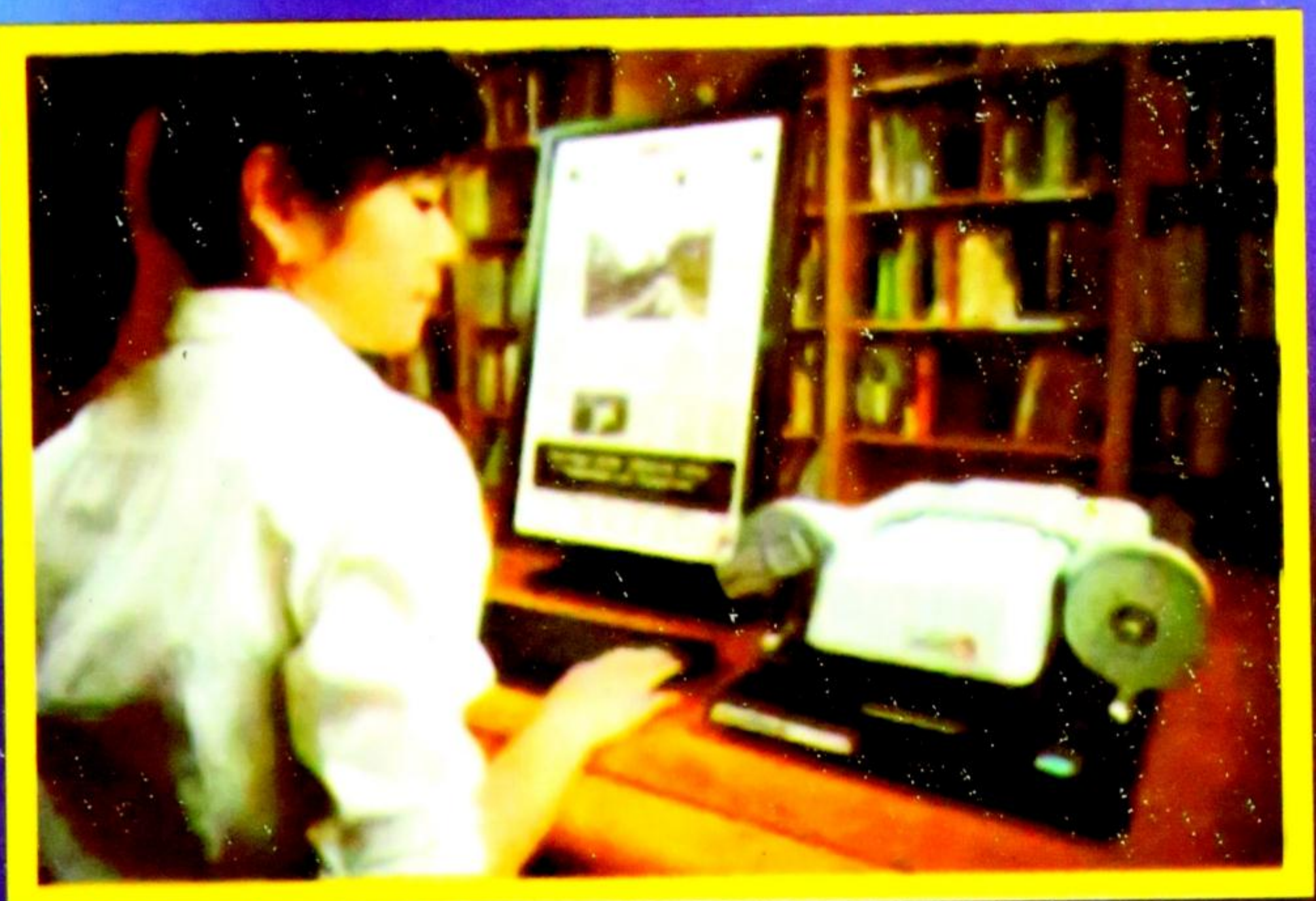


ELEMENTS OF MODERN REPROGRAPHY

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* MULTIMEDIA * LIBRARY DIGITIZATION

ELEMENTS OF MODERN REPROGRAPHY

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DEDICATION

This book is dedicated to the Almighty God, who makes all things possible; the ultimate decider and disposer of affairs.

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PREFACE

Advances in Information Communication Technology (ICT) have continued to impact significantly on all aspects of human endeavours and disciplines. The librarianship profession could not have been an exception to this global trend, having witnessed a phenomenal transformation in its practices and operations, owing to such technological influences. Consequently, the literatures on librarianship, especially research articles by professionals, have dealt with the subject of ICT application to library practices and operations extensively.

However, attention of such writings have remained largely focused on such applications to the library technical services and library routines including book selection and ordering, cataloguing, classification and circulation operations. Conversely, one of the most neglected and least discussed subject matter, over the years in the librarianship literatures, was *Reprography*. And even now that the interest is picked up, only a handful of materials are being written on the application of ICT to Reprography.

For someone who has been teaching different courses in librarianship for two decades now, and has thus developed interests in this area, it is only natural for a yearning gap in this regard to be observed and the impetus to fill it up. This is also similar to the case of the young practitioner, who is interested, especially in the application of ICT to the subject matter of *Reprography*.

These have led to the writing of *Elements of Modern Reprography*. This is with a view to meeting the dire needs of students of librarianship in institutions of higher learning, like the colleges of education, polytechnics, and universities. In addition, practitioners, experts, researchers and others with interests on librarianship in general and reprography in particular, as well as all lovers of knowledge would find *Elements of Modern Reprography*, an indispensably useful companion.

FOREWORD

May I say that I am indeed privileged and honored to have been asked to write the foreword for this *magnum opus*! I do understand that writing a technical book is a difficult task. Looking at the topics and contents of the book, it is a much-needed book for academia and industry. This masterpiece work of art has actually x-rayed reprography (i.e. the process of reproducing, reprinting, or copying graphic materials, especially by mechanical, photographic, or electronic means) in a way it has never been done before.

It started with the authentic historical background of each developmental stage of reprography up to the present day with their merits and demerits, presented a step-by-step process/procedure of how best to perform each operation and achieve the best results, and also itemized latest free software that can be used for optimum output. Not done with, the authors went ahead to identify simple faults and their likely causes and proffered solutions for corrections. In addition, they gave detailed report on general maintenance and safety tips and finally concluded the volume with issues relating to copyright law, including limitations and exceptions.

By working through this course, students and professionals will enhance their skills; both in content as well as their ability to use this technology adequately in the world of work. The undergraduate and postgraduate students who need to type their projects, theses or dissertations, the lecturers who use multimedia/projector/smart boards for

their lectures, the librarians, the journalists, printing press, publishers, all secretaries, etc. need such a book to upgrade the skills and knowledge of the things involved in processing, teaching and research and development activities.

Based on my experience of teaching ICT and Research Methodology at M.Sc. and Ph.D levels over the years, I have no doubt that this book will provide satisfaction and fulfillment to all readers. However, improvements are always possible. I must request the readers to indicate the areas for necessary future improvements and suggestions to the authors so that they can integrate the same in the later editions. Only through you, can we determine the value of the book, which is why we need your comments!

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1

INTRODUCTION

The growth of research and turn out of scientific and non-scientific journals and literatures/publications in various disciplines has been exponential in the last few decades. In spite of the advances in science and technology, which dominate the present information environment, the library still remains a foremost instrument for circulating published information materials in a more organized form. Therefore, reproduction of these materials by the library for the use of its teeming users is inevitable.

This book focuses on reprography in libraries by providing a background approach of the concept as considered as appropriate. Considering the fact that reprography constitutes parts of essential library services, it is ideal to start by identifying and tracing its place in the overall library operations.

Libraries, irrespective of types or the community of users they serve, are primarily concerned with the provision of unrestricted access to organized information and knowledge that are necessary and useful for the development of mankind and the expansion of the present frontiers of knowledge. Libraries are institutions that are responsible for the collections, organizations, storage, preservation, retrieval and dissemination of information materials (printed and non-printed) for use, together with trained and qualified personnel managing such institution. A modern library is regarded as a service institution, which allows open access to its collections and provides services to its users (Kumar, 2009).

Despite the increasing adoption of new technologies, which has continued to impact tremendously on the principle and practice of librarianship, the library had maintained its primary role of providing undeniable access to reliable information at all times. Thus, libraries adopt the technology of the day to enhance the provision of this primary function with a view to maximally satisfying its numerous and diverse users.

Types of Library Collections

For a library to function effectively and provide relevant services, it stocks various information resources or collections, which include:

- Fictions (story books).
- Juvenile (materials for babies and young children).
- Non-fictions/monograph (textbooks on various subjects).
- Reference collections (encyclopedias, atlases, dictionaries, yearbooks etc).
- Serial collections (newspapers, journals, newsletters, magazines etc).

Library collections can broadly be categorized into three forms namely:

Printed Materials: These refer to library materials that are printed with ink. Examples of printed materials are monographs/books, magazines, posters, newspapers etc. Note that not all printed materials are classified as book. For example, newspapers are printed materials, but are not classified as books in the library.

Non-printed Materials: These are category of library materials that are not printed with ink. Materials that fall under this category are mostly (but not all) non-book materials. Examples are Braille books, microforms, audio visual materials etc

Electronic/Digital Materials: These are library materials in digital or electronic format, e.g. e-books, e-journals, digital images, documents or musical files in digital formats etc

Library Functions

Libraries exist to perform certain basic functions, which include:

- Provision of timely and accessible information to users
- Acquisitions, organization and circulation of information resources that meet the economic, political and social needs of the users.
- Preservation and storage of cultural heritage of the community it serves.
- Provision of recreational services.
- Provision of information resources and facilities that aid life-long independent learning.

Library Services

Libraries provide certain services, which may vary according to the type or nature of library:

- Information Services
- Current Awareness Services (CAS)
- Selective Dissemination of Information (SDI)
- Lending Services
- Circulation Services
- Document Delivery/Inter-Library Loan Services/Resource Sharing
- Publication of Current Contents
- Extension Services
- Literature Search
- Translation Services
- CD-ROM/Database Search
- Reference Service/Referral Service
- Displays and Exhibitions
- Recreational Services
- User Education
- Information Repackaging
- Indexing, Abstracting and Bibliographic Services
- Computer/Information Technology Services
- Reprographic Services

Compartmentalization of Library Activities

For the library to fulfill its core mandate of providing access to organized information to its diverse users, library operations are distributed among various departments and/or units of the library. Functions provided by each of these sections/units are complementary. Hence, a lapse from a section/unit affects the overall library functions or activities and impedes the library from actualizing its goals, either in part or in whole.

An ideal library will definitely contain, at least, three departments, with various sections/units under various departments. However, there is no hard and fast rule as to the exact classification and designation of these sections/units under the departments as this will depend, largely, on the in-house policy of the library.

Various department/sections/units in the library are:

Administrative Department/Section
This is the department or section that is concerned with the day-to-day smooth running of the library; and especially those activities relating mostly with the staff and financial activities of the library.

Technical Services Department
This department is saddled with all activities that are indirectly concerned with the library users. Because of the nature of the routines being performed in this department, it is usually tagged "behind-the-scene", and strictly out of bound to library users.
Sections/units that may be found under this department include:

- Acquisitions
- Cataloguing and Classification
- Bindery
- Audio-visual Section

Readers' Services Department
Unlike the technical services department, this department is concerned with all activities that are directly concerned with the library users; accounting for why its activities are opened to and accessible to library users. Sections/units under this department include:

- Circulation Section
- Reference Section

- Serial Section
- Computer Unit
- Research/Documentation Unit
- Security Unit
- Children/Juvenile Section (mostly in public libraries)
- Audio-visual (AV) Section
- Reprography Unit: This unit is responsible for the reproduction of various library information resources purposely to:
  (a) enhance the library information service delivery;
  (b) enhance circulation of library materials; and
  (c) maximize users' satisfaction level.

2

REPROGRAPHY

Introduction

On timely basis, library users embark on research with only a handful of information at their disposal to satisfy their information needs or accomplish a given task. Therefore, concerted efforts are made by individual library user to reproduce or copy any relevant information that may be available in the library. Similarly, the library is not left out in this kind of activities of duplicating library materials for enhancing effective service delivery. This practice is termed "reprography". Today, reprography is very instrumental in the process of transmission of knowledge through library resources and services. It also helps in the preservation of information resources from total loss.

As an information professional, one is involved daily in reprographic decision making as to: how to repackage information gathered from various sources, in a format requested by the user; how to send a piece of information to a remote library user over the Internet; how to conserve the intellectual contents on a deteriorated or "dead media" from total loss; how to convert paper-based materials to digital format; how to conserve storage space and still maintain the needed records; as well as the legal implications of copying, reproducing and duplicating information materials by the library.

This book will address itself to these issues by providing information about the various reprographic processes and equipment available, the criteria for choosing a reprographic method, influence of modern technology on reprography and how to finish reprographic products.

What is Reprography?

Before an attempt is made to define the term "reprography", it is necessary to trace the etymological root of the word. It has its root in the Greek word "*graphia*" or "*graphy*", which means to scratch, write, record, draw, describe, that which is written or described. Reprography could therefore be simply seen as reproducing, copying or duplicating that which is written or described. In the library context, the written or described medium could be substituted with information materials.

According to Zonghe (n.d.), reprography refers to all means of copying and duplicating, which include the use of automated typewriting, phototypesetting, facsimile, and micrographic systems, as well as basic copying and duplicating systems. It is a vital subsystem of an organization's information system because it involves the reproduction of all types of handwritten and printed documents, including charts, drawings and photographs.

World Intellectual Property Organization (WIPO) (2004) describes reprography as "the generic term which is now used to describe all kinds of processes currently available, which enable facsimile copies of documents of every kind to be made instantly and cheaply on apparatus that is simple to operate." He added that such equipment is ubiquitous in almost all countries, and very large numbers of copies of literary, dramatic, musical and artistic materials are made through the use of reprographic equipment around the world.

Reitz (2004) and Krishnamuthy (2005) also give a more explicit

definition of reprography as a generic term, which encompasses quick service reproduction (in facsimile) or copying of documents of all kinds by any process such as photography, microphotography, xerography and photo duplication, excluding large scale-professional printing. It then follows that reprography only entails small-scale reproduction of documents or graphic materials, with exception to large-scale printing, using large professional equipment with professional expertise.

Microsoft Encarta (2009) simply defines reprography as the reproduction of something printed, e.g. by offset printing, microfilming, photography, or xerography. The Freedictionary (2012) gives a rather vivid definition of reprography as the process of reproducing, reprinting or copying **graphic** materials especially by mechanical, photographic or electronic means. International Federation of Library Association (IFLA) (2012) on the other hand gives a rather concise, but precise definition of reprography as the science, technology and practice of documents reproduction. This definition is all-encompassing as it dissects reprography to identify its facets, which covers the study, the skills and knowledge involved in the practice and process of reproducing any kinds of documents.

The International Federation of Reproduction Rights Organizations (IFRRO) (2012), views reprography as "a form of reproduction, i.e. the duplication of a work", pointing out that it is a process that usually results in a copy on a graphic surface by certain processes such as: small-scale printing, photocopying, microfilming or by digital means such as scanning, digital copying on CDs and DVDs and electronic databases.

From the various, but similar, definitions above, it is therefore necessary to note that reprography in the library deals with the processes and skills involved in reproducing, copying or duplicating of any kind of (graphic) information materials in the library by means such as mechanical, electrical, photographic or digital; e.g.

photocopying/xerography, photography, small-scale office printing, scanning, digital copying on CDs or DVDs, micro copying or any other means available. Reprography is the process of duplicating, copying or reproducing library materials through photographic, electronic, mechanical or digital means with the aim of increasing access to circulated information or securing intellectual contents of library materials from permanent loss resulting from theft, mutilation or deterioration.

Modern reprographics have depended so heavily on the use of computer and ICTs that there is hardly a component of the system that has not been affected by the digital revolution. This justifies a digital copying or reproduction process that has been introduced into the definition. Though, in principle, the reprographic process remains almost the same, but in practice, a lot have changed about it. ICT has permeated evenly into the process of copying or reproducing information materials, which has given wider room for efficiency than was previously recorded with the manual system.

Library materials that could be reproduced include microforms, serials, reference materials, manuscripts, archives and records, maps, patents, posters, monographs, library catalogues, trade lists, publishers' catalogues, architectural/engineering blue prints as well as digital resources like e-books, e- journals, digital files/documents, and digital images.

The Need for Reprography in the Library

Provision of reprographic services in the library arises as a result of the need to enhance circulation of, and accessibility to research publications and other literature between libraries and their users and among libraries. Similarly, increase in publication turn-out, due to information explosion and the need to circulate such information to users in a precise and useable format for non-restricted usage, necessitated reprographic services in the library. In an ideal modern library that places emphasis on users' satisfaction, offering

reprographic services is inevitable. This is necessary to establish effective information service delivery, which in turn, maximizes users' satisfaction level on the use of library collections and services.

The nature of 21st century library users has changed considerably from what it used to be, few decades ago. The 21st Century library users need open access to information that best and directly gratify their information needs, placing newer and complicated challenges on librarians and information Professionals to assume newer roles and equally function as information consultants and managers. It is therefore incumbent on library and information centers to reproduce and repackage information and deliver such to both physical and remote (faceless) patrons of the library/information center. In developing economies like Nigeria, where budgetary/financial allocation to libraries are grossly inadequate, offering reprographic services is part of the key efforts to boost the internally generated revenue (IGR) of the library.

Relevance of Reprography to Library Functions

As discussed earlier in Chapter One, libraries, irrespective of their kinds, exist to perform some functions, primary of which is the provision of access to organized information for use. Reprography is very instrumental in the circulation of recorded knowledge in the library in the following ways:

- Reprography assists in reproducing, duplicating or copying library information resources to enhance dissemination of information on a large-scale to the library users and among cooperating libraries through document delivery and resource sharing.
- It assists in the reproduction or duplication of library catalogue records, which facilitates multiple accesses to the cataloguing entries by the users.
- Reprography is also relevant in the preservation of library

materials. As conservation and preservation constitute parts of library functions, reproducing certain valuable library materials such as records, archives and rare manuscripts, facilitates permanence of such documents, as the originals could be well preserved, while the duplicates are being circulated for use.

- Reproducing certain library materials assist in conserving physical space in the library. Reproducing bulky materials such as encyclopedias and backlogs of newspapers into microforms assist greatly in saving space as these kinds of materials take a lot of library space.
- Reprography also assists in guiding against losing library's rare, expensive and valuable collections to theft and mutilation. By reproducing such important library collections, the library would be able to secure the original copy.
- Reprography assists greatly in digitizing of library materials. Digitizing is necessary in the library to convert library materials usually from paper forms to digital formats for easy circulation and accessibility.

Importance of Reprography to Library Services

Reprography is exceptionally imperative in the provision of basic library services. It should be noted that certain library services depend so heavily on reprography that it would be difficult, if not impossible, to render such services without reprographic aids. Reference service, information repackaging, document delivery service and selective dissemination of information are some of the services that require heavy reprographic aids.

- Effective and functioning reprographic services in the library increases users' satisfaction level and equally promote effective library services delivery. This is evident as information needed by users could be made available to them as at when needed and in required format.
- Reprography service is also imperative in providing

reference services, especially in Reference libraries (i.e. libraries that do not loan out their collections to users). Having access to reproduce or duplicate materials such as reference collections is necessary as such materials are not to be loaned or taken beyond the reference section of the library.

- Reprography is necessary in securing valuable library collections as copies could be reproduced to serve the purpose of the original document thereby securing the original materials from stealing, mishandling and disintegration.
- Offering reprographic services in the library is another means of generating fund, internally. This becomes necessary as a result of under-funding that characterized libraries in developing countries resulting from dwindling national economy. However, reprographic services could be complemented with other services such as book binding, comb/ring binding, document lamination etc.
- Reprography is necessary in enhancing services such as document delivery and resource sharing among cooperating libraries. It gives library the opportunity to replicate documents to deliver to clienteles or shared with other libraries.
- Reprography equally improves the use of library resources as reproducing library materials enables users to have round-the-clock access to such materials, while the original remains with the library. It enables the users to take the duplicated copy out of the library premises and use it anywhere outside the walls of the library.
- Reprography enhances multiple accessibilities to library materials. In case of materials with limited copies, library can duplicate such to enable multiple users have access to such materials simultaneously; and to remove the bottleneck of waiting for a user to get through with the material before another user can access it.

- Reprography assists in the circulation of scholarly and research materials. Since library is an instrument for circulating scholarly and research publications, duplicating such materials enables researchers and information users to gain wider access to materials that aid the development of knowledge. Reprography increases the dissemination of created knowledge.

Constraints to Effective Reprographic Services in the Library

The followings are the major constraints to effective reprographic services in libraries, with special attention to developing countries:

- Copyright law
- Irregular power supply
- Lack of maintenance culture
- Inadequate maintenance/repair personnel
- Exorbitant cost of reprographic equipment
- Dwindling library budget
- Frequent technological changes

3

HISTORICAL DEVELOPMENT OF REPROGRAPHY

Reprography is a very old concept in library and information centres. It was originally intended to cover document reproduction techniques by photography namely: microfilming, Photostatting and contact copying with silver-halide papers. Reprography has since metamorphosed into a wide range of methods, materials, processes and equipment used for document reproduction. Reprography is now seen as an integral part of the process of conveying recorded knowledge to end users.

Singh and Garg (2002) point out that since the development of writing, the desirability for copying and duplicating information has dominated man's effort. In response to this, a number of copying and duplicating techniques were developed. These include: photography by L. G. M. Dagurre and W. H. F. Talbold in 1849; photostat by Abbe Rena Griffin in 1900; photocopying/xerographing by Chester F. Carlson in 1937; Micrography around 1939; typewriter, silver halide, diazo method, and electrofax around 1954.

Duplicating machines were the antecedents of the modern reprographic technology. These were mostly mechanical devices developed as part of the second phase of the Industrial Revolution, which started in the 18th century. The birth of duplicating machines and typewriter gradually changed the nature and practice of office work. Before the late 18th century, hand copying of letters and documents by clerks were prominent. Offices had to employ the services of clerks (copyists and scribes) to hand-

copy letters. This system was dominant for most part of the 19th century. The development of mechanical duplicators such as polygraphs, letter-copying presses, hectographs, mimeographs, spirit duplicators and offset duplicators play a pivotal role in molding and reshaping the reprographic world.

Letter copying press was patented by James Watt in 1780 and was popularly used around the time. An oiled paper is placed between the master and layers of dampened tissues on which the copy is to be made. A master could be used to make up to 50 copies. Polygraph was developed around 17th century but became much popular around 1800. In 1803, Hawkins and Peak patented polygraph in United States of America. Polygraph is a device that enables a writer to make a duplicate of a document simultaneously as the original is being written by moving a second pen parallel to the one held by the writer. Hectograph was introduced around 1876. This was a reprography process technology in which a dye-soaked master copy was laid on top of a cake pan containing gelatin. Copy paper could then be laid on top of the gelatin to transfer the image.

Mimeograph/stencil duplicator: This was invented by Albert Dick in 1884. This reprographic technology used waxed-paper "stencils" that pen or typewriter could cut through. Each stencil would be wrapped around the drum of the machine. The black and odour-less inks used for printing were forced out through the marks that were cut on the stencil with pen or typewriter. Special knives were initially developed for cutting through the stencil, but this was later developed to facilitate the use of typewriters to prepare masters.

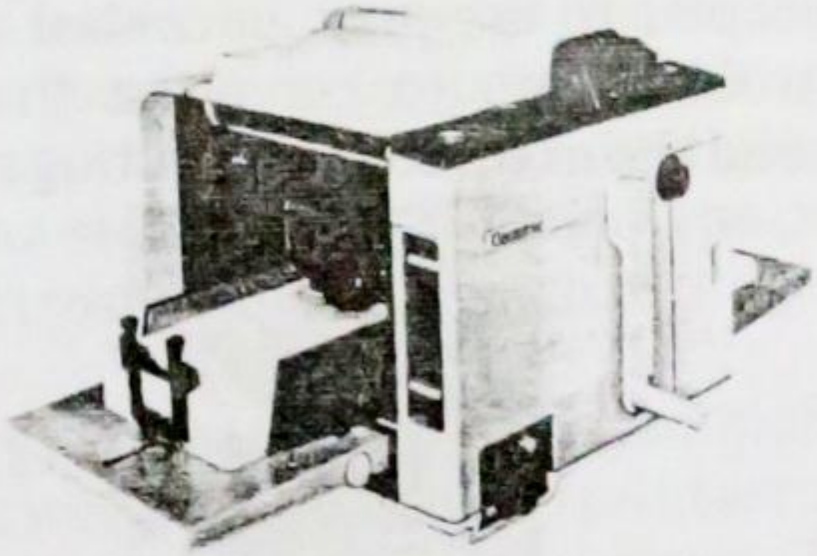


Fig. 3.1: A Stencil Duplicator: Gestetner 1566 Duplicator

Spirit duplicators, also known as Ditto Machine, were sold for commercial use by Ditto Inc. from around 1910. This machine used double-ply "ditto masters" or spirit maters. While the top sheet could be typed or written upon, the second layer was coated with coloured wax. The pressure of the impression made on the top sheet transferred the coloured wax on the second sheet,onto the back side of the top sheet, forming a mirror image. While the waxed sheet is removed and discarded, the top sheet would be mounted on the machine's drum with the back side facing outside. The master then transfers the image to copy papers that are already moistened with spirit (methyl alcohol).

Offset duplicators was discovered by an American Printer- Ira W. Rubelin 1904. Offset duplicator woks on the principle that water and oil do not mix. Offset is a form of lithographic printing. The process works by transferring ink from a lithographic surface (plate) to an intermediate moistened rubber/blanket and then offset to paper. The output product is usually of high quality and could be used for multi-coloured printing and can handle small, medium or large scale printing as the case may be.

Electro-fax was first developed in early 1950s at the Radio Cooperation of America. Copies were made on specially coated paper with liquid toner. The copy paper is coated with a zinc oxide powder. The machine was popularly used between 1950's-1980's. Images are directly formed on the copy paper, rather than first on the drum; unlike in xerography. Thus, electro-fax could be regarded as the immediate antecedent of xerography.

Xerography (or electro-photography), a photocopying technique that was developed in 1938 by a U.S. Physicist-Chester F. Carlson- with Xerox 914. It was the first photocopier to use plain uncoated copy paper. This copying process was less troublesome to complete than the spirit duplicator because it did not need the extra step of creating a spirit master.



Fig. 3.2: Chester F. Carlson

In this 1965 photo, Carlson enacts his 1938 experiment in which he wrote "10-22-38 ASTORIA" with india ink on a glass slide. The room was darkened and a zinc plate, covered with sulphur, was rubbed vigorously with a handkerchief to apply an electrostatic charge. He put the slide on the plate, exposed it to light for a few seconds, removed the slide and sprinkled lycopodium powder on the plate. He gently blew off the loose powder and what remained was the first electrophotographic copy. After Xerox became very successful, Carlson was showered with honors and wealth. He died in 1968 in New York.



Fig. 3.3: The Model A Xerox Copier

Xerography became available for commercial use by 1950's after it was patented in 1942. "Xerography" means a dry photocopying technique which has its root from the Greek words "Xeros" and "graphia" meaning "dry writing". Xerographic process is based on the principle of photoconductivity-a process involving an increment of certain photo-conductive substances (such as selenium), which permit the flow of an electric current through them when struck by light. Xerography uses no liquid chemicals, unlike electro-fax and cyanotype processes. Xerography process combines electrostatic printing with photography.

Xerographic technology is now commonly used globally in most modern office photocopiers as well as laser and LED printers; and it is the standard for office and small-scale reprographic copying. The first commercial automatic photocopiers were developed in 1960 by Haloid/ Xerox. Xerographic machines capable of duplicating coloured materials became

available in the 1970s.

Copyflo, another copying machine was developed in the late 1950s. This machine has the capacity to reproduce enlarged images from microfilm and has demonstrated that it is absolutely possible to reproduce or duplicate a book within few minutes. Copyflo is primarily instrumental in copying of out-of-print books.

The arrival of Computer Output Microfilm in the 1960s marked a turning point in the process of compact storage of archival records. Previously, the maximum reduction ratio was 24, but thanks to the COM process reduction ratios could be 48. The reduction ratio of 48x made it possible to fit over 2, 270 images on one microfiche card and over 4000 images on a 16mm microfilm. Ultra-fiche was created in 1962, although they are still rare. Ultra-fiche has reduction ratios of 150x and can store up to 3,200 images on a card. Some rolls of film with high reduction ratios can hold over 20,000 images.



Fig. 3.4: One of the earliest computer output microfilm processors.

Digital duplicator was introduced around 1986 by RISO Kagaku Corporation. This duplicating process, known as Risograph, was an improvement on the basic mimeograph technology. It uses stencil master, ink and drum but the whole processes are fully automated. The stencil master is produced with a scanner and thermal print head. A single master is capable of printing between 4000-5000 copies.

Digital breakthrough in the area of information and communication technologies, that characterized the late 20th and the early 21st Centuries, has led to the development of several sophisticated digital duplicating or copying technology, which has greatly revolutionized the reprographic industry. Today, libraries, information centres, business organizations and offices could copy, scan and print several documents in required formats, faster, easier and more conveniently than ever. All with a single machine that combines all these essential features into a single apparatus; such as All- in- One or Multi-function Printer.

Also, several improvements have been introduced to digital photocopiers, such as the ability to print on both sides without manual interruption. Advanced functions have equally been introduced. These include: automatic production of preset numbers of copy, scanning and printing function, sorting and collation, stapling, punching of holes, hot glue binding; among others. This has welcomed the birth of a new and modernized reprographic era.

4

BASIC REPROGRAPHIC PROCESSES (I)

Introduction

There are different reprographic processes that have been developed and used for several decades. However, technological advancement has greatly improved on these processes, especially with the introduction of various digital copying processes. The basic types of reprographic process that will be considered in this chapter are:

- Photocopying/xerography
- Duplicating/printing
- Micrographics
- Digital copying/duplication

The flowchart below summarizes the basic reprographic processes as discussed in this text.

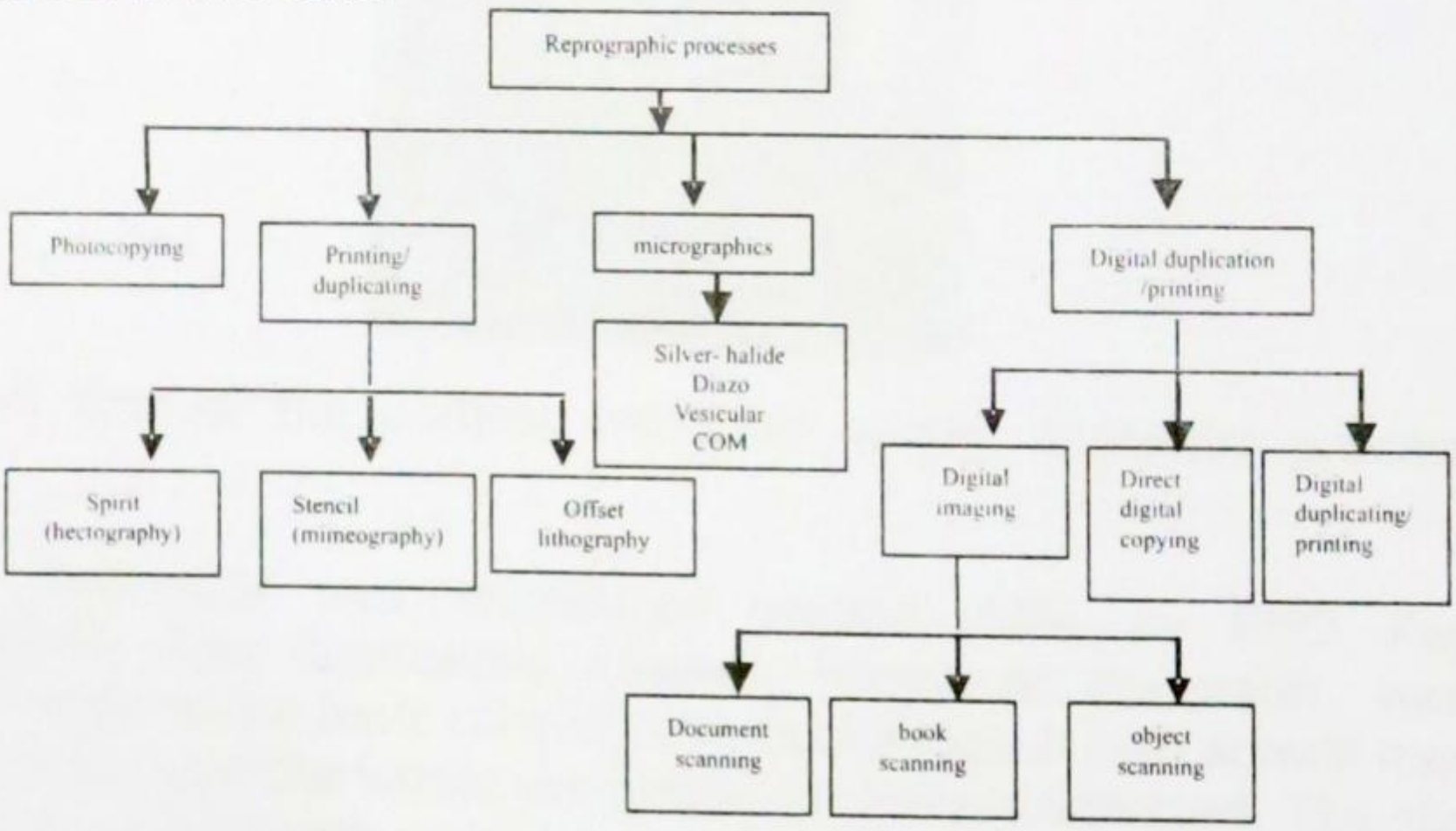


Fig 4.1: Reprographic Processes

Photocopying (Xerography Process)

The processes involved in xerographic photocopying are a combination of various complex electrical, chemical, physical, photographic and mechanical procedures. Photocopiers that use xerography contain either an organic photoconductor drum coated with organic substances such as zinc-oxide or cadmium sulfide; or aluminum drum coated with layers of selenium or silicon. The Xerox selenium drum was originally used until IBM alternatively developed organic photoconductor that uses organic compounds. However, these processes are summarized and simplified below:

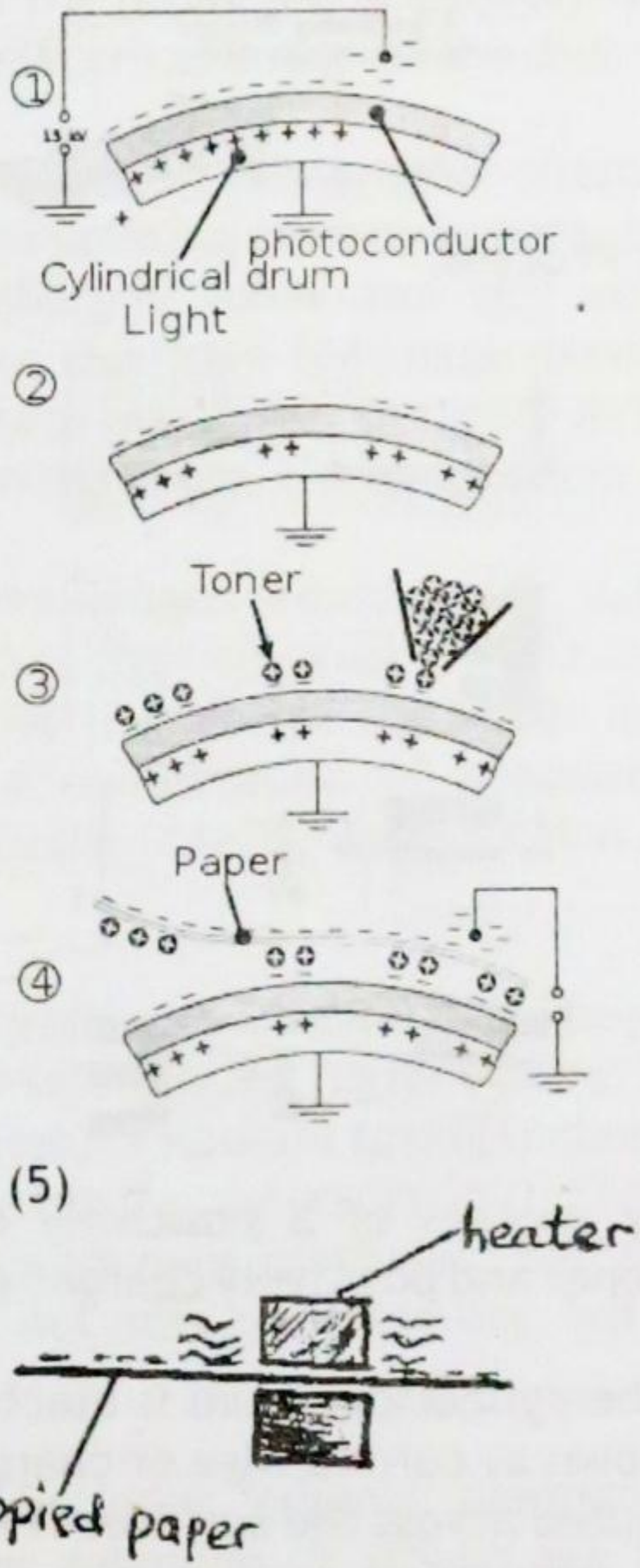


Fig. 4.2. Schematic overview of the xerographic photocopying process

using an organic photoconductor drum, which is negatively charged, uses a positively charged toner and negatively charged copy paper.

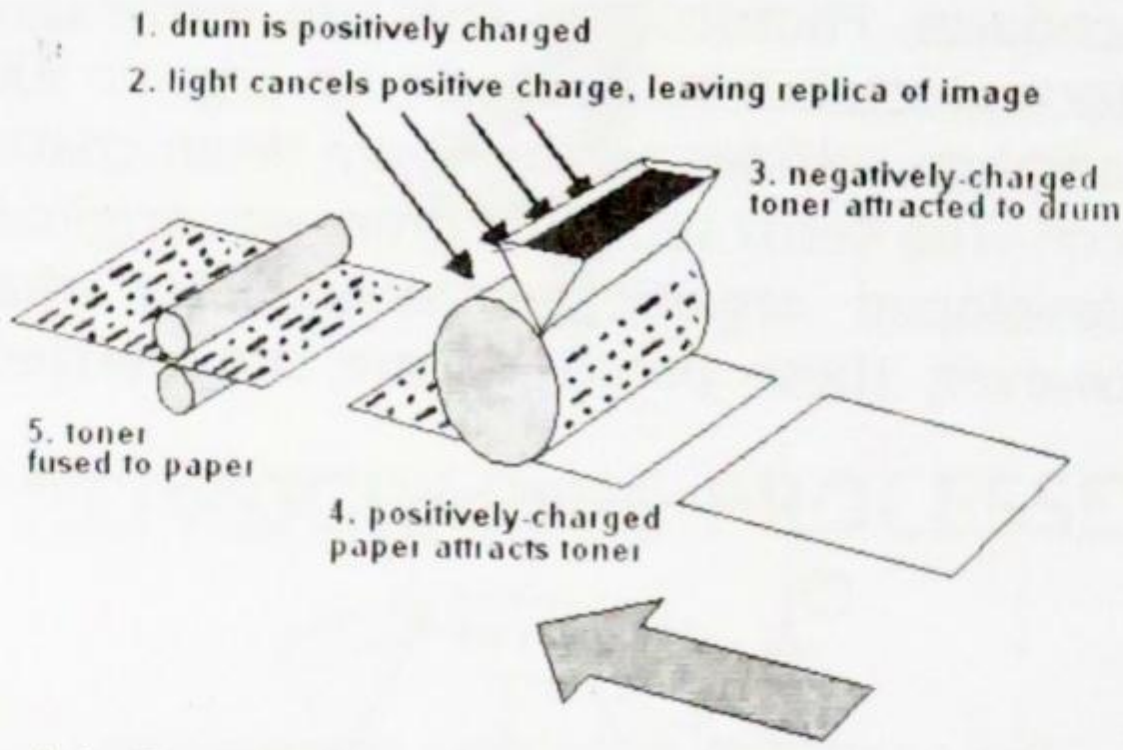


Fig 4.3: Xerographic Process

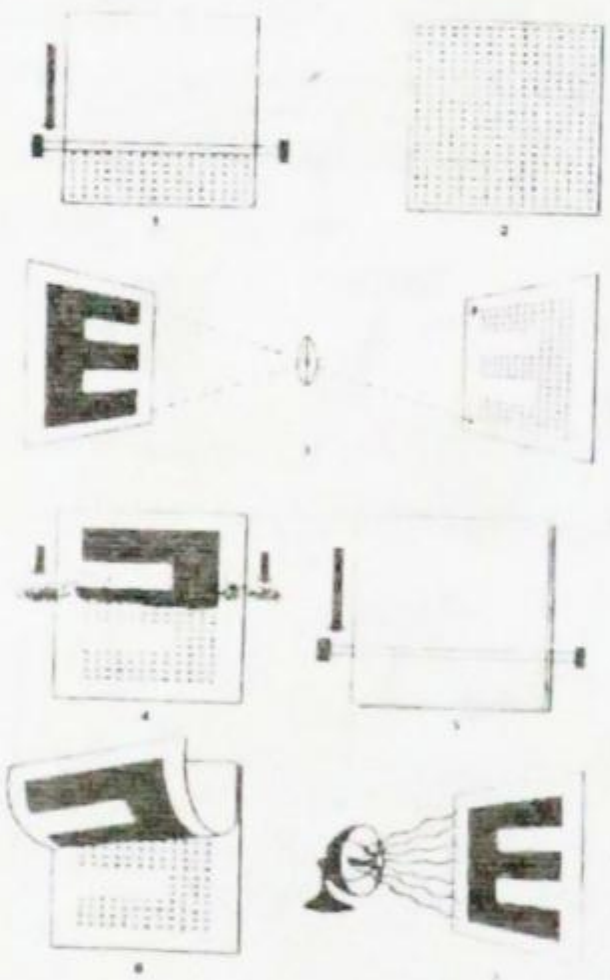


Fig 4.4: Xerography process of a positively charged selenium drum, negatively charged toner and positively charged paper.

Step 1: Charging: The cylindrical drum is electrostatically charged by a high voltage wire known as corona wire or charge roller. Up to -600 volts are uniformly distributed across the surface. The photoconductor drum is coated with organic compounds such as zinc-oxide or cadmium sulfide, which becomes conductive when exposed to light. An organic drum is usually negatively charged.

Step 2: Exposure: The master or original document to be copied is placed face down on the glass platen and illuminated from below by a bright lamp. The white areas of the original document reflect the light onto the surface of the photoconductive/electrostatic drum through the combinations of lenses and mirrors (additional lenses with different focal lengths are used for enlarging or reducing the projected image). The corresponding white areas that are exposed to light become conductive on the drum and the charge will be dissipated or grounded. The corresponding black areas (containing texts or images) of the original document remain unlit on the drum and negatively charged. This results into formation of a latent electrical image on the drum surface.

Step 3: Developing/Development: Xerographic photocopiers use "toner" (a kind of black powder) for printing on copy papers. A negatively charged drum uses a positively charged toner and vice versa. The positively charged toner is applied to the drum for image development. The black areas on the drum (i.e. areas negatively charged) in Step 2 attract toner and form a visible image on the drum. The toner sticks to these areas.

Step 4: Transfer: the toner image formed on the surface of the drum is transferred from the drum to the copy paper, which has a higher negative charge than the drum. The transfer of the toner image onto the copy paper is facilitated by a combination of pressure and electrostatic attraction. The paper takes the polarity opposite that of the toner, but the same with the drum.

Step 5: Fusing: The toner image transferred onto the paper from the drum is permanently bonded or fused to the paper by heat and pressure rollers (also known as Hot Roll Fuser) or Radiant fusing technology known as Oven Fuser (i.e. heating mechanism through radiation). That is why copy papers are warm when emerged from copy machines. Without fusing, the toner image on the paper will not stay permanently, but wiped off when in contact with anything.

