VISUAL COMMUNICATION

WEEK 12

Publication Printing techniques

Learning Outcomes

At end of this week lesson the students should be able to:

1. Explore the history and evolution of printing processes.
2. Analyze in detail printing methods
3. Apply the printing processes of publications
4. Visit and learn from printing industry

Introduction to Printing

According to Cambridge Dictionary (2024), printing is the activity or business of producing writing and images on paper or other material with a machine. Printing is the process of reproducing text and images, typically using ink on paper or other materials, through various techniques and technologies. It involves the transfer of an image or text from a digital file or physical template onto a substrate (e.g., paper, fabric, plastic) to create multiple copies of the original content. Printing is a critical component in publishing, advertising, packaging, and many other industries. According to Lechêne (2024), printing, traditionally, a technique for applying under pressure a certain quantity of colouring agent onto a specified surface to form a body of text or an illustration. Certain modern processes for reproducing texts and illustrations, however, are no longer dependent on the mechanical concept of pressure or even on the material concept of colouring agent. Because these processes represent an important development that may ultimately replace the other processes, printing should probably now be defined as any of several techniques for reproducing texts and illustrations, in black and in colour, on a durable surface and in a desired number of identical copies.

Key Aspects of Printing

1. **History and Evolution**

   The whole history of printing is a progression away from those things that originally characterized it: lead, ink, and the press. Printing is used not merely for books and newspapers but also for textiles, plates, wallpaper, packaging, and billboards. It has even been used to manufacture miniature electronic circuits (Lechêne, 2024). The following is a brief summary, however, this will be extensively discussed:

- **Ancient Methods**: Early forms of printing include woodblock printing and movable type, first developed in China around 1040 AD.
- **Gutenberg Press**: Johannes Gutenberg's invention of the mechanical movable type printing press in the mid-15th century revolutionized the production of books and written materials.
- **Modern Printing**: Advances in technology have led to various modern printing methods that offer higher efficiency, quality, and versatility.

2. **Printing Methods**

According to Test Print (2022), the years, printing technology has advanced beyond our imagination, and users can now print their favorite designs on any material. However, the technique will vary, and that's how various printing types were discovered. With the difference in techniques, there also comes a notable difference in the quality. The choice of a specific printing type depends on the purpose of use, printing material, and desired quality. The following is a summary of different printing methods that will be discussed in details:

- **Offset Printing**: A common method where an inked image is transferred from a plate to a rubber blanket, then to the printing surface. Widely used for high-volume commercial printing.
- **Digital Printing**: Uses digital files to directly print onto the substrate, ideal for short runs and customizable prints.
- **Screen Printing**: Involves creating a stencil (screen) and using it to apply layers of ink on the printing surface, commonly used for textiles, posters, and signage.
- **Gravure Printing**: Uses a rotary press with engraved cylinders to transfer ink onto paper, known for high-quality image reproduction and used for magazines, packaging, and wallpapers.
- **Flexography**: Employs flexible relief plates to print on various substrates, often used for packaging and labels.
- **Letterpress**: An older method where raised letters are inked and pressed onto the paper, now mostly used for specialty printing like invitations.

3. **Printing Processes**

- **Prepress**: Preparation steps before actual printing, including design, layout, proofing, and making printing plates or screens. According to Arkansas State University (2024), prepress is the term used in the printing and publishing industries

for the processes and procedures that occur between the creation of a print layout and the final printing. This procedure includes the manufacture of a printing plate, image carrier, ready for mounting on a printing press, as well as the adjustment of images, photographs and texts or the creation of a high-quality print file. In today's prepress, either a PDF or native application files are created from programs such as Adobe Creative Suites, QuarkXPress, etc.

- **Printing**: The actual process of transferring ink onto the substrate.
- **Post-Press/Finishing**: Includes processes like cutting, folding, binding, laminating, and other finishing touches that complete the printed product.

