

# Copyright Law, Engineering and Impact of Technology in an Academic Library

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## **Abstract**

*The major purpose of establishing copyright law is to protect owners of creative work, in which it provides them with monopoly of exploiting their work for any purposes within a stipulated amount of time. Digital technology enables the transmission and use of all these protected materials in digital form over interactive networks. This process allows the conversion of such materials into binary form, which can be transmitted across the internet, and then re-distributed, copied and stored, in perfect digital form. The transmission of text, sound, images, computer programs and audio-visual works such as feature films over the internet is already becoming a cliché, as the technical constraints of narrow bandwidth such as energy, time and capacity to access these works begin to disappear. Today's copyright concern often concentrates on the new digital technologies, especially the internet and its friendly interface, the world wide web and the impact of technology on copyright has been rapid and tremendous and cannot be overemphasized. These new technologies are both promising and potentially harmful to various parties interested in the use and exploitation of works of authority, from books and music to films and web pages. This research focuses on the copyright, engineering and impact of technology in an academic library. This paper looks at how the law of copyright has fared in the face of technological developments or advancements and the impacts which these digital works have on copyright in an academic library and also looked on the role played by an engineer in a library.*

**Keywords:** Copyright Law, Engineering, Academic Library, Impact of Technology

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## **INTRODUCTION**

The purpose of establishing copyright law is to protect owners of creative work, by providing them with the exclusive right of manipulating their work(s) for any purpose within a stipulated amount of time.

Copyright enables the author enjoy the fruit of his/her labor. Copyright law protects a person's work from an annexation and this protection is of immense importance to creators, authors, performers, publishers amongst others [1]. The list of protected works has been expanded with recent technological developments to include computer software, databases and cable and satellite broadcasting. Therefore, in order for one to fully understand the nature and function of copyright, the definition of copyright must be detailed.

Copyright is the right given to an author to prevent others from copying part or all of his work and benefitting from such work in which copyright subsists. Copyright law gives an author, composer, writer, publisher or artist, exclusive right to copy, distribute, or perform and so on depending upon the type of work. Where any person other than the copyright owner exercises these rights or causes any other person to do these acts, without the license or authorization of the copyright owner, such a person is said to have committed copyright infringement [2].

Copyright is the body of law that deals with the ownership and use of works of literature, music and art. The basic purpose of copyright is to enrich our society's wealth of culture and information. The means for doing so is to

grant exclusive rights in the exploitation and marketing of a work as an incentive to those who create it.

The Black's Law Dictionary define copyright as the right to copy; specifically; a property right in an original work of authorship (including literary, musical, dramatic, choreographic, pictorial, graphic, sculptural and architectural works, motion pictures and other audio-visual works; and sound recording) fixed in any tangible medium of expression, giving the holder the exclusive right to reproduce, adapt, distribute, perform and display the work.

Definitions have been given to copyright by different copyright acts around the world but this definitions share a level of similarity as they all grant the author or owner, the exclusive right to manipulate or control their work for a prescribed amount of time. For instance, in the United Kingdom, the copyright, patents and design act defines copyright as a property right and sets out the three main types which it covers; original literary, dramatic, musical and artistic works, sound recording films and broadcast and typographical arrangements of published editions.

The Canadian Copyright Act defines copyright as the sole right to produce or reproduce the work or any substantial part thereof in any material form whatsoever.

The Indian Copyright Act defines copyright as exclusive right to do or authorize the doing of any of the acts stipulated therein [3]. The Nigerian Copyright Act also, even though it does not give a clear definition, sees Copyright as a right to stop or restrain other persons other than the author from doing anything or printing anything that would interfere or infringe the author's work. Nigeria is a country where piracy is prominent; as such the importance of the Law of Copyright cannot be over emphasized. Nigeria Copyright law traces its source to English Law and as such attention should be given to English Law in order to fully understand the evolution of copyright.

## ENGINEERING

Different scholars give various opinions about the term "Engineering", it is seen as the

scientific economic, social and practical knowledge on order to innovate, design, build and improve structures.