The copying processes between organic photoconductor drum and aluminum drum that uses selenium or silicon are the same. The only difference is in their polarity. Organic photoconductor drum is negatively charged and uses positive toner and negatively charged copy paper, while aluminum drum that uses selenium or silicon is positively charged and it

uses negatively charged toner and positively charged copy paper.

NOTE:

- Drum and paper adopt uniform polarity
- Polarity of toner is opposite that of the drum and paper
- White areas (where there is no image/text) on original or master reflect light onto the drum and corresponding parts are illuminated on the drum
- Dark areas (where there is image or texts) are not illuminated and corresponding areas are not exposed to light on the drum
- The white exposed/illuminated areas on the drum become conductive and the charges are dissipated
- The dark areas are not illuminated, resulting into formation of latent image on the drum.
- The dark areas on the drum that are not illuminated attract toner
- The toner image is transferred to the copy paper and bonded/ fused by heat.

Duplicating/Printing

There are three basic systems of duplicating/printing commonly used for reprographic activities namely:

- Spirit (Hectograph)
- Stencil (Mimeograph)
- Offset-lithography

It should be noted that while these systems have relative operational and cost advantages, and are still in use today; they are promptly overtaken by technological advancement and various improvement have been carried out on them for efficiency.

Spirit Duplicating Process: Also known as direct fluid duplicating/fluid hectograph, this is a form of hectograph that has been in use since late 1920's (Rhodes and Streeter, 1999). According to Owen (2004) "the spirit duplicator was an improvement to the gelatin hectograph process that was previously in use. The gelatin pad was replaced by a waxed-paper master sheet, and the ink was replaced by a form of carbon paper, which made distinctively purple impressions on the master"

The spirit duplicating process is based on the principle "that a heavy

deposit of carbon can gradually be softened by contact with a spirit solvent ..." (Hampshire, 1975). Gardiner (1968) expresses that "Spirit duplicating (hectography) is a process whereby the texts or images are typed or written with the aid of an alcohol soluble dye-carbon, which is transferred to the (copy) paper in a number of copies".

To use this process of duplicating, a spirit master has to be created. A spirit master can be created by any of these steps:

- hand drawing;
- printing;
- writing;
- stamping;
- keying on a typewriter; or
- on a thermal photocopier.

Doss (1955) stressed that masters should be made on hectographic master paper and copies should be made on hectograph paper to get the best result of quality print. The spirit master is a two ply sheet. The writing, drawing or typing is done on the top ply, while the second sheet has a heavy deposit of coloured wax (carbon), which is transferred to the back of the top sheet forming a mirror image of the written, drawn or typed text/image on the original. Thereafter, the second sheet would be removed and discarded. The top sheet would then be mounted onto the drum of the spirit duplicator with the back side facing out.

As the copy paper is fed into the duplicator, it is dampened/moistened with spirit by the damping/*moistening roller* or *moistening pad* (see Figures 4.5 and 4.6) just before it comes in contact with the master already mounted on the cylinder. The cylinder/drum transfers the reverse image to the copy paper, which now appears right-reading on the paper.

"The spirit in the name refers to methyl alcohol, a small amount of which was applied to each sheet of copy paper as it entered the machine, dampening it just enough to dissolve a bit of the waxy purple ink (aniline dye) from the master, which was attached to a rotating drum" (Owen, 2004). "To make copies, the master is placed on the drum or cylinder with the inked side up. Rotation of the drum causes a sheet of paper to be moistened with *spirit* as the paper is depressed against the master, thus transferring a small amount of the dye to the paper" (Doss, 1955). The

spirit solvent softens the carbon on the master mounted on the cylinder/drum causing it to transfer a very thin layer of the carbon to the copy paper while the spirit solvent evaporates quickly.

One could print up to 300-500 copies on a single spirit master, depending on the thickness of the carbon deposit on the master and the level of the solvent/fluid application. The spirit solvent has to be correctly regulated as it should not be too much or too little as weak or unclear copies would be produced. Similarly, too much pressure applied to the pressure roller will produce very sharp and clear impression on the copy paper but reduces the number of copies produced, and vice versa.

One major advantage of the spirit duplicating process is that it is possible to have a multi-coloured output/print-out, with a single impression. This depends on the colours of the carbons used in creating the master as it is possible to change carbons during the preparation of the master. It then follows that the final duplicated image could be similarly coloured. The major disadvantage of the spirit duplicating process is the use of carbon, which makes the hand dirty and the time in preparing the master, especially a multi-colour master where different coloured carbon papers have to be changed severally during the process.

Types of Spirit Duplicators

There are basically two types of spirit duplicators namely:

I) The Pad type
II) The Roller type

However, both types could be hand/manually or electrically operated.

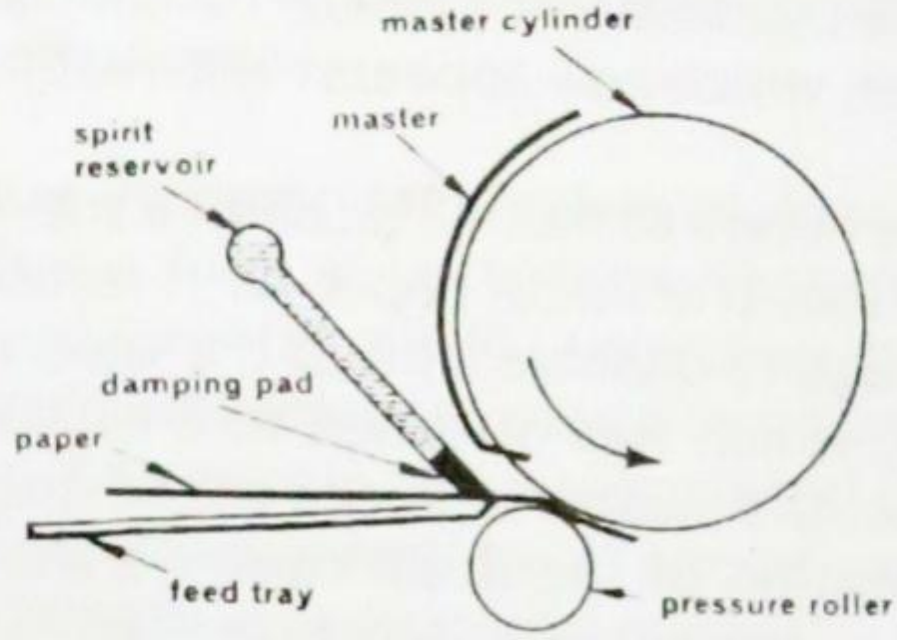


Fig 4.5 Spirit duplicator (Pad type)

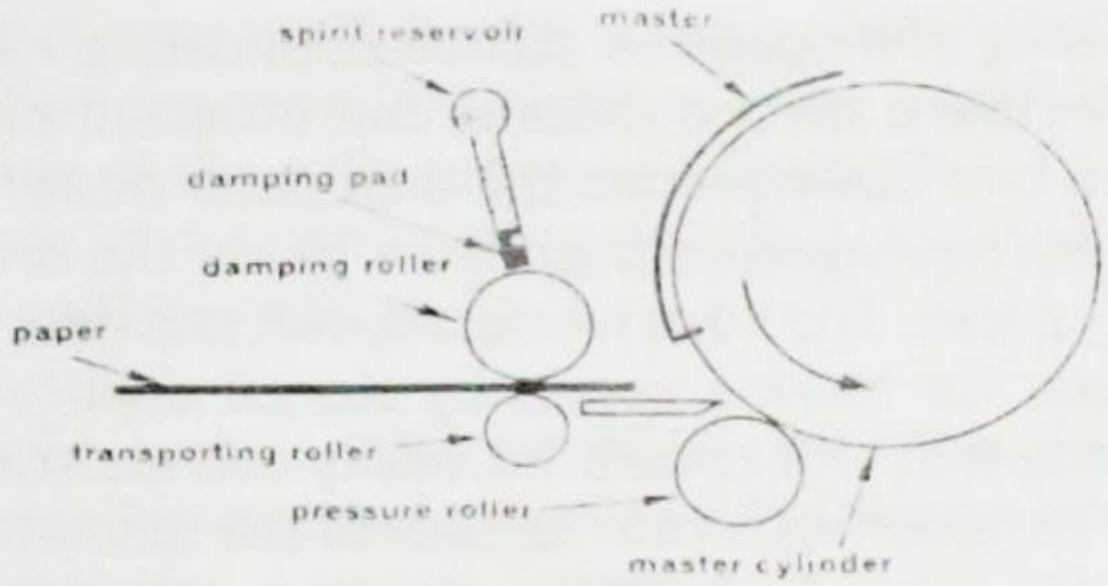


Fig. 4.6: Spirit Duplicator (Roller type)

Stencil Duplicating Process: This is a form of mimeograph, considered as the most widely used of the duplicating processes (Hampshire, 1975), and very useful and efficient in small copying. In this process, stencils are cut, through which ink can ooze/pass through. Stencils are made from a strong fibrous tissue coated on one side with a sealing compound that will prevent the passage of ink through the tissue. "In this process, a stencil is prepared on a thin, open-fibred paper coated with a waxy substance and Ink is forced through the stencil to print multiple copies on paper" (Peace Corps, 1989).

There are two basic steps involved in stencil duplication:
1) **Preparing the Stencil**: This could be done through any of the following ways:

a) Direct typing on the typewriter with the typewriter ribbon removed to prevent nothing coming between the key and stencil.
b) One can also write or draw directly on the stencil. However, stylus or ball point pen and backing sheet from stencil and duplicator manufacturers must be used. This method is the most appropriate for ruling tables and underlining as using typewriter for such would cut the stencil into pieces.
c) Electronic stencil writer or thermal printer (where stencils are required from existing copies). These are ideal for making special stencils from drawings or combinations of drawings and typing.

2) **Making the Copies:** To make copies with a simple silk-screen or portable duplicator, the stencil is taped to the screen and a paste duplicating ink is

rolled across the surface with a soft rubber roller.

For enhanced quality and speed, a stencil duplicating machine is ideal. This machine looks like a spirit duplicator but different in operation. The stencil is mounted face down around the duplicator drum/cylinder, which contain ink. The ink squeezed through from inside the drum through the stencil to the copy paper. The ink is oil-based, soft and does not dry quickly. However, the paper for making copies by stencil duplication must have soft, porous surface that will absorb ink easily and assist drying at a rate fast enough to avoid ink set-off onto the back of the following sheet.

There are two systems of inking that could be adopted in using stencil duplicating machines:

a) The capillary drum method
b) The twin cylinder

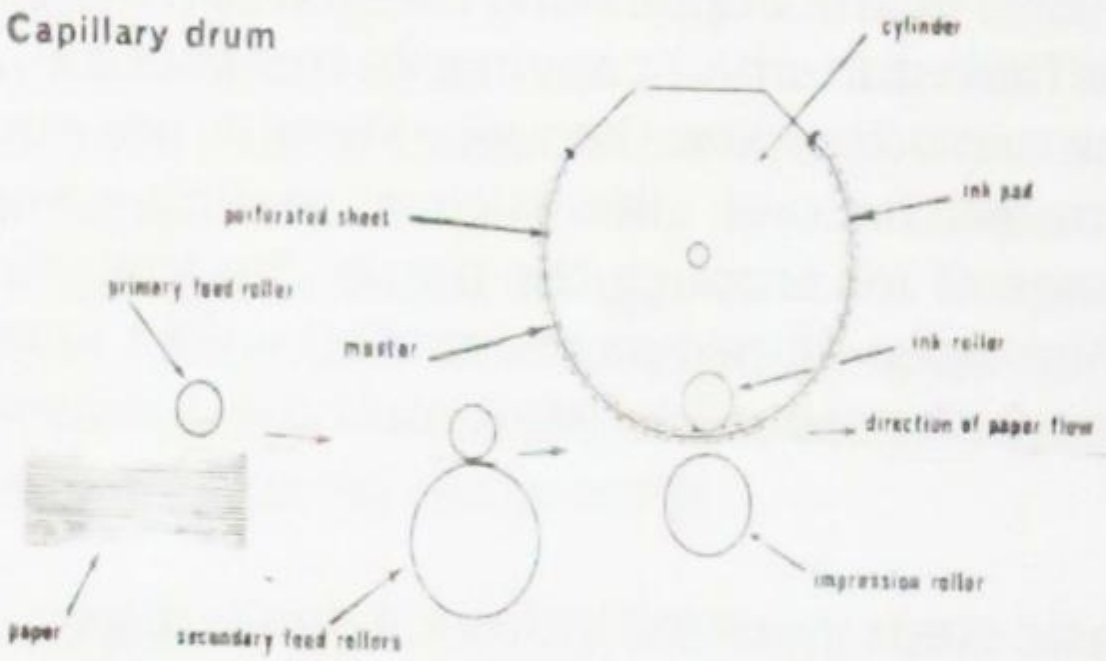


Fig 4.7: Capillary Drum

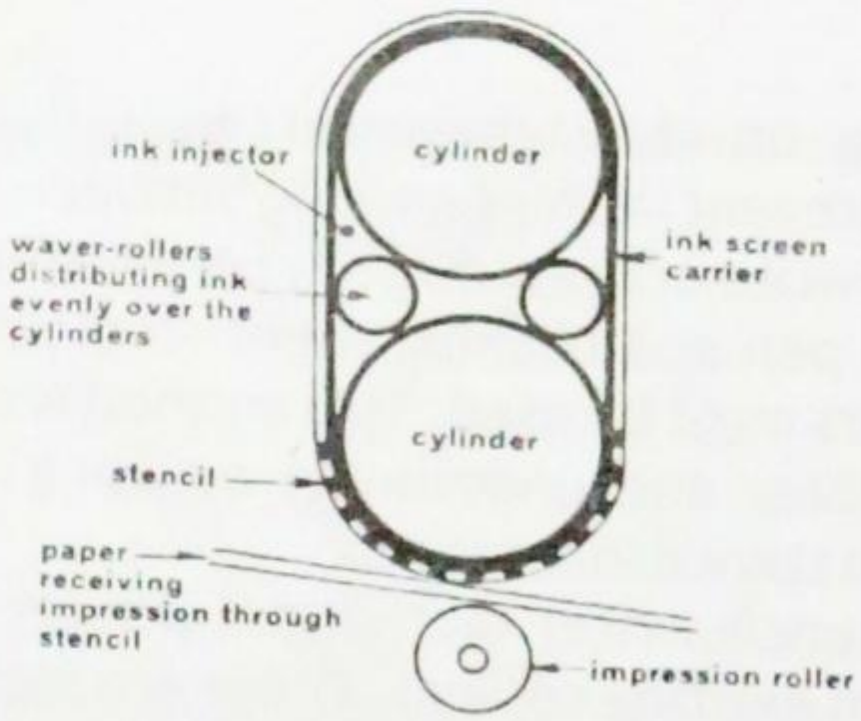


Fig.4.8: Twin Cylinder

In the capillary drum method, the drum is a form of perforated cylinder covered with absorbent cloth or silk screen, which contains the ink and the ink roller. When the cylinder rotates, the ink contained in the cylinder spread over inside of the cylinder by a centrifugal force. This causes the ink to squeeze out of the perforations through the stencil master onto the copy paper by a capillary action.

The twin-cylinder system offers better ink control because of the presence of oscillating (waver) roller that distributes ink evenly over the outside of the cylinder. A carrier screen that holds the stencil revolves round the twin cylinders located above and below the ink injectors. The ink injectors release ink, which squeezed through the ink screen and stencil onto the copy paper.

Offset Lithography (Photo Offset/Offset Printing)

This is a lithographic printing/duplicating process widely used around the world for printing books, magazines, newspapers etc. it is used for small, medium or high volume jobs. This printing process works on the principle that water and oil do not mix. The image is transferred (off-set) from a lithographic master (plate) to an intermediate rubber "blanket" and then to the copy paper (Rouse, 2010).

Water and ink are passed to the master roller and then offset to the intermediate rubber cylinder, and then to the copy paper. "As the master cylinder rotates, the ink is transferred by light pressure from the image areas of the master to the blanket cylinder, and (then) to the paper as it is fed between the blanket and the impression cylinder" (Hampshire, 1975).

Offset lithography is a process used for printing on a flat surface, using printing plates. The plate can be made of a variety of materials, but usually aluminum or metal. It is chemically treated so that the image areas, such as type, colours, shapes, attract oil-based inks and the wet non-image areas repel the oil-based inks (Bann, 2006; Seton Hall University, 2012).

Wisegeek (2003) explains that the "offset in the name refers to the fact that the ink is transferred to a separate surface-rubber *blanket*-before being applied to the paper". Therefore, the plate does not come in direct contact with the paper.

Types of Offset-litho Press

There are basically two types of litho press:

- **The table top model**: Used for simple, small (reprographic) and middle-scale duplicating.
- **The free-standing model:** Usually reserved for complex, large scale professional printing.

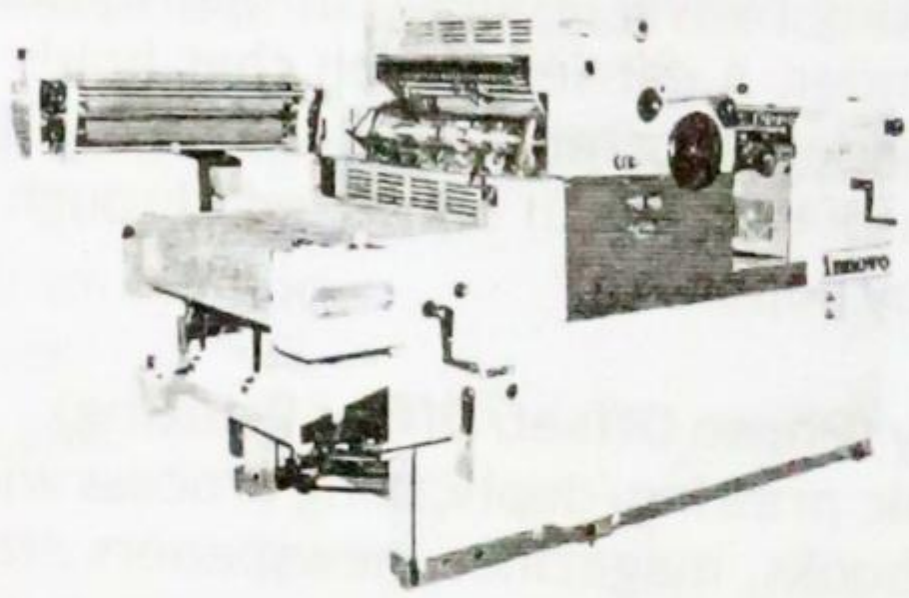


Fig:4.10: Free-standing Offset Press

However, the press may be **sheet fed** or **web-fed**

- **Sheet-fed press**: In this type of press, the papers are fed individually into the machine. The pages can be pre-cut into the final publication size or trimmed after printing.
- **Web-fed press:** Large rolls of paper are fed into the machine and the individual pages are separated and trimmed after printing.

"Sheet fed is popular for small and medium-sized job while web-fed is considered for high volume publications such as newspaper printing" (Rouse, 2010).

Steps in Offset-litho Duplication/Printing

- **Copy Preparation:** Artwork can be produced using word processing or graphic design software such as MSWord, Coreldraw, Adobe Pagemaker etc. Computer is now widely used for this process. It can be used for typesetting, image or graphic settings and general page layout. Pictures, diagrams or illustrations could be scanned using any type of scanner or transferred directly from a digital camera or smart phone onto the computer for editing and setting.

- **Offset Master:** An image setter is used to produce films (negative or positive form the prepared copy) from the step above. The film is then used to produce a printing plate (master) through a photochemical process. The plates are made by creating a film negative and positive of the copy image, and placing it over a photo-sensitive plate, exposing it to ultra violet- light in a light box with vacuum lids. Developer fluids are wiped over the surface of the plate and excess is later rinsed off with water. The non-image areas on the plate absorb water while the image areas attract the oil-based ink.

A single plate is made for one colour printing while in multi-colour printing, separate plate is made for each of the colours.



Fig 4.11: Artwork, film and plate

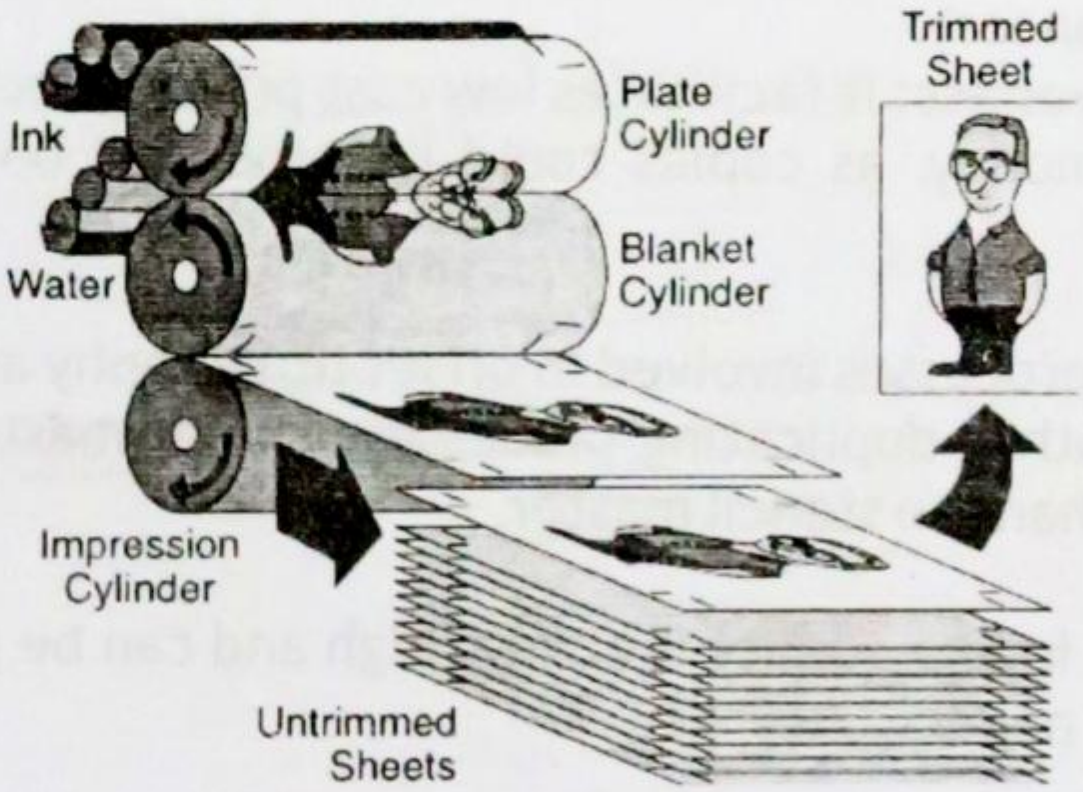


Fig: 4.12: Offset Litho Process

- **Printing/Impression:** The plate is then mounted onto the plate cylinder of the press. "The plate is kept moist throughout the printing process so that ink only applied to image areas. The ink first transfer (offset) to a rubber surfaced blanket cylinder, then to the printing media, usually paper" (Selton Hall University, 2012). The intermediate rubber blanket serves two major purposes, namely:
  (a) to protect the flexible aluminum/metal plate; and
  (b) to conform evenly to the surface of the printing media (paper, nylon, cloth, plastic, metal, wood) for quality printing.
- **Finishing:** After the printing is done, the printed sheets are collated, folded (creasing), trimmed and bonded. See **Chapter 13** of this text for details on various forms of boo'' binding.

Advantages of Offset Litho

Offset lithographic process is considerably used world-wide in reprographic operations. The reasons attributed to this by Hampshire (1975) and Wisegeek (2003) include the following:

Speed: Offset litho process is very fast in handling printing.

Efficiency: It is a very productive process, limiting resources wastage (man-power and finances).

Cheap/Cost Effectiveness: It facilitates low cost printing technique, and it does not waste money, as copies could be produced on cheap, yet quality papers.

Ease of Usage: The processes involved in offset lithography are relatively easy compared to other duplicating processes. Offset master (plate) is also easy to create than the stencil master.

Image Quality: The image quality is always high and can be produced on cheaper and quality papers.

Versatility: Copies could be printed on paper, cardboards, plastics, clothes, nylon etc because of the presence of the intermediate rubber *blanket* cylinder that conforms well with the texture of the printing

media.

Disadvantages of Offset-litho

- The press uses electricity to function. Therefore irregular power supply may hinder its usage.
- Creating copy (artwork) and master (plate) is a technical process, and consume time.
- Cost of procuring and maintaining equipment is high.

Difference between Printing and Duplication Processes

The difference between printing and duplicating are as follow:

Printing	Duplicating
Large- scale professional job	Small-scale reprographic job
It entails a very complex process such as setting image tone in multi colour printing	It requires very simple process usually one colour job
The goal is after high quality product output	The goal is not usually after high quality product output
It requires more of high professional skills and experience	It does not require high skill, experience or professionalism

5

BASIC REPROGRAPHIC PROCESS (II)

Micrographics

Information materials come in various formats and sizes. There is an attendant need by the library to preserve the recorded information contained in any type of medium and to make them readily available for use; now and in the future. To this end, several methods are being devised to ensure the longevity of recorded knowledge or information; putting into consideration space conservation and cost-effectiveness, among others. One of the veritable methods that was developed and has been in use for several decades is the use of photographic aid to convert books into a miniaturized or compact film format, which in turn will require a magnifying device for viewing. This process is known as micrographics.

Micrographics, also known as micro-copying, micro-reading, microfilming is a photographic or electronic process of reproducing printed or other graphic materials in a miniaturized size, which can then be re-enlarged by an optical reading apparatus for reading or reproduction. Micrographics deal with the production of microform and the preparation of enlarged copies from these forms. A microform is any form or type of film or paper containing micro photographic images. These images are small photographs where the details of the subject may not be visible without enlargement. Because these images are often similar to the film used in movie projectors, microforms are generally referred to as "microfilm"(Zonghe, n.d.).

According to Reitz (2004), micrographics is a generic term for the

techniques used to photographically reduce text or graphic images to a size too small to be read by the human eye. It could only be read with the aid of magnifying devices designed for that purpose. He stresses further that this process is usually for the purpose of preservation or compact storage, such as conversion of newspapers and periodicals' back files from print to microfilm or microfiche. Similarly, Iwhiwhu and Akporhonour (2009) describes micrographics as a series of activities, which record images onto a reduced format, high resolution photographic film in a manner that ensures their reproduction, retrieval and preservation.

The Need for Microfilming

There are basically two major reasons for microfilming library records, namely: for space saving and security or preservation. Microfilming for space saving is inevitable when library runs out of physical storage space. Library materials accumulate over a period of time, especially bulky materials such as reference collections or back issues of newspapers and journals. Microfilming is also considered for safeguarding the recorded knowledge contained in library materials. This is necessary for securing and protecting valuable records (such as historical records) that must be kept permanently or for many years by the library.

Alabama Department of Archives and History (ADAH) (2002) suggests that microfilm copies that serve the security purpose or back-up must be stored off-site as this would guarantee that if fire, flood, or other disaster strikes the library's offices, its records/information would not be lost.

Microforms (microfilm or microfiche) are very popular for their longevity. They are relatively stable and can last for up to 500 years, if quality polyester film is used, processed and stored according to International Standards. Apart from their relative longevity, they are relatively stable in technology, unlike digital imaging storage system that are subjected to constant migration due to instability or constant technological changes. Therefore, one of the major focuses of microfilming is to ensure indefinite permanence of recorded knowledge, especially archival materials. This is in addition to saving of storage space for bulky materials like reference and serial collections.

There is a set of clearly defined, accepted standards for microfilm. The International Organization for Standardization (ISO), the American

National Standards Institute (ANSI) and the Association for Image and Information Management (AIIM) have produced standards for both its creation and for its long-term preservation. Silver-halide microfilm that meets these standards has a life expectancy rating of 500 years (LE-500). Figure 5.1 shows the results for life expectancy rate of some information storage media as tested by International Standards. Silver-halide (preservation) microfilm has the highest LE rating, provided it is filmed and preserved accordingly.

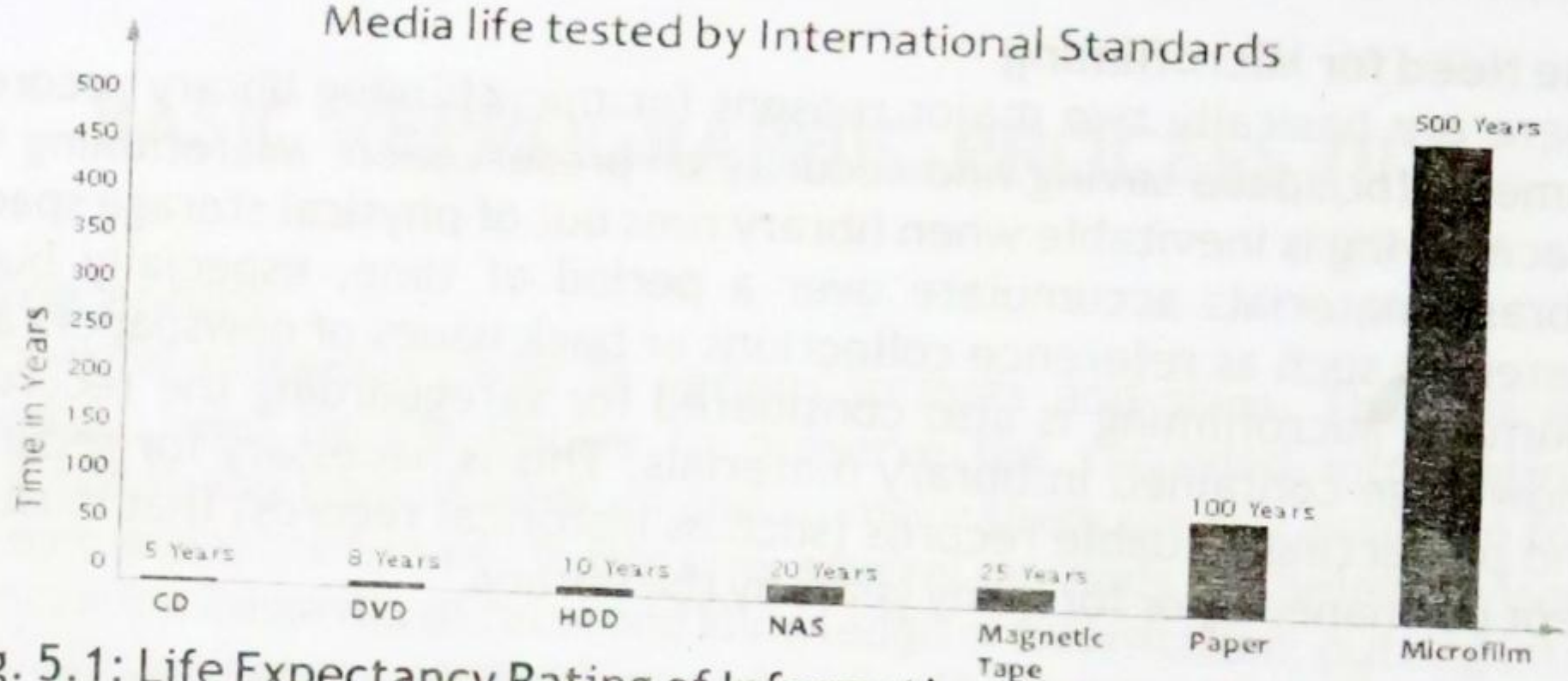


Fig. 5.1: Life Expectancy Rating of Information Storage Media

Hampshire (1975) points out that modern microfilming has transcended from a means of photographing documents to a reduced size negatives for safe keeping (in a reduced space) into providing easy and speedy access to images, which are now being put into active usage in business, technical and commercial aspects. Though, modern microfilming still focuses on space saving of records, emphasis is on speed of retrieval, referencing (indexing/keyword); as these are perhaps the major factors of modern microfilming systems.

Serials and reference materials constitute larger number of library materials that are usually microfilmed; due to the large physical storage space they occupy due to their bulkiness. Serial collections such as newspapers and magazines are acquired daily or at regular intervals into the library, in addition to trade and scientific journals that have accumulated over a period of time. Therefore, microfilming these kinds of materials provide durable, extremely compact and easy accessibility to the materials.

Uses of Microform

Microform storage can be used for:

- Any document of Size - A4, A3 & A2
- Books
- Government Records
- Manuals & Documents
- Manuscripts
- Bank Records
- Library/Information Centre Records
- Journals
- Theses
- Newspapers
- Research and Development Records
- Medical Research
- Maps
- Historical Records
- Archival Films and Videos

Formats of Microfilms

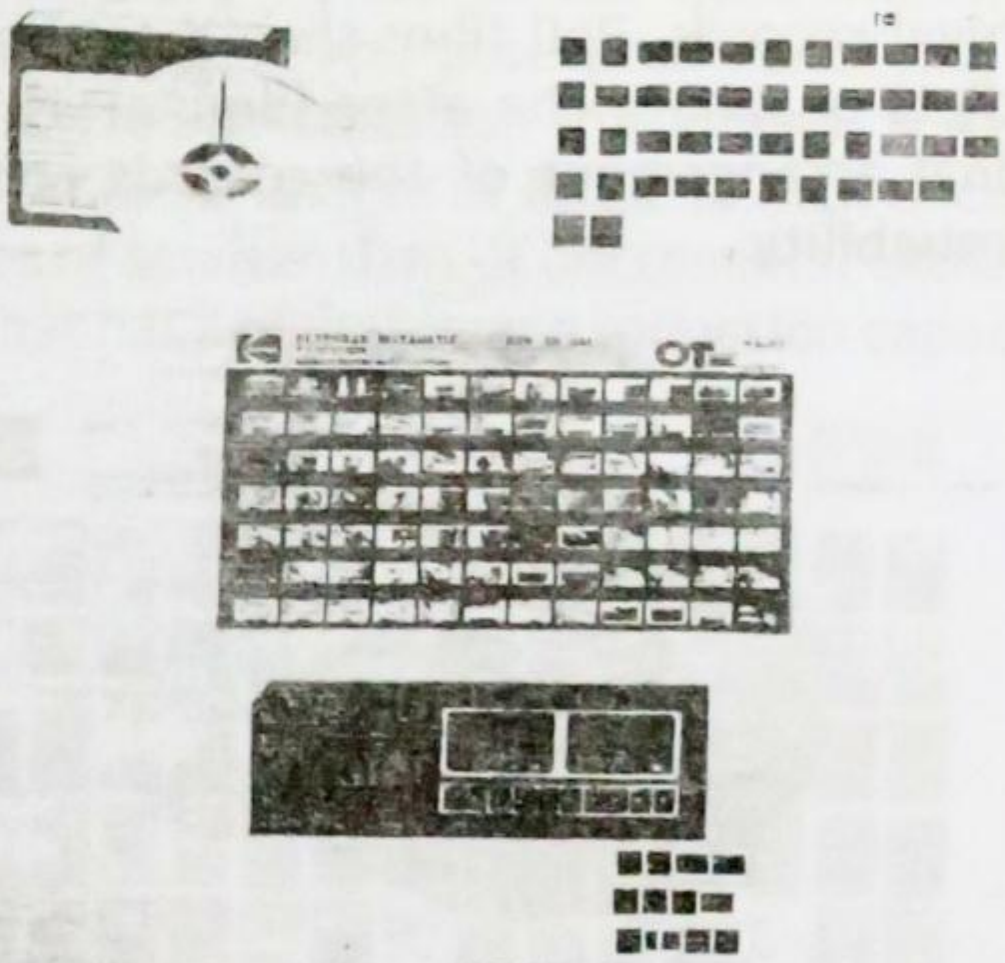


Fig. 5.2: Microfilm formats: (top left) Roll film, (top right) Jacketed film, (middle) Microfiche, (bottom) Aperture cards

Microfilm consists of a layer of emulsion coating, embedded in a base of

either cellulose (usually acetate or triacetate) or polyester. A Polyester-based film is stronger and more stable than cellulose. Polyester-based film absorbs less water and dry more quickly after processing. It is the only film base acceptable for preserving microfilms due to its durability, which spans up to 500 years.

Microfilm is used primarily for the storage and retrieval of information and records. Microfilmed records take up only 2 percent of the space needed for paper records. This reduces volumes of records that require large area of storage to a few areas.

There are various formats of microfilm, the most common of which are:

16 and 35mm Rolls: This is a continuous roll of film and available in both 16mm and 35mm, used for storing miniaturized text or micro images. This storage media could be in a linear array constituting of a single row (known as cine format) or double row of frames, which could be magnified or copied using specially designed equipment (e.g. microform reader-printer). The number of images on a roll of microfilm depends on the size of the documents that were filmed and the chosen reduction. Serialized formats as 16mm or 35mm rolls maintain the order and completeness of the original records and are therefore the only formats suitable for microfilming archival records. Roll films should not be cut into separate units such as jackets or microfiche after filming, as this process could destroy the original arrangement of the records and undermine their authenticity and reliability.



Fig. 5.3: Roll Microfilm

16mm Cartridges: A cartridge is a roll of film with a plastic cover, called a magazine. The cartridge provides faster access to a roll of film by making handling, threading, retrieving, and rewinding the film easier. The 4x4x1 inch magazine could also be directly labeled for easy identification.

Microfilm Jackets: Strips of 16mm or 35mm film may be inserted into a plastic sheet to form a microfilm jacket. This serves as a compartment for individual images or strips of film of different sizes, from 3 x 5 inches to 5x8 inches. A 4x6 inch jacket can hold up to 70 images of A4 documents. Because of its easy accessibility, microfilm jackets are useful for storage of information that needs to be updated continually.

Microfiche (pronounced "microfeesh"): This is a small card-shaped sheet of film for storing graphic materials in a miniaturized form arranged sequentially in a two-dimensional grid. The standard formats recommended by International Organization for Standardization (ISO) are 75x125mm (48 frames in 4 rows of 12) or 105mm x 148mm (60 frames in 5 rows of 120). It is also available in black and white or coloured.

Each sheet contains a title/index number heading across the top. This heading/index numbers are visible to the eyes (i.e. it could be read without magnification). It serves purposely for identifying each sheet as to what kind of miniaturized information it contains. A 4x6 inch sheet of microfiche can hold up to 98 images of 8 ½ x 11 inch documents, and can hold up to 500 images of smaller sizes of documents. **Ultrafiche** is another form of microfiche that has a higher image reduction capacity.



Fig. 5.4: A 4x6 inch Microfiche sheet holding 98 micro images

Aperture Card: This is 3 or 4x7 inches data processing punch card containing one or more small openings in which each frame cut from a strip of 35mm microfilm images are mounted. This facilitates independent usage of each frame and equally aids quick retrieval. Aperture cards are mostly useful for storing engineering or architectural drawings.

Types of Microfilms

There are different types of microfilms from which a library can choose. These include:

- Silver-halide/silver gelatin
- Diazo
- Vesicular
- Dry silver film

Silver-halide/Silver Gelatin: Silver-halide film is known for producing high quality images. It is usually used for long term, permanent/archival storage or preservation of information and only recognized for archival purpose because of its durability. If filmed and preserved accordingly, it could last for up to 500 years. As Iwhiwhu and Akpohonour (2009) posit, this is the only film used as camera film. it requires wet chemical processing and produces a reversed or negative image (i.e. white on dark background). Silver-halide film could also be used for creating duplicate of the camera film, which could be either negative image (white on dark background) or positive image (dark on white background). It reverses the original. Although, Silver-halide film is very strong compared to other types of films, but deteriorates fast if exposed to high temperature or humidity, chemical agents or pollutants, or frequent handling. It is primarily used as a back-up or security copy of library records, from which other copies can be made in case of emergency. It is frequently stored off-site from the library premises.

Diazo: Unlike the Silver-halide, which could produce both negative and positive duplicates from the original, Diazo film (a polyester-based film) could only produce a negative copy from a negative master and a positive copy from positive master. It does not reverse the original. Diazo refers to diazonium salts used in coating of the film. These kinds of films are exposed through strong ultra-violet radiations, which cause the diazonium

salts to react with dyes to produce white/colourless image on black or coloured background. It is mainly used for reference purposes, as it can sustain heavy use without scratching. It is equally used for routine duplicate printing, and not suitable for permanent or archival storage, as they can be easily damaged due to the ultra-violet radiations it uses for exposure. Also, it can easily fade away in reader-printer machine, and has about 25 year's life-span. However, Diazo films are not as durable as Silver-halide.

Vesicular: This kind of film also contains diazonium salts, but not combined with dye to form image. Rather, it uses vesicles or "bubbles" that form when exposed to ultra-violet light to create image. The light releases nitrogen gas in the film base, causing the diazonium salts to decay. The nitrogen releases bubbles where the light penetrates the film base. This results into formation of latent image on the film, which becomes rigid when the film cools.

Vesicular film could produce a positive duplicate from a negative master and a negative duplicate from a positive master. It also reverses the original just like Silver-halide. It is usually suitable for fast duplication due to its high sensitivity to light. However, pressure during processing can damage the bubbles that bear the latent images on the film, rendering it permanently damaged. The images on the film will disappear if exposed to heat. Similarly, faulty processing automatically results into poor image formation. Therefore, this kind of film is not also recommended for archival or long- term storage.

Dry Silver Film: This kind of film is primarily used in producing computer output microfilm (COM).

Steps in Microfilm Production

Steps in preservation microfilming are:

Selection: Decide on what is to be filmed. It is not everything that could be filmed because of time and financial implications. Therefore, only materials with archival or historical value to the library should be considered. It is recommended to select materials that you will keep in your library for a long period. The filming standards to be adopted are equally determined. Therefore, only clean and legible items are

microfilmed.

Guides on selecting what are to be microfilmed

- Develop in-house microfilming policy or guide.
- Determine how long the library is to retain each document or information material.
- A thorough assessment of library materials to select what is to be filmed.
- Decide on the volume of library materials to be microfilmed.
- Select clean and legible materials.
- Select materials that have historical or archival value.
- Select materials that are to be kept by the library for a long time or permanently.
- Select bulky or voluminous materials of high relevance in order to save storage space.
- A critical need for rapid accessibility or accessibility at multiple locations might justify microfilming short-term records.
- Consider digital imaging for materials that must be kept less than 15 to 20 years, as it would not be cost-effective to microfilm such.
- In case the volume of long-term materials are low and are infrequently used, there may not be need for microfilming, if the materials are well preserved.

Preparation: Clean the items to be filmed. Repair damaged page and prepare tag or identification mark for each of the items. Ensure that materials to be microfilmed are well arranged, remove paper clips, staples and other fasteners from the materials, and flatten any folded-up records or pages. Decide on the types of film, how many generations of films are to be filmed and reduction ratios to be used. All preparation work should be effectively supervised to enhance accuracy and timely completion.

Filming: This is the process of converting the materials into a miniaturized form. Several types of filming processes are available. Reprographic filming is photographed on either 16mm x 35mm roll film or as microfiche on 105mm x 148mm sheet film. Microfiche could be 60 frames or 98 frames with title strip at the top edge.

There are two basic types of camera usually used for microfilming:
Flow camera: both the original (master) and the film move simultaneously during exposure. This kind of camera is capable of:

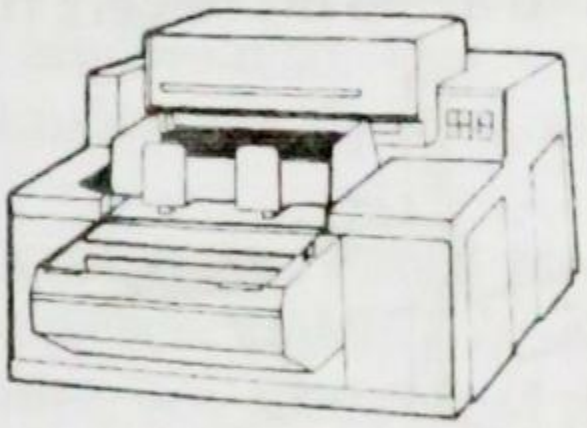


Fig.5.5: Flow camera

(a) Simplex filming (i.e. one line of images along the length of the film).