4. **Applications**

According to Vaniotis (2023), printing technology continues to develop and advance, with new printing methods developed to serve specific applications and needs. In turn, each type of printing method is ideally suited to a different situation, allowing you to choose the printing technique that best highlights your products or services. The following are some applications used in printing:

- **Publishing**: Books, newspapers, magazines, and journals.
- **Advertising**: Flyers, posters, brochures, banners, and billboards.
- **Packaging**: Labels, boxes, bags, and wraps.
- **Office and Stationery**: Business cards, letterheads, envelopes, and forms.
- **Textiles**: T-shirts, fabrics, and other apparel items.
- **Art and Photography**: Prints, canvases, and photo books.

5. **Environmental Considerations**

According to Wizix Technology Group Inc. (2022), it's estimated that over 1 billion ink cartridges are sold each year worldwide. The greenhouse gas emissions it takes to manufacture a supply of ink cartridges this size is astounding. The chemicals in printer ink can be extremely harmful to the environment in addition to the petroleum oil and non-biodegradable plastic casing found in some ink and toner cartridges.

According to one source, Americans use 85,000,000 tons of paper every year. That's seven trees a year per American. Much of that paper is used in schools or office environments. That is a lot of trees that have to be cut down to supply that amount of paper. And what happens to the majority of that paper? Landfills! In the modern, digital age, you would think that paper use has gone down, but studies have found that over the

last 20 years, paper consumption has actually gone up 126%. The average office worker uses 10,000 sheets of paper annually (Wizix Technology Group Inc., 2022).

- **Sustainability**: The printing industry is increasingly focusing on sustainable practices, including the use of eco-friendly inks, recycled paper, and reducing waste.
- **Digital Printing**: Offers a more environmentally friendly option for small runs and on-demand printing, reducing overproduction and waste.

An analysis of the history and evolution of printing

The history and evolution of printing are vast and multifaceted, spanning from ancient methods to modern digital technologies. Printing has played a crucial role in the dissemination of information, knowledge, and culture throughout human history. The history of print runs parallel with the history of civilization. It has been an integral part of our development as a species and has proved to be a key contributor in spreading culture across the globe.

Ancient and Early Methods

1. **Woodblock Printing (circa 200 AD)**

   It is the oldest method used for printing and is now overtaken by newer techniques. This traditional method involved carving an image or text onto a wood block. Then that block was used to make ink impressions on paper, fabric, or other materials (Test Print, 2022).

   - **Origins**: The earliest known form of printing, developed in China.
   - **Technique**: Involved carving an image or text onto a wooden block, inking it, and pressing it onto paper or cloth.
   - **Uses**: Primarily used for printing textiles and later for religious texts and images.

2. **Movable Type (circa 1040 AD)**

   Created by Bi Sheng in Song Dynasty China, Movable Type is similar to Woodcut, although this particular technique was used specifically for printing script. Before Movable Type, lettering had to be written out in full, whereas this technique allowed individual letters to be configured and placed together in any order. The tiles or tablets used to create the print were first made from clay, before wood and metal were introduced for better clarity and a more resilient finish (Instantprint, 2022). It is also a form of relief printing, similar to flexography, and letterpress printing is considered an art form. It uses a press with raised letters or images to transfer ink onto the printing surface (Test Print, 2022).

- **Inventor**: Bi Sheng in China.
- **Method**: Individual characters made from clay were assembled to form pages. After use, the characters could be rearranged for new pages.
- **Impact**: While innovative, it was limited by the vast number of characters in Chinese writing, making it less practical than block printing.

The Gutenberg Revolution

3. **Gutenberg Printing Press (circa 1440)**

   The text or design to be printed is first prepared and set in metal or wooden type. This includes selecting the typeface, size, and layout of the text or design. The type is then carefully arranged on a press bed in the desired layout, with the raised letters facing upwards. Finally, the press bed is then pressed against the printing surface, such as paper or cardstock, transferring the ink from the type to the surface to create the printed image. The final product is then cut to the desired size and shape (Test Print, 2022).

