies for Higher Diplomas, Diplomas and certificates include:

1. Information Technology Standards Association (ITSA)
2. Institute of Management Information Systems (IMIS)
3. Kenya National Examination Council (KNEC)
4. PITMAN