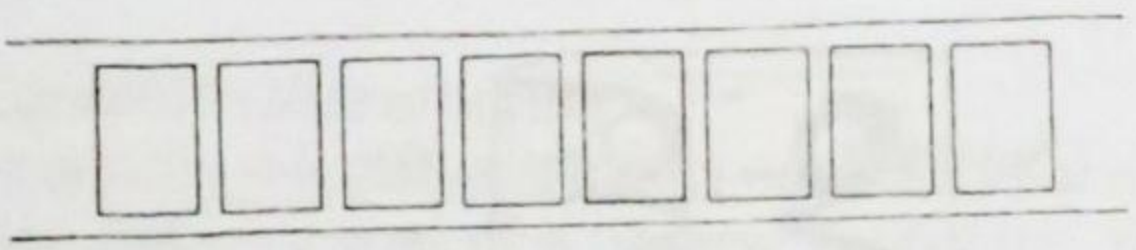


Fig.5.6: Simplex filming

(b) Duo Filming: two lines of images along the length of film

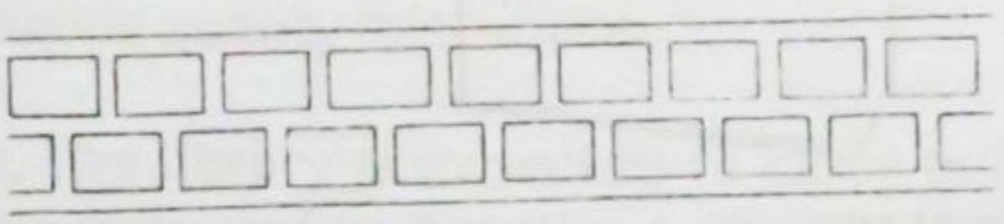


Fig.5.7: Duo filming

(c) Duplex Filming: both sides of a document are photographed as it passes through the camera, appearing side by side across the width of the film.

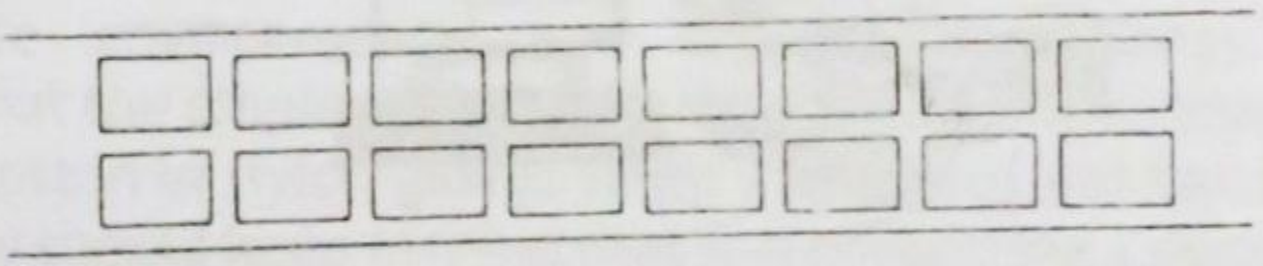


Fig. 5.8: Duplex filming

Planetary Camera: Both the original (master) and the film are stationary

during exposure, limiting exposure error. Planetary camera are used when the original are bound or bulky to go through flow camera. The quality is superb. It is useful for group photograph of several pages on a single frame of 35mm. one rule of using the planetary camera is for the operator to keep his fingers off the original, especially when he needs to hold down the pages for filming, so as to avoid his fingers from showing on the final product.

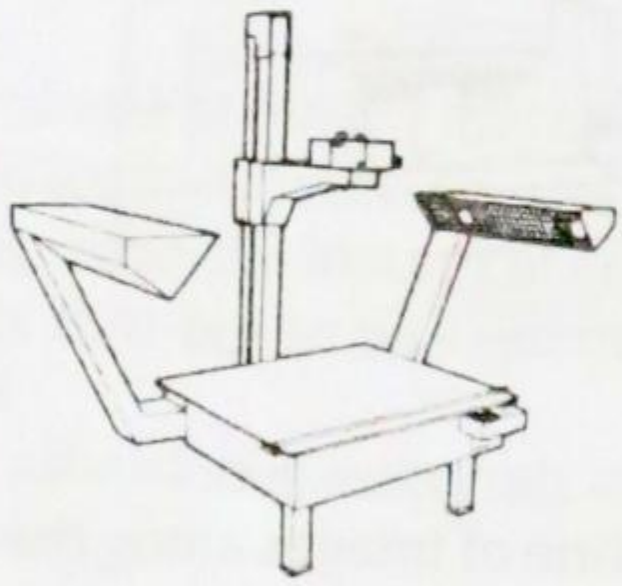


Fig. 5.9: Planetary camera

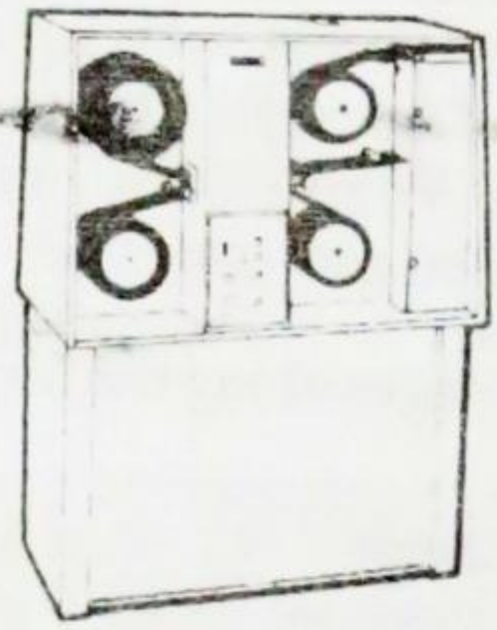


Fig. 5.10 Roll to roll duplicator



Fig. 5.11 Digital Roll-to-roll duplicator

Processing: After filming, the end result- positive or negative-(black/ coloured) produced are subjected to series of tests to clean and remove processing chemicals that are left over on the films. The films are also processed to archival standards of storage.

Inspection: The films are inspected to ensure that they are well filmed, processed and without any blemish. This is to ensure that the films are in good condition and will subsequently work and project well.

Record Creation: Records are created for each film, usually through Machine Readable Catalogue (MARC) or digital database. This is to facilitate easy accessibility and retrieval of the microfilms. Records could also be entered onto online databases such as Online Computer Library Centre (OCLC) or the Research Library Information Network (RLIN) to prevent duplication of efforts from other libraries that have access to the database not to photograph such materials again.

Quality Control in Microfilming

Producing quality microfilm is highly necessary for meeting the long-term information delivery goal of a library. Therefore, the library must make efforts to produce such high quality films that will meet its present and future information demands. Whether the library produces its microfilms in-house or contracts such responsibilities to a vendor, emphasis should be put on producing quality microfilms.

To this end, the library is expected to carry out routine quality control checks on every microfilm produced. The library has to check the quality of the Silver-halide film used for the negative master, and to verify if the film has no scratch and whether all the pages are completely microfilmed. Once the microfilming is completed, the library has to decide on the number and type of duplicates to be produced and ensure that the microfilm is stored according to International Standards (under appropriate environmental and security conditions). ADAH (2002) suggests that the employee performing quality control should always wear lint-free cotton or nylon gloves when inspecting and handling microfilm. The agency should keep in mind that it is protecting a significant financial investment by inspecting and handling microfilm with care.

Hampshire (1975) points out that quality control tests ensures that:

- Negatives are within the density tolerances.
- Negatives are consistent, both all the negatives on a roll and all the negatives on all the other rolls.
- The differences between line and background densities are controlled.
- Images are of adequate resolution and are sharp.
- Images are correctly positioned and are not reserved.
- Negatives are in mechanically good condition.
- The desired permanence will be attained.

Outsourcing

Just like in digital imaging, library can equally decide to microfilm its records/information materials in-house or to contract an outside agency to carry out the operation. Microfilming is a combination of several processes which include: selection, preparation, tagging, filming, processing, inspection and storage. Library may decide to perform some of these processes in-house and outsource others. However, this depends on the current financial strength of the library, available time, availability of relevant equipment and qualified personnel. It is recommended that small libraries who could not invest on procuring and maintaining microfilming equipment should consider outsourcing. However, library could also consider outsourcing if there is a mass of materials to be microfilmed with limited time available. Meanwhile, efforts should always be made to contact vendors or agencies that are familiar with and agree to follow International Standards on microfilming archival records.

It should be noted that microfilming is scarcely common in Nigeria. Digital imaging and storage are increasingly becoming popular and used.

Factors to Consider in Outsourcing

There are a number of factors the library needs to consider in making a decision about whether to microfilm in-house or to out-source its microfilming:

Access to Records: Records are obviously more accessible if they remain in the library. Will the library be able to access any of its records that are

with the vendor during the filming process? Library can request for on-site filming to be able to monitor and access any of its materials during the process.

Control over the Process: Outsourcing library microfilming translates to partial loss of direct control over the process. Meanwhile, the library can ensure indirect control over the process through a precise statement of procedures and specifications in a well-formulated, written and signed contract, of which the vendor must, strictly complied with. Microfilming in-house allows an agency to maintain control at every step of the process and to monitor and correct problems more quickly.

Expertise: Learning to microfilm skillfully and efficiently takes time; film processing and quality testing also require special expertise. The library has to ascertain that the vendor has necessary expertise and well-grounded in international microfilming standards and should have necessary equipment for filming and processing before contracting such.

Flexibility: Different records may require different cameras and film for microfilming. Archival records, for example, require Silver-halide film. Oversize documents need 35mm film to achieve a legible reduction ratio. Fragile records may be damaged by a rotary camera. A vendor can usually offer a wider variety of equipment and supplies that meet specific needs than an in-house operation.

Security: Microfilming in-house will enable the library to closely monitor and secure the library records and films. Records sent to a service vendor are at greater risk of loss and damage. Usually, some confidential records may not be handled by external vendors as they are not supposed to be exposed to non-library staff. In such a case, a vendor's camera operator may be requested to sign an agreement not to reveal the contents of the records.

Space, Staff, and Technical Requirements: Microfilming in-house will require the library to budget and spend, not only on purchasing camera and films, but also on maintenance, staff training or hiring, renovations, among others. Therefore, library could outsource its microfilming, if the cost of microfilming in-house is burdensome. Microfilming agency already has qualified staff and technical requirements necessary for effective

microfilming. However, such agencies or service vendors should be monitored to abide by the contract agreement.

Film Generations

Microfilms are meant to be permanent. To achieve this aim, generations of films are produced namely:

- The camera or master negative;
- The print master negative; and
- The positive-use copy.

Camera or Master Negative: This is the archival first generation of microfilm made of Silver-halide film. It is used for producing one negative for printing or reproducing positive copies. The camera negative is stored in a much secured place and enclosure at a monitored and consistent environmental condition. This is to ensure that the quality of the film is not reduced by generational loss or making of multiple copy. Camera or master negative is usually used as back-up, when print negative or positive use copy failed or damaged. Master negative are used only when the other generations of films are exhausted from use.

Print Master Negative: This is second generation rolls of Silver-halide film usually stored within the library premises. Print master negative is used to produce the original positive copy to be used by library users or other copies that may be requested by cooperating libraries, information centres or institutes. It is also used to produce additional positive copies as old ones got damaged or are lost. Print master negative are not allowed to be used by readers.

Positive Copy: This is the copy that is made available and accessible to users. Due to heavy usage and handling of positive copy (such as microfilmed newspapers), they are easily damaged. Therefore, the library produces new copies from print master.

Merits of Microforms

Cost-effectiveness: Microfilming of library materials could serve as a cost-effective solution to the management and preservation of long-term and permanent information materials/records. However, a microfilming program must be carefully planned to ensure that the final product meets both national standards and the library's needs. Library should familiarize

with the microfilming standards that are available.

Effective Record Management Programme: Microfilming long-term or permanent records facilitate effective record management in the library. This is made possible by enabling the library to keep track of recorded information in its custody by preserving them for long-term usage and by creating a tagging system through which the records could be easily accessed.

Storage Space Saving: it saves a lot of storage/floor space in the library, as bulky reference or back-files of newspapers/serials are always converted into microform for space conservation. It stores documents in a compact format. Converting paper records to microfilm can reduce storage requirements to barely 2% of the space required for the paper records depending on the size.

Technological Stability: Unlike the digital storage media, the technology used in microfilming is relatively stable and do not need constant migration such as associated with digital imaging due to technological instability. Microfilm is a familiar, stable technology that has existed for several decades, enough for its procedures and requirements to be well-understood.

Durability/Longevity: Microforms are known for their longevity and durability. If well exposed, processed and stored according to International Standards, it could last for up to 500 years.

Diversification: The filming, processing and storage are diversified, as numerous but similar standards exist. This enables the library to choose the one that is considered best for it.

Storage: Due to its durability and longevity, microfilm is a good storage media for archives or information materials that have historical or cultural value.

Security: It protects library archival records/information materials from total loss, as masters or first generation Silver-halide films could be kept at separate places other than the library to prevent loss to fire or flood.

Conservation: Converting library materials to microforms ensures the conservation or preservation of the intellectual contents of long-term or archival materials from total loss or damage. It also enables the library to increase circulation and access to information. Microfilms maintain the integrity and reliability of the information recorded on it. Records remain complete and in original order.

Disadvantages

User Resistance: Many users still prefer book as a medium, and some are not skilled in handing the microfilm reading/printing apparatus of which point-of-use assistance may not be readily available or provided by the library.

Time Consuming: The processes involved in reading a microfilm is time consuming (locating the right film, loading it onto the reader and moving through several images before locating the required one) may discourage some from using it.

Cost of Equipment and Maintenance: The cost of purchasing equipment for microfilming, reading and storing is exorbitant. Therefore, many libraries in developing nations may not afford it, due to dwindling financial resources that characterized such. Similarly, cost of maintaining the equipment is much.

Loss of Quality: Each generation of films produced from the master are not as clear as the original, due to resolution losses.

Mishandling by Users: Mishandling by users is another great challenge, as images on the films could easily be damaged due to heavy usage or mishandling. Similarly, using sharp objects on the films could damage it.

Access Limitation: Accessing microfilms is subject to availability of functional reader-printer machine. Therefore, the materials could not be readily accessible, if the machine breaks down.

Care for Microfilms

- Storage of microfilms should be taken seriously. It should be done in conformity with International Organization for Standardization (ISO)

recommendations to maintain the longevity of the films.

- Sharp pointed objects should not be used on the films and should not be held against any abrasive or rough surface. When handling Silver-halide microfilm, library staff or other users should always wear lint-free cotton or nylon gloves, as oils from the skin can damage film.

- Films should not be exposed to food or liquid substances (water or chemicals). Do not handle films near such, as they could easily spill over and damage the films.

- Microforms should not be placed near heat, direct sunlight or dust as this could damage the texture of the film or causes it to be brittle, and it is also inflammable.

- First generation Silver-halide film is strictly meant for preservation from which user copies could be reproduced. Therefore, it should not be used as a user copy, but rather be stored accordingly in a secured location off-library.

Issues in Microfilming

Equipment: Equipment necessary for a successful microfilming programme include: micro-scanner, microreader and printer. The library should decide what kind of equipment should be integrated into the library. The choice of equipment is dictated by the quantity and frequency of filming to be adopted as well as the financial strength of the library. Basic microfilm readers will allow users to view a roll of microfilm; readers/printers allow users to make copies of any image on a roll. There are also microfilm readers/printers that will scan images from the film into a computer. The library should also decide on the maintenance culture to be adopted to prevent total breakdown that may lead to reduced productivity of the library. Point-of-use assistance should also be decided upon, if available.

Storage: In order not to compromise the longevity of microforms, storage should be properly handled. This becomes relevant as substandard storage could easily damage the films. Therefore, various standards are

developed for this purpose such as those developed by the International Organization for Standardization (ISO), The American National Standards Institute (ANSI) and the Association for Image and Information Management (AIIM). A library should adopt one and should not compromise any of the specifications. Library should invest on the equipment and tools necessary for maintaining accurate storage environment for the films.

Different types of microfilms have different storage requirements. The first generation Silver-halide copy should be stored off-site, preferably in a climate-controlled vault. The ideal storage temperature for microfilm is -18-21°C; relative humidity should remain 40 (+/-5), Density: 0.9 -1.1. If the library decides to keep second generation Silver-halide microfilm within the library premises, it should be stored in a controlled environment. Any acetate film should be stored in a freezer.

ADAH (2002) recommends that:

> *...the best container for rolls of microfilm is one that is airtight and protects the film from dust, humidity, and impurities from the air. The silver-halide first generation roll should be kept in the inert plastic container in which it was originally placed when created. Rubber bands should not be wrapped around a roll of microfilm; a button and string tie can be used instead. The rolls should be stored on metal shelves or racks or in metal storage cabinets. They should be kept in a storage room that is isolated from work space and other storage areas and separated from other types of microfilm and from paper records, which emit fumes that are damaging to silver microfilm.*

Store Microfilm in two geographically different locations to ensure absolute storage safety in case of flood, or fire outbreak or other environmental or artificial disasters. Microfiches should be stored in boxes or cabinets. Relative temperature and humidity should equally be maintained. Only duplicate films should be accessed, if available.

Standards: Standards are available for every aspect of microfilm handling. Therefore, these standards should be adequately studied as applicable to the area or region. ISO, AIIM and ANSI have formulated various standards for the production, processing and preservation of microfilms. These

standards are designed to ensure international consistency of both filming format and quality so that microform could be used by anybody at anywhere.

Processing: Some forms of special processing techniques are available, to increase the durability of the films. As Chaudary (2011) explains, the use of polysulfide treatment greatly retards damage from pollutants. Polysulfide treatment was developed by the Image Permanence Institute of Rochester, United States. This could be added during the film processing stage or for already-processed film. The solutions prevent blemishes on the film by converting a certain percentage of the silver in the film into more stable silver sulfide for longevity.

Modern Microfilming/Computer Output Microfilm (COM)

Computer output microfilm (COM): This is a kind of film produced by converting computer-generated signals into readable characters at high speeds through the use of magnetic tape (as input). Computer Output microfilming is the process of copying and printing data onto microfilm from electronic media found on any kind of digital computers.

As pointed out by Taylor (n.d.) COM usually consists of two units namely:
1) a high-speed recorder that transfers digital data onto microfilm using laser technology; and
2) a processor that develops the microfilm once exposed to a light source.
A COM recorder generally operates with a duplicator or convertor that generates copies of microfiche; and a sorter that separates duplicate microfiche cards into bins or trays for easy, end-point distribution. Each functional unit is connected to the next, providing a linear path from creation to end-point distribution of the microfiche.

A COM recorder can operate "on-line" or "off-line," This translates that it can be connected to a single computer, a local or wide-area network. Similarly, it can function independently as a stand-alone device that reads digital data from formatted magnetic media, such as tape.

A computer output microfilmer can translate data into microforms at a very high speed of up to 1,200-3,000 images per hour. Because no hard copy is produced unless needed, COM eliminates the space required to

store massive amounts of computer-printout information. Each computer-generated microfiche contains from 72 to 288 times more information than a standard-size-computer printed page, depending on the size of the fiche.



Fig. 5.12: A COM reader



Fig. 5.13: SMA 105: an example of Microfiche Convertor

SMA 105 Microfiche Convertor accepts both digitally born data and scanned images. It has a speed of 1200-3000 images per hour. It is a fully automatic digital convertor with automatic inbuilt processor. Easy to store voluminous records and access microfiches which has permanent storage-life above 500 years. It features automatic indexing using file name and number and maintains uniform density through-out the fiche produced. It stores output as: TIFF, PDF, JPEG, doc or xls formats.

Benefits of COM

Computer output microfilm offers certain number of benefits to the library and users alike. These include:

- Reduction of Storage Space
- Increased Information Accessibility
- Cost Reduction
- Improved Quality
- Improved Service
- Digital Preservation or Electronic Record Retention/Archiving

Reduction of Storage Space: COM prevents building up of paper records as these could be reduced into micro images, which take up few storage spaces compared to bulky paper records. Taylor (n.d.) points out that a one-cubic-foot box of paper records holds an average of only 3,000 pages. One microfiche card holds 230 documents (or images), and a one-cubic-foot records storage box holds 6,000 microfiche cards-a minimum of 1,380,000 pages. To store that many paper documents, 460 one-cubic-foot records storage boxes would be needed.

Increased Information Accessibility: COM records are accessible over a shared network. This enables remote library users to have access to microfilmed records as made available over the library's network. Remote accessibility of library records on the Internet enables multiple and simultaneous accessibility.

Cost Reduction: Using COM to store or distribute information is more economical than most electronic media or digital imaging processes. COM is cheaper to manage as mass of information could be produced at cheaper rate compared to paper or other electronic formats, which deteriorates or needs frequent migration due to technological instability.

Improved Quality: The newest COM technology provides superior image quality for improved user productivity. Such features as enhanced titling, enlarged file breaks, and bar coding make access and filing easier. Improved quality also results into legible copies that could be accessible on the reader and printer. In addition, there is no resolution loss in COM, as copies are reproduced from the master.

Improved Service: The use of COM services improves the general library services, especially information service. The use of COM assists in the

circulation of information materials in the library.

Digital Preservation or Electronic Record Retention/Archiving: With the proliferation of electronic records, the use of COM facilitates easy electronic record management. Using COM, electronic records can be moved from diverse, incompatible electronic storage systems to a "universal" reader.

COM provides a sophisticated electronic records management tool that ensures proper retention of archival records, by decreasing any unauthorized destruction of records and increasing public access. Computer-generated microfilm is more efficient for capturing important records created in an electronic format. COM plays a very crucial role in the broad spectrum of digital preservation of archival records. The use of COM facilitates proper preservation of archival records, which in turn enhances record management and accessibility.

6

BASIC REPROGRAPHIC PROCESS (III)

Digital Copying and Duplicating

Digital copying and duplication is the use of computer and other digital devices (such as scanner, digital duplicator, printer etc.) for processing and reproduction of information resources. This is to save physical space, increase accessibility and longevity of intellectual records.

Technological advancement in the area of information and communication has resulted in the development of sophisticated digital devices and new techniques of processing information. This is practically evident in conversion of paper-based or analogue information resources to digital/electronic format that could be accessible over the internet and computer terminals. In the same vein, information materials could be reproduced into printed format using computer printer or digital duplicator. The followings are the basic processes under digital duplication and printing:

Digital imaging/scanning
Direct digital copying
Digital duplication

Digital Imaging: Digital imaging/scanning is the process of optically generating images, printed texts, graphics or an object and converting such into a digital image, using an image scanner such as flatbed scanner, drum or document scanner, 3D scanner, hand-held scanner, planetary scanner etc. According to Chaudary (2011), digital images are "electronic photographs" scanned from the original documents, stressing that digital

imaging became popular in the 1990's as low cost and improved image capture devices were developed.

Scanners function together with a computer system and an application software. Computer provides an interface for the captured digital image to be viewed for processing, and also application software is used for executing the capturing task and for image processing. While older drum scanners use a photomultiplier tube as the image sensor, most of the modern scanners adopt a Charge-coupled Device (CCD) or a Contact Image Sensor (CIS).

Charge-coupled Device (CCD) Flatbed Scanner

The processes involved in generating digital images in all digital scanners are quite similar. A flatbed scanner that uses CCD technology, contains a flat glass pane upon which the document or object to be scanned is placed, face down. The glass pane is illuminated from below by a bright light (Usually Xenon or Cold cathode fluorescent). The document to be scanned reflects the light to a movable mirror, then to a fixed mirror from which the CCD picks up the image and converts it into digital image. The CCD-type scanner usually contains three rows (arrays) of sensors with Red, Green and Blue filters.

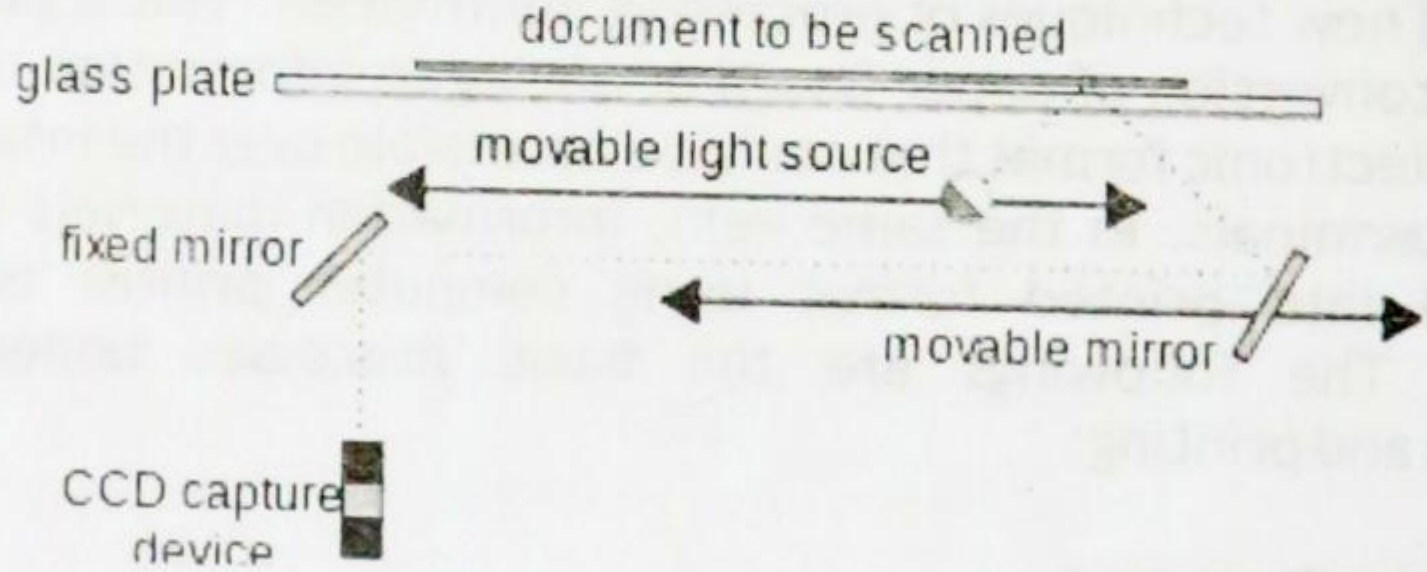


Fig. 6.1: Schematic View of CCD Scanning Process

Contact Image Sensor (CIS) Scanner

The processes involved in CIS scanning are similar to the CCD explained above. CIS scanner uses a moving set of Red, Green and Blue LED bulb for illumination in connection with a monochromatic photodiode array for light collection. Document or object to be scanned is placed on the glass platen, and the scanner lid is lowered over it to shut out all surrounding light. The sensor array (CIS) and the light source move across the glass

pane, reading the entire image area. The image or object to be copied reflects light, which results into formation of visible digital image that is picked up by the CIS capture device. Scanned documents are saved as TIFF, JPEG or PDF format.

Image Processing

Digital images generated by scanners are subjected to series of manipulation, using specialized graphic editing software. Such scanning application software include Adobe PhotoShop, Photopaint, Microsoft Image Editor, Adobe Image Ready etc. These software are capable of handling various editing tasks such as cropping, reduction, enlargement, adjusting contrast, colour balancing, changing of background, correcting perspective distortion, converting to black and white or gray-scale, image restoration (in case of deteriorated original), among others.

Conditions Necessary for Acquiring Useful Digital Image

There are two fundamental conditions necessary for making the scanned image to be useful. These are:

1) The physical connection of the scanner to the computer
2) How the scanned image/information is transferred from the scanner to the computer application (i.e. Application Programme Interface)

1) Physical Connection to a Computer

There are usually two means of connecting a scanner to a computer:

- Direct (to a host computer)
- Indirect (Network) to a server or host and shared by users/ clients/workgroups

a) Direct Connection to a Computer

Wikipédia (2012) explains that scanner could be connected directly to their host computer, using any of these physical interfaces, arranged from slow to fast:

- Parallel Port
- GPIP (General Purpose Interface Bus)
- SCSI (Small Computer System Interface)
- USB (Universal Serial Bus)
- FireWire
- Proprietary Interface

b) Indirect (Network) Connection to a Computer

This type of connection allows a single scanner to be connected to a host computer, to be accessible by all users/clients/workgroups within a local computer network.

2) Application Programming Interface

For a scanner and the computer to function collectively, application software on the computer system must communicate with the scanner. Different scanners use different operational protocols or standards. However, for this to be simplified and uniform, Applications Programming Interface (API) was developed.

The API presents a uniform interface to the scanners. This translates that, irrespective of the scanner operational protocols or standards, they can use uniform API for image acquisition. Therefore, an API does not need to identify the scanner protocol before it accesses the scanner; so far the device driver is present and functioning. Each scanner manufacturer provides software (Device driver) that serves as a link between the scanner API and the computer application. It is the device driver supplied by the manufacturer that enables the API to read the image from the scanner. The Driver translates the Image *meaning* to the API. The API is for scanning utility while the computer application (e.g. Adobe PhotoShop) is for editing.

Some scanners API interfaces are:

- SANE (scanner Access Now Easy): An open source API, allows batch scans without special support from the device driver.
- TWAIN: An application that lets you scan an image directly into an application such as PhotoShop for instant editing or processing. Usually comes with new scanners as part of software package and also embedded in some image or graphic editing software, such as PhotoShop. TWAIN is used by most scanners.
- ISIS (Image and Scanner Interface Specification): Created by Pixel Translations, is used by large scanning machines.
- WIA (Windows Image Acquisition): an API by Microsoft for use on Microsoft Windows

Images are usually and best saved as JPEG, Bitmap, TIFF, or PNG while text

documents are best saved as PDF file format. Files could be compressed to save memory space.

Merits of Digital Imaging

- Digital images are best preserved than analogue images
- It offers wider accessibility
- There is no resolution loss from one copy to another during copying and recopying processes
- Image enhancement/processing/editing
- Digital imaging saves physical space as bulky paper-based library materials could be converted into compact digital images.
- There is no decay or deterioration resulting from usage or over use.

Demerits

- Rapid Technological Change
- Legal issue/Copyright
- Lack of Uniform Digitizing Standards (unlike in microfilming)
- Recopying/Migration Problem
- Software Requirement Before Accessibility
- Consumes Time, Energy and Capital Intensive to Digitize and Process Large-scale Job
- Cost of Preparing Materials for Scanning, Indexing/Tagging

Document Scanning and Processing

There are scanners specifically for scanning/digitizing paper documents for storage. These are called document scanners. While all-purpose scanner can equally be used for this purpose, the best result is achieved using dedicated document scanners. Rotary scanner or drum scanner is an example of document scanner. It requires the paper document to be fed into a series of rollers.

Document scanners usually have larger document feeder than those found on photocopier or all-purpose scanners. This is to facilitate the feeding of wide-range of different sizes of documents. Document scanners are usually known for their high speed in scanning documents. It can scan between 20 to 150 pages per minute. It can also perform duplex scanning

without human interaction with the original.

Document scanners resolutions are usually lower than that of image scanners. Unlike the image scanners that use up to 600dpi (dots per inch), document scanners use between 150 to 300dpi.

Document Processing

Scanned documents outputs are usually processed using "Optical Character Recognition" (OCR) technology. OCR software enables a scanned image of a text document to be converted into accurate editable and searchable texts; provided the printed texts on the original document are clearly printed and are in type faces and sizes that are in conformity with the OCR software specifications. OCR may come directly from the scanner manufacturers while some are embedded into scanning software that could be purchased and installed separately on the computer, such as Open Book 9, FineReader or Omni page. Rajshekaran, Nair and Nafala (2010) state that "instead of scanning as Image and then running OCR, many scanning software provide (accessibility) for running OCR immediately on the software and then send the document to some word processing software".

Scanned documents or records are of great archival value. Therefore, proper organization and retrieval mechanisms must be devised for storing the digital archival records. The generated digital images must be stored in PDF or TIFF format so as to facilitate their integration into the library/information centre's document management database. JPEG format is not suitable for this purpose, as it cannot function with OCR but rather, it is the most suitable for images or graphics. Document scanner with OCR machines converts text documents into ASCII file while image scanner treats texts as graphics.

Document scanner has automatic document feeder mechanism, which automatically feed in the documents to be scanned. However, the library has to decide on manual the processes such as preparing the documents to be scanned and indexing or tagging them.

Documents Preparation

- Physically inspect the documents to be scanned to ensure that they are in good condition, complete and in order.

- Ensure that documents are not folded.
- Ensure that documents are without staples, paper clips or tags that can jam the scanner.

Tagging/Indexing

Give document identification numbers under which they could be traced for easy accessibility.

Include date and time of scanning, if necessary.

Assign relevant keywords that best describe each document, so that they could be easily retrieved or traced through such keywords in the library document management system.

Basic Steps in Document Scanning

- Prepare the documents (inspect them to ensure that they are in order and complete)
- Tag the documents for identification purpose
- Power on the computer system and the document scanner
- Click to "open" the scanner driver on the computer
- Feed the document into the scanner
- Select 'start new scan'.
- Select output type as "Editable Text" or "OCR", if your scanner has this option. This will enable you to eventually format the digital images acquired.
- The preview image of the scanned document appears.
- You can edit, as appropriate, by cropping to desired size, or areas to be scanned.
- Save the image as a PDF file. Use "keyword" or indexing term that describe the document as file name.
- Click on **Add new** to scan additional documents to the same folder.

Converting a Word Document into a PDF Document

Scanned and processed documents are usually saved as PDF (Portable Document Format), because PDF is most suitable for easy browsing through the pages of documents. However, the computer system has to be installed with AdobeReader or similar PDF reader before the PDF documents could be accessed by the system. PDF, at times, comes as read-

only file, i.e. it could only be read and printed, and not for editing o formatting. Word processing software such as Microsoft Office 2010 allow word documents to be converted into PDF format without additiona software or add-ins needed. After the document is typed and formatted follow the steps below:

1. Click the **File** tab.
2. Click **Save As**.
3. In the **File Name** box, enter a name for the file, if you haven' already.
4. In the **Save as type** list, click **PDF (*.pdf)**
5. Click **Options** to set the page to be printed, to choose whethe markup should be printed, and to select output options. Click OI when finished.
6. Click **Save**.

Figure 6.2 shows the procedure for converting a word document to a PDF format. In the **File Name**, you can accept the default name or type a new file name and click the **Save** button to save the document as PDF

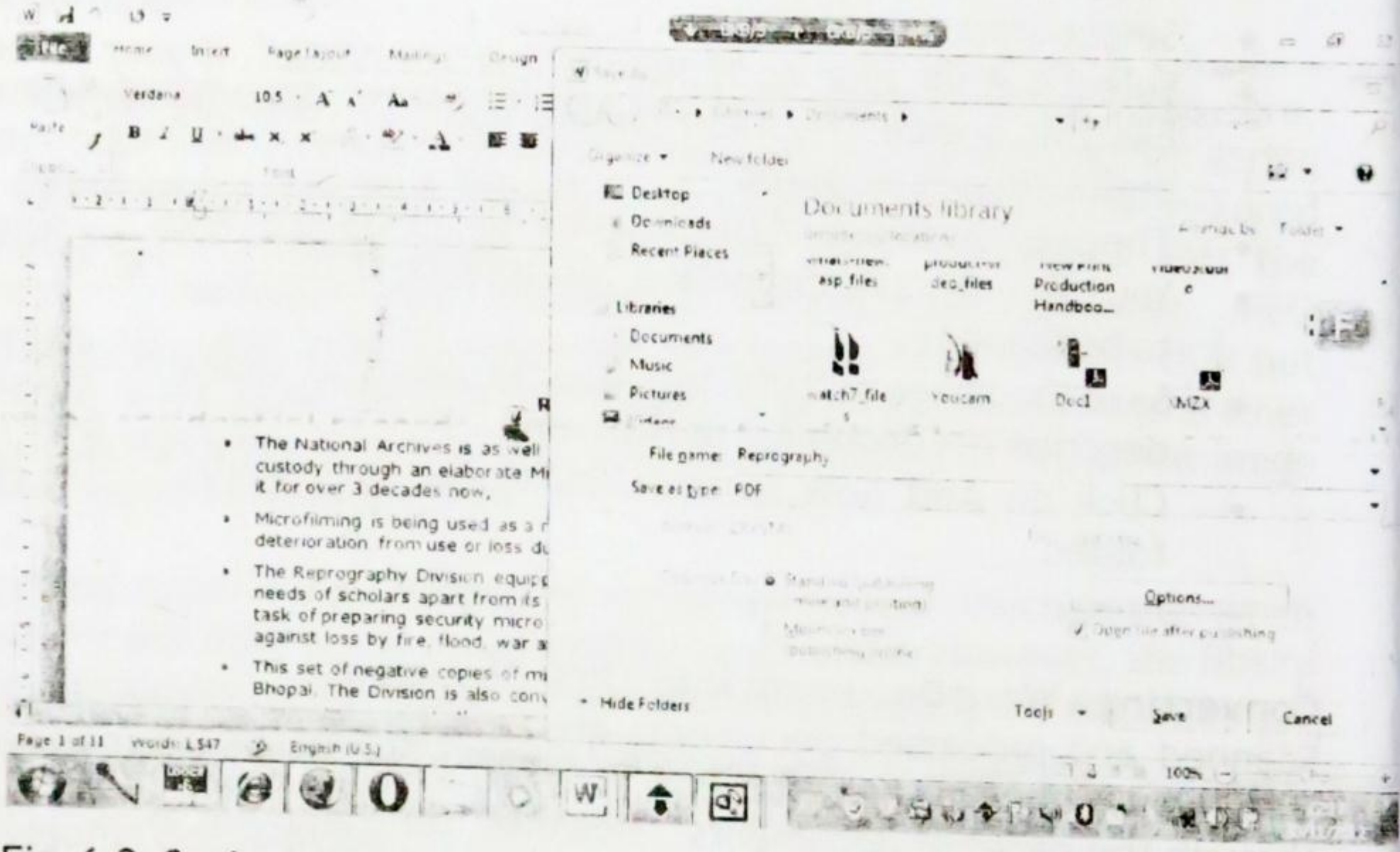


Fig. 6.2: Saving a word document as PDF format.

Book Scanning/Digitization

Book scanning is another form of scanning that takes place in the library or information centre. It is the process of converting paper books, newspapers or magazines to digital format or e-book by using dedicated scanners and software meant for this purpose. According to Wikipedia (2012), "book scanning is the process of converting physical books and magazines into digital media such as images, electronic text, or electronic books (e-books) by using an image scanner". Book scanning is usually carried out in the library to:

- increase accessibility, to information materials by making them available online;
- conserve library materials; and
- secure original copies of library materials.

Kirtas (2012) stresses that "quality results are the primary objective of any book digitization project. Quality includes not only superior images, but also high accuracy OCR, comprehensive metadata, and complete book integrity. And achieving this will allow you to use the book images to their fullest capability both now and for future undefined needs."

The processes involved in book scanning are very technical and requires a lot of manpower, financial resources and time. Digital or e-books are meant to be read on-screen, and as thus, are usually available in formats such as PDF (Portable Document Format), TIFF (Tagged Image File Format) or DjVu. Digital images that are generated by scanners are converted into digital text format such as ASCII through the use of OCR software. OCR allows the files to be reformatted, searched or processed using other applications such as WORD, ADOBE PAGEMAKER/READER. Book scanning is instrumental in retrospective conversion of paper-based library materials to digitally accessed information materials.

Types of Book Scanning

Book scanning in the library can generally be classified into three namely:

- Small-scale/Simple/Manual or Do-It-Yourself:
- Middle-scale/Mid-range or Semi-automated
- Large-scale/ Professional/Fully automated

Small-scale/Simple/Manual or Do-It-Yourself: This ranges from

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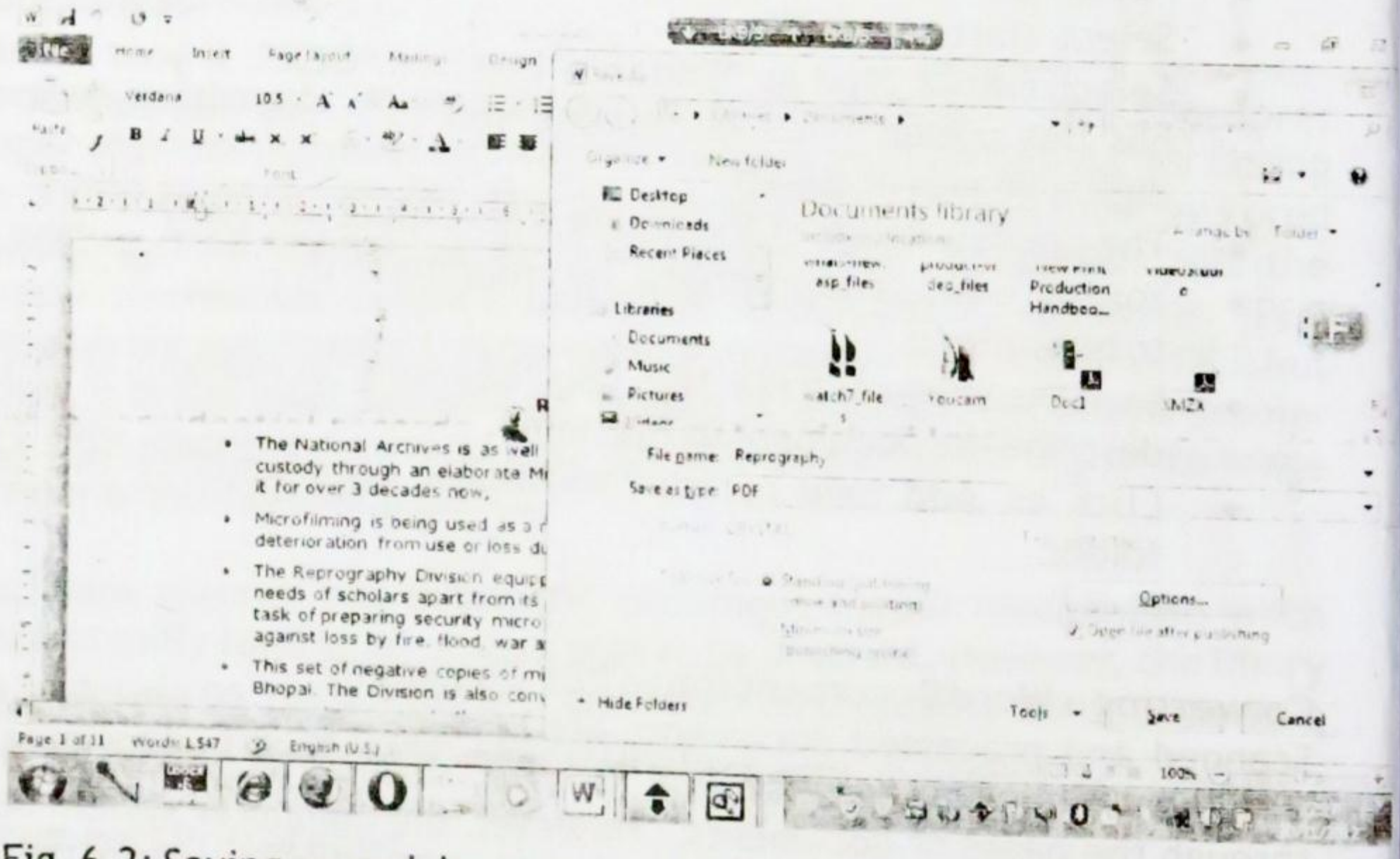


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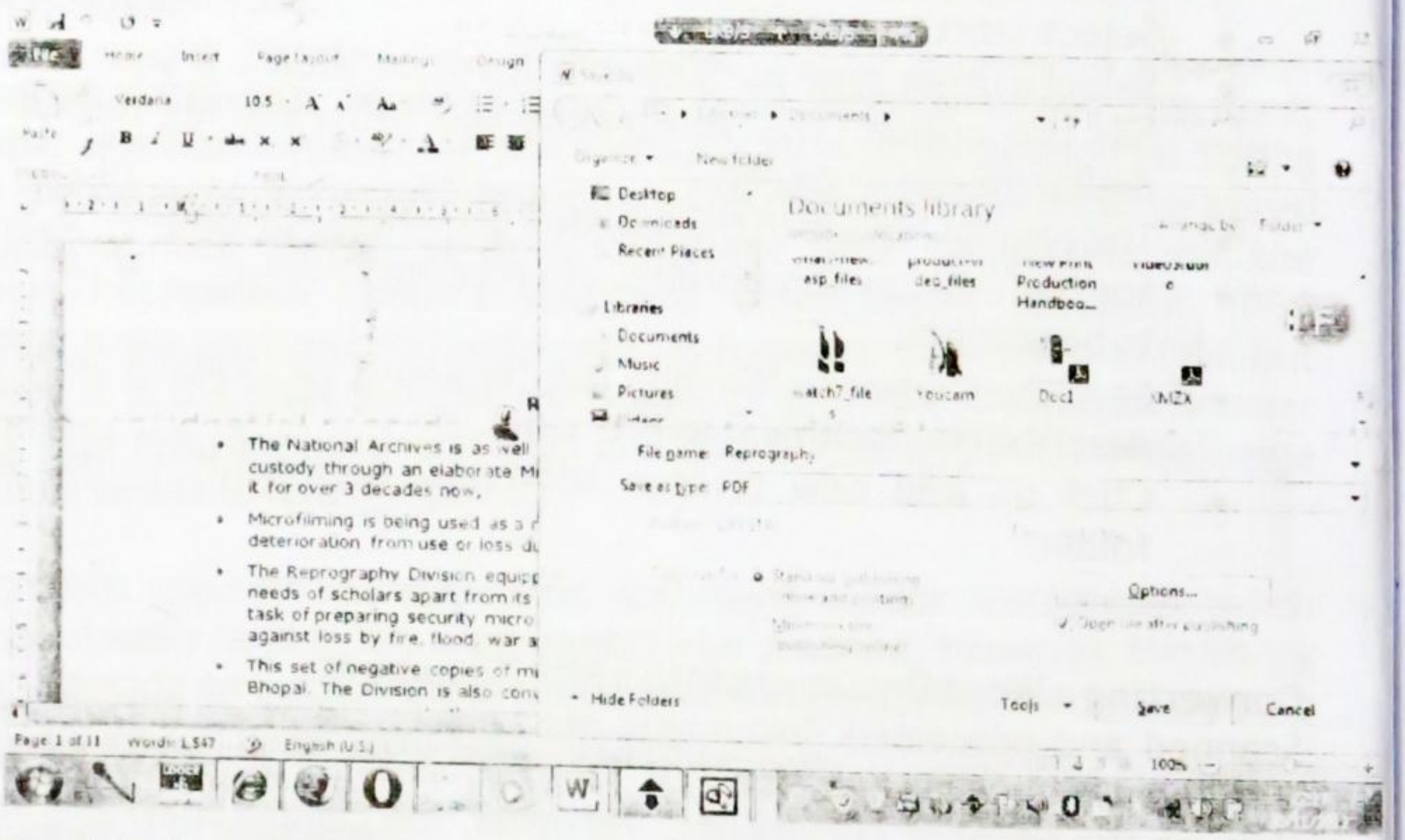


Fig. 6.2: Saving a word document as PDF format.