   - **Inventor**: Johannes Gutenberg, a German blacksmith and inventor.
   - **Innovation**: Introduced the mechanical movable type printing press using metal type pieces.
   - **Process**: Combined movable type with a press mechanism, significantly speeding up the printing process.
   - **Impact**: Revolutionized the production of books and written materials. The Gutenberg Bible (1455) is one of the first major books printed using this method.
   - **Consequences**: Facilitated the spread of knowledge, contributing to the Renaissance, Reformation, and Scientific Revolution.

Expansion and Refinement

4. **16th to 18th Centuries**

   - **Spread of Printing**: The printing press spread rapidly across Europe and eventually to other parts of the world.
   - **Refinements**: Improvements in press design and typecasting, the introduction of copperplate engraving, and other advancements enhanced printing quality and efficiency.
   - **Content**: Growth in printed materials including newspapers, pamphlets, and books, which became more accessible to the public.

5. **Industrial Revolution (19th Century)**

    - **Steam-Powered Presses**: Introduction of steam power increased printing speed and volume.
    - **Stereotyping**: Technique of creating plates for entire pages, further speeding up the process.
    - **Lithography**: Invented by Alois Senefelder, allowed for the printing of images and text from a single plate, improving cost-effectiveness and versatility.
    - **Impact**: Enabled mass production of printed materials, contributing to increased literacy rates and the spread of information.

Modern Printing Technologies

6. **20th Century Advances**

    - **Offset Printing**: Developed in the early 20th century, it became the dominant commercial printing method. Involves transferring an inked image from a plate to a rubber blanket, then to the printing surface.
    - **Phototypesetting**: Replaced hot metal typesetting in the mid-20th century, using photographic processes to set type.
    - **Digital Printing**: Emerged in the late 20th century. Uses digital files to directly print onto substrates without the need for plates.

Contemporary Printing

7. **21st Century and Digital Revolution**

    - **Inkjet and Laser Printers**: Common in both personal and commercial use, offering high-quality prints with minimal setup time.
    - **3D Printing**: A transformative technology that builds three-dimensional objects layer by layer from digital models.
    - **Sustainability**: Increased focus on eco-friendly practices, such as using recycled materials and sustainable inks.
    - **Customization**: Digital printing allows for on-demand and personalized printing, reducing waste and allowing for greater flexibility.

Impact and Legacy

- **Cultural Transformation**: Printing has profoundly impacted education, science, religion, and politics by making information widely accessible.
- **Economic Influence**: Spurred the growth of publishing, advertising, packaging, and many other industries.
- **Global Connectivity**: Enabled the rapid dissemination of ideas and information, fostering global communication and understanding.

Analyze in detail printing methods

Printing goes back a long time, to roughly 3000 BC and even earlier to be exact. It has been an essential part of the growth and development of civilization over the years, proving to play an integral role in spreading culture (Vlahos, 2021). Printing methods have evolved significantly over time, each with unique techniques and applications. The following is a detailed analysis of various printing methods:

1. Woodblock Printing

History and Development:

- Originated in China around 200 AD.
- Used extensively in East Asia for printing on textiles and paper.

Technique:

- An image or text is carved into a wooden block.
- Ink is applied to the surface, and the block is pressed onto the paper or fabric.

Applications:

- Early books, religious texts, and decorative textiles.

Advantages:

- Simplicity and durability of the woodblocks.
- Ability to produce consistent prints over multiple uses.

Disadvantages:

- Labor-intensive and time-consuming.
- Limited detail and complexity.

2. Movable Type

History and Development:

- Invented by Bi Sheng in China around 1040 AD.
- Perfected by Johannes Gutenberg in the 15th century in Europe.

Technique:

- Individual characters made from materials like clay, wood, or metal.
- Characters are assembled to form pages and can be reused and rearranged.

Applications:

- Books, newspapers, and other written materials.

Advantages:

- Greater efficiency compared to woodblock printing.
- Easier to correct errors and make changes.

Disadvantages:

- Still relatively slow compared to modern methods.
- Requires skilled labor to assemble and disassemble type.

3. Letterpress Printing

History and Development:

- Dominant method from the 15th century until the mid-20th century.