Engineering is also seen as the science by which the properties of matter and sources of power in nature are made useful to human. They are made useful to human in structures, machines, products etc. [4].

An engineer is an individual who specializes in one of the branches of engineering. Engineers solve real-world problems using scientific principles from disciplines that include computer science, mathematics, physics, biology and chemistry. It is this variety of subjects as well as the challenge of real problems that makes engineering so interesting and so rewarding [5].

In other view, engineers are seen as people who design, construct and maintain structures, materials and systems while considering the limitations imposed by practicality, regulation, safety and cost [5].

According to Collins English Dictionary, an engineer is a person who uses scientific knowledge to design, construct and maintain engines and machines or structures such as road, railway and bridges [6].

An engineer is a person who repairs mechanical or electrical devices [7].

## Engineers in Library

As library is concerned in this present 21st century, engineers help and assist in carrying out some functions in the library. Engineers assist users in enhancing and updating their knowledge and skills, and also provide information that regards new innovations, views, theories and research. ICT (Information and Communication Technology) are majorly used to collect, store, retrieve and disseminate a great amount of information to help engineering professionals [8].

The systematic collection of data concerning libraries, their activities, operations, staff use and users, at a given time or over a given period, is as a Library Survey. These Library Surveys are conducted to study the existing library conditions, library facilities, personnel

of the library, nature of users and non-users, library services, library resources; to compare the present conditions and desired standards; to make suggestions for their improvement; and to develop library standards [8].

There are lots of discipline in the field of engineering, the engineers generally invent, design, build and produce the products that make up the present-day civilization. The engineers find out the basic and provides necessary solutions to practical problems faced by the society and organizations precisely. Hence, they play a key role in the library development.

### **DIGITAL TECHNOLOGY AND ITS IMPACT**

With the advancement of technology in this 21st century, the world has now become more or less a digital world. Technology has brought together nations and the world has now become a global village. The economy of most nations in the world is accessible through the aid of electronic via the internet. The arrival of Information Communication and Technology (ICT) into many aspects of everyday life has led to the development of the modern concept of the information society. Currently, there are nearly 2 billion internet users and over 5 billion mobile phone connections worldwide. According to a report given by the International Telecommunications Union (ITU), as at 2011, there were more than 45 million internet users in Nigeria, which is 26.5% of the population [5].

We continue to live in information Age—an age where our economy's greatest assets are not steel and coal, but ideas and their practical applications. As a matter of fact, information and Communication Technology (ICT) has played or is playing a major role in making life more comfortable for persons in various fields of life.

The development of digital technology due to technological innovations and advancement unfolds a new opportunity to significantly improve the administration of library services thereby playing a major role in offering solutions to the issue of delay in rendering reference services to the clientele of the library

and also in carrying out the routine of the library [9].

The term “technology” has different definitions proffered by scholars and dictionaries. Technology is derived from the Greek word “Teknologia” (“Tekne” meaning art, skill cunning of hand and “Logia” meaning “logy”, i.e., Study or Science). Technology can be defined as the application of science, especially to industrial or commercial objectives. It is also the scientific method and material used to achieve a commercial or Industrial objective. Another definition considers technology as electronic or digital products and system considered as a group.

Oxford Advanced Learner's Dictionary defines “digital as a system of receiving and sending information as a series of the numbers, one and zero, showing that an electronic signal is there or is not”. Digital technology is primarily used with new physical communications media, such as satellite and fiber optic transmission [10].

Additionally, technology is the application of math, science, engineering, and the arts for the benefit of life as it is known. A current example is the rise of communication technology, which has lessened barriers to human interaction and as a result has helped brood new subcultures; the rise of cyber culture has, at its basis, the development of the internet and the computer. It should however, be noted that not all technology enhances culture in creative way; technology can also help facilitate political oppression and war via tools such as arms and artilleries.

Technological changes and indeed the development of new technologies frequently raise issues concerning the applicability, adequacy and operation of existing norms. Digital technology not only allows copying content, it can also be used for protecting context. Thanks to copy protection and controlled access, impermissible uses can be prevented. The technological breakthrough caused by digitalization has become even greater with the internet [11].