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2. Click **Save As**.
3. In the **File Name** box, enter a name for the file, if you haven't already.
4. In the **Save as type** list, click **PDF (*.pdf)**
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6. Click **Save**.

Figure 6.2 shows the procedure for converting a word document to a PDF format. In the **File Name**, you can accept the default name or type a new file name and click the **Save** button to save the document as PDF.

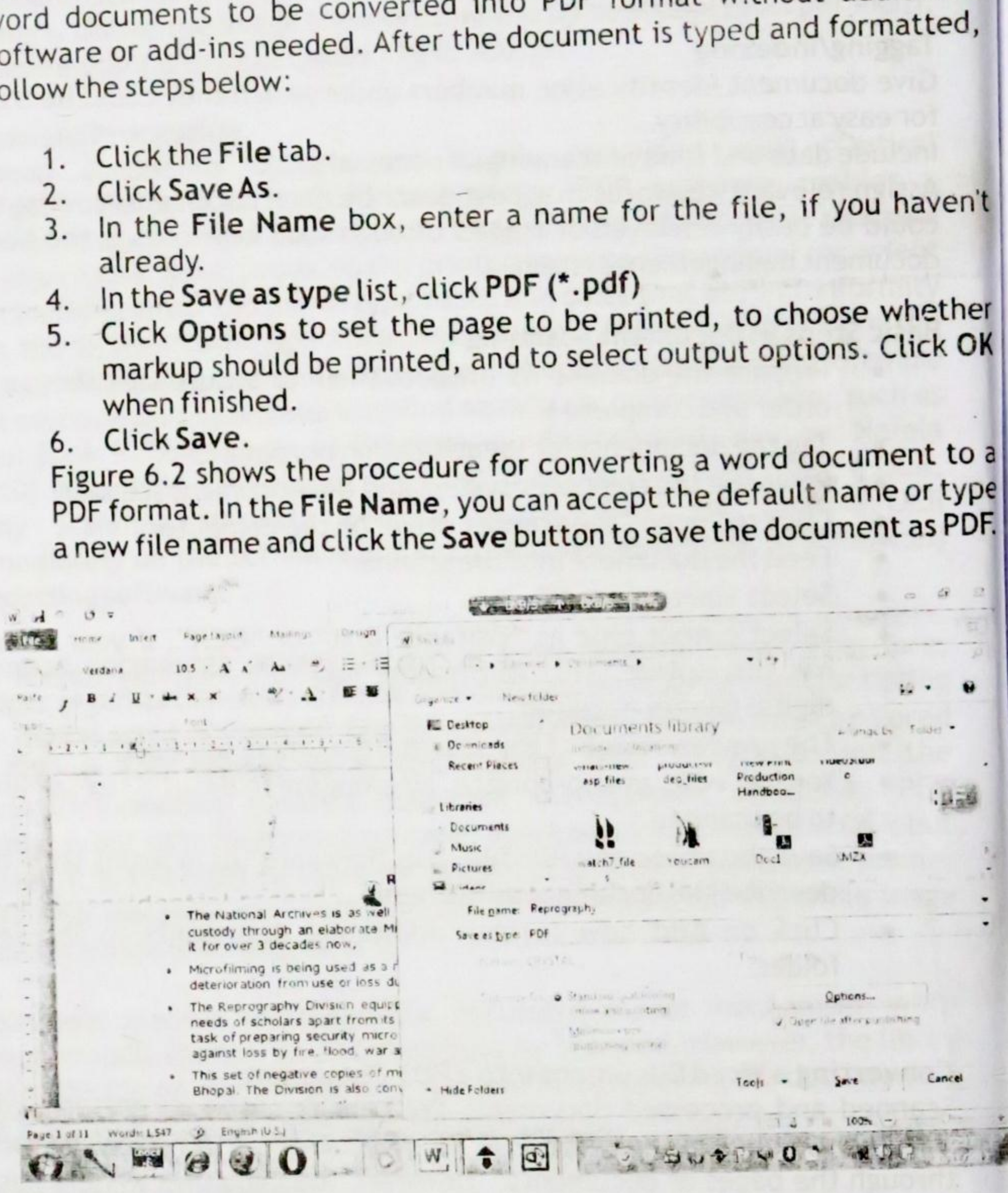


Fig. 6.2: Saving a word document as PDF format.

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- Small-scale/Simple/Manual or Do-It-Yourself:
- Middle-scale/Mid-range or Semi-automated
- Large-scale/ Professional/Fully automated

Small-scale/Simple/Manual or Do-It-Yourself: This ranges from

converting a page or few pages of books, pamphlets or magazines into electronic format. This process only requires basic scanning skills to operate flatbed or document scanners.

Middle Scale/Semi-automated Scanning: This involves scanning of books, magazines or newspapers that are not too large in quantity; in such sizes that could be conveniently handled manually or semi-automatically. Middle-scale scanning requires basic scanning skills and book scanning software knowledge. However, automatic equipment is occasionally used to enhance the process.

Large-scale, Professional Automated Scanning: This kind of scanning is usually carried out by large libraries or information providers, who wish to digitize their entire collections and make them available on the Internet in what is tagged *Digital* or *Electronic* Library. Such projects include Digital Memory of Library of Congress, Project Gutenberg, Questia, Million Book Project, Alexandria Library etc. This kind of scanning requires huge financial resources and equipment to digitize a wide range of book; therefore the use of fully automated system is inevitable. Automated paper transport (APT) devices are used for turning the pages of the books automatically. The use of application software (book scanning software e.g.: BookDrive Capture, OpenBook 9) is also necessary for this kind of operations for controlling the camera or scanner and for image processing and file conversion.

Book Scanning Hardware

- Robotic Book Scanner
- Planetary/Over-head Scanner
- Document or Drum Scanner
- Automated Paper Transport Devices
- Flatbed Scanner
- Digital Camera
- V-shaped Scanner



Fig. 6.3: RCBS PRO-VNI Automatic Book Scanner

RCBS PRO-VNI uses two 9.0MP colour CMOS cameras. Maximum scanning size is up to 15.4 inches x 10.6 inches. It offers maximum protection for books due to the V-shaped cradle that supports the book spine during the scanning process.

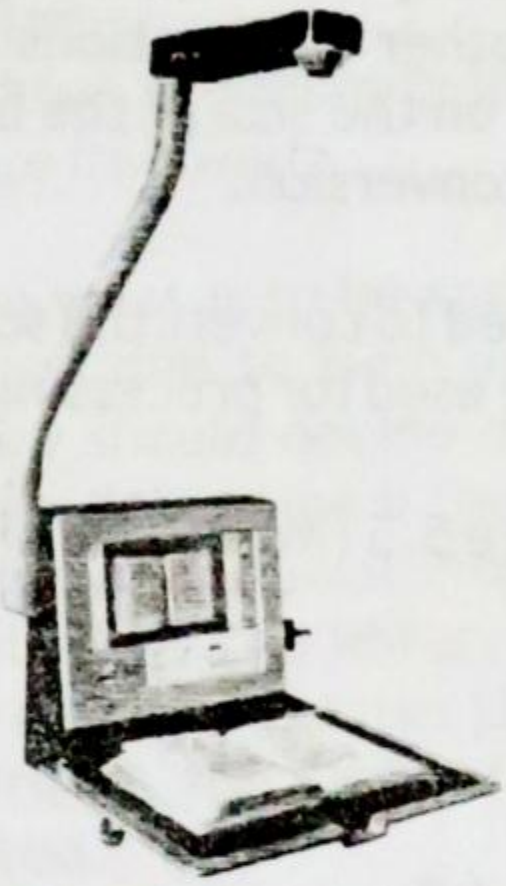


Fig.6.4: Book2net Spirit Book Scanner: an example of planetary book scanner

This book scanner features an embedded touchscreen PC, which facilitates instant viewing of digitized image for processing.

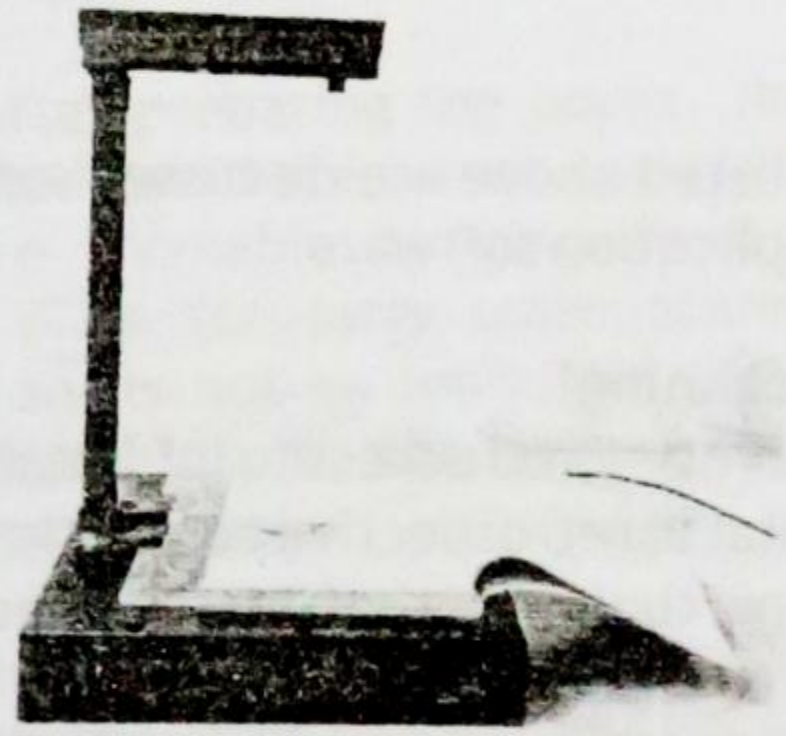


Fig. 6.5: RCBS PRO-500C over-head/ planetary book scanner

RCBS PRO-500C features multi-languages OCR with 96% compatibility for English language. It equally offers maximum protection for the books.

Book Scanning Software

Various forms of book scanning software are available to digitize library collections. Koenig (2012) points out that book scanning software helps to organize the images of each page into an electronically available book with or without character recognition. There are also software programs for free or fees, which are capable of making the captured digital images searchable or used by other applications (i.e. OCR). Time spent on digitizing a book will vary on the size of the book and the quality of image you require for your text conversion.

Application software is used to convert the scanned images to final e-book form. Among the software used for processing scanned books are:

- Adobe Acrobat
- Book Drive Capture 5.5 (Available in Pro, Mini and DIY Series)
- Book Scan Wizard
- BookScan Editor
- DigitalBook
- Image Magick
- Nuovo IRIScan Book 2
- Fine Reader OCR
- OmniPage 18 OCR Software
- OpenBook 9
- OpticBook (A300, A600 and 3800 Series)
- Scan Tailor

Some of the software listed above are discussed extensively in Chapter 9 under reprographic application software

Advantages of Book Scanning

- It facilitates unrestricted access to information materials.
- It is instrumental in retrospective conversion.
- It gives the opportunity for the library collections to be accessible online by the remote users.
- It facilitates simultaneous/ multi-access to a single information material; i.e. many users can access electronic collections simultaneously.
- It saves a lot of physical space in the library.
- E-books are so handy that library users can access them anywhere

and anytime.

- Various e-books related to users' areas of interests could be downloaded from library database or gateways.

Basic Book Scanning Processes

Irrespective of the type of book scanning being carried out, (simple or professional), similar steps are followed:

1) **Selection:** Decide on what is to be scanned. It is not everything that could be scanned due to time and financial implications. Therefore, the library should decide on what is to be digitized. The library should also determine if the material to be scanned is protected by copyright or approval should be sought. Digitization policy could be devised by the library to guide her through the process. The policy clearly indicates the yardsticks for selecting what are to be digitized, the kinds of scanning mechanism and software to be adopted.

2) **Prepare the Books for Scanning:** Collate and arrange the books, magazines or newspapers to be digitized. Remove any unnecessary page or attachment that will not be digitized. Ensure that all the pages are well arranged, clean and legible.

3) **Scanning:** After preparing the books, the next thing is to scan them using dedicated scanner or camera. Different kinds of book scanners are available ranging from manual DIY to fully automated ones for large-scale scanning. Align the pages accordingly so as not to have the edges chopped off on the generated digital image. You can scan two pages together, if you are scanning small books.

Mazanov (2011) suggests that depending on what you are scanning, a minimum of 300dpi (dots per inch) is alright. However, scanning for some special uses such as internet archives requires higher resolution, up to 600dpi. Files could be saved as tiff, jpeg, cbr, xml, cbz, png or DjVu format.

In large-scale scanning, automated paper transport (APT) devices may be used for turning the pages of the books automatically.

Some of these mechanisms use Vacuum technology for picking the pages and turning them over automatically. APT works with built-in motion detection mechanism which triggers the camera to fire only when a page is turned and is perfectly still. Depending on the capturing software and mechanism used, one can capture relative high number of pages. OpenBook captures up to 20ppm (pages per minute), i.e. 1,200 pph (pages per hour). BookDrive Capture 5.5 captures up to 1,000 pph.

4) **Processing/Editing with Software**: Crop the generated digital image to remove unwanted edges and shadows or reflections from opposite page. Different book scanning software (such as BookDrive Capture, OpenBook 9 etc) is used for editing the digital images. Book digitizing software is handy for image enhancement, cropping, contrasting etc. OpticBook 3800 has Shadow Elimination Element (SEE) to eliminates the book spine shadow and text distortion associated with books scanned on flatbed scanners and copiers.

   In case you scan two pages simultaneously, each page needs to be separated. ScanTailor is very handy software for handling this kind of image "tailoring" process. All other book scanning software can equally handle this task.

5) **Collation:** Collate the processed/files. Convert to PDF (or desired format) if the default format is different from PDF.

6) **OCR the File:** OCR the generated digital file using any of the available OCR software such as FineReader or Omnipage. OCR converts the scanned images into a digital text format such as ASCII, which could be reformatted, searched or processed by other applications. The final output is ready, usually accessible in PDF format.

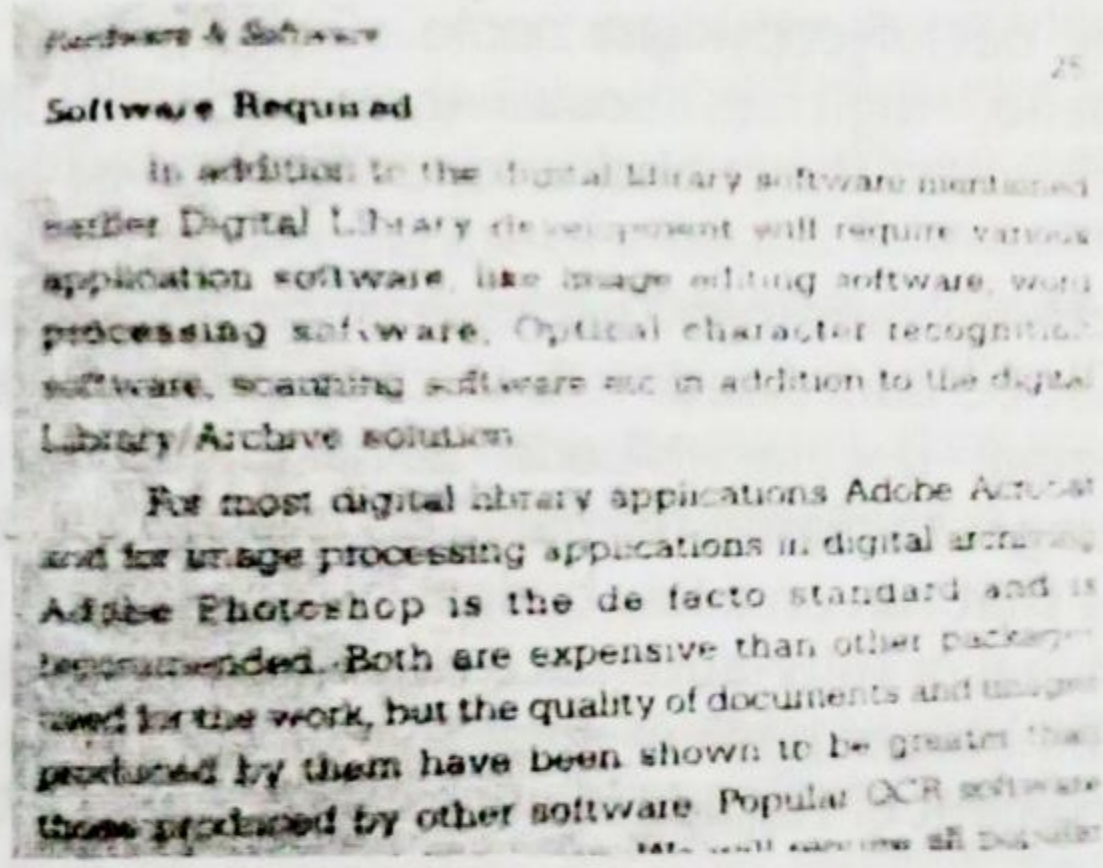
Flip Book Scanning

Digital camera or phone camera could equally be used for scanning pages of books, by flipping through the pages and capturing each page, one after the other, with the digital or phone camera. A high resolution digital or

phone camera of 2.0MP (mega pixel) and above is required for this process. Figure 6.7 shows a page that was scanned with 2.0MP phone camera. Digital images acquired with digital or phone camera could be transferred onto computer system for enlargement or printing. In using your phone to scan, ensure that you are in a well illuminated place, and rest your elbow against something in order not to capture a distorted or unclear image that may not be useful.



Fig. 6.6: Flip book scanning with smartphone



Software Required

In addition to the digital library software mentioned earlier Digital Library development will require various application software like image editing software, word processing software, Optical character recognition software, scanning software etc in addition to the digital Library/Archive solution.

For most digital library applications Adobe Acrobat and for image processing applications in digital archiving Adobe Photoshop is the de facto standard and is recommended. Both are expensive than other packages used for the work, but the quality of documents and images produced by them have been shown to be greater than those produced by other software. Popular OCR software

Fig 6.7: Part of a book page scanned with a 2.0MP phone camera

Scanning to Audio

Book scanning software that turns text into speech is available through specialized suppliers. These are particularly useful for supplying reading materials for the visually impaired that would be otherwise too costly or

time-consuming to be converted either to Braille or read out loud for an audio recording (Koenig, 2012). Text to speech facility is enabled on Adobe Reader 9, and book digitizing software such as OpenBook 9.

Issues in Book Digitizing

There are a number of issues that are associated with digitizing library books in the contemporary society:

- **Copyright Issue:** Just like book photocopying, digital/electronic copying of copyrighted books is also considered illegal. Due to influx and increased usage of electronic books, digital copyright laws have been developed. However, the library enjoys a "fair use" privilege under which it can duplicate materials for research use of their patrons.

  Efforts of large-scale book scanning through projects like Project Gutenberg, Million Books Project, Google Book Search etc are being frustrated due to copyright issues. Most of them relied on digitizing out-of-copyright books. Google Book Search, on the other hand, digitizes books that are still protected under copyright unless the publishers specifically exclude such.

- **Destructive Scanning:** The issue of destructive scanning is one that must be addressed. It is the act of scanning, through which the original document/book is destroyed in the process of converting it to digital format. This is usually experienced among libraries that run on a low budget, which cannot afford high-end-professional or fully-automated book scanning. It involves cutting off the binding of book or magazine, and feeding the loose leaves into document or flatbed scanner, one sheet at a time.

  The first challenge under destructive scanning is how to cut the binding. Secondly, the process takes longer time, scanning one sheet at a time with flatbed scanner or ADF (Automatic Document Feeder). Irregular page size or paper texture may cause the ADF to malfunction or cause paper to jam. The third challenge under destructive scanning is how to re-bind the scattered books or determining what to do with the loose sheaves.

- **Accessibility:** Accessing digital books is subjected to availability of certain functional hardware and software. For instance, you can only access a PDF file if only you have a PDF reader such as Adobe Reader on your system or device. Unlike the conventional book that is directly accessible, digital or electronic books could only be accessible if the right hardware and software specifications are met.

- **Preference:** Although appreciation and use of digital technology is increasingly expanding, the use of paper-based books is still very much popular and will continue for several decades to come. Even as the much predicted *paperless society* seems to be a mirage with each day passing by. This may not be unconnected with attendant challenges of digital technology, especially the issues of accessibility and storage.

Digital devices are powered by electricity. Adequate power supply is still a major issue in developing countries today. This is coupled with the issue of *accessibility* as previously explained. Similarly, appreciation and use of ICT in Africa is still very low compared to other parts of the world. These major challenges, among others, affect the use of e-books. To this end, majority still prefer physical/ paper-based books to e-books as it is easily available and accessible. It equally avails the reader the opportunity of full systematic browsing through of each page, rather than straining one's eyes to the screen.

Object Scanning

Library stocks special materials such as objects, realia or models. Some of these special collections have historical or cultural value, while some are used for illustrating an experience; such as illustrating a story for the children. In order to secure these priceless library collections, they are often digitized, using 3D scanners. This kind of scanners is specifically designed for converting three-dimensional objects into a digital image. 3D scanners uses laser for scanning objects by taking 3D snapshots of such object. Depending on the size of object to be scanned, 3D scanner takes a couple of scans of the object from various angles. It then uses specialized visual editing software to fix together all images scanned from various

angles and re-create such into one image that has perception i.e. 3D digital images could be rotated on the screen to view from various angle.

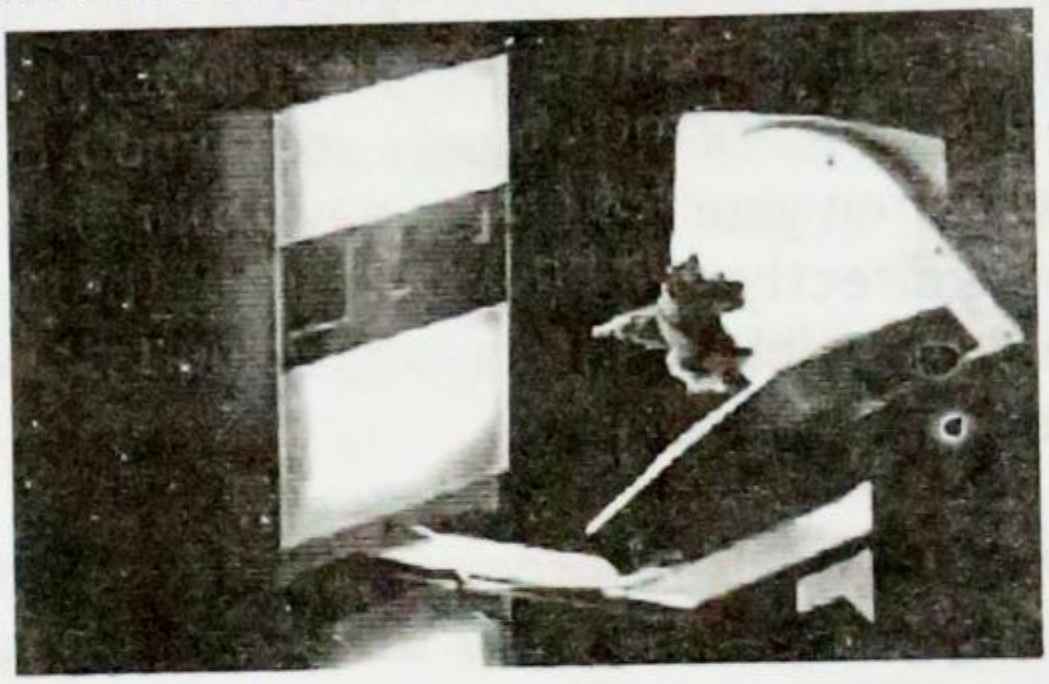


Fig.6.8: NextEngine 3D Scanner (an example of 3D scanner)

Factors that can Diminish Scanning Purity

Certain factors could reduce purity level of scanned images (books, documents and objects). These include:

- Scanner Noise
- Optical flare/Reflections
- Scratches
- Dust
- Newton Rings
- Out of Focus Sensors
- Poor Software
- Improper Scanner Operation
- Poor analogue to digital conversion (usually from distortion or bad CCD/ CSI capturing device).

Direct Digital Copying

Electronic files or documents could be copied from one location to another, especially as part of conservation library materials. Direct digital copying is the process of directly copying electronic or digital files or documents from one location or electronic storage device to another. For example: copying a file from a computer memory to a flash disk or CD-ROM, or vice-versa. The process also includes converting a VHS or Audio tape to CD, VCD, or DVD formats. Direct digital copying becomes imperative for effective information dissemination. In practice, it is useful for document delivery, resource sharing, and information

repackaging, selective dissemination of information, among others.

Open file location, select the file or folder to be copied, right click on it, and select **Copy** as in Fig 6.9. Open or select location where you want to copy the file into as in Fig 6.10. In this case, my flash drive **AMUSAN (E:)** was selected. Right click and select **Paste**. The file is pasted into the selected location.

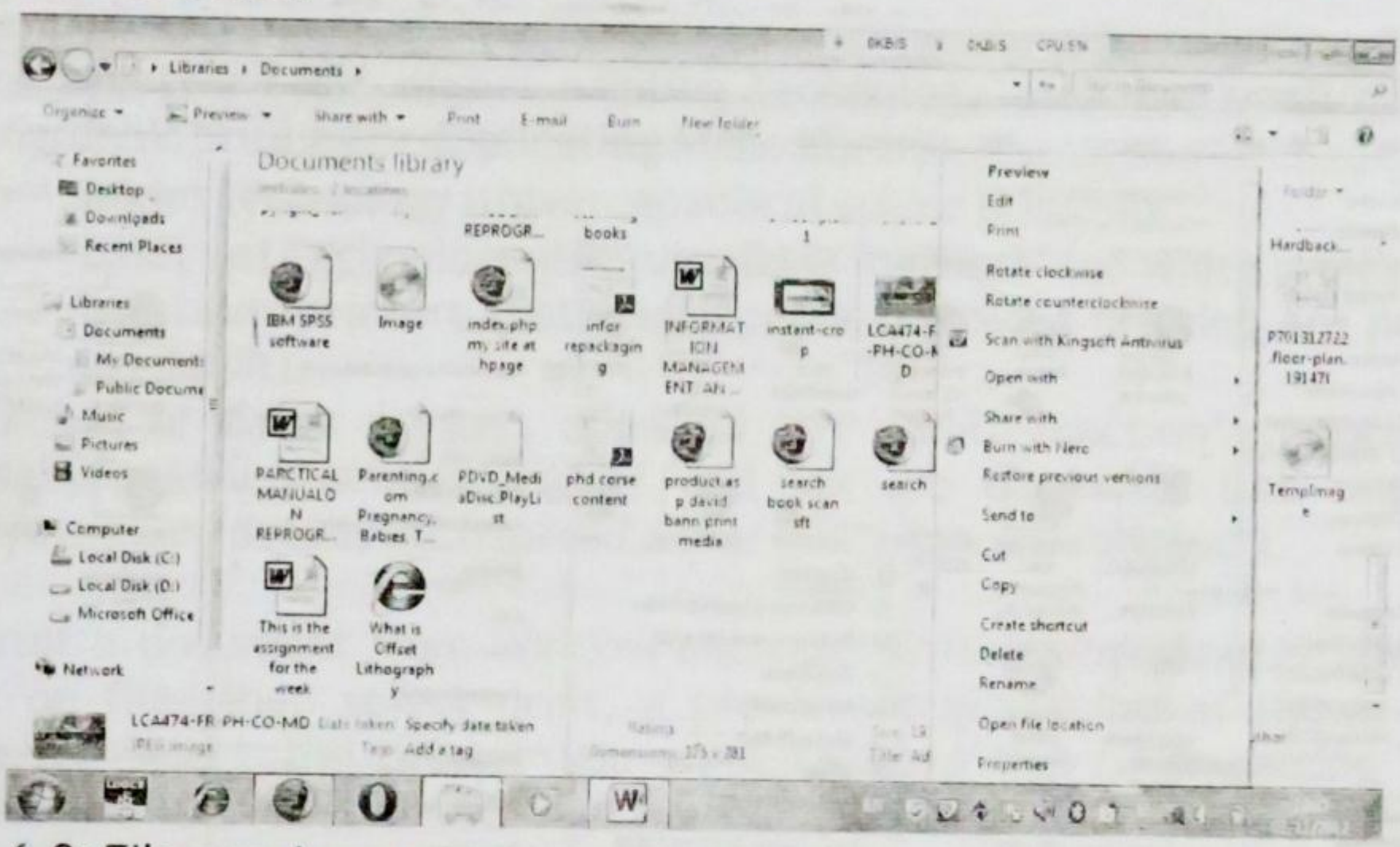


Fig. 6.9: File copying process

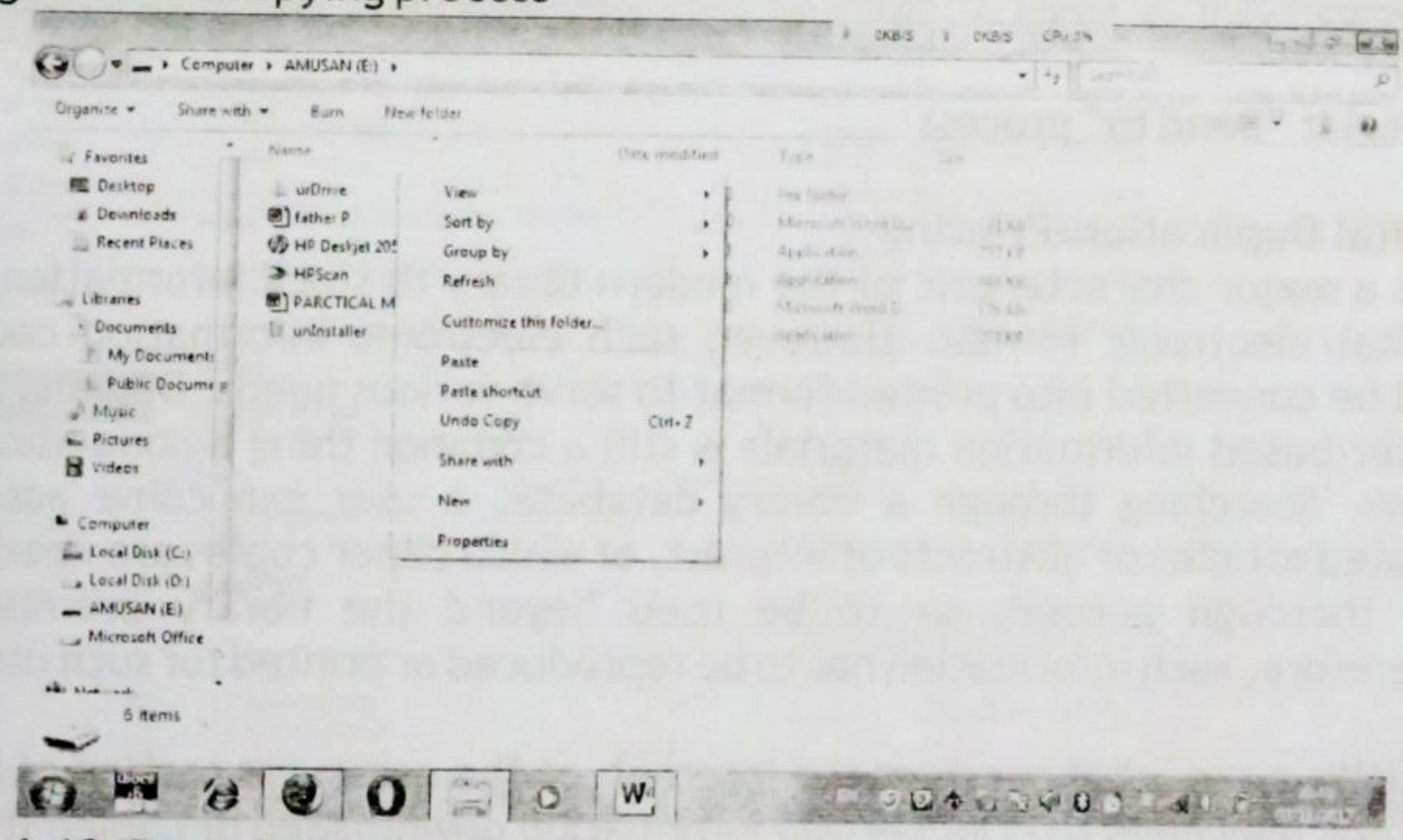


Fig 6.10: Paste Process

You can also send the file directly to a folder or locaton. To do this, select the file or folder you want to copy, select **"Send to"** button as in Fig.6.11. A drop menu appears. Select the location you want to "send" the file into. A copy of the file will saved into that location. Note that this process stll keep the original file on your computer. It only send a copy to another location selected.

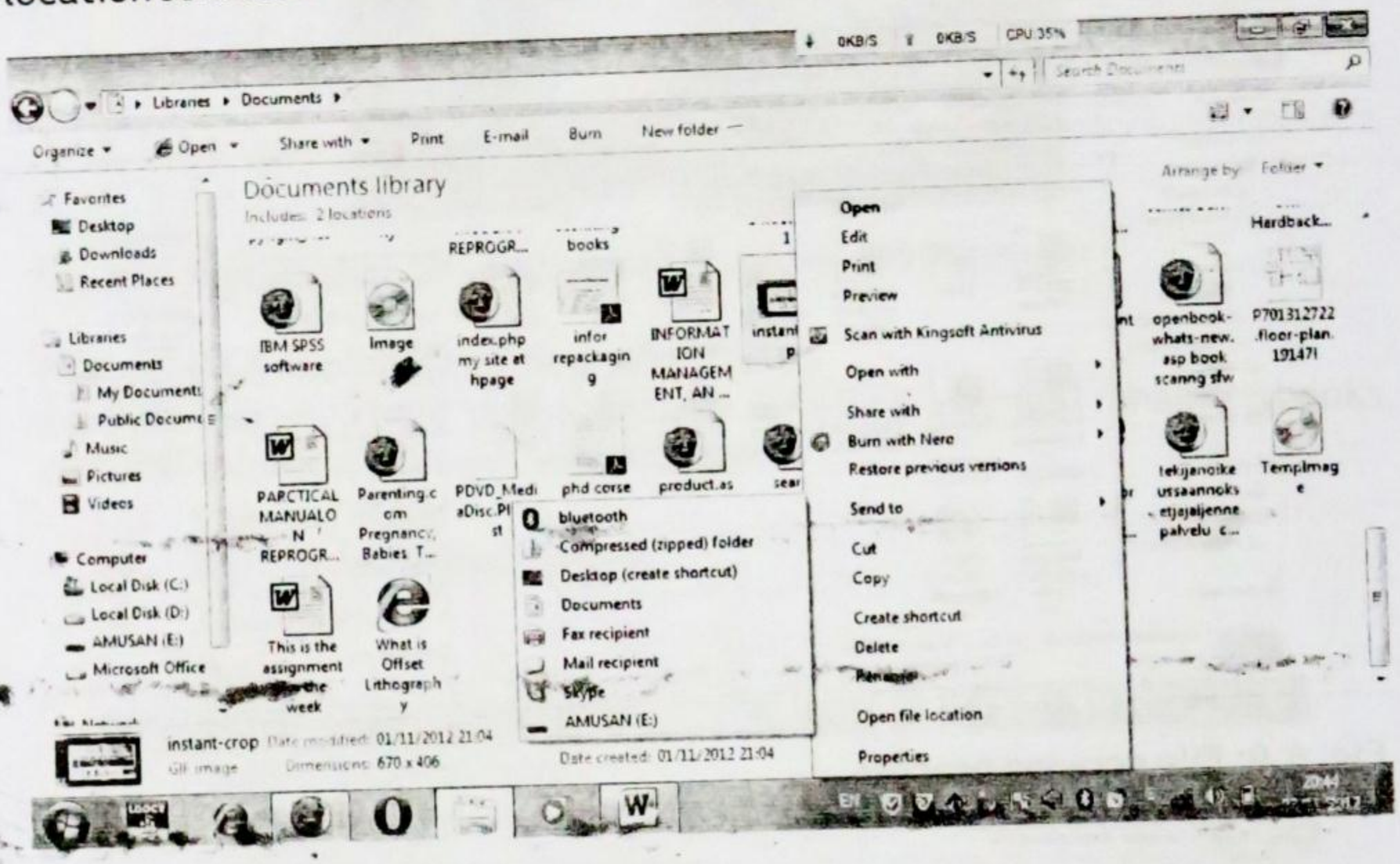


Fig 6.11: **"Send to"** process

Digital Duplication/Printing

It is a major characteristic of the modern library to stock information in digital/electronic format. However, such electronic information could still be converted into printed format to serve various needs. Demand for paper-based information materials is still a common thing among library users. Searching through a library database, a user can come across related articles or abstracts of interest, of which paper copies are needed for thorough perusal; or to be used beyond the library premises. Therefore, such information has to be reproduced or printed for such user.

Equally, a user that accesses the Internet, at the computer section of the library, may need to print certain information downloaded or copied from the web. Therefore, the library has to cater for this kind of need.

Reference librarians also gather information from various sources in the library or on the Internet to answer users' queries. Such information has to be repackaged into sizable format that correctly answer the users' queries. However, such could be handled with desktop publishing software like word processor. The final output is printed in paper format to be delivered to the clienteles.

There are two basic digital printing technology used for small-scale reprographic printing or duplicating in the library:

- Inkjet technology (this is capable of colour printing)
- Laser Jet technology (this usually is for black and white printing, but laser printers that are capable of colour printing are now available).

A number of these printers come as MFP (multi-function products), whereby scanner, printer, copier and fax are combined into single apparatus. See details in Chapter 7 under multi-function products.

To print a document from Window Microsoft Office Word Starter 2010, click on file, then select print, a preview is generated as shown in Fig.6.12. Select the printer you want to use, and other setting as applicable. Then click on the Print button.

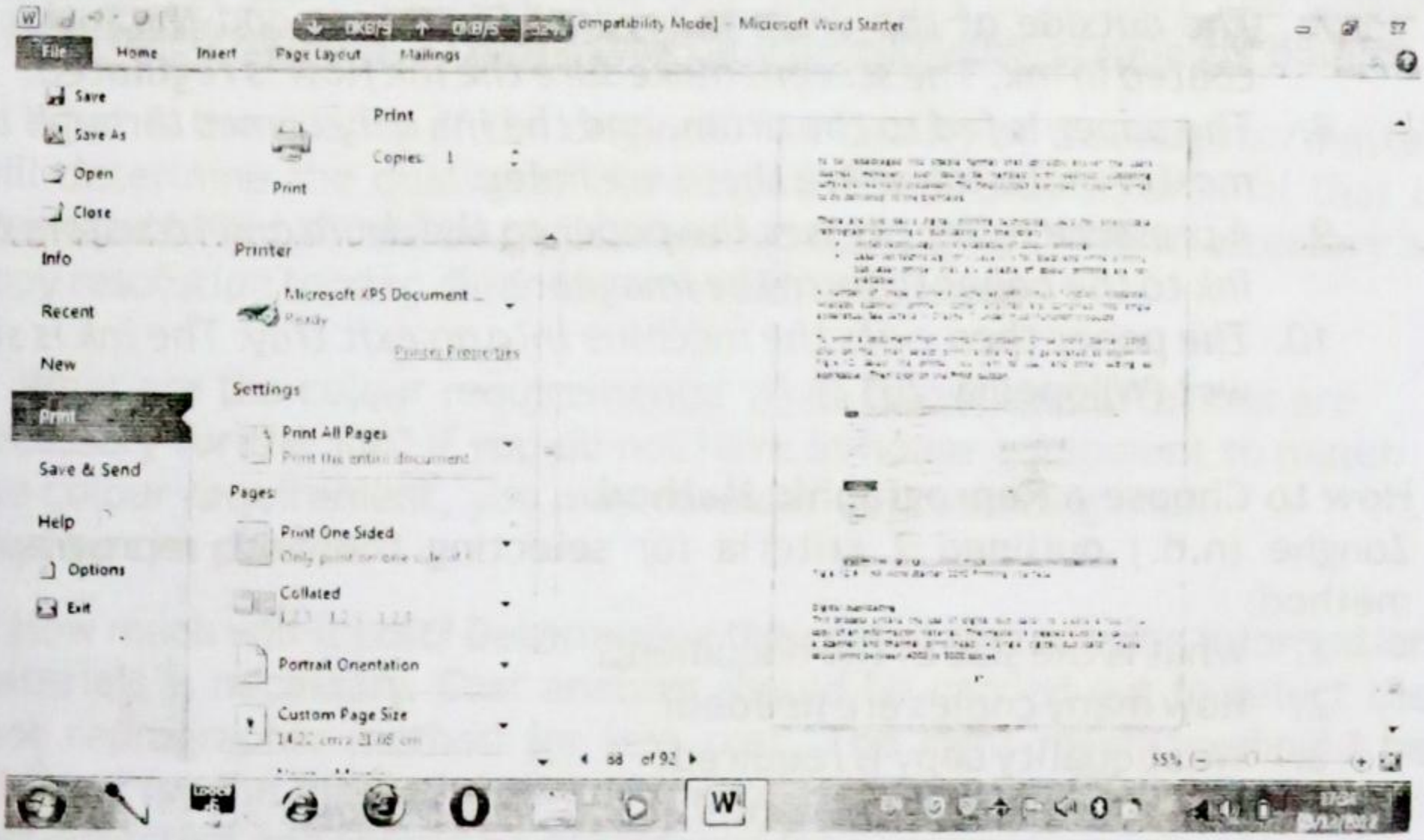


Fig 6.12: MS Word Starter 2010 Printing Interface

Digital Duplicating

This process entails the use of digital duplicator to create a facsimile copy of an information material. The master is created automatically by a scanner and thermal print head. A single digital duplicator master could print between 4000 to 5000 copies.