Technique:

- Raised letters are inked and pressed onto the paper.
- Uses movable type and mechanical presses.

Applications:

- Books, newspapers, business cards, and invitations.

Advantages:

- Produces high-quality, sharp text.
- Can create a tactile, embossed effect.

Disadvantages:

- Labor-intensive setup.
- Less efficient for high-volume printing.

4. Lithography

History and Development:

- Invented by Alois Senefelder in 1796.

Technique:

- Based on the principle that oil and water do not mix.
- Uses a flat stone or metal plate; the image area is inked, and the non-image area is treated to repel ink.

Applications:

- Posters, maps, packaging, and fine art prints.

Advantages:

- High-quality image reproduction.
- Suitable for both text and images.

Disadvantages:

- Complex process requiring skilled operators.
- Not suitable for very high-volume printing.

5. Offset Printing

History and Development:

- Developed in the early 20th century and became the dominant commercial printing method.

Technique:

- The image is transferred from a plate to a rubber blanket, then to the printing surface.
- Uses CMYK color model for color printing.

Applications:

- Books, newspapers, magazines, brochures, and packaging.

Advantages:

- High-quality, consistent prints.
- Efficient for large print runs.

Disadvantages:

- Setup can be costly and time-consuming.
- Not economical for short runs.

6. Gravure Printing

History and Development:

- Developed in the 19th century.

Technique:

- Uses engraved cylinders to transfer ink onto the paper.
- Each cylinder represents one color, requiring multiple cylinders for full-color printing.

Applications:

- High-volume printing such as magazines, packaging, and wallpaper.

Advantages:

- Excellent print quality with rich colors and fine details.
- Very efficient for long runs.

Disadvantages:

- High setup costs due to the need for engraved cylinders.
- Not economical for small print jobs.

7. Flexography

History and Development:

- Evolved from letterpress printing in the early 20th century.

Technique:

- Uses flexible relief plates to transfer ink to various substrates.
- Can print on a wide range of materials, including plastic, foil, and paper.

Applications:

- Packaging, labels, newspapers, and wallpapers.

Advantages:

- Versatile, can print on non-porous surfaces.
- Fast and efficient for long runs.

Disadvantages:

- Lower image quality compared to gravure and offset printing.
- Initial setup can be costly.

8. Screen Printing

History and Development:

- Originated in China and Japan over 1,000 years ago, widely popularized in the 20th century.

Technique:

- Uses a stencil (screen) to apply layers of ink on the printing surface.
- Each color requires a separate screen.

Applications:

- Textiles, posters, signage, and electronic circuit boards.

Advantages:

- Versatile and can be used on various materials.
- Suitable for both short and long runs.

Disadvantages:

- Time-consuming setup for multiple colors.
- Less detailed than some other printing methods.

9. Digital Printing

History and Development:

- Emerged in the late 20th century with the advent of digital technology.

Technique:

- Uses digital files to directly print onto the substrate without the need for plates.
- Includes inkjet and laser printing technologies.

Applications:

- Small runs, on-demand printing, personalization, and variable data printing.

Advantages:

- Quick setup and turnaround.

- Cost-effective for short runs and customizable prints.

Disadvantages:

- Higher cost per unit for large runs compared to traditional methods.
- Lower quality and durability for some applications.

10. 3D Printing

History and Development:

- Developed in the 1980s and rapidly evolved with advancements in digital technology.

Technique:

- Builds three-dimensional objects layer by layer from digital models.
- Uses materials such as plastic, resin, metal, and more.

Applications:

- Prototyping, manufacturing, medical implants, and art.

Advantages:

- Allows for complex, custom designs.
- Rapid prototyping and reduced material waste.

Disadvantages:

- Limited to certain materials.
- Slower and more expensive for mass production compared to traditional methods.

The printing processes of publications

The printing process of publications involves several key stages, each critical to producing a high-quality final product. These stages include prepress, printing, and post-press/finishing. The following is an in-depth look at each process:

1. Prepress

Prepress is the preparation stage before the actual printing. It ensures that all files and materials are ready for the printing process.

a. Design and Layout

- **Creation**: Using software like Adobe InDesign, Illustrator, or Photoshop to create the layout and design of the publication.