## TECHNOLOGICAL DEVELOPMENT

Technological developments are always creating new possibilities for production and use. What started with the printing press in the 15th century has continued into the 21st century; from the invention of radio and television to the establishment of the internet. Prior to the 1970s books, sound recordings and motion pictures were recording and delivered on traditional media such as paper, magnetic tape, vinyl records. All these changed with digitalization. Digitalization is transforming analogue information such as text, picture and sound into an electronic form which can be saved and edited in any way and without loss of quality [12].

These traditional methods of recording words, pictures, sounds and moving images are termed “analogue” methods because they attempt to preserve a complete correspondence between the information which they intend to represent (be it texts, images or sounds) and the methods by which the information is recorded—the substratum or medium.

By contrast, digital methods do not seek to preserve all the possible variation in the information, usually sounds and images. Instead, sounds and images are sampled at predefined time intervals and granularity, through the use of an analogue-to-digital converter (ADC), and the value of each sample is converted into a binary number—either one or zero.

These 1s and 0s—“bits” as they are known—can be stored on the traditional media, but they are more frequently stored on magnetic, optical—magnetic media. The digitally stored information is then used to reconstruct the original information. In the reconstruction process the bits are either used directly or have to be manipulated, e.g., by way of a digital-to-analogue converter (DAC), to produce the words, sounds or images [13].

While in analogue technology, information is translated into electric pulses of varying amplitude, in digital technology, translation of information is into binary format (zero or one) where each bit is representative of two distinct amplitudes. However, digitalization of work calls for change in the way we perceive and

protect analogue works. The law of copyright has traditionally dealt only with analogue works. In the process, it has built up several fixed ideas and expectations about such works. These are the copyright norms which have to be reviewed, modified or discarded when we deal with digital works [5].

### Digital Works

Digital works are simply technologies that make use of information transmitted by means of discrete values using the binary system—a combination of 1 and 0 rather than at continuous range. Examples of digital works to be discussed in the paper include computer, computer programs, database, photocopier, digital recording, communication technology, satellites, internet and cable [14].

Prior to digital technology, electronic transmission was limited to analogue technology, which conveys data as electronic signals of varying frequency or amplitude that are added to carrier waves of a given frequency [10]. Broadcast and phone transmission has conventionally used analogue technology. Digital was for many centuries a fairly unimportant word. It wasn't until the early 20th century that it became significant and widespread and it did so as direct result of the invention of the modern computer. Digital computers and electronic had been sufficiently inexpensive and compact to become suitable for use in the home [11]. Information gained from digital equivalent, a laser disc could store a film as digital video and digital sound, digital music could be purchased on a CD (Compact disc), and filmless cameras could be used to produce a digital photograph. Almost everything is digital to the point that one need not to use the adjective “digital” to qualify something as it *prima facie* assumed digital [2].

### Computing System

There are a lot of terms used to describe computers. Most of these words imply the size, expected use or capability of the computer. While the term computer can apply to virtually any device that has microprocessor in it, most people think of a computer as a device that receives input from the user through mouse or keyboard, processes it in some fashion and displays the result on a screen. Computer is a device that computes,

mostly a programmable electronic machine that perform high-speed mathematical or logical operations or that assembles, stores, correlates or otherwise processes information [6]. A computer is a general purpose device that can be programmed to carry out a set of arithmetic or logical operations. Computers are subject to various modes of classification. It could be main-frames, mini-computers or microcomputer.

In addition, a computer can also be seen as a machine that is designed to perform operations that are specified with a set of instructions called a Program [15].

Computer hardware refers to the computer equipment, such as the keyboard, the mouse, the terminal, the hard disk, and the printer.

Computer software refers to the programs that describe the steps that we want the computer to perform.

### Computer Hardware

All computers have a common internal organization. The processor is the part of the computer that controls all the other parts. It accepts input values (from a device such as a keyboard) and stores them in the memory. It also interprets the instructions in a computer program. If we want to add two values, the processor will retrieve the values from memory, and send them to the *arithmetic logic unit* (ALU). The ALU performs the addition and the processor then stores the result in memory [11].