How Digital Duplicators Work

1. *The original is placed on a flatbed scanner or fed through a sheet feed scanner, depending on the model.*
2. *When the start button is pressed, the image is scanned into memory by reflecting light off the original and into a CCD (charge-coupled device).*
3. *The image is burned onto the master material that is coated on one side, in a series of small holes by the thermal print head.*
4. *As the master is burning, it is stored while the old master is removed.*
5. *There is a clamp plate on the drum that opens by motor. The drum turns and the old master material is fed into the disposal rollers and onto the disposal box.*
6. *The new master is fed into the clamp which closes; then, the drum is turned, pulling the master onto the drum.*
7. *The outside of the drum is covered in screens and the inside is coated in ink. The screens make sure the ink flow is regulated.*
8. *The paper is fed to the drum, and the ink only comes through the master material where there are holes.*
9. *A pressure roller presses the paper to the drum and transfers the ink to the paper to form the image.*
10. *The paper then exits the machine into an exit tray. The ink is still wet* (Wikipedia, 2012)

How to Choose a Reprographic Method

Zonghe (n.d.) outlined 7 criteria for selecting the best reprographic method:

1. What is the size of the document?
2. How many copies are needed?
3. What quality copy is required?
4. How much time is available?
5. What is the quality of the original?
6. What are the colour requirements?

7. How much will it cost?

Answering these questions will assist in choosing the best method in terms of cost-effectiveness, convenience and quality.

1. What is the size of the document?
For large size copying, bigger equipment is needed. Choose equipment that has reduction/enlargement facility.

2. How many copies are needed? The number of copies needed to be made also dictates the kind of reproduction techniques needed. Irrespective of the reproduction technique, cost of reproduction reduces with each copy made. That is, the more copies you run, the less your cost for each copy.

3. What quality copy is required? The quality of work required will determine the kind of reproduction method to select. Library users need clean and clear copies of information materials that is legible enough for thorough perusal. Unclear copies produced by the library portray the library badly. Therefore, library needs to be producing quality copies for its teeming users.

4. How much time is available? The best thing for the library is to beat the deadline for job requested. The time necessary to prepare the master should be considered, as well as the time for collating, stapling or binding.

5. What is the quality of the original? The quality of the original/master will determine the quality of the output. Therefore, an original that is clear and bright should be considered for duplication. This is necessary as copy resolution tend to diminish with each copy made.

6. What are the colour requirements? What colour specifications are necessary for the job? If you do not have in-house equipment to match the colour requirement, you may consider out- sourcing from commercial printer.

7. How much will it cost? Determining the cost of reproducing information materials is necessary. Cost analysis should be carried out to select the best reprographic method for less cost. The right machine should be selected for the mass of work to be done. For example, a laser printer is cost-effective and should be considered for a voluminous job rather than an ink jet printer which is to be used for smaller work.

7

REPROGRAPHIC EQUIPMENT AND MATERIALS

Introduction

There are various equipment and materials that are used for reprographic activities in the library. The equipment/machines vary in size and quality of output. Though, the list is inexhaustible but attempt is made to cover major equipment, commonly used for various reprographic processes in the library.

Photocopier

This is a machine or device which is used for producing copies of text or graphic materials by the use of light, heat, chemicals or electrostatic charges (Encyclopedia Britannica, 2007). It is also called a copier or copy machine. It is used for making paper copies of text or graphic documents quickly and cheaply. Most modern copiers use a dry copying technology known as xerography; though, other technology such as inkjet is also available. Photocopiers are typically of two main types:

Desktop Copiers: Those that sit on the desk.
Free Standing: Those that stand freely on their own.



Fig. 7.1: Example of a Desktop Photocopier

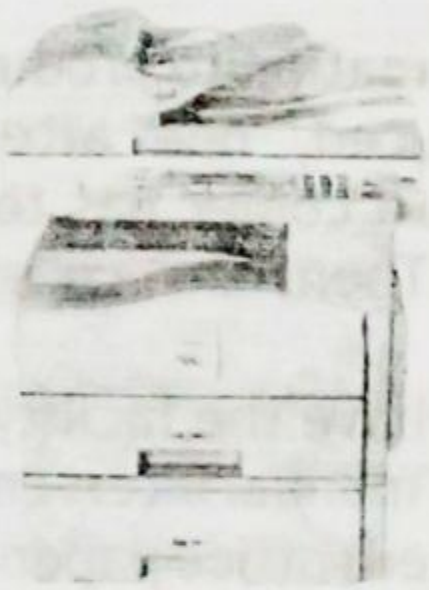


Fig. 7.2: 400 × 400 - Ricoh Photocopier: Example of a Freestanding Photocopier (SOHO MFP).

However, photocopier could be the conventional ones that produce black copies, or colour copiers that produces excellent black and accurate coloured copies.

Advantages of Copier

- The process is faster and easy to use.
- There is no need for treated paper, but office copy papers could directly be used.
- The original could be retained.
- Library patrons usually prefer this medium to copy documents or information resources.

Disadvantages

- Copy resolution diminishes for every copy that is being recopied.
- The machine is usually expensive to maintained or repaired when it breaks down.

Advantages of Modern Digital Photocopiers over Analogue Technology

The older analogue photocopiers are fast giving way to new copiers that use digital technology. Digital copiers consist of integrated scanner with laser printer and have a number of advantages over the analogue copiers as follow:

- One major advantage of digital copier is that some of them can equally function as high-speed scanners and printers. For instance, when copying a set of 10 pages, 10 times, a digital copier scans each of the 10 pages only once into an internal memory and

uses the stored information to produce 10 sets. These 10 sets are automatically produced, one after the other and collated; whereas, an analogue copier has to scan each page at a time, making 100 scans. Then, the collation and sorting has to be manually done.

- Modern copiers also have the facility to carry out duplex/side by side copying without manual intervention.
- It uses plain (untreated) office paper
- Ability to print on both sides (front and back) of the paper
- Automatic image quality enhancement
- Copying multiple originals into a single sheet of paper
- Image adjustment (customized enlargement or reduction)
- Creasing and hole punching facilities
- Continuous copy function. Up to maximum of 999 preset copies with subtractive counter.
- Interactive and friendly interface.

Basic Steps in Using Copiers

To photocopy a document, connect the copier to a power source and switch on the machine. The power "on" light/ indicator will display usually red in colour. Wait for few seconds or minute for the machine to process and "ready". The red light will change to green on the start button. This signifies that the machine is ready to function. Check that papers are available in the paper tray. You can use the hand-fed/ side tray of the machine or automatic fed tray locked inside the machine.

Open the lid/cover of the copier and place the original document on the glass, face down. Pay attention to the alignment marks around the left edge of the glass platen. Ensure to align the document accordingly.
Note the orientation of the original you place on the glass. This will determine how to feed in the copy paper. If the original is placed vertically (portrait), the copy paper must also be fed into the machine accordingly. If the original is placed horizontally (landscape), the same must be done to the copy paper. This is to prevent cutting off lower part or sides of the copy made, if inconsistent orientation is used.

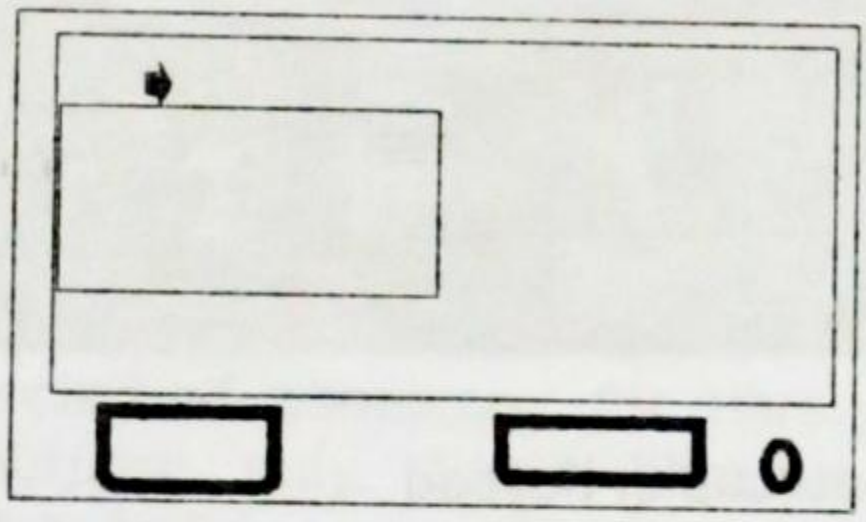


Fig.7.3: Horizontal (Landscape) Orientation

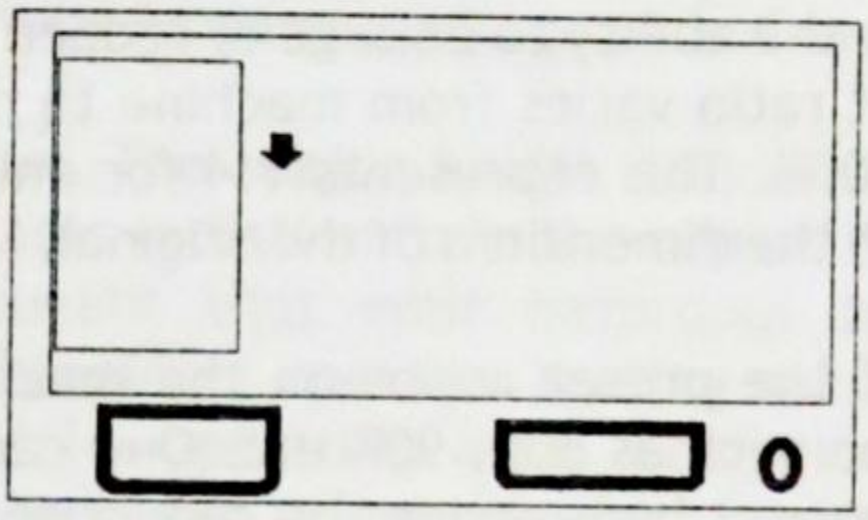


Fig.7.4: Vertical (Portrait) Orientation

The hand-fed/side paper-fed tray usually adopts horizontal (landscape) orientation. Once the original is carefully placed and aligned, lower the lid/ cover. Select the paper tray you want to use, and then press the green **"START"** button (on the right side of the control pad of the machine). The copy is produced and automatically dropped into the output tray or enclosure.

Making Multiple Copies

If you are making more than one copy of a single original, follow the steps outlined above. But before pressing the "START" button, select the required numbers of copies, using the numeric keypad. For example, if you are making 15 copies of a single original, press 1 followed by 5 on the keypad. The display screen on the machine will display 15. The number will be counting down as each copy is made. Copiers could make up to 999 preset copies. You can cancel this process by pressing the C key anytime.

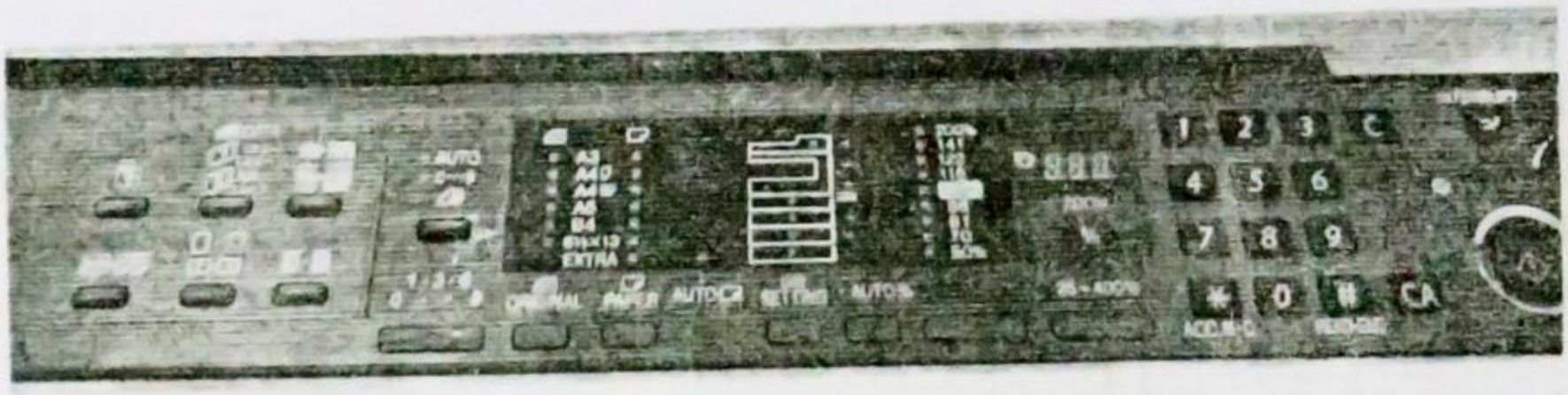


Fig. 7.5: A Typical Photocopier Keypad

Enlargement and Reduction

Modern copiers have the ability to enlarge or reduce copy of the original. However, the aspect ratio varies from machine to machine, but usually between 24% and 400%. This represents 1:4 for enlargement or 4:1 for reduction in line with the dimensions of the original.

One can use any of the preset ratios on the machine by pressing the corresponding button such as 80%, 90% etc. One can also customize the reduction or enlargement by pressing the reduction or enlargement key until desired ratio is reached. Once the ratio is set, press the **START** button to make copy.

Double Sided Copying

Modern digital copiers are capable of making side by side (double-sided copies). Press the duplex button on the left side of the control panel until **1>2** or **A B** is displayed on the machine interface. Then place the first side of your document on the glass as earlier instructed above, and press the **START** button. No paper will roll yet. Now turn the original over and place the second side. Again, press the **START** button and the copy will be made. Remember to press the duplex button again to re-select 1>1 when you finished duplex copying. For accidental pressing of any key, always press the C key to cancel such operation.

Issues in Photocopying of Library Materials

Two issues will be examined in relation to photocopying of various library materials namely:

- **Copyright Issue:** Complete chapter is dedicated to the issue of copyright in this book (Chapter 14) where it is extensively discussed because of its relativity to photocopying and other

reprographic library activities. Copying of copyrighted materials (such as book or other intellectual properties) through any means specified (e.g. manually, electronically) is prohibited in countries that have effective copyright laws. Violation of copyright law, known as piracy, is considered criminal and punishable. However, the privilege of "fair use" enables the library to make limited non-commercialized photocopy for library users, mostly for research purpose only. Some libraries pay royalties on copyrighted materials to be able to make photocopies of such work to their users, while some do not permit making of large copies or whole document or large part of a work.

- **Health Issue:** The major health concern is the exposure to hazardous laser radiation from the copier. Some contain Class 1 laser component that emit hazardous beam to equipment operator. Therefore, operator seating specifications should be followed while operating such equipment. Another health concern is the use of *selenium*, which emits harmful fumes that come from heated toner during fusing. Similarly, looking directly into the exposure light source (fluorescent, tungsten halogen, or xenon flash) may damage one's eyes. Equipment manufacturers health and safety information outlined on the equipment manual or other sources should be carefully studied before operating such equipment and should never be compromised.

Scanner

Image scanner is a device that optically scans images, printed texts, handwriting or an object, and converts it into a digital image. Scanner is a very valuable reprographic device in the library as it assists greatly in the area of retrospective conversion or digitizing of library materials. It generally helps in converting materials from other formats to digital images/formats that could be manipulated by computers or shared for usage among library users.

Merits of Scanner

- It is useful in digitizing library collections for wider accessibility and storage.
- For conserving out-of-print or rare collections.

- For preserving information on deteriorated materials.
- For converting graphic arts or paintings to digital materials in order to secure the original.
- For day to day digital copying.
- For converting realia or objects to digital images.

Types of Scanners

There are different types of scanners, which include:

- Desktop/Flatbed Scanner
- Drum/Document/Rotary Scanner
- Book Scanner
- Hand-held Scanner
- 3D Scanner
- Planetary/Over-head Scanner
- Slide/Film Scanner
- Digital Camera/Smart-phone Scanner

Desktop/Flatbed Scanner: This is usually the commonest of the scanners. It is flat in shape and place on the desk. It is commonly used for digitizing pictures or loose leaf documents. Materials to be scanned are placed face down on the glass platen one after the other.

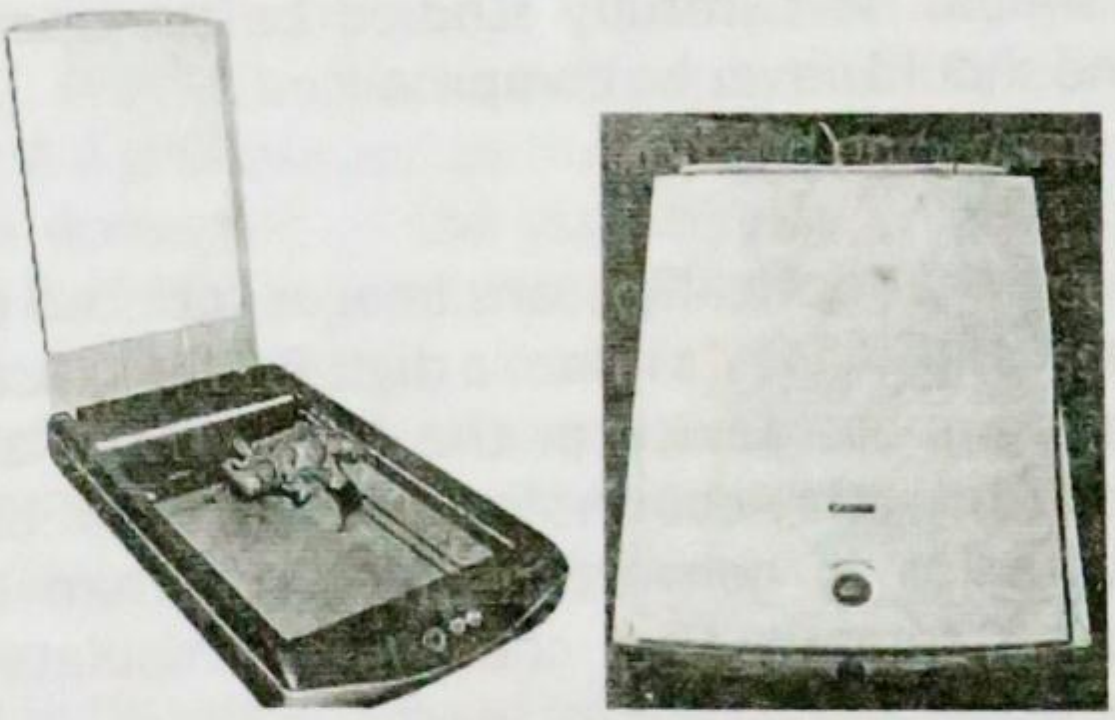


Fig. 7.6: Flatbed Scanners

Drum/Rotary or Document Scanner

This kind of scanner is specifically designed for scanning large number of documents. It requires the image which is usually paper documents to be

fed into a series of rollers (Bansal, 2010). Document scanners contain Automatic Document Feeder (ADF) mechanism, which automatically feeds in the documents to be scanned.



Fig. 7.7: Document Scanner

Book Scanner: It is a specially made scanner for scanning books or magazines, resulting into no damage to the books or magazines. Book scanner is usually a combination of various mechanisms assembled together to function collectively. It varies in size and specifications, but usually contains a V-shaped cradle on which the book spine will rest. This is in addition to double high resolution digital cameras and LED bulbs for illumination. See Figures 6.3, 6.4 and 6.5 for other examples of book scanners.

Examples of Book Scanners

ScanRobot 2.0 MDS

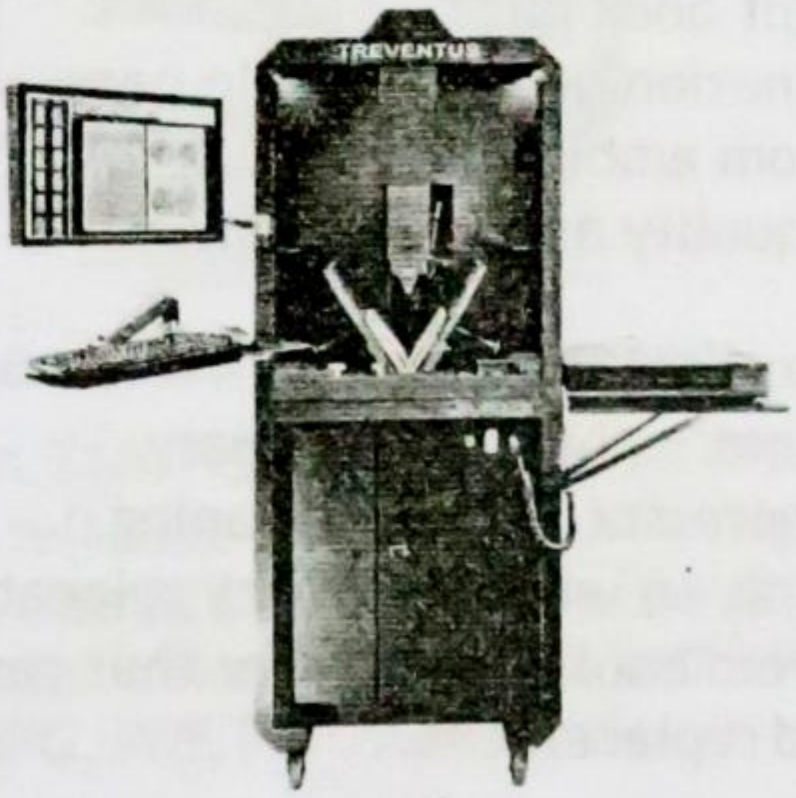


Fig.7.8: ScanRobot® 2.0 MDS (Mass Digitization System)

The ScanRobot® 2.0 from Treventus is a high speed mass digitization system (MDS), specifically designed for large volume digitization of any bound material. It is an automatic book scanner which significantly increases the productivity and lowers the overall costs of the library digitization project. It has a speed of up to 2,500pph. It can also function in a semi- automatic mode for gentle scanning of fragile books with speed of up to 1,000pph. However, the page speed can vary depending on paper quality, book size and book condition.

It also features automatic page turning mechanism. The lighting system is a user and book-friendly LED lighting (without any IR, UV or heat radiation). It can capture image at 300 dpi or 400 dpi resolution. It can capture images in 30-bit colour, greyscale or black and white. It Stores output formats as jpg, jpg2000, tiff, tiff G4, png, gif, bmp, pdf (including OCR layer), XML, DjVu.

The mechanical advantages of ScanRobot® 2.0 MDS Unit include:

- Adjustable 60° to 100° book cradle opening angle to avoid overstretching of books.
- Wooden book cradle for most gentle book handling.
- No clamps or glass plate needed to flatten the pages.
- Robust and simple design.

Capturing unit advantages include:

- One central capturing unit with equal and constant distance to the left and right book page.
- Constant illumination over the whole page.
- Independent from ambient light.
- Constant scan quality and resolution.

System attributes advantages include:

- Integrated system: only 1 PC necessary.
- Built in air-compressor for easy cleaning.
- Self-standing unit on wheels for easy relocating.
- Collects dust from books into a filter that can be easily taken out for cleaning and replacement.

KABIS II + (PLUS)

KABIS II + (PLUS) is an automatic book scanner from Kirtas Technologies, Inc. with a digitization speed of up to 2,000pph. It could also be operated manually with speeds from 300-2,000pph.

It features an automatic book centering cradle that increases post-processing productivity. The 110 degree position is optimal for low stress, gentle book positioning and is ideal for fragile and old books. It equally features an automatic page turning mechanism- SureTurn robotic arm with its vacuum head, which gently lifts and turns the page. Within the vacuum head is a Page Edge Sensor technology to detect multi-page or no-page lift conditions. This is to ensure that only one page is turned at a time. This results into full book content integrity and quality.

Apart from providing a simple user interface that facilitates quick digitizing, KABIS II+ Manager software equally facilitates downloading and integration of bibliographic records of books from OCLC or library database to include with the book metadata.

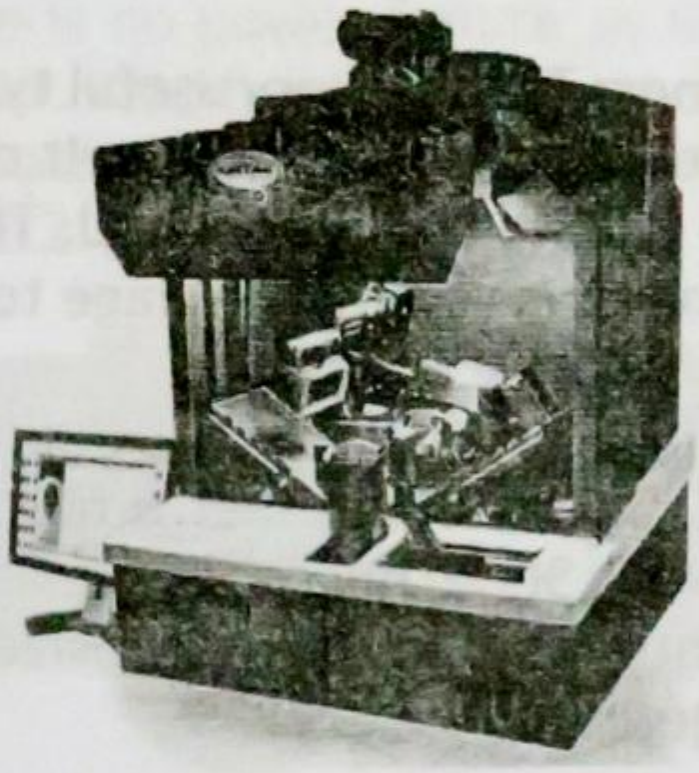


Fig.7.9: KABIS II PLUS System (automatic book scanner)

KABIS II + features Canon 21MP camera in full 24 bit colour for image capturing; one image for left-side page and one for right-side page. The image can be captured at true 325 x 325 pixels per inch (ppi) or 400 x 400 ppi resolution with superior colour sharpness and clarity. It produces output as TIFF, JPG2000, JPG, PDF, PDF/A etc.

Hand-held scanner: This scanning device is moved by hand and has evolved greatly. It is mostly useful for scanning data such as bar-codes. The operator's hand must be stable and moved at regular speed to get a clearer, non-distorted image.

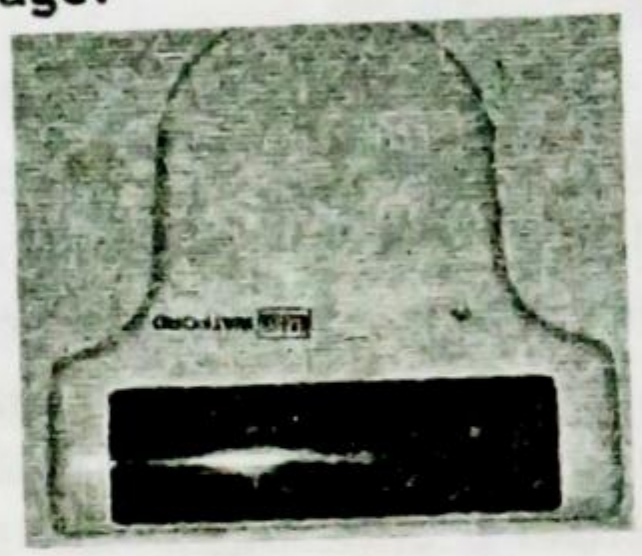


Fig. 7.10: GeniScan GS4500 Hand Scanner

3D Scanner: This is mostly used for industrial designs, engineering, construction designs, test and measurement. It produces three-dimensional image/ models of objects. It is used in the library to digitize special collections like realia, models or objects. See Figure 6.8 for 3D scanner.

Planetary/Over-head Scanner: This is a very useful type of scanner in the library. It digitizes library collections from above. It contains a flat plate on which the material to be scanned will be placed. This enables a better view and capture of the books and reduces damage to books. See Figures 6.4 and 6.5 for images of planetary scanners.

Slide/Microfilm Scanner: This kind of scanner is used for scanning slides (positive) or film (negative). Slide/microfilm scanner is essential in microfilming library books into compact or miniaturized sizes for effective long-term or archival storage.

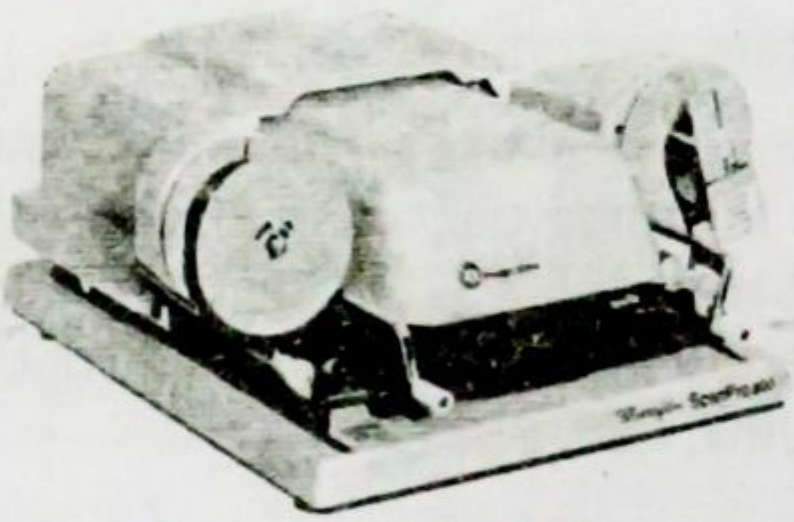


Fig. 7.11: Scan Pro 800 MICROFILM SCANNER

Small & sturdy, the compact ScanPro 800 Microfilm Scanner, from e-ImageData, is a resourceful device for microfilm scanning. It uses Windows computer application software with familiar icons and text labels.

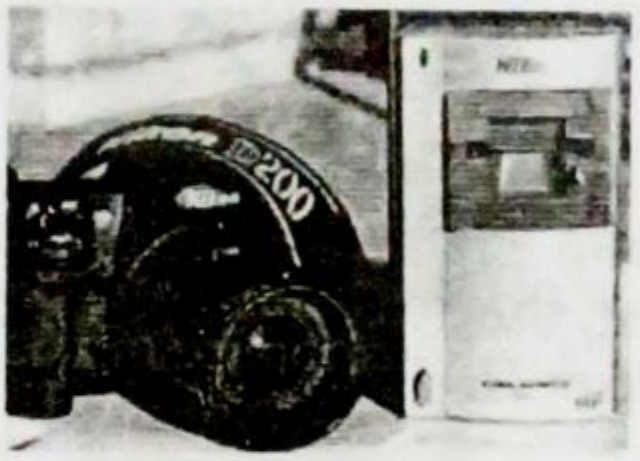


Fig. 7.12: DSLR camera and slide scanner

Digital Camera/Smartphone Scanner: digital camera/smartphones are equally used as scanners. These gadgets come with special image stabilizing and editing applications, and are capable of saving images as PDF or JPEG format. It offers image editing options such as cropping, image enhancement, brightening or contrast, rotation etc. These kinds of scanners are useful for scanning bulky or large book with thick spine, without damaging the spine. It is used if form of a planetary scanner. It offers advantages such as speed and portability which makes them easy to take around. There is no power failure as they are usually powered by battery. The major disadvantages of these kinds of scanners are distortion, reflections, shadows and low contrast. See Figure 6.7 for image acquired with 2.0MP phone camera.



Fig.7.13: Digital cameras

Multi-Function Products/Printers/ Peripherals (MFP)

This is also called All-in-One (AIO) or Multi-function Device (MFD). This useful reprographic device combines the functions of multiple devices for

more efficiency. A single MFP may function as a combination of some or all of these:

- Printer
- Scanner
- Copier
- Fax or E-mail

Most common MFPs perform similar basic functions of print, scan, copy and fax or e-mail. However, they vary in size and output quality. MFPs are available either as desktop or free standing equipment use Ink jet or Laser Jet printing technology.

Kinds of MFPs

All-in-one (AIO): this usually combines print and scan functions, mostly for small-scale reprographic output. Example is HP Deskjet 2050J510 series. It may come with photo organizing software and OCR, smart card reader, direct connection to digital cameras or similar uses. They also have light scribe functionality for direct CD labeling, using NERO or Roxio for designing the outline. AIOs are usually connected through USB or Parallel port. Most of them use Ink Jet printing technology and can print in black and white or colour.

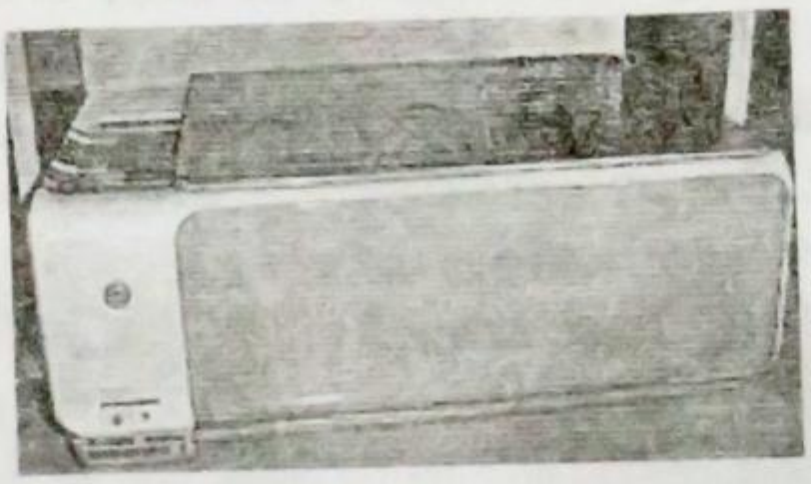


Fig. 7.14: Example of an AIO: A Hewlett-Packard Photosmart C3180, featuring card readers and photo printing.

Small Office/Home Office MFP (SOHO MFP)

These usually come either as large desktop or small free-standing, at times with extra paper trays. They are capable of performing basic print, copy, scan and fax functions only. Unlike AIO, SOHO MFPs have networking capacities. This is in addition to USB connection port, and they are capable of sorting and collating output products. They have capabilities for faster output performance.

Office MFP: these are mid-sized free standing unit. They contain most of

the features of SOHO MFPs, but in addition have advanced copying and finishing functions such as duplexing, stapling, hole-punching and booklet creation. They usually have networking facilities.

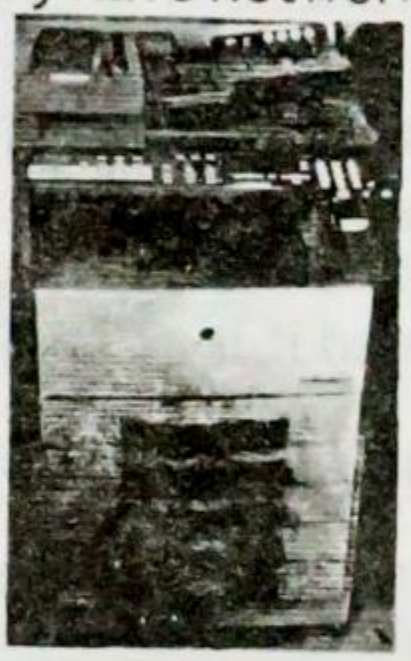


Fig. 7.15: A Konica Minolta bizhub 210. An example of a freestanding SOHO MFP.



Fig. 7.16: A Canon IR2270. An example of a mid-range Office MFP

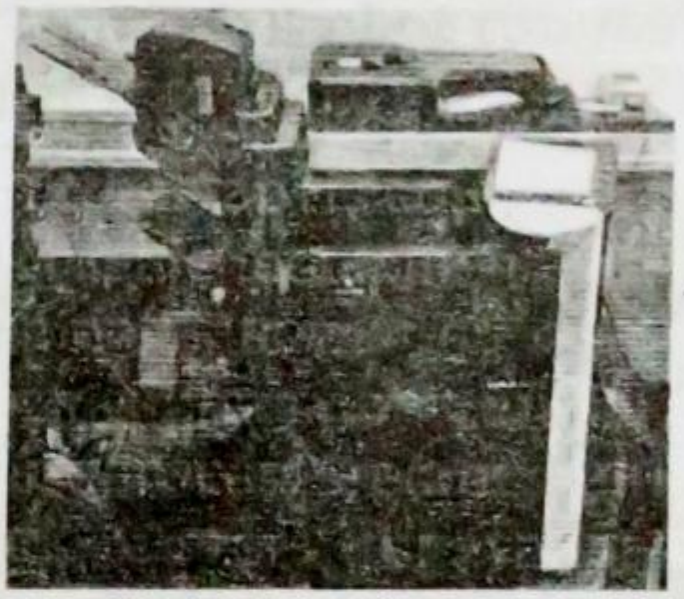


Fig. 7.17: A Konica Minolta Bizhub C451 with an attached finisher. An example of a mid-range Office colour MFP

Production Printing MFP (PP MFP): This is also called "Print on Demand" devices or "Digital Press". It is a large sized free-standing unit specifically

designed for large- scale reprographic activities. This is a very suitable device for library reprographic unit. The major distinguishing feature from other MFPs is that PP MFP focuses on high speed, very high quality output and highly advanced finishing functions such as: book creation and covers insertion, cover binding (using hot glue) and trimming. This kind of MFPs is very suitable for various restoration activities in the library (i.e. in restoring deteriorating library materials back into readable and usable state). The machine is all-in-one for copying, collating, binding, casing and trimming of the book. Indeed it is a "book maker". Some PP MFPs are capable of printing up to 100 ppm (pages per minute) and produce high quality copies comparable to those produced by offset press.



Fig. 7.18: A Konica Minolta Bizhub 750. An example of a high end Office Black and White MFP

Factors to Consider before Integrating MFPS into the Library System

There are a number of features to look for in MFPs before a library can decide to integrate them into its system. These include:

Print and Copy Features

Can the printer driver function with different operating systems? What connection type does it use (Network, USB, Parallel, Wireless or others)? What is the print speed? (i.e. how many pages can the machine print per minute?) What kind of paper format and size can the machine print on. Could it print on thick/ glossy papers for book cover? Does it have direct CD/ DVD labeling facilities? Does the machine adopt Ink Jet or Laser Jet printing technology? What is the scanning resolution? Does it have image enhancement capacity? Does it have duplex printing capability? Does it has "n- in- 1" function? (i.e. can it print more than one page on a single paper,

e.g. 2 or 4 pages in 1 etc?)

Scan Features

Does it have automatic document feeder (ADF)? Does it have duplex scanning capacity? What type of scan transfer methods are available (TWAIN, FTP, WebDAV, SMB etc)? What scan file formats does it support (PDF, TIFF, JPEG etc)

Document Finishing Capabilities

Does the machine have the following functions?
Stapling (single point, two point as well as the staple positioning)
Hole punching
Folding (Half fold/ crease)
Cover insertion for booklets
Cover binding (for production printing models)
Trimming facilities

Networking Features

Most of the MFP's have networking capabilities to facilitate remote printing and file transfer. What type of networking capability does it has (wireless or wired)?

User Interface

Most MFPs have LCD screens as user interface. AIO and SOHO MFPs contain simple LCD display screen, while Office MFPs contain advanced LCD panels. Modern Office MFPs have touch sensitive LCD screen and computer-like user interface with optional keyboard and mouse. This should be considered vis-à-vis the user friendliness of the MFP.

Computer Printer

There are usually two types of conventional small or medium scale printers usually used for reprographic activities.

- The Ink Jet which is capable of both black and colour printing; and
- Laser Jet which is usually known for dry black printing. Meanwhile, Laser Printers that are capable of colour printing are now available in different model.

Laser and LED Printers

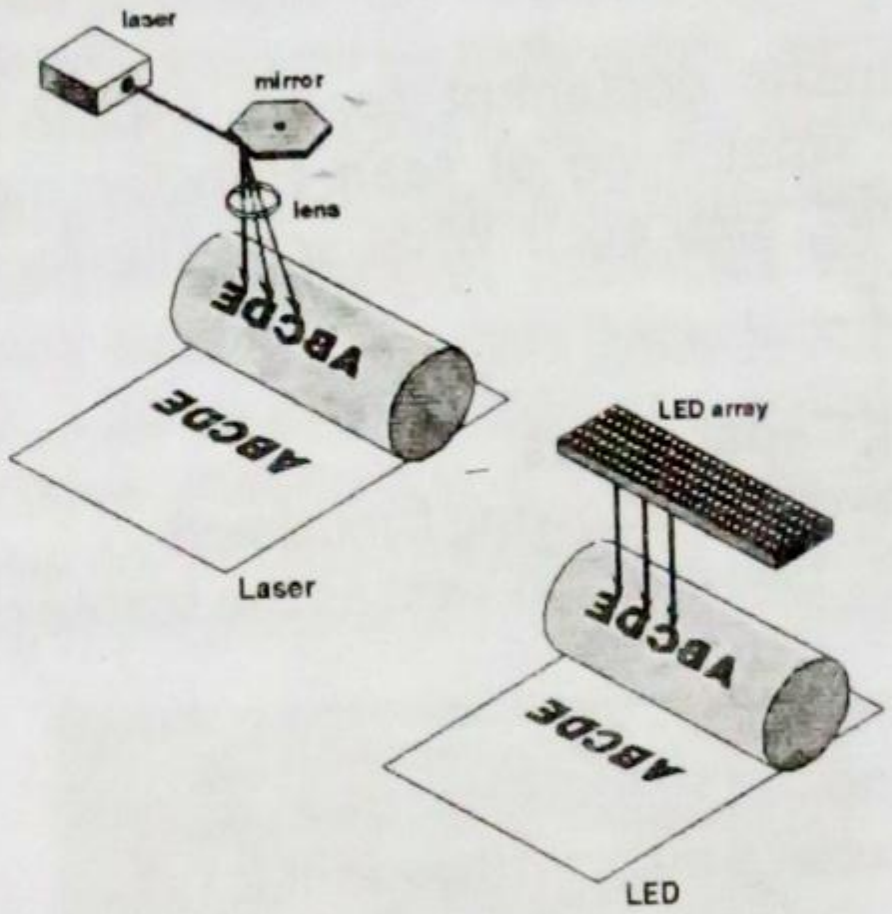


Fig. 7.19: Laser and LED Printing Technology

The difference between a laser and LED printer is how the light image is "painted" onto the drum. The laser uses a single light source that is directed by moving mirrors. The LED printer uses an array of hundreds of LEDs that are selectively beamed onto the drum. In a real laser printer, there are many more lenses and parts than in this simple diagram.

Printer is used as reprographic equipment by connecting it to a computer system for small-scale or middle-scale reprographic printing.

Computer

Modern reprography depends largely on computer and other ICTs. Computer is versatile reprographic equipment which can be used with any other modern reprographic equipment. It can be used for desktop publishing to complement information repackaging service. It is a key instrument for digitizing library materials. Computers are used with scanners to process or edit captured digital images. Computers are also used with MFPs and printers for various duplicating, copying or reproduction of information materials in the library.

Photographs and micrographic materials could be converted to digital images with the help of computer. Similarly, audio visual materials are

processed with computer. Computer is equally instrumental in copying of various multimedia resources and for direct digital labeling, which are parts of reprographic activities that take place in the library. Computers also have in-built memory to store processed information for future usage.

Microform Reader

Microforms are too tiny to be read with ordinary eyes. Therefore a magnifying apparatus known as microform/ microfilm reader is needed to view or read microfilm or fiche. A microfilm reader-printer is another apparatus that, in addition to magnifying the micro images onto a viewing screen, is also used for producing a paper copy of the microfilm.

Types of Micro-readers

There are different types of microform readers that are in use today. These include both desktop and free-standing devices. Technological advancements have equally led to the development of digital/ computerized microform reader, scanner and printer.