- **Formatting**: Ensuring text, images, and graphics are properly formatted and aligned.
- **Proofreading**: Checking for spelling, grammar, and layout errors.

b. File Preparation

- **Color Mode**: Setting the document to the appropriate color mode (CMYK for print, RGB for digital).
- **Resolution**: Ensuring images are high resolution (300 dpi) for print quality.
- **Bleed and Margins**: Adding bleed areas to allow for trimming and setting safe margins to prevent content from being cut off.

c. Proofing

- **Soft Proofing**: Reviewing a digital version of the document for accuracy.
- **Hard Proofing**: Printing a physical proof to check colors, layout, and content.
- **Corrections**: Making necessary adjustments based on proof feedback.

d. Plate Making (for offset printing)

- **Image Transfer**: Transferring the digital image onto printing plates using a process called Computer-to-Plate (CTP).
- **Plates**: Creating separate plates for each color in the design (typically CMYK).

2. Printing

The printing stage is where the prepared files are transferred onto the chosen substrate. Different methods are used based on the type and volume of the publication.

a. Offset Printing

- **Setup**: Installing the printing plates on the press.
- **Ink Application**: Applying ink to the plates, which transfer the ink to a rubber blanket and then onto the paper.
- **Run**: Printing the desired number of copies, adjusting ink levels and registration as needed.

b. Digital Printing

- **Direct Print**: Printing directly from digital files without the need for plates.

- **Advantages**: Quick setup, cost-effective for short runs, allows for customization and variable data printing.
- **Output**: Producing the final prints using inkjet or laser printers.

c. Other Methods

- **Screen Printing**: Using stencils to apply ink layers on various materials.
- **Gravure and Flexography**: High-volume methods often used for packaging and specialty publications.

3. Post-Press/Finishing

Post-press involves all the processes that occur after printing to finalize the publication.

a. Cutting and Trimming

- **Trimming**: Cutting the printed sheets to the final size, removing any bleed areas.
- **Precision**: Ensuring accurate cuts to maintain uniformity across all copies.

b. Binding

- **Saddle Stitching**: Binding the pages with staples along the spine, common for booklets and magazines.
- **Perfect Binding**: Gluing the pages together at the spine, suitable for thicker publications like books.
- **Spiral Binding**: Using plastic or metal coils to bind pages, allowing them to lay flat when open.

c. Folding

- **Techniques**: Folding sheets into the desired format, such as bi-fold, tri-fold, or z-fold.
- **Accuracy**: Ensuring precise folds to avoid misalignment.

d. Other Finishing Touches

- **Lamination**: Adding a protective plastic coating to covers or pages for durability.
- **Varnishing**: Applying a glossy, matte, or satin finish to enhance appearance and protect the printed surface.
- **Die-Cutting**: Cutting out specific shapes or designs, often used for custom covers or unique formats.

- **Embossing/Debossing**: Creating raised or recessed designs for a tactile effect.

4. Quality Control

Throughout the entire process, quality control is crucial to ensure the final product meets the desired standards.

- **Inspections**: Conducting regular checks at each stage of production.
- **Consistency**: Ensuring color consistency, print quality, and accurate binding.
- **Final Proof**: Reviewing the final product before full production or distribution.

Further Reading

Suggested materials to be read by the Learner

Ethics in Image creation

With the growth of digital image usage have come frequent scandals about news photographs that have been "doctored" or changed. Sometimes these changes are designed to fool the public. Other times the photographs are changed to improve the image of the person in the photo. For example, an actress might have wrinkles removed or her body slimmed in places. Changing photographs to intentionally mislead an audience is completely unethical. No desktop publisher or photographer should be willing to participate in such an action. (Lake and Bean, 2008).