The *processing* unit and the ALU use internal memory composed of *read-only memory* (ROM) and *random-access memory* (RAM) in their processing, most data are stored in external memory, or secondary memory, using disk drives that are attached to the processor.

The processor and ALU together are called the central processing unit (CPU). A *microprocessor* is a CPU that is contained in a single integrated-circuit (IC) chip, which contain millions of components in an area smaller than a postage stamp [11].

We usually instruct the computer to write the values that have been computed into a data file or to print the values on the terminal screen or on paper using a printer. The computer can also write information to diskettes, which store the information magnetically or to a writable compact disk (CD) which stores digital information using a process similar to the process used to stamp out LP records. A printed copy of information is called *hardcopy*, and information stored on a disk or CD is called an *electronic copy* or a *soft copy*.

### COMPUTER PROGRAMS AND SOFTWARE

Computer programs are organized list of instructions that, when executed, causes the computer to behave in a predetermined manner. They are set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result. There are system programs and processing programs. System programs are those that control program, which schedules the execution of other programs [16]. Processing programs are those whose execution is controlled by the operating system.

Computer technology plays an increasingly important role in modern society. The defining feature of computers which distinguishes them from all other machines is that they can be programmed. That is, some type of instructions can be given to the computer and it will process them. A computer cannot operate without instructions. The instructions are compressed in to the hardware for instance in the Read Only Memory (known as ROMs), the circuits from which digital information can be retrieved, are often created, reproduced and distributed in media and they are separated from the computer hardware. Computer Program according to the Nigerian Copyright Act is been referred to as “a set of statements or instructions to be used directly in a computer in order to bring about a certain result” [12].

Asein J.O, points out that this definition by the Act is very similar to the definition recommended by the National Commission on New Technology uses of copyright works

established in 1974 by the U.S Congress (CONTU) and adopted in S. 101 of the U.S Copyright Act as amended in 1980 [17].

A computer program is seen in section 51(1) as a set of statements or instructions to be used directly in a computer in order to bring about a certain result. It is made up of several different components, including the source code and object code, the structure, sequence and/or organization of the program, the user interface, and function, or purpose of the program [13].

They are generally either translated into machine code by compiler or an assembler before being run, or translated directly at run time by an interpreter. The form of appearance of the program, which can be on the computer screen or printed out on paper, is normally referred to as the source code. Another form of appearance is the object code, where the program is transferred (“compiled”) into the digital values “0” and “1”.

In this form the program is unintelligible for persons, but it is machine readable, for example from a diskette, and in that form it can be used actually to control the operations of the computer. A computer program is made up of several different components, including the source code and object code, structure, sequence and organization of the program. The source code is regarded and described as the highest level of computer language while the object code is regarded as the lowest level of computer language.

The object code is machine readable and would be unintelligible to human and often comprises of a string of binary numbers like 01101001 where the 0s and 1s represent OFF and ON commands for the machine to obey its sequence thereby enabling the computer to perform its functions [13].

The source code, on the other hand, is human readable and must be translated into object codes for the computer to act upon instructions, since the computer would not understand the source code. Eventually, every program must be translated into a machine language that the computer can understand. This translation is performed with the aid of compilers, interpreters, and assemblers.

Usually the computer hardware and the programs are accompanied by manuals and other support material, prepared by the producer of the program, which provide the necessary instructions and reference materials for more advanced uses of the program. The program and such reference materials and manuals (together with the more technical background material which rest with the producer) are referred to as computer software. The computer software is actually incapable of any precise definition. It is a general term used for digitally stored data such as computer programmers’ and other kinds of information read and written by computers usually in an intangible form [13].

The computer hardware is only as effective as the instructions given to it and these instructions are contained in the computer software. Computer software can also be called computer program as the two are used interchangeably. It consists of series of instructions that tells the hardware of a computer what to do or how to do it. It is used to enable interaction with the program through its user interface. This user interface controls how one enters data, instructions and how information is displayed on the screen. Software is asset of programs, which is designed to perform a well-defined function.