Fig. 7.20: The 3M Model 148 microfiche reader: antecedent of modern digital microform reader



Fig. 7.21: A digital microform reader

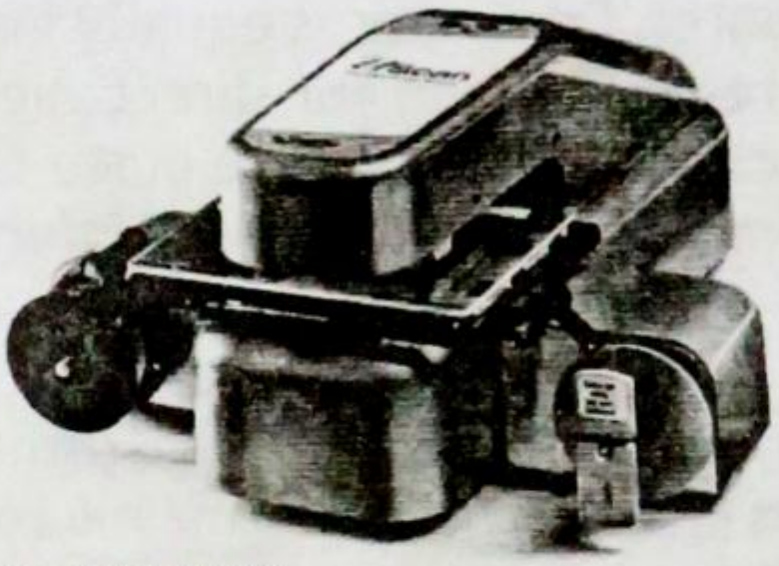


Fig. 7.22: UScan Microform scanner

The all-in-one UScan Microform Scanner is specifically manufactured by The Crowley Company for scanning microfilm, microfiche, aperture cards, and photographic materials. It scans in colour, bi-tonal, and gray scale. It equally features multiple output options (USB, email, cloud) and very portable.



Fig. 7.23: ST BookReader Center Digital Microfilm Reader

The ST BookReader serves as a microform scanner, reader, and features OCR, and TTS (Text to Speech). Other models are available that serves as all-in- one (multipurpose) which combines scan, read and print features.

Factors to Consider in Selecting Reprographic Equipment to be Integrated into the Library

Before integrating any reprographic equipment into the library, certain factors are inevitable considered:

- **Nature of work to be done:** This is perhaps, the primary factor to be considered in selecting reprographic equipment for the library. What nature of reprographic work does the library need at the

moment? Is it photocopying, scanning/digitizing, binding, trimming, micrographics, faxing, colour or black and white printing? Having a clear image of the nature of reprographic work the library needs will suffice in deciding on the right equipment to perform the tasks required.

- **Quantity of work to be done:** The library has to decide on the amount or number of work proposed to be done. Does the library attend to robust number of researchers who frequently require such services or otherwise? This may be juxtaposed with the number of library users. The speed of the equipment matters a lot. A machine that produces less than 10ppm (pages per minute) is not suitable for a bigger library. Thus a bigger library such as academic library should select a faster machine to be able to serve large numbers of clienteles in minimum time possible; yet maintaining service quality.

- **Quality of work to be done:** Does the library reckon with service quality? What is output quality that the library requires? Reprography equipment varies in size, price, speed and output quality. Therefore, the library should select the equipment that best matches the output quality needed. A digital printer to be procured for colour printing of images should be known for good colour separation and quality output.

- **Users' Requirement:** The nature of job request from users should also be considered before integrating new reprographic equipment into the library. It amounts to waste of financial resources to procure equipment of which there will be no demand for its productions. There is no need to procure a colour copier if heavy demands are only made for black and white.

- **Availability of Fund vis-à-vis Cost of Equipment:** The library should consider the available financial resources in relation to the cost of the procuring the equipment. Costs are incurred on ordering cost, purchase, shipment, installation and operator training. If the library could not afford an expensive machine, it could settle for a less expensive one that could still serve or

perform most of the functions the library requires. Always choose affordable equipment and operate it economically, as suggested by U.S. Fish and Wildlife Service (2011).

- **Quality/Reliability of the Equipment:** This is equally an essential factor to consider. The library needs to widely consult by seeking specialists advice (if need be) on selecting the best equipment, in term of quality and reliability. Similarly, library could ask for demonstrations from equipment vendors before final choice is made. Only equipment from reputable manufacturers should be patronized as they usually come with warranty in case of system failure.

- **Cost of Maintenance:** The library should consider the cost of maintaining such equipment. Is there after- sale services or expert closer to the library to repair the equipment? Are spare parts of the equipment readily available?

- **Office Space:** Is there enough space in the library to install the equipment? This is necessary to determine the size of the equipment to be procured. It is pointless to buy large equipment without enough space to install such.

- **Availability of Skilled Operator:** Is there a skilled operator in the library to manage the Equipment or he has to be re-trained? Will there be need to employ additional skilled staff? These have to be decided.

- **Technological State of the Equipment:** Technology is emerging at an increasingly rate. Do not buy equipment that adopts older or obsolete technology. For example, an analogue copier will be cost ineffective for the library when we now have digital copiers and MFPs that can perform efficiently.

- **Health and Safety Issue:** It is very important to consider health and safety issues associated with the equipment before integrating such into the library. Select equipment that conforms to your library health and safety standards. Ensure that you have a

spacious and well-ventilated area to install the equipment.

- **Type of Paper and Supplies Required:** identifying the type and availability of paper and other supplies such as ink or toner required by the machine is necessary. Does the machine use plain paper or treated ones? Are the paper and other materials readily available?

- **User Friendliness:** the user friendliness of the equipment is another factor to consider. What nature of user interface does it have? Would it be simple or complex to operate the equipment? Would it require certain basic skills before the operator could handle it?

Reprographic Unit Equipment Operator

According to Los Angeles Community College District (LACCD) Class Specification (2010), reprographic equipment operator is one who sets up, operates and performs minor maintenance on high speed copying machines and other related reprographic equipment.

A reprographic equipment operator is therefore expected to be knowledgeable in operation and maintenance of reprographic equipment (especially, digital programmable copiers); proper output /product finishing and binding; stock taking and basic record keeping techniques; and operation of computer systems.

Skills and Abilities

A reprographic equipment operator should demonstrate high skill of operating reprographic equipment. In addition, he should have the ability to:

- carry out minor repairs and adjustment to reprographic equipment;
- meet schedules and deadlines;
- perform work according to specifications;
- maintains accurate record of work done and stocks requirement and utilized;
- accurately estimate quantity of materials needed to complete a work;

- learn general and specialized computer applications;
- be friendly and not hot-tempered, good inter-personal skills; and
- work with other departments and units in the library to achieve common goal.

Typical Duties of Library Reprographic Equipment Operator

Typical duties of library reprographic equipment operator include the followings:

- Sets up and operates the reprographic equipment for reproduction of a wide variety of materials as may be required by the library staff or users.
- Cleans, adjust and carry out minor repairs on reprographic equipment.
- Respond and attend to inquiries from customers (mostly library staff and users).
- Contact service representatives concerning major repairs and services of reprographic equipment.
- Operates various bindery and finishing equipment.
- Keep the records of productions.
- Order parts needed to make minor repairs on reprographic equipment.
- Perform other related duties as assigned.

8

MAINTENANCE OF REPROGRAPHIC EQUIPMENT AND MATERIALS

Introduction

Before discussing maintenance of reprographic equipment and materials in the library, it is necessary to conceptualize what maintenance is, and identify its various types.

What is Maintenance?

Maintenance, in this context, can be defined as the process or act of putting resources together by an organization to promote indefinitely, the operational ability and productivity of an equipment or tool in a safe and healthy working condition and environment.

Imbibing a high sense of maintenance culture is a necessity in the library, as all library equipment and tools are essential to daily library routines and effective service delivery.

Types of Maintenance

Although, several types of maintenance have been identified, but generally, there are two basic types, which are discussed below:

- Preventive maintenance
- Corrective maintenance

Preventive Maintenance: This is a kind of maintenance carried out on equipment before total breakdown occurs (Wikipedia, 2012). This kind of

maintenance is usually carried out with a view to forestalling equipment failures which could translate into production loss and violation of health and safety standards. This kind of maintenance is carried out at intervals to check the condition of the equipment and necessary servicing are carried out, if necessary. Preventive maintenance is relative cheaper, and time and energy conserved.

Part of preventive maintenance is **"Periodic or Time Based Maintenance (TBM)"**. Mantenimiento Petroqimical (2011) points out that this type of maintenance is usually the basic one carried out by the user of equipment, which consists of series of elementary tasks such as visual inspections, cleaning, lubrication, retightening of screws etc. TBM serves two major purposes:

- to prolong the life-span of the equipment; and
- to diagnose early, any imminent fault or any variation in the operation of the equipment which, if not timely prevented, could degenerate and cause a major setback or production loss.

Corrective Maintenance: This is the kind of maintenance which is required when an equipment/ tool totally break down, failed or stop functioning. Corrective maintenance is required to bring failed or worn-out equipment back to working order. As the result of that, it is usually more expensive as a damaged or worn-out part can cause further damage to other parts, thereby resulting into multiple damages. The exorbitant cost of carrying out corrective maintenance on failed equipment should always be considered. If the cost will be too burdensome, total replacement should be considered.

Reasons for Maintaining Reprographic Equipment in the Library

Reprographic equipment are important to library activities. Therefore, regular and proper maintenance of the equipment is necessary for the following reasons:

- **To Prolong the Life-span of the Equipment:** Timely and proper maintenance of reprographic equipment will generally prolong the life span of the equipment as well as its operational ability.
- **To Diagnose Imminent Faults Early:** Simple maintenance (such as Periodic / Time based Maintenance (TBM)) are very effective in diagnosing early faults that could culminate into production loss.

- **To Save Cost:** Maintaining reprographic equipment will enable the library to save certain cost over a period of time. For instance, while the cost of replacing and equipment or carrying out corrective maintenance may be expensive, regular TBM or preventive maintenance is cheaper and easy to carry out. This enables the library to save some financial resources that could be diverted to other productive aspect of the library.
- **To Prevent Equipment Breakdown and Malfunctioning:** Maintaining reprographic equipment enables the library to prevent unnecessary total breakdown or malfunctioning of the equipment which could lead to unnecessary spending.
- **Users' Satisfaction:** Maintaining reprographic equipment in the library increases users' satisfaction level. Imagine how easily the effort of a researcher could be frustrated, while, after strenuous efforts to retrieve a number of information, could not reproduce such for outside-the-library use as a result of equipment breakdown or malfunctioning.
- **To Increase Productivity Level:** One of the primary reasons for equipment maintenance is to increase the productivity level of the library, staff and services. Equipment breakdown or malfunctioning could render the operator (library staff) redundant, thereby affecting the library service from that end. Faulty equipment also results into production loss, as machine could not produce up to required capacity.
- **Securing the Source of Library Internal Generated Revenue (IGR):** Reprography service in the library is one of the major sources through which the library generates funds internally. Therefore, equipment breakdown, failure or malfunctioning resulting from improper and irregular maintenance will adversely affect the library's income generation. Therefore, proper and regular maintenance of library reprographic equipment is necessary to secure the library's channel of generating income internally.

Promoting Safe and Healthy Working Environment: Maintenance promotes health and safe working environment for the operator, users, library staff and library environment in general. Poor maintenance could result into certain artificial disaster and pose health risk or expose staff to other work-related hazards.

Detecting and Correcting Simple Faults in Library Reprographic Equipment

Before discussing various means of detecting and correcting simple faults in library reprographic equipment, it is pertinent to identify the categories of faults that could affect the equipment. Faults in reprographic equipment could generally be categorized into three namely:

- Electrical/electronic faults
- Mechanical/hardware faults
- Software faults

Electrical Faults: These are electrical or electronic problems that the machines may experience from time to time, ranging from simple to complex. Since most of the reprographic equipment use electricity to function, it is a common thing for them to experience certain electrical faults, e.g. no power supply to the equipment, cut or broken fuse etc.

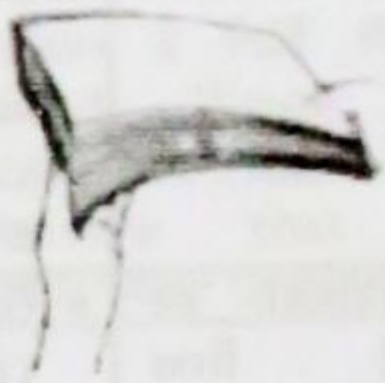
Mechanical/Hardware Faults: These are faults that are associated with motorized or other hardware components of the equipment such as loose screw, broken belt or chain.

Software Faults: It is a common thing today to find some modern reprographic equipment that use special software to function, especially while using such as a computer peripherals, e. g. Scanners, Digital copiers, All- in-One printer etc. These devices contain micro-processors and uses dedicated software to function. However, a fault in the device or computer software may alter its functionality.

How to Detect Simple Faults in Reprographic Equipment

One major way of detecting faults is through regular/routine check of the equipment usually by the operator. This regular check enables the operator to notice any variation in vibration, sound and quality of output/ production pertaining to the equipment. Similarly, simple faults could be detected through simple maintenance such as Periodic/Time-Based maintenance. This kind of maintenance assists in early diagnosis of any fault in the equipment for proper correction.

Simple Faults, Likely Causes and Corrections

Faults/ Problems	Likely Causes	Corrections/Solutions
Power not supply to equipment (copier)	• Equipment not connected to power source. • Power outage. • Fuse break. • Power switch in off position.	• Connect the power cord to power supply. • Ensure that there is power supply and the main socket is functioning. • Carefully remove the fuse and replace with new one. • Turn the power switch to the "ON" position. If all these fail, refer to specialist.
Ready light not display or delay longer	• The copier is not ready yet or a part has been disengaged.	• Give the machine few seconds or minute to process and "ready" for operation. • Ensure that all detachable components of the machine are perfectly and correctly fixed, especially the paper trays.
Copy papers Jamming	• Copy papers are damp • Copy papers are rough, dirty or creased • Multiple papers are fed simultaneously • Presence of foreign object such as staple pin, paper clip in the machine	• Warm copy papers before using • Ensure that only neat papers, without crease are used for copying • Carefully brush down the edge of the papers with your thumb before loading them into machine, as shown in Figure 8.1  Fig 8.1

		• Open the machine to check if there is any foreign object blocking the copy papers
Removing jammed papers form machine		• Refer to the equipment operating manual for instructions on how to remove jammed papers from the machine. Do not pull carelessly, as this could damage other components of the machine
Images out of margin areas on copy	• Master not properly aligned on the copier • Margin not properly fixed on the copy master	• Open the copier lid and align the master according to the margin indicators on the left edge • Fix the image within the margins and preview before sending the print
Loose screw	• Screws may be lost from previous maintenance exercise	• Get a screw- driver to retighten the screw. In case of lost screw, get a new screw of the same size and fix accordingly
Blank or Fainted print out	• Toner or Ink does not supply well • Toner or Ink is exhausted Note that any toner or paper related problem will be indicated by a corresponding light on the copier	• Ensure that a master or original is placed on the glass platen • Adjust the toner or Ink control to darken the printing tone • Replace toner or Ink cartridge with a new one, In case the one currently in use is exhausted
Thin vertical or horizontal line across copy	• Damaged copier cleaning blade or printer drum	• Refer to professional or expert for repair. Do not touch the drum surface with hand.

Paper not rolling out of machine	• No paper in tray	• Check if the selected paper feed tray still has papers, otherwise add papers
Toner spreading out of machine	• Not properly fixed or damaged toner cartridge	• Fix toner cartridge properly or replace with new one
No audio or video	• Audio or video cord not properly connected to the mains	• Ensure that the audio or video cord is properly plugged into device at both ends, or replace cord with new one
Device not responding to instruction	• Software problem • Damaged connecting cord • Devices not within range (wireless/ Bluetooth device) • Malfunctioning port	• Refer to software specialist for repair • Replace cord with new one • Place both devices within range and re-launch the command • Check that the connection to the port is perfectly fixed, or use alternative port
Unable to open copied files	• Copied file format not supported by device • Corrupt or damaged file • Interrupted copying process • Software required not available	• Convert the file format to one supported by your device • Scan file to detect if not infected with *virus*. • Try to recopy the file • Some files need specific software to be available on the system before one can access such. E.g. you need Adobe Reader to view a PDF file and a Flash Player to play Internet Video. Therefore, ensure that required software is available.

System Software

System software facilitates other software to run properly, by interfacing with hardware and with other software or custom software made to user specifications. "System software helps run the computer hardware and computer system. It includes operating systems, device drivers, diagnostic tools, servers, windowing systems, utilities and more. The purpose of systems software is to insulate the applications programmer as much as possible from the details of the particular computer complex being used, especially memory and other hardware features, and such accessory devices as communications, printers, readers, displays, keyboards, etc." (Mobile-Rent-A-Geek, 2008)

Application Software

Application software is a kind of computer software that is designed to be applied to specific tasks that directly benefit the user. Science Daily (2012) views Application software as a "defined subclass of computer software that employs the capabilities of a computer directly to a task that the user wishes to perform." Application software such as a word processor, graphics editor or spreadsheet, business, or educational software enables a user to perform specific tasks. Application software is used to automate all sorts of functions for efficiency.

Features of Software

Some of the important features of software, as outlined by Pawan (2001) are:

- user friendliness;
- provision to on-line interaction, especially while editing, inputting, retrieving and in- data management;
- provision to obtain outputs in various formats; and
- compatibility and portability.

Reprographic Management Software

As we are concerned with reprography, only reprographic software that is essential to the libraries is being considered. Hundreds of software is available that is useful for various reprographic activities in the library. These could be categorized as follows:

Word Processor/Desktop Publishing

- MS Word
- Adobe PageMaker
- Corel Draw

Graphic Editing Software

- Photoshop
- MS Image Editor
- Adobe ImageReady

Book Scanning Software

- BookDrive Capture
- Book Scan Wizard
- Scan Tialor
- Image Magick
- Scan2PDF
- BookScan Editor
- DigitalBook
- Nuovo IRIScan Book 2
- Fine Reader OCR
- OmniPage 18 OCR Software
- OpenBook 9
- OpticBook (A300, A600 and 3800 Series)

Multimedia/Data Burning Software

- Ulead Video Studio
- NERO

File Conversion

- Total Video Converter
- Total file Converter

Word Processor/Desktop Publishing

Information gathered from various sources are formatted using any of the word processing software such as Microsoft Word or Adobe PageMaker. MS word is a common word processor used for typesetting and processing of

word documents. Electronic information retrieved from various sources could be formatted using word processors such as Microsoft Word.

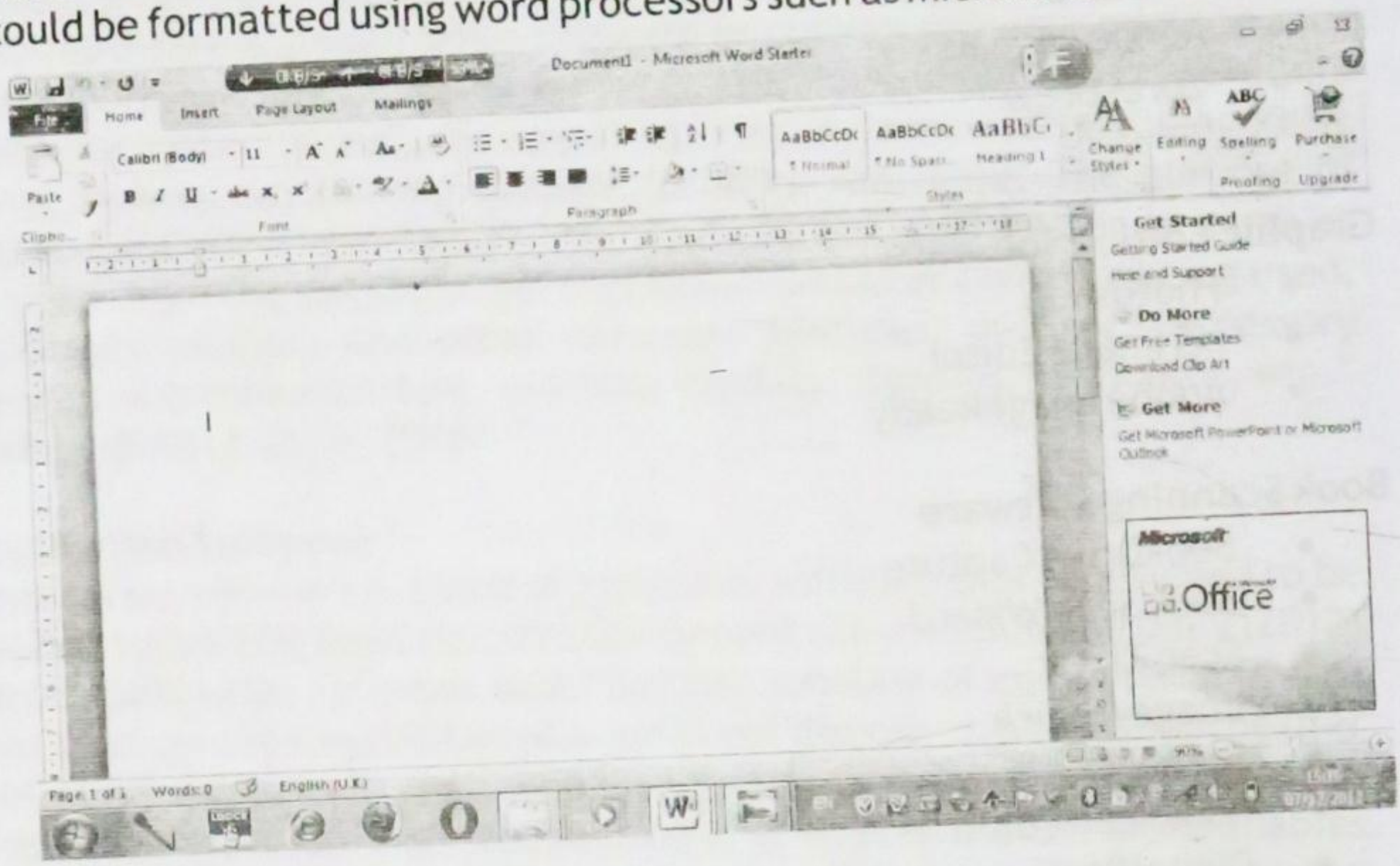


Fig 9.1: Microsoft Word Starter interface

Graphic Editing Software

Adobe photoshop and image Ready are significant examples of graphic editing software. It is very handy in editing and enhancing scanned digital images (such as cropping, toning and general image enhancement).

Book Scanning Software

BookDrive Capture 5.5

BookDrive capture is camera-based, very resourceful book scanning software. The software was developed by Atiz Innovation Co. Ltd. The software is available in three different categories:

- Book Drive pro: for large-scale professional scanning;
- BookDrive Mini: for not too large scanning; and
- BookDrive DIY: for manual/ small-scale or do it yourself scanning.

The software is used for controlling the high resolution camera used for scanning books or magazines. It is a software for scanning, with functions such as cropping, and general image enhancement, all in a single

interface. The software could be used to capture as high as 1000pph (pages per hour), scanning both the verso and recto (left and right pages) together.



Fig 9.1 : BookDrive Capture Interface

General features of BookDrive Capture
The features are categorized into three namely:

- Camera-related features
- Capturing/editing features; and
- Interface/general software management features

Camera-Related Features

The software has capacity for controlling dual-camera, as well as in-software camera status control. It displays vital information about the camera (such as battery status, shutter speed, aperture adjustment) right on the screen/interface. Camera setting could also be controlled/ adjusted within the software. It supports RAW (.CR2) file format which facilitates capturing of high quality images. It equally supports camera models such as:

- EOS 1Ds Mark III
- EOS 1D Mark IV, III
- EOS 1D X
- EOS 5D Mark II, 5D Mark III, 7D

- EOS 60D, 50D, 40D
- EOS 450D (Rebel Xsi), 500D (Ti1), 550D (Rebel T2i), 600D (T3i)
- EOS 1000D (Xs), 1100D (T3)



Fig.9.2: Some digital cameras that are supported by BookDrive Capture

It facilitates single or dual page capturing (i.e. one can capture single page, left or right, or both left and right together).

Capturing/Editing Features

Time-lapse: when the time-lapse mode is turned on, the cameras could be automatically programmed/ controlled to take shots at every pre-defined interval between 1-10 seconds. All that is required of the operator is to turn the pages of the book one after the other, while the cameras automatically capture. Similarly, automated paper transport devise could be used to automatically turn the pages.

Instant Crop

The software enables one to instantly crop, rotate or resize the captured images as they are being shot. One can also instantly export captured images to TIFF, PDF or PDF/A format.

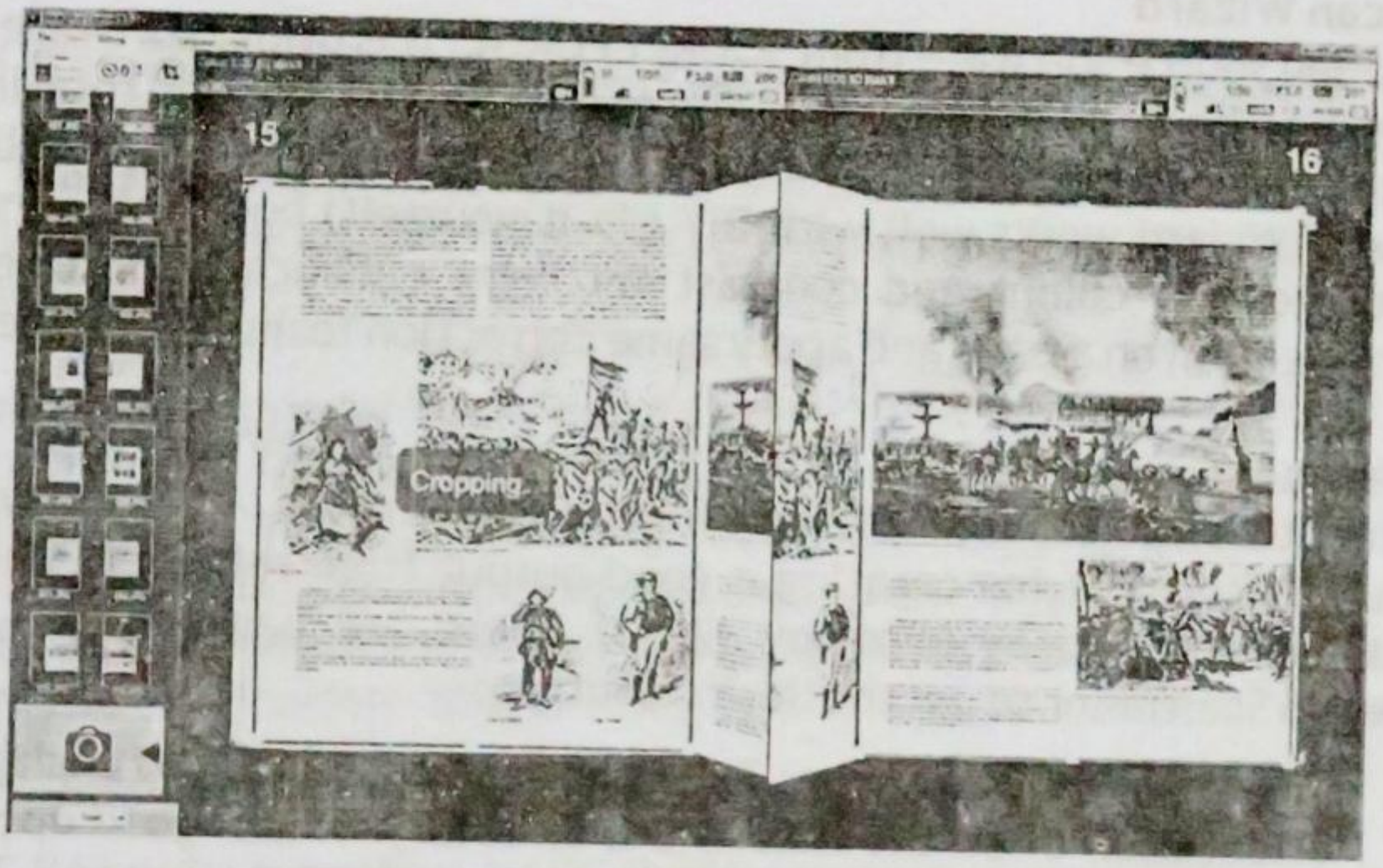


Fig.9.3 BookScan Editor Cropping Interface

Easy Insert and Replace: The software also permits easy replacement of scanned pages, in case some pages were skipped. One can go back to insert the missing pages or replace any bad shots with better ones. In addition, it has option to re-index file.

Interface/General Software Management Features

Multi language support: the software supports some of the prominent world languages: English, German, Russian, Spanish, Japanese, Korean, Chinese and Thai. BookDrive Capture has option for resuming unfinished book scanning, and continues from where it was stopped. All the files and settings of the previous job will come back alive.

Smart Preview: It displays the thumbnails of the past shots, full preview of the current shots and the magnified view of area of interest simultaneously. This enables one to verify the clarity/ sharpness or otherwise of the mages in line with the library's quality standards.

Metadata/Tags: The bibliographic details of the book such as title, author(s), and imprint could be recorded in a standard complex .XML files for future use. It facilitates bibliographic search of digitized books.

Book Scan Wizard

This is open source software from SOURCEFORGE. It is utility software that helps to scan book. It automates features such as cropping and rotating. It produces output as TIFF files which can be converted into PDF or e-book. Book Scan Wizard works well with DIY (do-it-yourself) book scanners and features general colour and contrast settings/ enhancement. One can make correction on a page and apply same correction to multiple pages

ScanTailor

This is another open source software from SOURCEFORGE. This software is particularly suitable for creating a good output from relatively unclean images. As outlined by Mazanov (2011) There are basically six steps involved in ScanTailor to get the desired output:

1. **Change the Orientation**: This function enables one to change the orientation of all the files in the directory. This is good option in case the book is scanned in a different orientation.
2. **Split Pages**: in case you scan two pages of a book together, this function automatically split them into two. Similarly, single page scans with some marginal text from other page are detected and corrected. Most of the times the auto detection works well with single page and two page scans. But it is a good idea to check manually whether all the pages have been divided correctly, so that it does not create problems later.
3. **Deskew**: After the pages have been split we need to change the orientation for better alignment of the text. Although, this may be done automatically, but it is a good idea to check the pages manually, in case something is missed.
4. **Select Content**: This step enables you to select the portion of the text that you want to appear in the final output.
5. **Page Layout**: Here one can set the dimensions for the output page and how each page contents will be outlined on the page.
6. **Output:** Produces the final output with all the above changes. The output is stored in a directory called "**Out**". The original images are not changed, so that in case you want some changes or something goes wrong, you can always go back to the original files.

- **Book Scan Editor Software**

Book Scan Editor is book scanning software by Kirtas Technologies. It is a very resourceful software that offers all the tools necessary for book digitization programme. It produces output as .xml file, suitable for metadata searches.

Important Features of Book Scan Editor

Pagination and Tagging: The "New Book View" functions of the software facilitate quick and easy book pagination and "tagging" of the processed book. It produces scan output as .xml metadata. Tagging enables the book to be given an identification tag that will aid its retrieval in the library's metadata. Pagination aligns images with page numbers, improving navigation within the book.

MARC Records: It enables MARC (bibliographic) records of the book to be added to the metadata file within the book scanning process through Z39.50 protocol or from other SQL databases for complete book information.

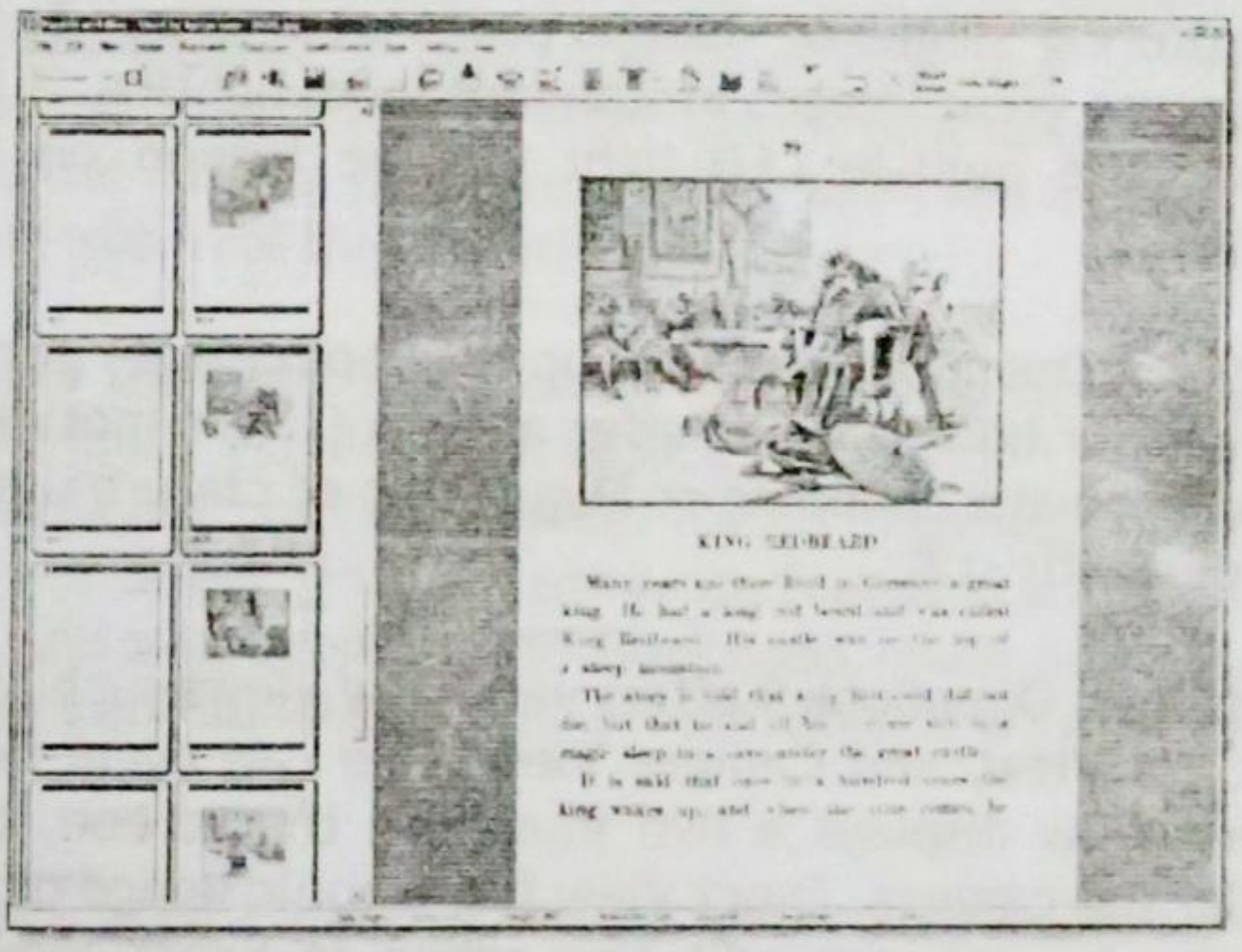


Fig. 9.4 : Book Scan Editor Interface

Automated Tagging: BSE PRO software automates the tagging of images within the book. Select the "Table of Contents" image and the software will link the Chapters, etc. to the specific images. The same can be done for the "Table of Illustrations". When output through Kirtas software to

PDF format, the tags become bookmarks in the searchable PDF.

Open Book 9: OpenBook Version 9 is another book digitization software from Freedom Scientific, Inc. The software supports 64-bit and 32-bit versions of Windows® 7, Windows Vista® and Windows 2008 Server, and 32-bit versions of Windows XP and Windows 2003 Server operating systems. It currently supports only left to right reading languages.

General Features of OpenBook 9

Optical Character Recognition (OCR): OpenBook 9 supports scan to editable text feature. Once a document is placed on a scanner or under the camera, OpenBook begins to read and display the recognized text on the screen within seconds of acquiring the image. It features a range of OCR Strategies (Fastest, Balanced or Most Accurate) which automatically select and use the appropriate OCR engine combinations for processing the work.

Portable Reading Camera: OpenBook 9 supports "PEARL" camera, specifically designed for capturing text images such as books or documents and render the images for reading in a matter of seconds. The camera is capable of capturing single or double pages at a time. The PEARL is designed to capture great images in standard room lighting. If the room is unusually dark, the built-in LED light can be turned on to provide additional lighting.

Motion Detection: OpenBook captures up to 20ppm (pages per minute) or 1,200pph (pages per hour). It also offer an in-software motion detection that prevents automatic snapping or acquisition of picture until a page is turned and is perfectly still.

Multi-view Display: OpenBook 9 offers variety of views such as Text View, Exact View, Split View, and Camera View. One can cycle between the views. Camera View displays a live image on the screen, of the item currently under the camera. Exact View is a graphic image of the original acquired image; you cannot edit text while in Exact View. You can, however, edit text using Split View or Text View.

Enhanced Workflows: OpenBook 9 offers variety of pre-defined workflows which include:

- **Acquire and Read**: Acquires a single image, places it at the end of the current document, and automatically moves to and begins reading the newly acquired text.
- **Acquire in Background**: Allows users to read pages that have already been acquired, while continuing to acquire single images in the background. Newly acquired text pages are placed at the end of the current document, but the user is not moved to the newly acquired pages.
- **Multipage Automatic:** This workflow uses the feed from a document feeder, a timer, or the motion detection with the camera to continually add new pages until commanded by the user to stop. New text pages are placed at the end of the current document, but users are not automatically moved to the new text.
- **Insert and replacement:** This workflow enables the user to acquire and insert a new page or replace a page with a new one. To insert pages into the current location, open the Acquire Menu and choose Acquire and Insert New Page. From this submenu, you can choose to acquire a page and have it added to the current document either before or after the current page. If you wish to replace the current page press CTRL+SHIFT+F4 or select Replace Current Page from the Acquire menu.

Online Accessible Updates: Updates are available for download through the software vendor's (Freedom Scientific) website. List of available updates are displayed under the Help Menu, provided the system is connected to the internet. This feature helps Freedom Scientific to make minor changes and improvements to OpenBook much more frequently. However, checking for updates is only available for the English version of OpenBook.

Split Facing Pages: in case you capture the left and right pages of the book together, this function enables you to split them into two. The Split Facing Pages feature of OpenBook separates two pages acquired in a single image from the scanner or camera into two separate pages in the document.

Table Reading Order: In addition to the ability to recognize documents containing columns, OpenBook 9 recognizes most tables. By default,

OpenBook organizes tables by row. Users have the option within workflows to set the workflow to organize tables by column.

Pending Pages included during Save: Choosing to save a document while there are still pending pages waiting to be recognized, will save both the unprocessed content along with the processed pages. This means that if you have acquired 200 pages, but you need to close and save the document while there are still 100 unprocessed images, OpenBook will save the 100 processed pages as well as the 100 images waiting to be processed. The next time you open the document, OpenBook will automatically resume processing images. However, if you save a PDF that is currently being processed, only the processed content is saved. This is because OpenBook processes PDF files differently from other image types.

Image Acquisition Source: OpenBook 9 enables the user to choose the source through which the image is to be acquired. One can select either scanner or camera as the capturing device.

Scan Text to Audio: OpenBook 9 features scan text to audio facility. It has an Audio folder as part of the Software Library. When you save text to audio, OpenBook saves the audio file to this Audio folder by default.

Multimedia/Data Burning Software
NERO

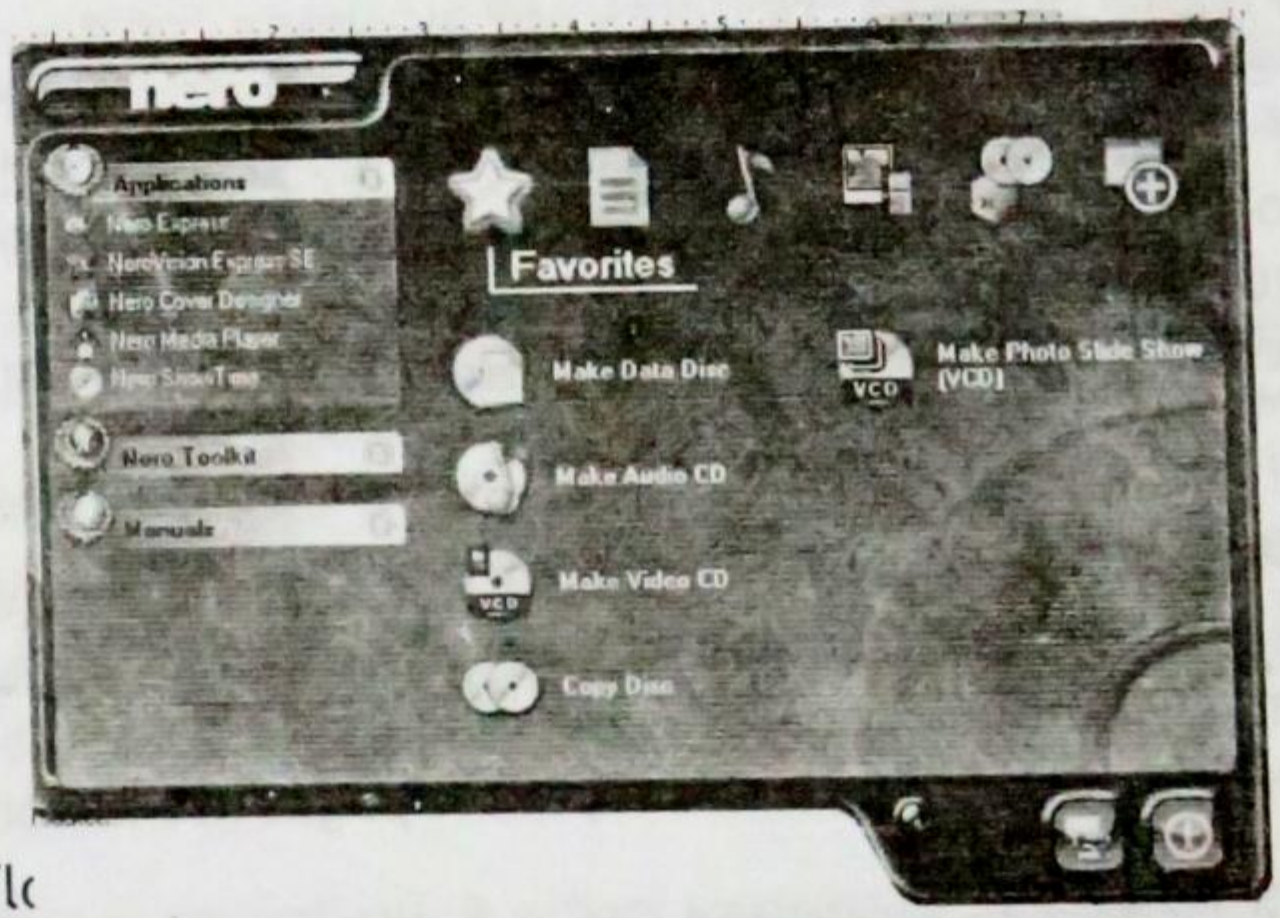


Fig. 9.5: NERO fl

NERO is used for multimedia creation. It is specifically useful to:

- Make data, audio, data+ audio and video disk
- Burn audio, data and video disk
- Back up entire disk
- Copy disk
- Format/ prepare rewritable disk
- Make MP3 disk
- Make photo slide show
- Capture video
- Record TV show
- Make and play back video files
- Design CD/DVD label and cover/jacket etc

The major relevance of NERO software to reprographic activities in the library is inherent in the areas of data capturing, disk copying and CD/DVD cover design. NERO is a useful software in refreshing or copying of data from one disk to another. It is also useful in direct digital CD/DVD labeling. To use NERO, click on the desired applications or icon that represents the needed application. Check **Chapter 13** for details on using NERO for cover design, as part of information products finishing.

ULead Video Studio

This is a multimedia management software used for capturing and editing digital video. It is very handy for processing film collections in the library. It could be used to capture VHS film, to be converted into digital format.

File Converting Software

Total File Converter

This software is used for converting audio and video files from one format to another such as mp3, mp4, mp5, 3G etc.

10

REPROGRAPHY AND CONSERVATION OF LIBRARY MATERIALS

Introduction

Library materials are susceptible to degradation. One of the major functions of the library is to preserve and conserve organized information resources or recorded knowledge that are useful to mankind. The library serves as an instrument for producing, promoting and preserving access to past and present intellectual records or literatures for present and future use. The lastingness or otherwise of the information depends on how effective or otherwise the library preserves and conserves such. It is also relatively important for the library to preserve the medium on which information are recorded against theft, mutilation, natural or artificial disasters as well as pests and other environmental hazards. This is necessary because library materials undergo a continuous and inevitable natural ageing due to chemical and physical instability.

The purpose of library preservation and conservation is to prolong the useful life of books and documents, and to facilitate and promote reader access to information. To produce, promote and preserve accessibility to recorded knowledge, library duplicates and reproduces information materials in different formats, for three categories of usage:

- the library itself (in-house use; not directly requested by users);
- the library patrons (physical and remote; directly requested by users); and
- Other libraries (for cooperating libraries/ resource sharing).