The predicament you face comes when images are changed for other purposes. Few people would object to red eye being removed from an image. Even removing a slight blemish from a face is excusable. From that point on, you will have to make your own judgments. Is it acceptable to change the color of a car in order to make it more attractive for an ad? What are the ethics of removing a person from a group image because they haven't given permission to use the image while the others have? What about extracting a person's image from one location and placing them in another background? Designers face all these questions and many more every day. (Lake and Bean, 2008).
According to Lester (2021), Some art directors know that shock advertising can make a company a media standout for the moment and give a fresh, edgier look to a traditional company. Sisley, a clothing brand owned by Benetton, showed young women with dark rings around their eyes "snorting" the white straps of a slinky dress from straws for its Junkie campaign, misspelled by its Chinese advertising company as "Fashioin". Humorous commercials can also get a company's product noticed. The Swedish vodka company Absolut, known for its advertising campaign in which it commissions artists to produce posters that incorporate the shape of the bottle in clever ways, asked comedian Zack Galifianakis to produce a series of web-only commercials with the comedy duo Tim

Heidecker and Eric Wareheim that were as bizarre as they were funny, the advertisement became a popular YouTube download.
(Weblink: http://bit.ly/2DpYDUT)
Sisley created an obvious connection to addiction in its advertisement.
Linking sexual activity with products is a long-established tactic for advertisers. If you stacked two particular Pepsi cans produced in 1990 you could see the word "SEX," although a spokesperson said it was just a coincidence.
(Weblink: http://bit.ly/2E0dWoO*)*
Probably few consumers linked sex with a sugar drink, but when Pepsi cans were stacked, some did.

Summary

Printing remains a vital process across various sectors, continually evolving with technological advancements. Whether producing a single custom item or millions of copies, the diverse methods and techniques of printing enable the creation and dissemination of information, art, and products in a multitude of forms.

The history and evolution of printing demonstrate a continuous advancement in technology and methods, each stage building on previous innovations to improve speed, quality, and accessibility. From ancient woodblocks to digital presses, printing has been a pivotal force in shaping human civilization, knowledge dissemination, and cultural development.

Each printing method has its strengths and weaknesses, making them suitable for different applications and needs. From the ancient woodblock printing to modern digital and 3D printing, the evolution of printing technologies reflects advancements in both artistic expression and industrial efficiency. Understanding these methods helps in choosing the appropriate technique for a given project, balancing factors such as cost, quality, and production volume.

The printing process of publications is a complex workflow involving multiple stages to ensure high-quality output. From the initial design and file preparation to the actual printing and finishing processes, each step is vital to producing professional and polished printed materials. Understanding these stages helps in managing and executing successful printing projects, whether for small-scale custom jobs or large-volume commercial prints.

Question

Hands-On Exercise I

Look at ads, magazines, brochures, logos, and other printed projects and try to find different printing techniques used. Visit printing Firms or companies and interact with the large scale industrial processes.

REFERENCES

Arkansas State University (2024), *PRE-PRESS, PRESS AND POST-PRESS 3-PART WORKFLOW* https://www.astate.edu/a/printing-services/pre-press-and-post/

Cambridge Dictionary (2024) *Printing*, *English Meaning*, https://dictionary.cambridge.org/dictionary/english/printing

Instantprint (June 6, 2022) A Brief History of Printing Press & Printmaking https://www.instantprint.co.uk/printspiration/be-inspired/the-evolution-of-print

Lechêne, Robert (2024), *Printing Publishing*, https://www.britannica.com/topic/printing-publishing, Encyclopædia Britannica, Inc.

Test Print (2022), *17 Different Types Of Printing Methods And Techniques* https://www.testprint.net/printing-methods-techniques/#comment-295. Test Print.

Vaniotis, George (October 17, 2023). *Benefits & Uses of Different Printing Methods*, https://blog.industritag.com/benefits-uses-of-different-printing-methods/ IndustriTAG

Vlahos, Jackie (November 15, 2021) *The History of Printing* https://www.printivity.com/insights/2021/10/05/print-history/

Wizix Technology Group Inc. (2022), *How Do Printers Impact the Environment*, https://wizixtech.com/printing-impacts-on-the-environment/ WiZiX Technology Group.