There are two major types of Software:

1. System Software; and
2. Application Software

The System Software generally viewed, is defined as computer software and it is designed to provide services to other software. The System Software manages and mostly operates computer hardware thereby provides a platform for other application software [13]. It can also be said as a set of instructions that serves as an intermediary between computer hardware and application programs. It may be directly manipulated by intelligent and knowledgeable users. System Software always provides with important self-regulatory functions for computer systems, such as loading itself when the computer is turned on, also managing hardware resources such as secondary storage for all applications, and providing commonly used sets of instructions for all applications to use. System Software is the class of programs that controls and support

application software and is usually independent of any specific type of application.

Systems Software includes the operating system and all the utilities that enable the computer to function. The Operating System is a set of programs that coordinates all activities among the computer hardware devices. Examples of operating systems includes: LINUX, MAC OSX, WINDOW XP, WINDOWS 7, WINDOWS 8 and unix. The utility programme, on the other hand, is a type tasks. Examples are: Antivirus, File manager, Screen saver and Diagnostic utility [13].

Application Software, on the other hand which is the second type of software, is a set of computer instructions that provide more specific functionality to a user. That functionality may be broad, such as general word processing, or narrow, such as an organization's payroll program. An application program applies a computer to a certain need.

Application programming is either the creation or the modification and improvement of application software. Application software includes programs that do real work for users like word processors, spreadsheets, email, and database management systems falls under the category of applications software. Examples of application software are Microsoft Word, Microsoft Excel, Outlook Express and Internet Explorer [13].

Application Software is created for users. They manage their specific task to suit their needs like a media player of word processors.

#### Attributes of Good Software

- i. *Maintainability*: Software should be written in such a way that it may evolve to meet the changing needs of customers. This is a critical attribute because software change is an inevitable consequence of a changing business environment.
- ii. *Dependability*: Software dependability has a range of characteristics, including reliability, security and safety. Dependable software should not cause physical or economic damage in the event of system failure.

iii. *Efficiency*: the software describes the programs that run on system. Software is written in a computer language. Software has been efficient and it must be responsive, timely processed, and memory utilized.

iv. *Usability*: Software must be useable, without undue effort, by the type of user for whom it is designed. This means that it should have an appropriate user interface and adequate documentation.

#### Databases

A systematically arranged collection of computer data, structured so that it can be automatically retrieved or manipulated [18]. In addition, a database is a collection of stored integrated data representing the totality of the organization of interest.

A database is a generalized integrated collection of sharable data which is structured on natural data relationships so that it provides all necessary access paths to each unit of data in order to fulfill the different needs to all [18]. From the above definitions, one can deduce the followings:

- i. A database is integrated: This implies that the database captures the totality of the organization for which the database is set up. It involves pooling all the facts from all the departments within the organization together into a common repository. This makes the database also incorporate the concepts of 'private ownership' of data within this generalized system so that a user is not granted access to private data of others.
- ii. A database must be structured on natural relationships: Generally, a database captures not only the real objects, but also their natural attributes which constitute a natural relationship. There exist natural create relationship between objects which provide the access paths that can be used to access units of data entities.

More specifically, a database is an electronic system that allows data to be easily accessed, manipulated and updated. In other words, a database is used by an organization as a method of storing, managing and retrieving information. Modern databases are managed

using a database management system (DBMS) [13].

Databases are structured to facilitate the storage, retrieval, modification and deletion of data in conjunction with various data-processing operations. The Copyright Act does not expressly define database; however, section 51 of the Act classifies written tables or compilations which are an aspect of database as literary work. Databases can be classified according to types of content: bibliographic, full-text, numeric and images [18].

Computer databases on the other hand, are collections of facts, statistics, bibliographic citations, and other information, including complete texts of some copyrighted works. It is usually stored in a computer and could be in form of graphics, reports, scripts, tables, text etc. representing almost every kind of information.

### Photocopier

Today, in almost all countries, such equipment is abundant and very large numbers of copies of literary, dramatic, musical and artistic material are made through the use of reprographic equipment around the world. The development of fast and efficient photocopying machines has benefitted business and government tremendously. It has however, created copyright problems and stimulated changes in existing copyright laws and regulations in the world.