Effective reprographic operations for any of the above uses depend, among others, on what the library has in stock to offer, as the library can only reproduce what is available and in good readable format. The only means to ensure this is through sustained conservation of information resources. For information (intellectual contents) not to be lost with the medium on which they are recorded (due to technology obsolescence, over-use, degradation, theft or mutilation, pests), efforts are made on timely basis by library to preserve the intellectual contents on the media. It should be noted that the value of information material or medium is inherent in the worth of information/intellectual contents it contains. For example, a clay tablet or a piece of paper containing very useful information is considered valuable than a leather- bonded, but *empty* book. To his end, libraries and information centres make concerted efforts through various reprographic processes to achieve this.

What is Conservation?

Conservation and preservation are occasionally used interchangeably. Conservation "refers to the treatment and repair of individual items to slow decay or restore them to a useable state" (Chaudary, 2011). Iwhiwhu and Akporhonour (2009) citing Rosenberg (1993) describe conservation as the practice of restoring what has been damaged, identifying and treating damaged materials so as to restore access to the information contained in them. Conservation of library materials deals with the examination, restoration, treatment and continuous care of information resources to preserve them for present and future use. Conservation of library materials is also the process of copying library and archival materials to ensure the survival of their contents and to extend access.

Conservation and Preservation

Preservation, as distinguished from conservation is the process in which all actions are taken to check and prevent deterioration. Preservation deals with keeping materials in their original format for as long as possible. Preservation of library materials is the act of maintaining or restoring access to books, artifacts, documents and records through the study, diagnosis, treatment and preservation of decay and damage. Chaudary (2011) further points out that "through preservation efforts, patrons can be rest assured that although information materials are constantly deteriorating over time, the library itself will remain a stable, reliable environment for their information needs".

While preservation is concerned with the treatment and prevention of the physical format or media (on which information are recorded) against deteriorating agents through de-acidification, security, environmental control, repair or binding; conservation on the other hand is much interested in safeguarding the intellectual contents of any information material, with little or no regard to the kind of media the information is recorded upon. Means of conservation include: microfilming, photocopying, digital imaging etc.

In conserving a library material, information or intellectual contents are extracted off "dead", obsolete or deteriorating media, and present such information in another usable format to preserve lasting accessibility to the information. In sum, preservation deals with protecting the media, while conservation deals with safeguarding the intellectual contents on the media for present and future use.

Merits of Conserving Library/Information Resources

There are a number of advantages that are associated with conservation of library materials, including that it:

- preserves the intellectual contents of library materials from permanent or total loss
- saves physical space in the library. Bulky materials such as back-files of newspapers could be microfilmed to save space and also to maintain permanence of records.
- prevents mutilation, wear and tear to the original, resulting from excess usage.
- increases multiple and unrestricted accessibility to recorded information in various formats to both physical and remote library users.
- helps in securing the present and future of information use. Technologies come and fade away, but through conservation, the recorded knowledge in the library stays, thereby giving library users assurance that libraries will always be there to cater for their information needs, irrespective of format on which such information are recorded.

Reasons for Conserving Library Materials

The major aims/primary reasons for conserving library materials as

outlined by are to:

- limit damage from use;
- prevent loss of information due to material degradation;
- overcome format obsolescence;
- promote the sharing of information/ unrestricted accessibility by distance or time; and
- secure intellectual contents of the materials in case the original is stolen on lost to disaster.

Reprographic Processes in Library Conservation

Reprography is inevitably necessary in conservation of library materials; and be done through photocopying, microfilming, duplicating and printing as may be applicable to any of the followings:

a) **Refreshing:** This entails copying from one physical medium to another. Not necessarily that the original is deteriorated or the medium is obsolete. For example, duplicating an out-of- print book, in order secure a copy or more for future use; in case of loss or damage of the original copy. Refreshing includes photocopying of a book, or copying of e-book on a CD-ROM to another CD-ROM. Refreshing also include copying from one medium to another similar medium, usually to serve as replacement or "back-up" in case the original is lost or damaged. The main reason for this is to secure the information on the material for future use.

b) **Migration:** Migration is transferring digital resources from one hardware/software generation to the next. Technological life-span of most electronic, magnetic or optical medium is relatively short, unlike microform. Computer hardware and software change rapidly, which renders some information inaccessible due to obsolescence of the media upon which they are recorded.

Some information media, such as 3½ Floppy disk, VHS and audio tape, are now regarded as "dead" or "endangered media", because they are now obsolete thereby rendering the information they contain inaccessible. This poses greater challenge on the library to secure access to the information on these *dead media*. This is done by "migration" of the information contents from the old media whenever newer technologies are being developed, as this will facilitate perpetual access to the information. Copying of information on 3½ floppy to CD-ROM or Flash disk

is an example of migration of information. Another one is copying of information on VHS to DVD format or from audio tape to MP3 format. The major aim of "migration" is to fight technology obsolescence i.e. to ascertain that even when a certain technology fades away, the information will still remain and be accessible.

c) **Conversion/Reformatting:** Changing document from one format to another, e.g. from analogue or paper-based to digital, or from one file format to another, e.g. converting a PDF file to JPEG. A good example of this is converting a physical book to electronic book (e- book) that could be accessible by wide-range of users within and beyond the library premises. This also includes converting or reformatting library materials into microforms to maintain their lastingness and to save physical space. This is rather, most widely form of conversion of paper-based information materials. Microforms are easy to store and are much durable.

d) **Restoration:** Rescuing information on deteriorating documents from total loss by transferring them to another media or format. Library materials could become deteriorated due to heavy usage or ageing. Therefore, for the information on such deteriorated materials to be conserved, libraries recapture the information to a new media or format, e.g. photocopying of a deteriorated document, or carrying out repair of a damaged book.

Replacement photocopying, replacement microfilming and replacement image digitization are parts of restoration activities in the library. This is replacing mutilated or damaged pages of a book with other corresponding duplicated or copied pages. This is to ensure that all information contained in the books or materials are completed.

- customize information to user needs
- facilitate dissemination, organization, and communication of information
- facilitate quick information service delivery
- meet the information needs of remote or extended users of the library who may find it difficult to physically present in the library
- present to information user, exactly what he needs in a simplified and related and useful format. This is necessary to combat information overload resulting from information explosion. As Sethi (2012) puts it, an annotated bibliography is like a map in the world of information overload.
- facilitate interactivity between user, knowledge base, and technology.

Processes or Steps Involved in Information Repackaging

1) **Analysis of the Target Group:** A successful information repackaging service depends on full knowledge of the nature of the target group, the choice of information carrier/medium. Therefore the first step is to study the nature of potential information user. This will enable the library on the choice of methods and media that best appeal to the user. For example, a translation service may be required for providing information to illiterates, under the library extension service.

2) **Gathering and Analysis of Information:** Information is sought from different sources available. Information must be sought from only reliable and consistent sources. The librarian analysis the information retrieved and arranges them in logical order.

3) **Sorting/Filtering of Information:** The librarian or information professional uses his critical thinking and information literacy skills to filter and synthesize the information to meet the exact information needs of the user. The information contents are critically evaluated to ascertain their reliability and accuracy.

4) **Selecting Information Carrier:** The message carrier should be the

a view of communicating a message in a convenient and effective form to a target audience defined for the purpose. Repackaging of information is rearrangement of physical media in which information has been presented, which is tailored to the requirements of a specific clientele. Information repackaging entails gathering of information from various sources and presenting such in a usable format.

The aim of repackaging is to enhance the acceptance and use of information products and the assimilation and recall of their contents. Repackaging services are the result of attempts to cope with the information explosion and the competition for fast, reliable, convenient and efficient information support for corporate decision making. Iwhiwhu and Akporhonour (2009) points out that the major purpose of information repackaging service is to "locate, retrieve, evaluate, interpret and repackage information on a particular subject in order to save time, labour and costs to the users".

Functions of Information Repackaging

The basic functions served by repackaging of information are that it:

- serves as a time-saving tool.
- functions as a systematic and selective sorter of useful information.
- functions as a means for more extensive information transmission and delivery.
- is a translation tool.
- serves as an opportunity for the practical application of research results.
- is a means of prompt delivery of relevant information to both physical and remote information users.
- is a tool for enhancing the overall productivity of the library in the circulation of information.

The Need for Information Repackaging

Information now scatters around in multifarious sources due to technological advancements. The need to make information accessible in a relevant and useful format places new and complicated challenges on information professionals. As a remedy, information is being repackaged to meet the exact information needs of the users. Information repackaging is therefore necessary to:

- customize information to user needs
- facilitate dissemination, organization, and communication of information
- facilitate quick information service delivery
- meet the information needs of remote or extended users of the library who may find it difficult to physically present in the library
- present to information user, exactly what he needs in a simplified and related and useful format. This is necessary to combat information overload resulting from information explosion. As Sethi (2012) puts it, an annotated bibliography is like a map in the world of information overload.
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4) **Selecting Information Carrier:** The message carrier should be the

one that best appeal to the user or as may be requested. A paper copy should not be issued to a user that requests for an electronic format of information. This is the area where reprographic skills count. The library should be able to reproduce information in the exact format requested by the user or that attracts the user.

5) **Repackaging:** The information is repackaged in the exact format requested or that best appeal to the user. Information carrier or medium should be well outlined before embarking on production to minimize financial and time wastage.

6) **Feedback System Planning:** Information repackaging is not complete without adequate feedback from the users to establish their level of satisfaction. Therefore, a feedback mechanism must be designed by the library to measure the success or otherwise of its information repackaging service.

Reprography and Information Repackaging

People need information on a daily basis for decision making processes, planning and reduction of uncertainty level. They in turn seek for sources that best gratifies their information needs. In order to meet the diverse information needs, whether those requested by the users or those that the library intends for a targeted user, the library select, analyze, process and present information in more understandable, readable, acceptable and usable forms. This process is called Information repackaging (IR).

Information repackaging is concerned with the process of collecting, analyzing, evaluating information that best match a requester information queries and packaging it in a presentable and useable format. Information repackaging involves transfer of information from one form to another in a more attractive and usable package. Therefore, to transform information into a tangible product that could be transferable, usable and preserved for future use, reprography comes to rescue. It then follows that the major aim or target of information repackaging will fail if the information product is presented or packaged in unusable or improper format.

The typing, streaming, writing, copying, duplicating, reproduction or printing and finishing of information products must be effectively

executed. Check Chapter 13 (Reprographic Products Finishing Procedures) for details on how to present and package the end products. The repackaged information has to be presented in a format requested by the users or that will be appealing to the targeted users, based on the brief initially obtained about the user. If an electronic copy is requested, the information should be packaged as such, the same for paper-based. Even if the librarian uses more than a format to gather the information, other formats should be converted to the required/requested format. There are instances where a user may request for both print and electronic formats. Information necessary for an extension service may also be packaged in different format and languages that will appeal to the targeted audience. E.g. a useful paper-based research report may be reproduced into a graphic audio- visual media that will facilitate easy comprehensibility, recall and usage, which are the goals of IR.

Successful information repackaging processes, among other things, depend on the efficacy of the reprographic approach employed by the library. Therefore, there is need to engage the use of a reprographic processes that best matches the uses requirement, and portrays the library as a ready information producer in the contemporary information arena.

Reprographic skills necessary for completing an information repackaging process include an effective information processing skills. The use of information technologies is highly pertinent in the contemporary society. Modern/ digital information processing devices are now increasingly used for managing and handling of information products.

The reprographic unit of the library is saddled with the responsibility of packaging and repackaging information products necessary for various information services. They are to design and produce the information carriers or products. The reprographic unit works in line with specifications to produce the information medium/carrier in the exact formats requested by the user or that best appeal to the targeted audience (that will facilitate easy comprehension and utilization of the information). Sheti (2012) cautions that in designing the repackaged information, it is very essential to have specific information about the target audience, as this would help to design and repackage the information accordingly.

Information repackaging is experienced in a number of information services provided by the library. Therefore, reprography is the major tool for propelling systematic information repackaging service with the aim of providing a platform that facilitates effective service delivery.

12

REPROGRAPHY AND MODERN TECHNOLOGY

Offering reprographic services in the library in this digital age is no longer "business as usual". With the increasing application and usage of modern technology to information management, a new approach has evolved. Library now embraces the new technology to enhance her information service delivery system. This is found incumbent for the library to survive in this competitive global information arena, characterized with different information output/sources.

The use of information and communication technologies is tantamount to effective reprographic service delivery that focuses on total quality, and satisfactorily meets the diverse information needs of the clientele. ICT is globally identified as an efficient tool for service improvement. It then follows that its application to reprographic activities in the library is of immeasurable value.

Uses of ICT in Modern Reprographic Process

Modern reprographic processes rely so heavily on the use of ICTs. Most of the modern reprographic practices are now automated or digitized. The use of electronic format of information is now a common phenomenon across the globe. Modern technologies are useful in library reprographic activities in the following ways:

Increased Accessibility/Circulation of Information: One major aim of reprography is improving access to, and circulation of information resources. The use of ICT has immensely influenced the realization of this

goal. Hundreds of information in printed and non-printed formats are duplicated and made available through the use of high-end digital copier or devices (computer, scanner etc). The use of ICTs enables the library to reproduce information faster and more efficiently than before, thereby increasing the number of copies available for circulation. Similarly, information could be reproduced in electronic format to be circulated among libraries or between libraries and their users.

Digitization of Library Materials: Paper-based or analogue information materials are digitized using ICT facilities such as computer and scanner. Digitizing of information materials prolong the archival life-span of such materials and equally enhances multiple accessibility. It also helps to conserve and secure the recorded knowledge or information in the library. Reprographic practices as digitization enables users to gain wider access to e-books, scholarly/ academic e-journals, digital archives or other electronic materials. Digital or computerized microfilming is equally becoming wide-spread in the information world.

Conservation of Library Materials: The process of conserving library materials enables the library to secure and preserve the intellectual contents/ information stocked in the library. ICT is necessary to accomplish this task, as information materials could be converted from one format to another more durable format; thereby saving the information contained on the deteriorating or dying media from total loss. Even though technology changes, but adopting the current technology in storing and preserving information will see the library transcends far into the future as a reliable source of information and accumulated knowledge.

Online Library: Large organizations like project Gutenberg, Alexandria library and other digital libraries now digitize collections with the aim of making them universally accessible over the Internet. This process depends on the use of modern scanning technology. The use of robotic or software controlled scanning mechanism with automatic page turner devices helps to increase efficiency and also prevent destructive book scanning that usually results from manual/ DIY scanning processes.

Specialized Library Services: Providing specialized library services such as information repacking, document delivery, selective dissemination of

information, or current awareness services, which to a large extent, depend on reprography are better provided through the use of ICTs. Information could be reproduced in required formats and forwarded to the users as timely as possible. Information is gathered from various sources such as the Internet, information databases or gateways. While all that is gathered may not be relevant to the users information need, the information will be filtered in line with the user requests. The end product is repackaged and transferred to the user in a presentable format, using basic desktop publishing and reprographic skills. These processes are enhanced with the use of modern/ digital technologies.

Reprography and Technological Instability

While digitization takes the central stage in modern reprography, it comes with its attendant challenges of technological instability and accessibility. Digital technology, especially image scanning, has been very instrumental in the reproduction of library materials for wider storage and accessibility, but due to instability of digital technology, the problem of using the medium for long term/ archival storage becomes disturbing. The frequent obsolescence nature of digital technologies may not allow the library to use certain information stored on some digital media in the next two to three decades; thereby rendering such information inaccessible to future generation. The durability nature and longevity issue of digital formats are yet to be resolved; thus making the paper forms and microforms the most widely used storage media, as they have transcends several decades and generations.

The issue of accessibility is still prevalent. Specific software and hardware requirements must be met before one could access electronic/ digital documents. For instance, a MS WORD 2007 Document file will not be accessible on a system with lower version of the software, unless the original file was saved with lower specifications (which may not always be the case). Similarly, an ADOBE file will only be accessible on a computer that has ADOBE already installed on it. These kinds of obligatory requirement deprive users, who do not have the required software, access to the information contained in them.

Benefits of Digital Storage System

- Digital Storage System is best suitable for Instant Access of Records
- Easy to access throughout the network and web
- Less space used for record storage
- Best digital storage media
- Magnetic tape drives
- Enhanced database/metadata management system

Defects of Digital Storage

- Not reliable for permanent storage.
- Digital data is an invisible data made up of (+/-) charges.
- Easy data loss due to its venerable features like virus & hacking which is the most important concern today.
- Continuous software & hardware technology migration has caused major loss of data across the globe.

Media gets easily affected by light rays, electric field, magnetic field, friction, scratches etc.

13

REPROGRAPHIC PRODUCTS FINISHING PROCEDURES

Introduction

Reprographic service is not completed until the duplicated, copied or reproduced information are packaged in a presentable format. This ranges from the simple collation and stapling of photocopied or printed pages to more technical book binding or direct CD labeling. Information is gathered from various sources, refined and repackaged. It is therefore necessary to put finishing touches to the repackaged or duplicated information materials. Apart from the aesthetic purpose that this serves, it equally facilitates durability of the materials.

Types of Products Finishing

There are a number of ways for finishing reprographic products, which include:

- Stapling
- Trimming
- Sorting/Collating
- Folding
- Perforating
- Binding
- Direct CD Labeling
- Encapsulation/Lamination; and
- CD/DVD Labeling and Case-making

Reprographic finishing is necessary in order to efficiently and

attractively package the final information product/document in a presentable and usable format.

Reasons for Reprographic Product Finishing

There are a number of reasons for carrying out information products finishing. These are:

- Durability
- Aesthetic
- Tagging/ identification
- Easy usability

Finishing Processes

Stapling: This is perhaps the commonest and simplest form of fastening or binding. Stapler of various sizes is used for this purpose.

Trimming: Cutting through volumes of paper to produce the exact size needed.

Sorting and Collation: Automatic sorting and collating machines are now commercially available. Most modern photocopiers and printers have these functionalities. Sorting and collation involve the arrangement of printed or duplicated copies according to the page number or in a sequential order.

Folding: This is mostly needed if binding of the pages is necessary.

Perforating: This involves punching of round or square hole(s) on documents where fasteners or binders may be slot in.

Binding: A visit to the technician workshop is recommended to acquire full hands on experience on book binding. The processes explained below will serve as a veritable guide. Simple binding methods include stapling, wire stitching and book binding.

Types of Book Binding

Zonghe (n.d.) identifies three types of book binding namely:

- Edition binding
- Perfect/Adhesive binding

- Mechanical binding

Edition Binding: This is also known as hard cover or case binding. Pages are grouped (sorted and collated), stitched or sewn together and glued. Reprographic edition binding is mostly manually carried out. But today, there are binding machines capable of automatically executing all the binding processes with little or no human intervention.

Manual Edition Book Binding

There are certain materials needed for edition binding. These include:

- Binding cloth
- Straw board
- Adhesive/glue
- Hammer
- Needle
- Book binding Thread or wire (for sewing or stitching respectively)
- Pencil and ruler
- Hand drilling machine

For the processes involved in edition book binding to be fully understood, it is necessary to give a dissection of parts of book.

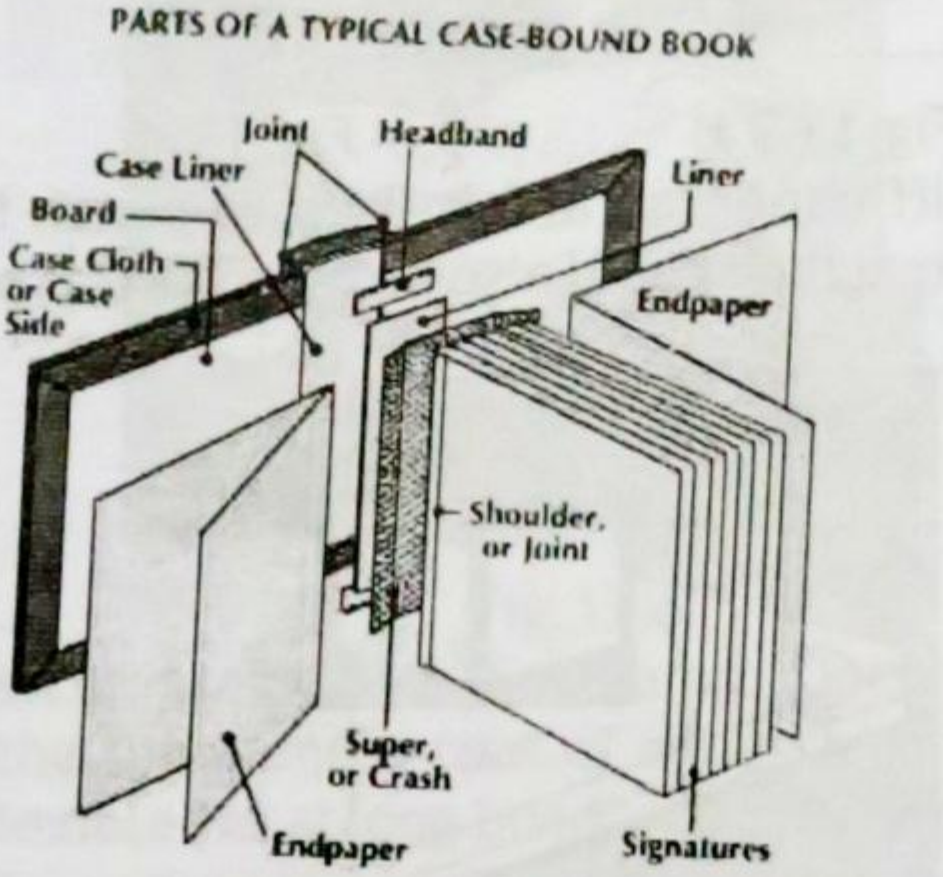


Fig. 13.1: Parts of a Typical Case-Bound Book

Step by Step Analysis of Edition Binding Processes

Reuels (2012), Scarlet (2012) and Butler (2012) provide step-by-step instructions of edition binding. The steps are as follow:

Preparing the Text Block

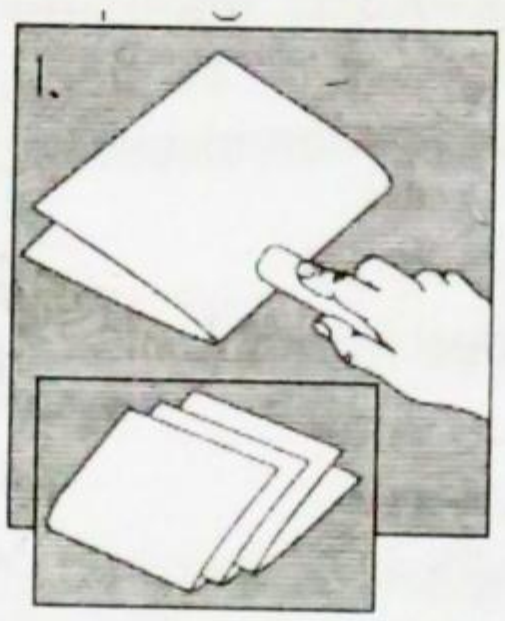


Fig. 13.2: Sheets of paper are folded with a bone folder and interleaved to make a signature

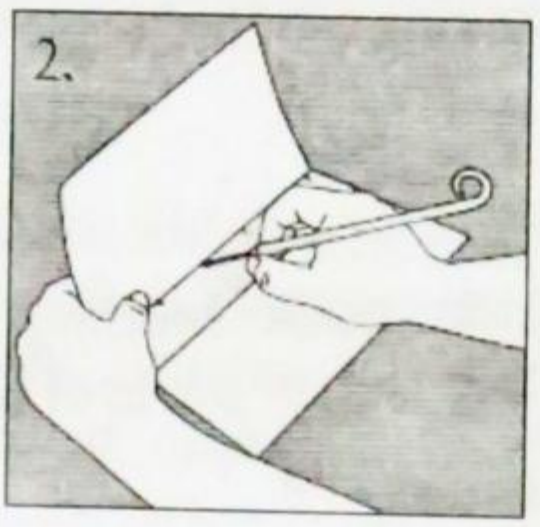


Fig.13.3

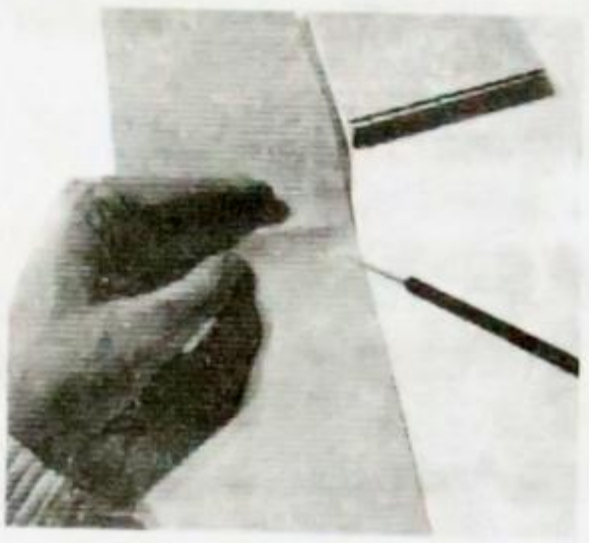


Fig.13.4

Guided by marks on a stiff paper, an awl is used to punch holes in each signature. A hand drilling machine could also be used for this purpose.

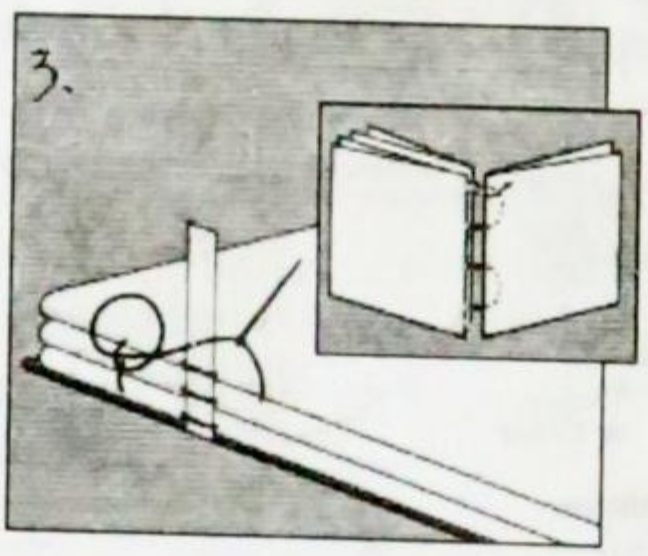


Fig. 13.5

A signature is sewn or stitched to binding tape using long needle and book binding thread or wire. (In bindery terms, "sew" indicates the use of

thread; "stitch" indicates the use of wire.) Additional signatures are added and sewn in turn.

Types of Book Stitching/Sewing

- **Saddle/Flexible Stitching or Sewing:** In flexible sewing, each signature is sewn through its binding fold (the fold at the back, or spine, of the book) and to the adjacent signatures. Saddle/ Flexible-sewn books open easily and the pages lie flat.

- **Side Stitching/Sewing:** In side-sewing and side stitching, the gathered signatures are simply sewn straight through, from one side of the book to the other, near the binding fold. When a book is side-sewn, the endpapers are tipped to narrow strips of drill cloth. These strips are sewn together with the signatures. A side sewn book ordinarily may not have a super, since the function of the super is performed by the drill strips. Most books intended for heavy use (such as textbooks and encyclopedias) are fastened by the process of side-sewing or side stitching or both.

An end paper/sheet of strong paper is sewn or tipped on using adhesive.

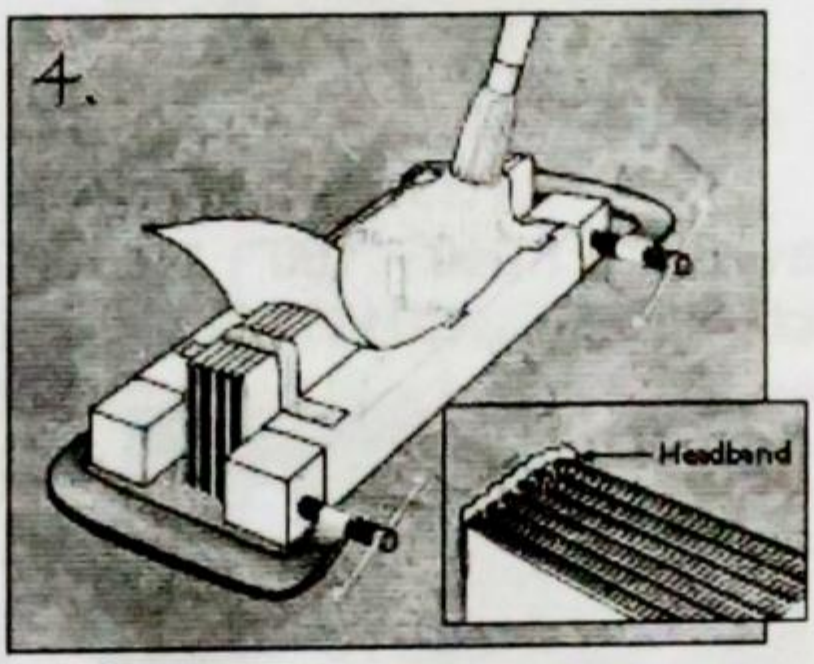


Fig.13.6

The text block is compressed with a clamp. Open weave cloth, called super, is laid on the spine and a coat of adhesive is brushed through the super to form a flexible yet strong bond when dry. A decorative headband may be glued to the ends of the text block.

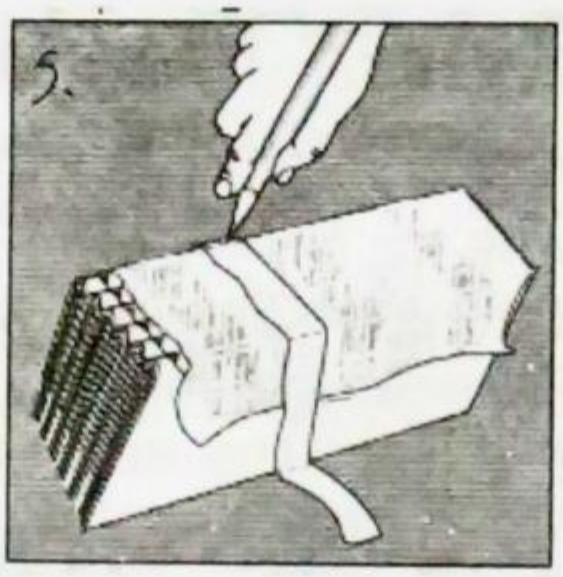


Fig.13.7

Width dimensions for the cover and spine strip are captured from the text block by wrapping a strip of paper around the spine and marking the spine width and cover size.

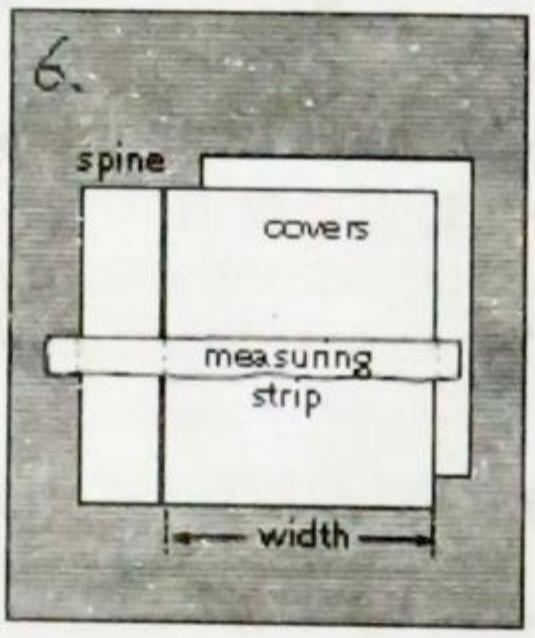


Fig. 13.8

Covers are cut from heavy duty (.060"-.100") binders/ straw board. The spine piece is cut from acid-free stock .010"-.012" thick.

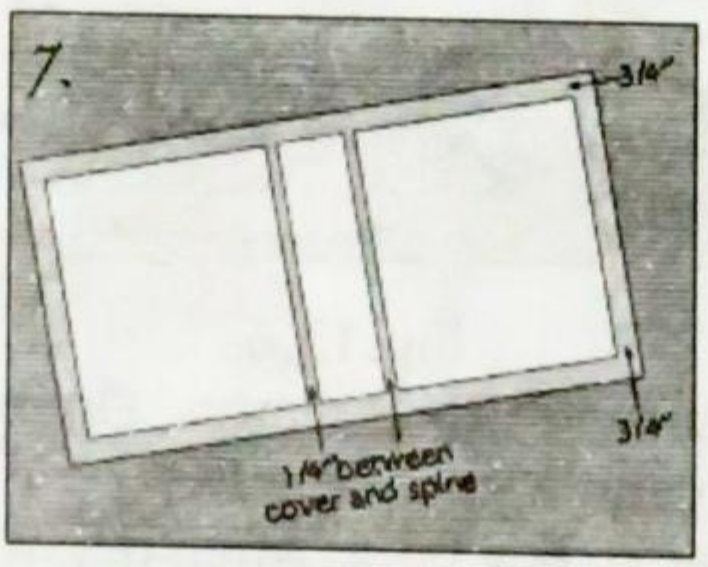


Fig. 13.9

Covers and the spine are laid on book cloth and the cloth is cut 3/4" larger on all sides. Adhesive is spread on the inside surface of the book cloth and the three pieces are positioned, pressed to remove air and allowed to dry.

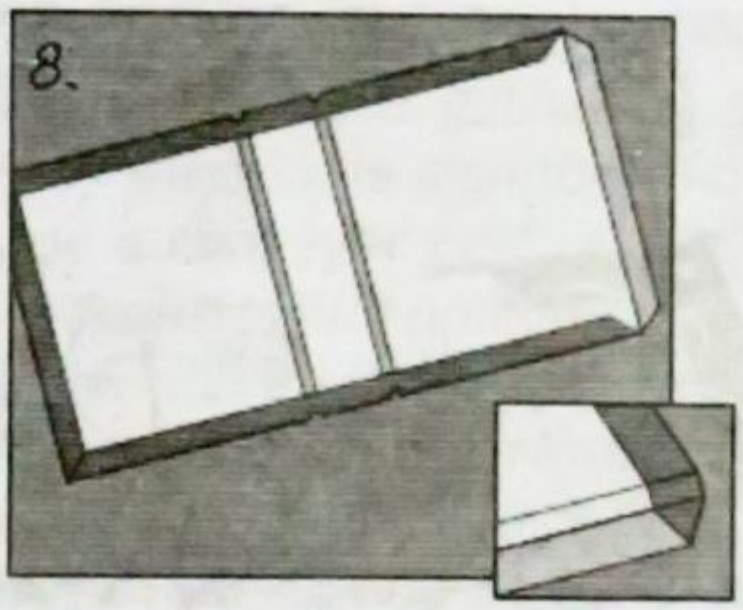


Fig. 13.10

The overhanging book cloth is turned over the covers and spine and glued down with adhesive.

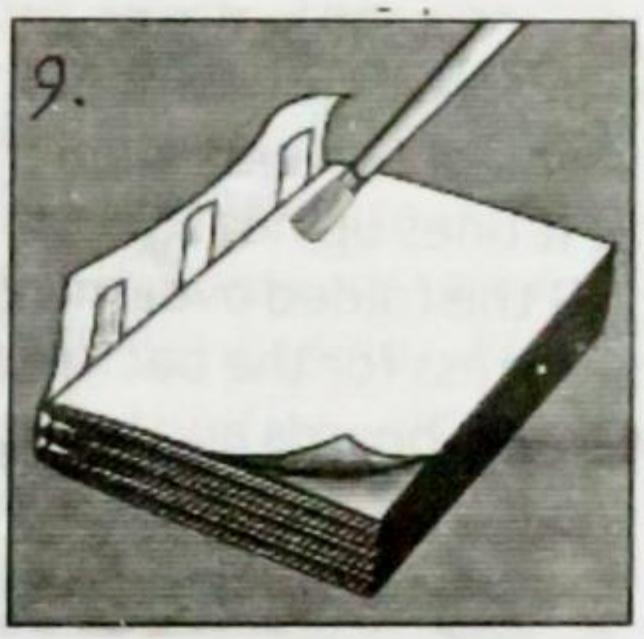


Fig.13.11

Adhesive is applied to the super and binding tape to bond these to the end sheet. Trim the edges of the text block if need be before casing, to ensure that the final product is neat.

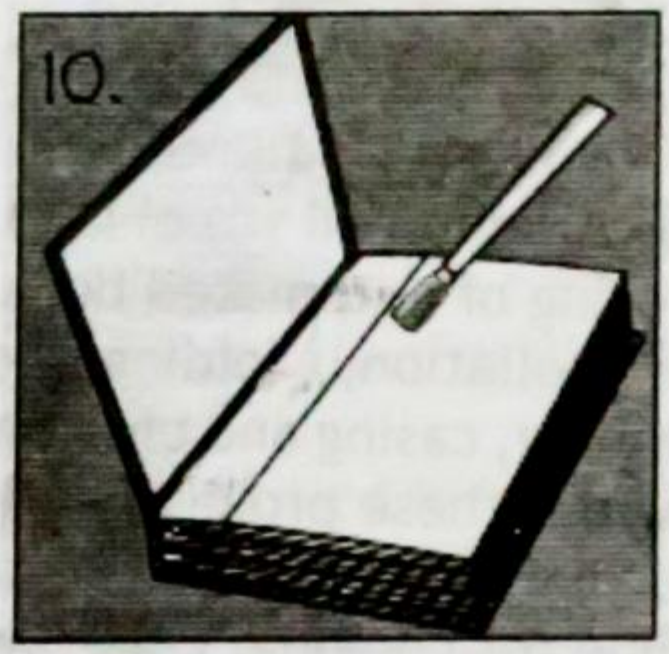


Fig. 13.12

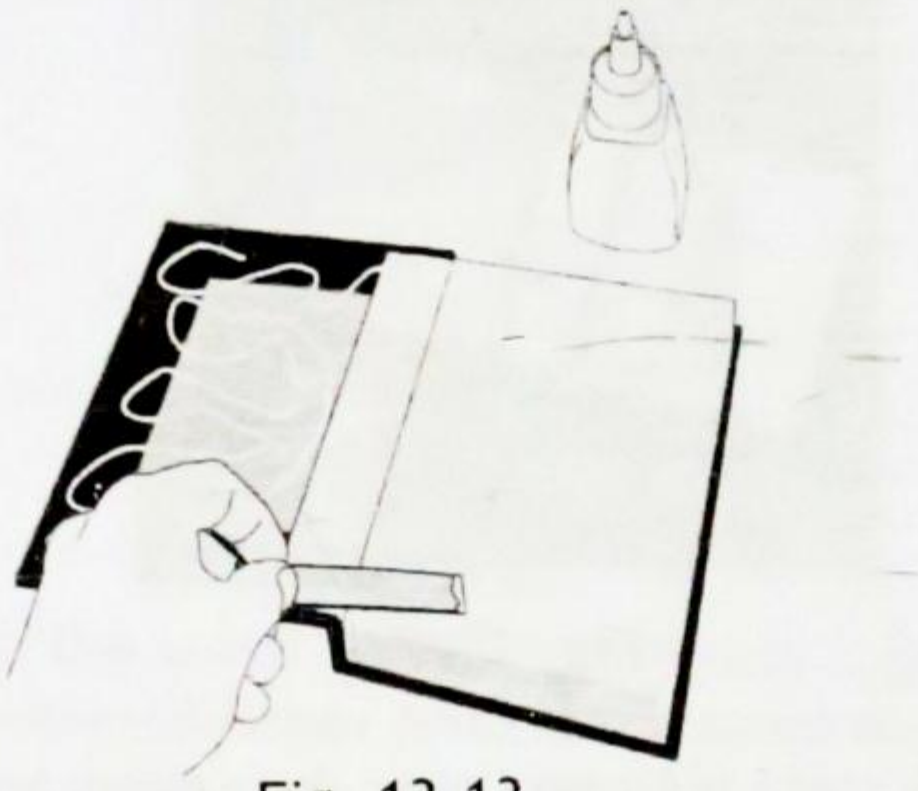


Fig. 13.13

The text block is placed on the inside of the cover blank. Coat the inside of the cover and the first page with adhesive or glue. The end sheet is then glued to the cover. Ensure that it lines up neatly with the edge of the case in such a way that it covers up all the folded over material and the inside of the cardboard covers. Repeat process for the back of the book. Finally, the book is pressed or clamped between boards and let dry.

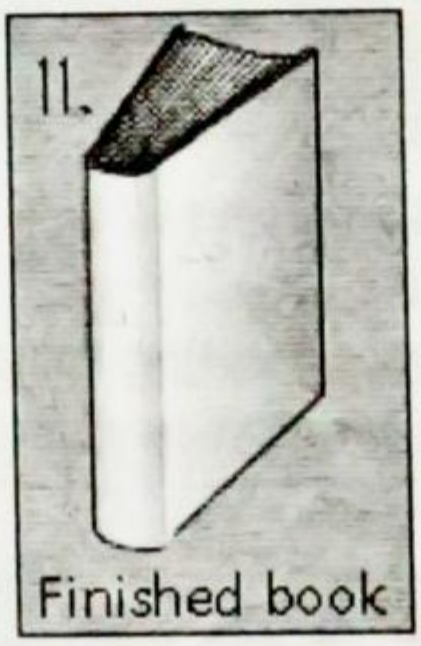


Fig. 13.14

Automated/Machine Edition Binding

Automated binding entails using of automated book binding machine for the process of signature collation, folding/creasing, sorting and arrangement, sewing or stitching, casing and binding. There are machines that are capable of carrying out these processes with little or no human intervention. Example of such machines is the Konica Minolta Bizhub 750; a high end all-in-one machine for copying, collating, binding casing and trimming of the book.

Ferdinando (2012) explains the processes of automated binding as follow:

> *Signatures are put in order on a gathering machine, or gathering line. Piles of successive signatures are arranged in order in bins beside a conveyor belt. A mechanical arm takes a first signature from its pile and places it on the belt. The belt carries the signature to the next position, where another arm places a second signature on top of it. The process continues until, at the end of the line, a complete set of all the signatures in the book has been assembled in the correct order.*
> *Next the signatures are fastened together. Three processes are in common use. Probably a majority of all [text] books ... are saddle/flexible sewn. The process is also called Smyth sewing, after David McConnell Smyth, inventor of the first flexible-sewing machine.*
> *In flexible sewing, each signature is sewn through its binding fold (the fold at the back, or spine, of the book) and to the adjacent signatures. Saddle/ Flexible-sewn books open easily and the pages lie flat. After the signatures are sewn together, the endpapers, which help hold the book in its cover, are tipped to the first and last signatures with thin lines of glue applied near the binding fold.*
> *The book then passes to the nipper-gluer, in which the backbone is compressed to reduce the bulk created by the sewing thread and a coat of glue is applied to the spine to further bind the signatures together. Some books require overall smashing, instead of just backbone nipping, to reduce excess bulk.*
> *Now a unit, the signatures are trimmed to final size by heavy knives. Then, in the rounder-backer, the backbone of the book is rounded to help the book hold its shape, and the joint, or shoulder, in which the cover boards will hinge, is formed. If desired, gilding-usually of artificial gold-or stain is applied to the top of the book.*
> *Then the super, or crash, is applied to the spine of the book. This strip of open-mesh fabric, easily penetrated by glue, extends beyond the edges of the backbone. Later it is glued*

to the cover boards beneath the endpapers, helping to hold the book within its covers. A paper liner is applied over the super, and decorative headbands are glued to the spine. The book is ready for its cover.

Book covers, or cases, are prepared on case making machines in which the boards and case liner are glued to the covering cloth (case cloth, or case side). Decoration- the book's title, author, and publisher, together with any desired illustration- may be applied to the case side either by printing, before the case is assembled, or by stamping- usually in artificial gold foil- after assembly.

The book and its cover are brought together at the casing-in machine. Here, glue is applied to the endpapers, and the super and endpapers are glued to the boards and sealed under heat and pressure. Other machines wrap the book's dust jacket around it and, if desired, put the book into an individual carton and address it for mailing.

... For long-run books- volumes of which many thousands are printed- highly automated production lines may be built. In these, books are mechanically bound with little or no human attention."