A machine that makes copies of document and other visual images quickly, cheaply in paper and in multiple forms is referred to *photocopier* [19].

### Impact of ICT on Libraries and Librarians

In today's library, technology incorporates two cultures of change: innovation; where the application of technology improves what is currently being done, and transformation, where technology changes "fundamentally what is done, or is applied to new things" [15].

The following are the benefit and impact of technology in Libraries, this depends on the functional areas and how well the library has revised its manual procedures and processes:

- **Improved productivity**—existing staff are able to cope with increased workload or take on additional responsibilities or both. Library staff members generally feel that automation has increased their workload and responsibilities.
- **Reduced staff**—Libraries are able to reduce staffs that are involved with labor-intensive, manual processes with high volumes of activity once the Integrated Library Software (ILS) has been installed. Most Libraries has little or no reduction in the number of overall staff as a result of automation as many has been moved to different places and positions.
- **Reduce unit cost of operation.** The efficiencies that can be achieved with an ILS allow a library to reduce the costs associated with a particular activity. For example OCLC bibliographic utility allows libraries to avoid duplication of effort associated with creating original cataloguing records. This may result in the reduction of professional staff and delegating work to lower—skilled and lower—paid staff.
- **Reduce errors.** Errors in manual system are significantly reduced as majority of systems use barcode scanner to uniquely identify an item.
- **Improve control.** Integrated Library Software allows accurate recording of the status and location of all items so that all users will learn about update information associated with a particular item or record.
- **Improve speed.** Materials are getting on the shelves faster and circulation-related transactions happen quicker.
- **Improve access.** With more desktop workstations available to library staff members, they have access to the latest information about library materials and patrons. They also provide several indexes to the library indexes, for example keyword indexes.
- **Increase range and depth of service.** With some internet accessible ILS system, library customers have access to library's collection 24 h and allow patrons to have access to part of their records. Patrons are no longer constrained to visiting the physical library in order to receive services.



Information technology promise fast retrieval of stored information and revolutionize our concept of the functions of a traditional library and a modern information center. Recently, technological developments have dramatically changed the mode of library operations and services.

Today, Modern ICT is impacting on various aspects of libraries and the information profession. Advancements in ICT and the wide spread use of ICT is resulting in digital information sources and digital media replacing and becoming the dominant form of information storage and retrieval. ICT also survives and makes true rules of Library Science 'every reader his/her book/information', 'Save the time of the reader' [19].

## CONCLUSION

The practicability of copyright law has been considerably challenged and impacted by the advent of internet and digital technologies. Copyright law gives an author, composer, or artist several exclusive rights: copy, publish, distribute, and perform. Make derivation works, etc., depending upon the type of work. Digital technology coupled with the internet, has provided the opportunity to copy and disseminate information in a way that the inventors of the printing press could never have imagined.

The impacts of technology on copyright are numerous and the idea that copyright subsist in a computer program is a welcome development.

Computer generated works are capable of being owned and the idea of authorship and ownership of a computer generated work cannot be treated with levity. This type of work and programs must be generally protected. The impacts which digital technologies and internet have had on copyright as discussed above include; Ease of Access to copyrighted works; Ease of Reproduction of the works; Ease of Dissemination of the work, Ease of Storage and most importantly the Growth of Copyright Infringement and Piracy.

While our current Copyright Laws are not without its merit, they have been rendered limited in the light of Digital Technology, the industry is turning on its head and new business models and channels are the norms. There is a clear and present need for us to bring the Nigeria Copyright Law in line with current realities particularly with the growth of digital technology especially new media, mobile technology and access to the internet.

Libraries are shifting from ownership to access. Online access to journals, newspapers, and other information resources has opened the libraries otherwise limited collection to an utmost limitless set of possibilities.

The impact of technology in academic libraries has been pervasive and significant. The benefits that have resulted are dependent in part—the efficiency of the library before it was automated, how well technology (through automated system) has been integrated into the library's work flows and which functional area within the library is being considered.

Also, the role of an engineer in a library cannot be over emphasized. They play a functional role in the development of a century library.

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