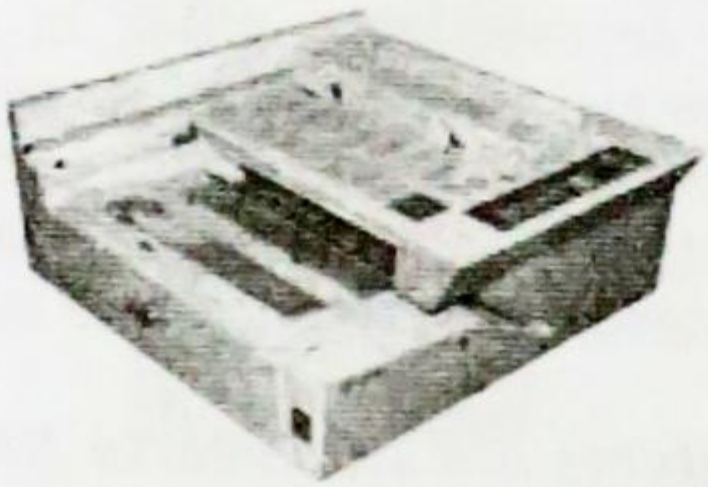


Fig 13.15: Full automatic glue binding machine

Perfect/Adhesive Binding: Technological advancement has led to the development of glues that set and dry quickly and is flexible enough to hold pages tightly together when it becomes dry. In this process the gathered signatures are pressed together between clamps. The spine edge is roughened, and a coating of glue is applied to hold the leaves

together. The casing -in process is the same as those explained under edition binding above.

Mechanical Binding: This includes spiral, comb, spring or PVC binding. It is mostly used for reports or documents that require constant update. Sheets are punched with the help of automatic or mechanical devices and binders / fasteners are inserted. Binders or fasters could be wire or plastic spiral/coils or combs.

Comb Binding

Comb binding is a simple, inexpensive and effective method of book binding. Comb binding machines require little setup and can be used by almost anyone. Comb binding supplies are made from plastic. They usually consist of 19 total loops that attach to the 11-inch side of paper. The supplies are available in a wide selection of colours and diameters. Those who are binding books smaller than 11-inches can easily cut off excess length with a pair of scissors. A huge advantage comb binding has over many other binding formats are the ability to be re-opened for adding or removing pages. The binding elements can also be removed and re-used for other projects.

Different Types of Comb Binders

Comb binding machines are available with different features and settings, depending on the project and needs of the operator. One of the biggest differences between comb binding machines is the punching mechanism. Some machines come with a manual punch, enabled by pulling a handle, and others have an electric punch.



Fig. 13.15: A typical comb binding machine

Comb binding machine features an adjustable margin depth which allows the operator to adjust how deep into the paper the holes are to be punched. This is necessary for binding books and reports of varying thicknesses. The thicker the book, the farther it is recommended to punch into the paper. This helps to prevent sheets from accidentally tearing out.

How to Use A Comb Binding Machine/Comb Binder

Officezone (2012) gives step-by-step instructions of how to use a comb binding machine. The steps are as follow:



Fig. 13.16

Make adjustments to the comb binding machine, such as adjusting the margin depth, comb opener size and disengaging punching dies.

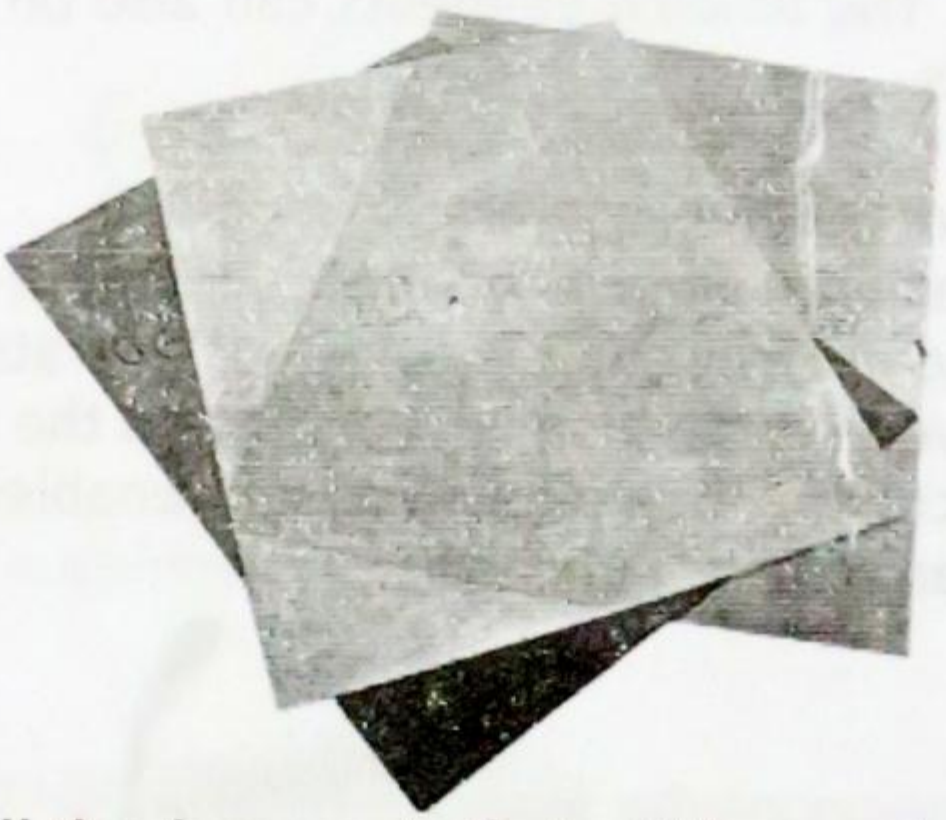


Fig.13.17

Gather together all the documents that will be punched. This includes the paper, front cover and back cover.

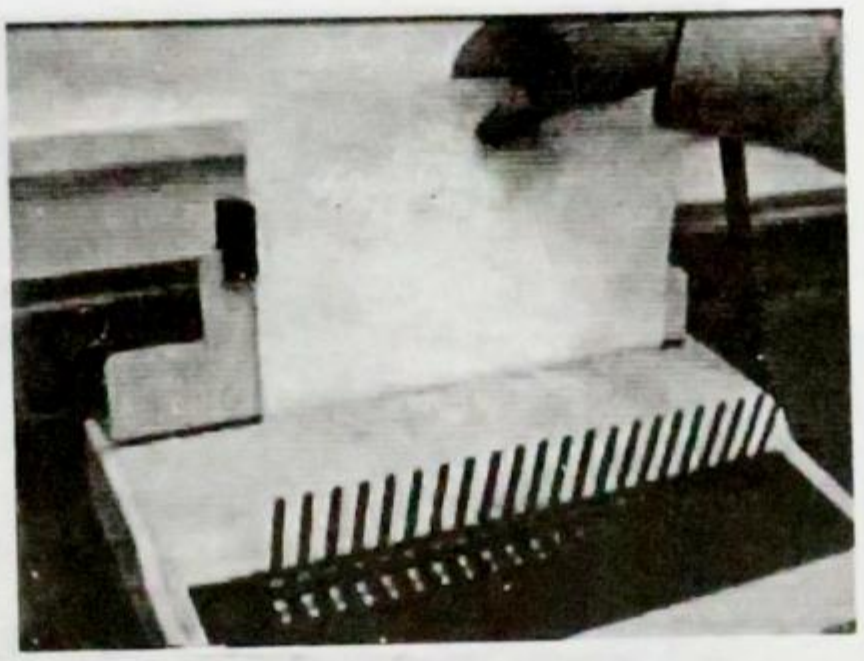


Fig. 13.18
Grab some sheets of paper to be punched. Insert about 80% of the maximum amount the machine is capable of punching. Pull the handle and punch the paper.



Fig.13.19
Once all the sheets have been punched, align the holes. This will make it easier to insert the comb.

5.

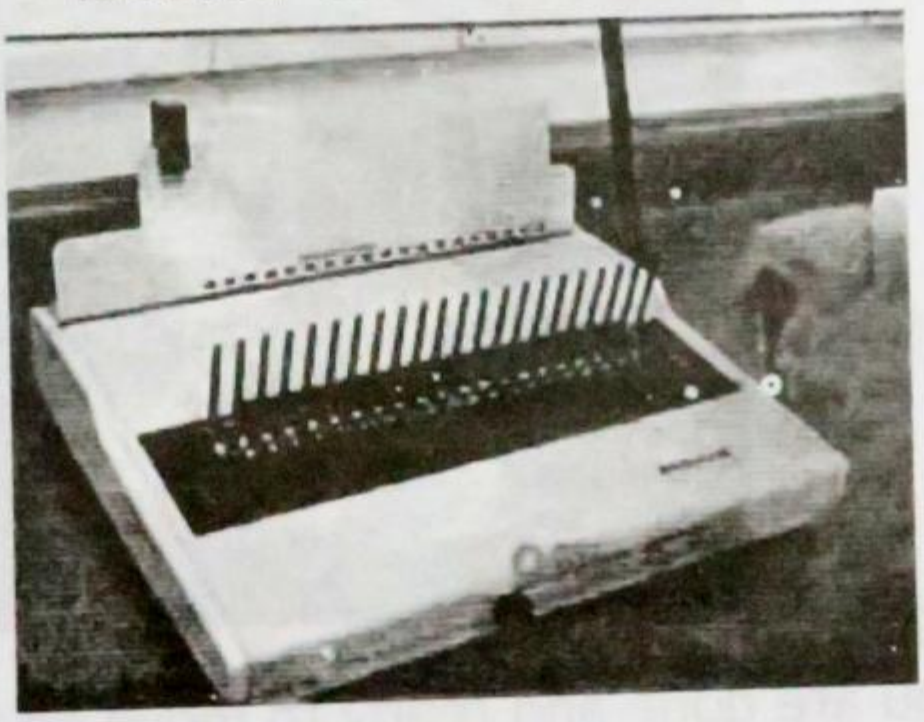


Fig. 13.20
Place the comb on the machine's comb opener and open it.

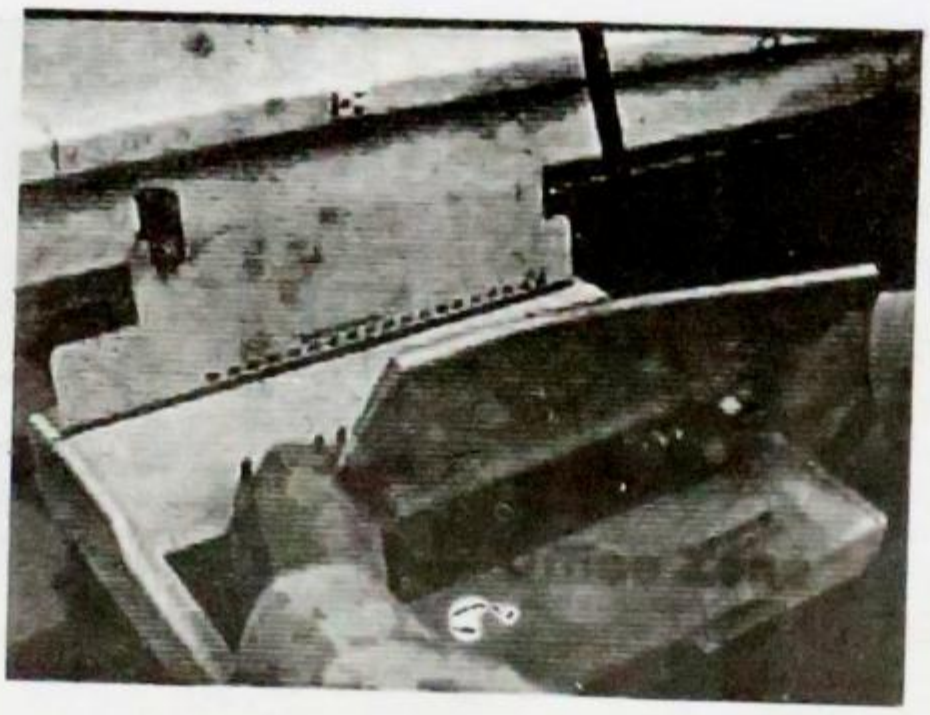


Fig.13.21
Insert the opened combs spines through the holes in the paper.

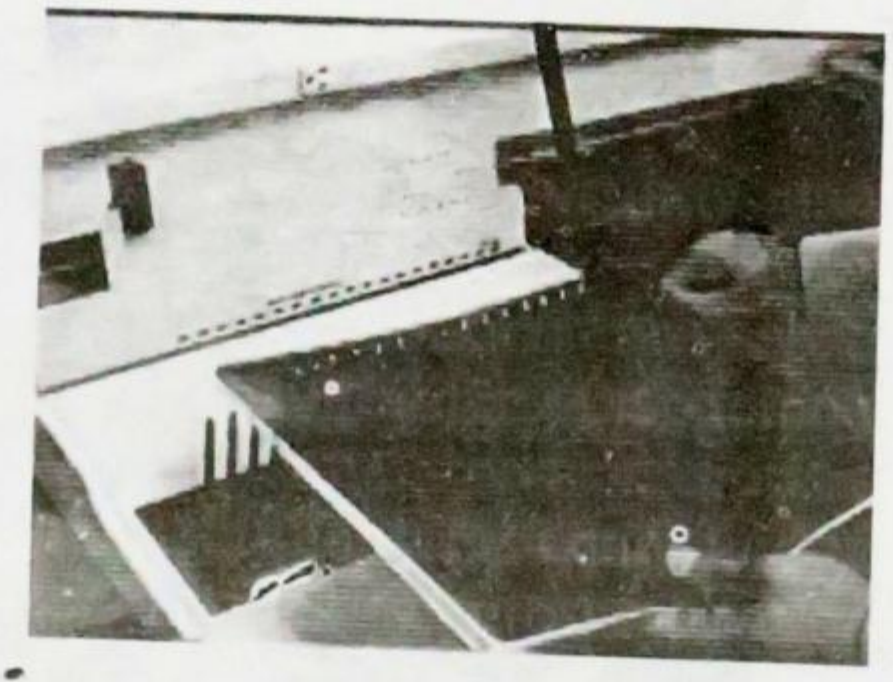


Fig. 13.22
Release the comb opener and close the comb.



Fig.13.23
Now you are done and ready to move on to the next book!

Encapsulation and Lamination



Fig.13.24
CoLibri Book Cover System (encapsulation machine)

Encapsulation and lamination are parts of reprographic finishing processes to ensure durability of documents. Fragile or deteriorating documents could be laminated as part of restoration exercise to prevent loss of intellectual contents contained on the records. Covers of repackaged paper- based information products could be equally be laminated to make them more durable. Similarly, fragile or deteriorating library materials could be encapsulated within a gloss or matt polyethylene film. This is to prevent wear and tear resulting from heavy usage, especially, materials that are commonly used for document delivery or resource sharing services.

CD/DVD Labeling and Case Making

Nero cover designer

Nero cover designer is an application for designing and producing CD/DVD covers and labels.

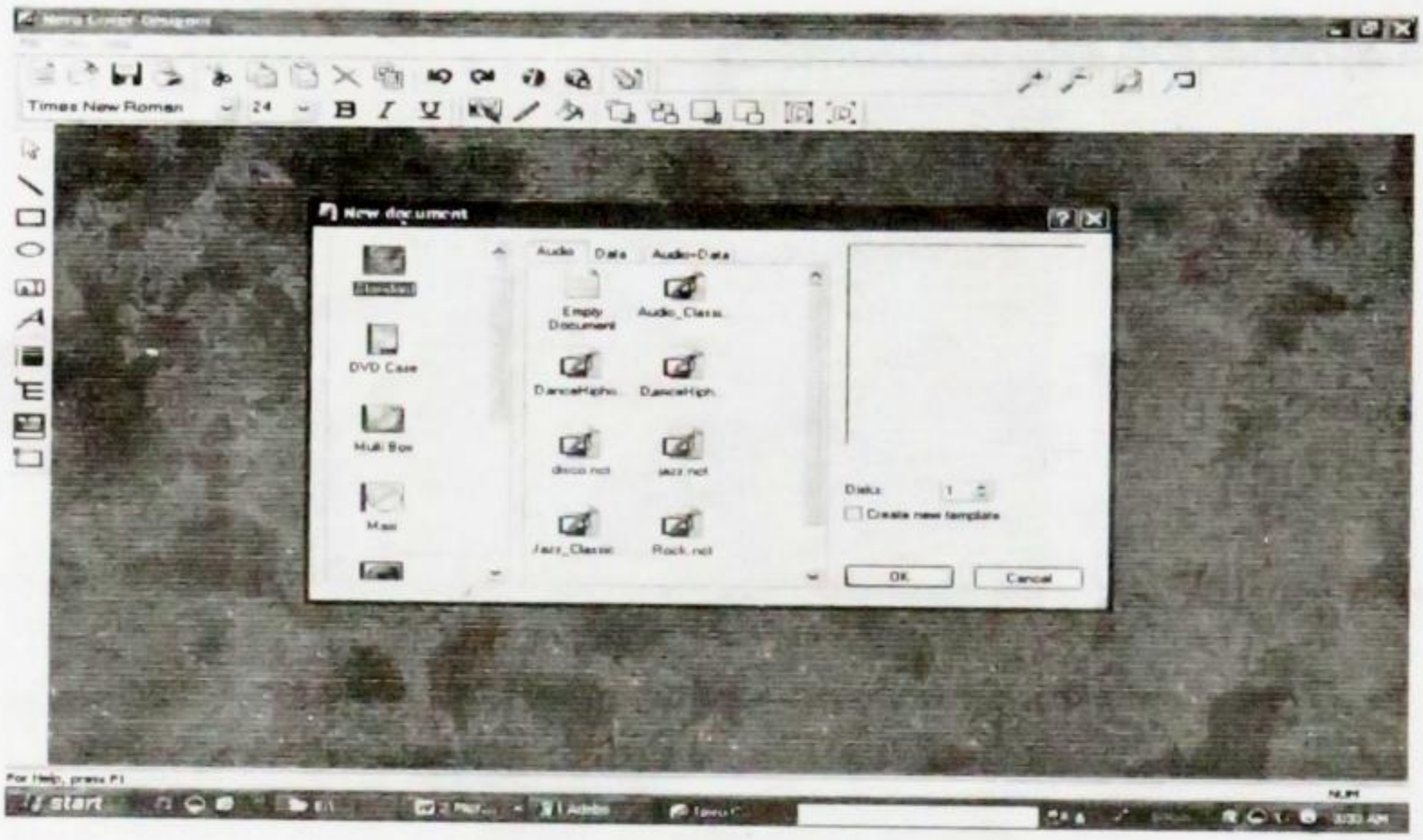


Fig. 13.25: Nero cover designer interface

Steps in using NERO Designer

- Open NERO and select **"NERO cover designer"**, under **"Applications"**. The **"New document"** float window will appear as shown in Fig. 13.25.
- Select from the list, the cover type you want to create and the kind of disk (audio, data or audio+data)
- Choose a design from existing templates or **Create New Template** and click **OK**.
- Depending on the cover type selected, another window, known as the work space (Fig. 13.26), is displayed. The window consists of:
    a. The non-shaded portion which can be edited and is the size of a CD/ DVD cover
    b. Four tabs for different CD cover elements at the lower frame. The tabs are: Booklet (Front), Booklet (Rear), Inlay and Disk 1(Label for a CD/DVD).
    c. The toolbar at the left frame of the window contains tools for creating and manipulating the cover elements.
    d. The menu bar with the associated functions
    e. The icon bar for quick access to functions using buttons
    f. The formatting bar, for easy object formatting.

- Design the cover elements for each tab.

- Save the design by clicking on the **File** button, then select **Save as.** Type in the file name and click **Save.**
- Print the results. To print the designed product, click on the **File** button, select **Print,** select the printer you want to use and click **Print.**
- You can print the disk label directly on the disk, using any of the MFP's or AIO's printers that support the function. You can equally print on dedicated sticker label, which would be cut to size and fixed to the CD/DVD plate.

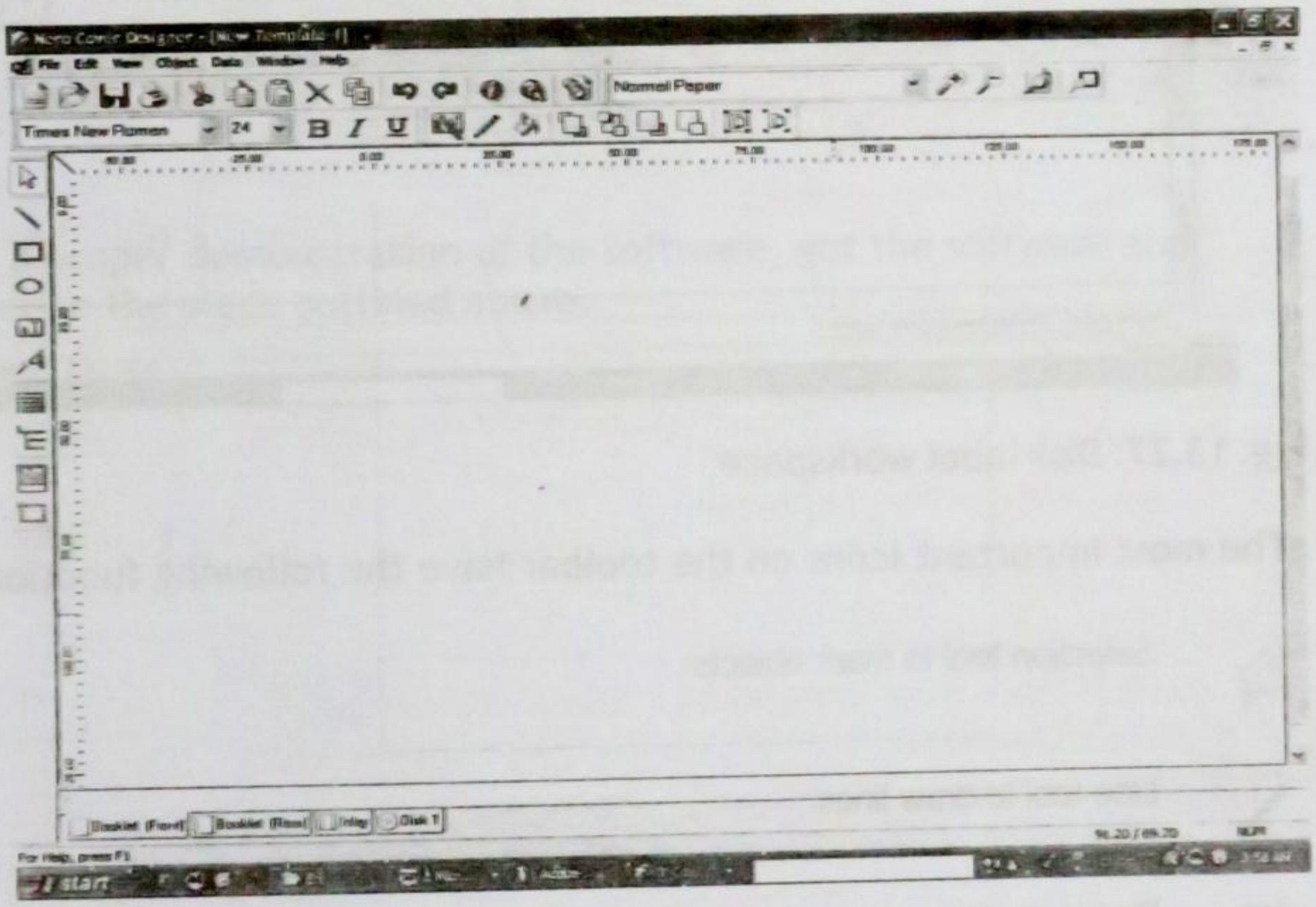


Fig 13.26: Booklet (front or rear) workspace.

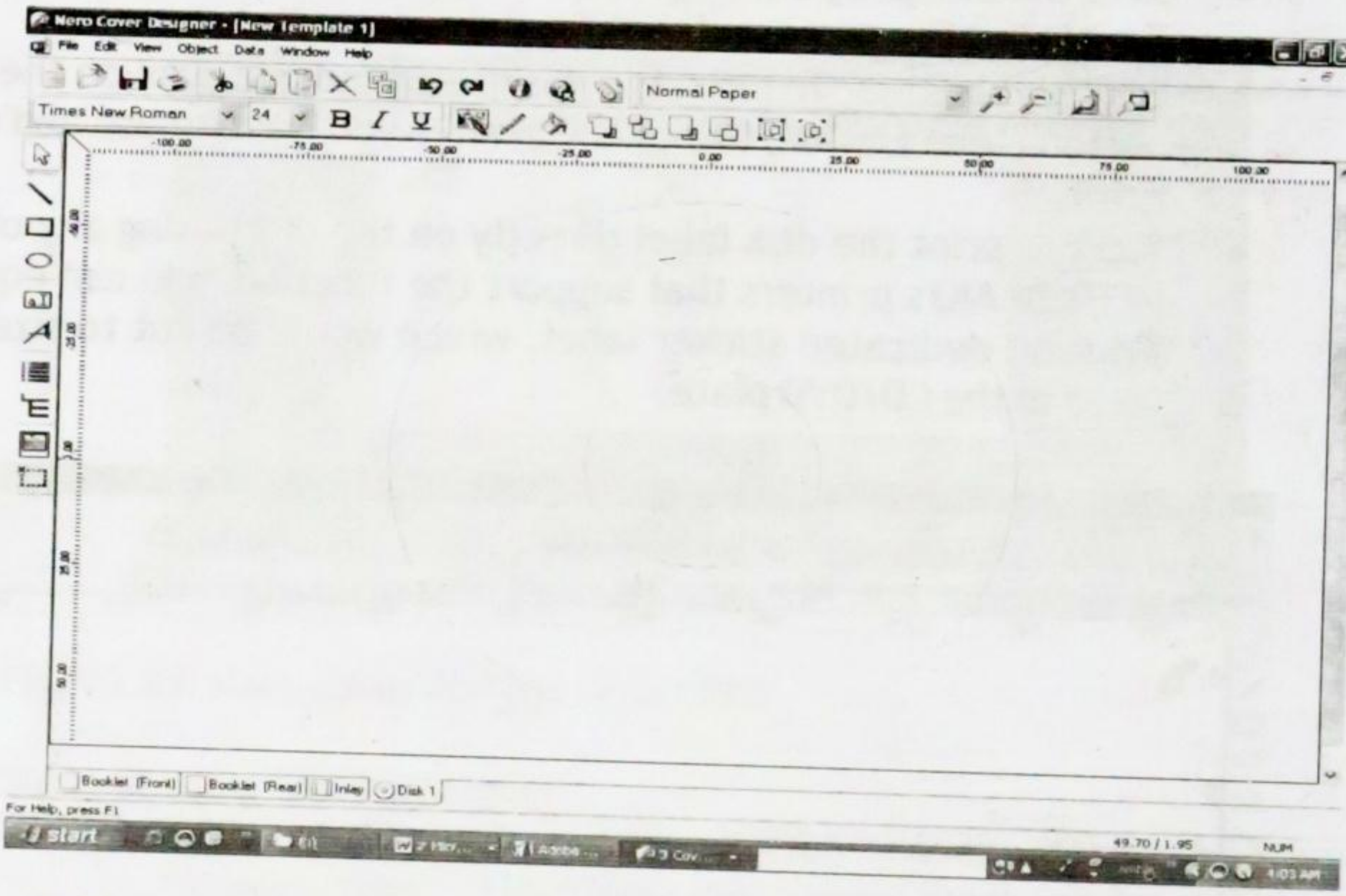


Fig. 13.27: Disk label workspace

The most important icons on the toolbar have the following functions:

Selection tool to mark objects

Line tool to draw lines

Rectangle tool to draw rectangles and squares

Oval tool to draw ellipses and circles

Text box tool to insert a text box. Double click to open a window for text entry (block of text)

Artistic text tool to insert artistic text

Track list tool to insert a track list for audio CDs etc.



Directory tool to insert a directory for data CDs etc.



Image tool to insert saved images



Field tool to insert fields, such as title, artist, number of tracks, playing time.

For a proper demonstration of the software, get the software and practice the steps outlined above.

14

REPROGRAPHY AND INTELLECTUAL PROPERTY LAW

Copyright

Copyright is one of the intellectual property laws. Others are Trademarks and Patent. Copyright is the exclusive right by the owner or creator of an intellectual work such as literary works, music, films etc to be the sole producer of such work. It is a means by which the author is given a property right over their intellectual or artistic creations. It equally focuses on the right of reproduction of literary or artistic work by persons other that the rights owner. Copyright law forbids unauthorized copying, duplication, reproduction in any form or means such as mechanical, electrical, digital, and photographic (e.g. photocopying, scanning, digital copying, electronic storage in databases etc.). Copyright does not mean that one should not copy, but prior permission should be sought from the right owner of the work, and credit should be given.

Antecedent of Modern Copyright Law

As pointed out by Koskinen-Olsson (2005), the foundation of modern copyright law is the Berne Convention. WIPO (2004) states that Article 9 of the Berne Convention states that the author of a literary or artistic work has the exclusive right of authorizing or prohibiting the reproduction of his work in any manner or forms. However, The Berne Convention Act of 1988 qualifies all authored works as being copyrighted and does not required display of the familiar copyright notice. Works distributed after this time do not necessarily requires copyright notice. It is therefore assumed that all works are protected by copyright laws unless otherwise exempted by

"fair use" or classified for public usage. There are also various national copyright laws which stipulate what constitute as copyright in each country. However, all national, regional or intercontinental copyright law is based on the principles of the Berne Convention Act.

Limitations and Exceptions

Article 9(2) of the Berne Convention under limitations and exceptions permits copying or reproduction of copyrighted materials for special cases or situations, provided that:

- Such reproduction is not in conflict with the normal exploitation of the original work;
- Such reproduction does not unreasonably prejudice the legitimate interests of the author.

The European legislation Directive 2001 as reported by Koskinen-Olsson (2005) equally deals with the issue of reproduction right and limitations and exceptions under Article 2 and 5.

- Article 2: the reproduction right: member states have the right to authorize or prohibit copying
- Article 5: Exceptions and limitations: right holders should receive "fair compensation".

This is equally supported by the Nigerian Copyright Act under the Second Schedule which outlines exceptions from copyright controls.

It then follows that reproducing for "special cases" such as research or academic works, under the "limitation and exception" right, (such as the one which the library enjoys) the right holders of the works copied or reproduced must be fairly compensated to reward for the use made of their works which may affect their economic interests.

Modern Technology and Copyright

Technological advances have led to the development of various digital copying devices. The use of ICTs for reprographic activities namely: copying, reproduction and duplication as experienced in the library today is on a large scale, and violates the provisions of these two provisions. Most times, we librarians are oblivious that those photocopying we made are illegal. Emphasis is on librarians in developing countries where costs of reading materials are beyond the reach of common man: and enforcement of copyright law is, in practice, not fully operational.

The Nigerian Copyright Act (NCA) 1990

The Nigerian Copyright Act 1990, as amended by Decree 42 of 1999, section 5(1) states that *"copyright in a work shall be exclusive right to control the doing in Nigeria of any of the following acts, that is-*

(a) in the case of a literary or musical work, to do and authorise the doing of any of the following acts-

(i) reproduce the work in any material form;

(ii) publish the work; ..."

However the duration for copyright ownership of literary and artistic works as stipulated under the First schedule of the NCA is "seventy years after the end of the year in which the author dies; in the case of government or a corporate body, seventy years after the end of the year in which the work was first published.

Fair Use and Fair Dealing

The principle of "fair use" or "fair dealing" permits the copying or reproduction of literary or artistic work of which copyright subsists. This, as explained under "limitations and exceptions" rights, enables the copying or reproduction of copyrighted materials. This translates that copying or reproduction of copyrighted materials for special cases such as review, research or scholarship does not constitute copyright infringement.

The fair use right was introduced into the copyright law across the globe to help libraries and other educational institutions in their promotion of reading and life-long learning.

Acts that may constitute as fair use or fair dealing under the NCA 1990 include:

- Copying for purposes of research, private use, criticism or review or the reporting of current events,
- the making of not more than three copies of a book (including a pamphlet, sheet, or music, map, chart or plan) by or under the direction of the person in charge of a public library if such a book is not available for sale in Nigeria;
- the reproduction for the purpose or research or private study of an unpublished literary or musical work kept in a library, museum or other institutions to which the public has access;

However, under Second Schedule (a), this is further subjected to the condition that, "if the use is public, it shall be accompanied by an acknowledgement of the title of the work and its authorship except where the work is incidentally included in a broadcast" (NCA, 1990)

Reprographic activities in the library are carried out under the "fair use" or "fair dealing" rights. Copies are made in different types of libraries in large quantities for research, without the consent of, and remuneration to, right holders, which may prejudice their legitimate interests. The use of modern photocopiers and other ICTs in the library make it much easier to copy an intellectual work, under fair dealing/use, which makes it more likely to decrease the copyright holder of appropriate revenue.

Availability of reprographic services in a library may increase the use of certain information materials, and at the same time decrease the purchase strength of such materials. Library users would prefer using materials in the library if reprographic services are available rather than purchasing such materials (Liebowitz, 2001).

Zonghe (n.d.) advances some questions one should ask to determine "fair use". These are:

1. *"Is the purpose of reproduction commercial or nonprofit?*
2. *What is the nature of the copyrighted work? (That is, while copying two or three paragraphs from scholarly article would be permissible; you might need permission to copy a poem or to copy the music and lyrics of a published song)*
3. *How much of the material is to be reproduced?*
4. *What effect will copying have on the market for the copyrighted work?*
5. *How often am I copying the material? Is it systematic (regular, planned copying)?*

For example, reproducing two or three pages of a book for one class would be acceptable, while copying ten chapters for several' classes would be illegal unless permission were granted by the copyright holder. Likewise, making small numbers of copies of the same copyrighted article for class-work would be illegal if it occurred regularly, such as every few months".

Impact of Reprography on Copyright

The major impact of reprography on the copyright is that it diminishes the revenue base of the right holders. For instance, while it could increase the total journal use, it could equally decrease individual journal subscription. Reproduction of copyrighted work is, in the widest sense, a clear infringement of copyright law. Library and users, at times copied and use copyrighted materials outside the jurisdiction rubrics of "fair use" right.

Liebowitz (2001) proposes three measures to deal with the impact of reprography on copyright:

- **Strict Copyright Payment:** Royalties should be paid for each copy of copyrighted work copied.
- **Compulsory Licensing of Photocopy (Reprographic) Machines:** Owner or renter of copiers (reprographic machines) to pay yearly fee into a fund to be distributed among copyright holders of intellectual proprieties.
- **Allowing Price Discrimination:** This is charging of different prices for the same item to different individuals. Publishers sell higher to libraries than individuals to compensate for "fair use" that may affect the author's interest.

Reprography increases the dissemination of created knowledge. New knowledge is created from existing ones. Therefore, the need for reprography becomes imperative to promote the creation of new knowledge; by removing obstacles to intellectual research.

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GLOSSARY

A

API (Application Programming Interface): Software that controls communication between a program and a computer environment. APIs make it easier for software developers to create the links that an application needs to communicate with the operating system or with the network.

ASCII (American Standard Code for Information Interchange): This is used to describe documents using the plain text format. ASCII files are easier and quicker to transfer and format by most application programs without requiring any special software.

B

Back -up: This is the process of making a copy of a file, record or document to be kept for archival purpose, which would be used in case the original is lost or damaged. Back- up copies are usually stored **off-site** or in a more secured location.

C

Comb binding: A form of mechanical binding in which a row of interconnected curved plastic teeth is inserted into slots punched along the binding edge of the leaves of a publication to hold them together. It is usually used for documents that must open flat and used continuously.

Conservation: The use of physical or chemical methods to ensure the survival of the information material.

Copyright: The exclusive legal rights granted by a government to an author, editor, compiler, composer, playwright, publisher or distributor to publish, produce, sell or distribute copies of a literary, musical, dramatic, artistic, or other work within certain limitations.

Crash: A sudden system failure usually resulting from virus attack or malfunctioning hardware or software components of a computer system.

Cropping: A photograph or digital image from which part of the top,

bottom, or sides, has been eliminated or trimmed in the process of reproduction to reduce, to desired size or remove, unnecessary detail.

D

Database: A collection of related data stored and maintained on a computer system.

Deterioration: Damage that occurs to an item by physical, chemical, or biological means after it has been produced, usually over a period of time.

Digital imaging: The process of capturing, storage, manipulation and converting physical images into digital format through the use of dedicated scanner and computer.

DjVu ("pronounced déjà vu"): This refers to a digital document or file format with advanced compression technology. DjVu is usually meant for Internet distribution of high resolution images of scanned documents or photographs and it is specifically useful for storing scanned documents that contains a combination of texts, line drawings, indexed colour images and photographs.

Document Delivery Service (DDS): The provision of published or unpublished documents in hard copy, microform, or digital format, upon request. DDS is provided as part of Inter-library loan service in most libraries.

DPI (dots per inch): A measure of print resolution which refers to the number of dots per inch that makes up a character. 300 to 600 dpi is recommended for scanning digital image while 150dpi is recommended for documents.

Driver: A piece of software that tells the computer how to operate an external or added device, such as a printer, scanner etc.

Drum: A kind of cylinder present in copiers, printers, or rotary scanners, which picks up charges and on which latent images are formed during development, from where copy paper picks the toner. There are basically two types: organic photoconductor drum coated with zinc oxide or cadmium and aluminum drum coated with selenium or silicon.

E

Electro-photography: Another term used for xerography. See xerography for details.

Encapsulation: The process of enclosing a flat document in a thin polyester envelope. The edges are sealed to protect it from damage, used in conservation and preservation to provide support for large, fragile or brittle books.

F

Finishing: A generic term for the final steps in making repackaged information presentable and usable, which include folding, trimming, binding, labeling, and dust jacket.

G

GIF (Graphics Interchange Format): One of the suitable formats commonly used for storing graphic images displayed on the WWW. Other formats include JPEG and TIFF

H

Headband: In bookbinding, a band of woven cotton or similar material glued or sewn to the back of a book at the head.

I

ICT (Information and Communication Technology): The use of computer or digital technologies for information handling, processing or transfer.

Information management: the acquisition, organization, storage, retrieval, dissemination and use of information.

Information Overload: this occurs when a person receives more information than what he can effectively manage, use or deal with. This often leads to or cause confusion known as data smog.

In-house: Activities that are completed by the library using its own resources.

J

JPEG (Joint Photographic Experts Group): An image compression format used to transfer colour photographs and images over computer networks.

L

LE (Life-expectancy): The expected lifespan of an information material or medium. Microfilms usually have an LE of 500 years, whereas paper-based books have LE of 100 years.

LED (Light Emitting Diode): A semi-conductor device that emits light produced by converting electrical energy.

M

Magnetic disk/tape: A disk/tape that is coated with iron oxide, thereby enabling the introduction (writing), retention (memory and reading of magnetically recorded information.

Master: In reprography, this is the plate, stencil, negative or document from which copies are made, usually more than once. The quality of master copy deteriorates with extended use.

Media: A generic term for non-print library materials (films, filmstrips, slides, video recordings, audio recordings, CD-ROMs, machine-readable data files, computer - software etc. Microforms are not considered media because they are reproduction of print documents.

Micrographics: A generic term for the techniques used to photographically reduce text and/or graphic images to a very small size which could not be read without magnifying aids.

Migration: A move from one hardware platform or software system to another superior or more durable one.

Modern Technology: The use of computer and similar electronic digital devices for design, development, installation, implementation, and communication of information system and applications. See also ICT

Monographs (textbooks): A short book which treats a single subject,

complete in one physical piece, usually written by a specialist in a particular field.

MP3: Compressed electronic sounds file usually occupying only about 10 percent of the conventional **.wav** sound files.

N

Newton's rings: An interference of light waves usually caused by a series of concentric light and dark coloured circles visible when a convex glass lies on another piece of flat surfaced glass. This trapped a layer of air between them which resulted into formation of contour patterns known as newton's rings. Newton's ring is one of the factors that can diminish scanning purity. The rings are named after Sir Isaac Newton who first investigated them quantitatively.

O

Obsolescence: Used to describe the premature replacement of products (hardware or software) because technological advancements have necessitated their replacement by more up-to-date items.

OCR (Optical Character Recognition): A process by which typed or printed characters on a page are electronically scanned, analysed and converted into a digital character code capable of being processed by a computer. OCR eliminates the time-consuming process of re-keying information on printed documents. However, achieving a clear and perfect OCR copy depends on the clarity and legibility of the prints as well as how supportive the OCR software is. Some signs, images and unrecognizable characters cannot be converted.

Offset-litho: An ink-based printing process, in which ink adhering to image areas of a lithographic plate is transferred (offset) to a blanket cylinder before being applied to paper or other surface.

Off-site Storage: Temporary or permanent storage of archival or library materials at a location outside the walls of the main facility, usually for security purpose or lack of adequate storage space in the library.

P

Paper jam: When paper gets tangled in printer or photocopier. Damp, dirty or crisp papers always jam. Instructions manual should be read carefully on steps to handle paper jam.

PDF (Portable Document Format): This is a suitable format for accessing e-bqoks or publishing and distributing electronic text documents on the Internet.

pH: A chemical symbol representing the concentration of hydrogen ions in a given substance aqueous solution. A standard measure of its acidity or alkalinity on a scale of 0-14, with 0=strongly acidic and 14= strongly alkaline, used in preservation to detect acid paper, film etc. A product with a pH of 6.0 or higher is considered acid-free.

Preservation Microfilm: A microfilm produced and stored according to standards, intended to be kept or preserved indefinitely.

Preservation: Prolonging the existence of library and archival materials by maintaining them in condition suitable for use, either in their original format or in a form more durable.

Reader-printer: A machine designed for enlarging, viewing and making printed copies of microforms.

Protocol: A set of commands that determines how two computers, or a computer and other device communicate with each other. Http, FTP, TCP/IP are common protocols used.

Q

Query: any (information) request from library users submitted as input in a search for information relevant to the user's information need(s).

R

Realia: Three-dimensional objects from real life. It may be man-made or natural objects, specimen or samples

Reprography: A generic term for quick-service document reproduction or copying by any means except large scale professional printing. Reprographic processes include photography, xerography, photo duplication, digital imaging or copying etc.

RLIN (Research Libraries Information Network): An information management and retrieval system consisting of an online union catalogue.

Spiral Binding: A form of mechanical binding in which a continuous coil of wire or hard plastic is drawn through small holes or slots punched in the binding edge of the covers and leaves of a publication to hold them together.

S

SQL (Structured Query Language): A specialized programming language for sending queries to databases.

T

Text block: Gathered signatures of a written or printed book sewn, stitch or adhered in a single unit, usually trimmed before attachment to the case or cover.

Toner: In xerography, this is a form of dark powder-like substance used by photocopiers and laser jet printers to print on copy papers. Toners may be positively or negatively charged, depending on the kind of drum the copier or printer uses.

U

Users: These are the people that use the library or any of its resources. It is often interchanged with patrons, clients, clienteles, information users, library users.

V

VHS (Video Home System): A video recording and playback format consisting of hard plastic cassettes containing half-inch videotape. Also called video cassette.

Virus: A malicious program that searches out other programs and infects them by installing a copy of itself into them without the operator suspecting. The embedded virus is executed once the infected program is run resulting into irreparable loss to the computer system, causing data loss or system crash.

W

Word processing: A means of converting information into a readable text that could be easily formatted. Word processing systems usually consist of a computer and a keyboard for data input or typing, a monitor and a printer.

Window: A rectangular viewing area on a computer monitor where data is displayed. (See also Windows)

Windows: In computing, a graphic interface in which programs, directories and files are indicated by icons and data is displayed in rectangular frames that can be manipulated by the user. The term is associated with Microsoft products. (See also Window)

X

Xerography: A form of electrostatic dry copying process, using a form of powder known as toner transferred from an electro-statically charged drum. Xerography has its root from the Greek word *xeros* and *graphos* meaning "dry writing".

Z

Z39.50 Protocol: A client-server protocol that allows a computer user to query a remote information retrieval system using the software of the local system and receive results in the format of the local system, often used in portal and gateway products to search several sources simultaneously and integrate the results.

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