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INFLUENCE OF DIGITAL TECHNOLOGY ON PRINTING TECHNOLOGY: A SURVEY ON SCREEN PRINTING IN AKURE, ONDO STATE, NIGERIA

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ABSTRACT: *Screen printing is one of the most reliable printing methods practiced in Nigeria despite the emergence of new approaches to printing. The paper examined the extent of practice of screen printing among screen printers in Akure, Ondo State, Nigeria, in relation to the adoption of digital technology in the printing profession. Questionnaires and interviews were employed as tools to elicit relevant information from the screen printers on the extent on practice of screen printing in the study area. The results revealed that the prevalent digital technological tools adopted in printing are Direct Image printing machine, Large Format printing machine, and the Flex cutting machine. Findings also identified that the practice of screen printing has been influenced by digital technology in the areas of printing quality, costing and billings, and enrolment for apprenticeship. The research further revealed that screen printing is well practiced despite digital technological advancements in the printing industry.*
KEYWORDS: digital technology, digital printing, screen printing, serigraphy, Akure

INTRODUCTION

Although many new methods of printing have emerged, screen printing remains one of the most reliable printing methods practiced in Nigeria. The practice of screen printing has been adopted since the inception of printing itself. It is described as versatile, durable, cost-efficient and high quality. These are just some of the many reasons why screen printing continues to be the most popular method of printing in a variety of commercial and retail applications.

Screen printing, which could also be referred to as serigraphy, is a printing method where a mesh is used to apply ink to a surface through a mesh screen. To make a print, a stencil containing a design is placed on a mesh screen stretched across a frame and a product or material is placed under the screen. The ink is then pressed through a screen with areas blocked off. Onoja (2014) defined Screen Printing as an art form which involves creating images by forcing ink using a squeegee (a flat rubber tool) through a fabric or silk screen onto the surface to be printed. A stencil attached to the screen prevents ink from passing where no image is desired. Screen printing is both an artistic technique and a production printing method. A person who practices screen printing is called a screen printer.

With the emergence of new technological innovations and dynamic economy, there is a greater increase of diversity in the activities carried out in the print industry. The advent of computer technology and the internet brought so many opportunities especially in the area of information

dissemination and transfer or sharing of knowledge and ideas (Ibiwoye, 2017). The place of digital technology in the advancement of digital printing cannot be overemphasized. Printing Technology has improved greatly as a result of the influence of the machine age. Now there are machines such as Direct Image printing Machine which prints directly on materials such as matte paper and card paper. The Large format printing machine prints directly on materials such as Self Adhesive Vinyl (SAV), Flex, and flag material. The embroidery machine inscribes logo and texts on clothing materials through the embroidery process. All of these and many more came up to execute the works that could rather be done through the screen printing process despite the fact that these Printing machines or tools in the printing industry are said to be capital intensive (Adeyeye, Falola, Waribo, & Akinbode, 2015). The pervasive practice of digital printing has affected the business of screen printing in no small measure.

Statement of the Problem

Screen printing plays a major role in the printing industry. It is one of the major printing forms which has been in existence for a very long time. The printing materials are easily accessible and the practice and products is a form of representation of the Nigerian culture. However, in recent times, the advent of digital technology is said to have taken over the practice of screen printing. Digital technology has influenced screen printing in diverse ways (such as piecing, print quality, raw materials, etc), thereby limiting its practice particularly among printers in the country. There is need to know how much of screen printing is still being done, despite technological invasion.
In addition to this, there is a noticeable gap in scholarship, with regard to the documentation of the methods and practices of screen printing, which this study seeks to fill. This study therefore sought to assess the influence of digital technology on printing in Nigeria, particularly on the practice of screen printing among printers in Akure, Ondo state, Nigeria.

Research Questions

1. What are the digital technological products adopted in printing among screen printers in Akure, Ondo State, Nigeria?
2. How has digital technology influenced screen printing among screen printers in Akure, Ondo State, Nigeria?
3. How much of screen printing is still in practice among screen printers in Akure, Ondo State, Nigeria?

Aim and Objectives

The aim of this study is to investigate the extent of practice of screen printing among screen printers in Akure, Ondo State, Nigeria, in relation to the adoption of digital technology in the printing profession.
The specific objectives of this research are to:
1. identify the digital technological products adopted in printing among screen printers in Akure, Ondo State, Nigeria.
2. determine the influence of digital technology on screen printing among screen printers in Akure, Ondo State, Nigeria; and
3. assess the extent of practice of screen printing among screen printers in Akure, Ondo State, Nigeria.

Justification of the study

Screen Printing has been existence for a very long time. It has also been shown in a number of researches carried out in the country that Digital technologies are taking over the screen printing jobs, which implies that the use of digital technology in printing is on the increase. Therefore, there is a need to assess the influence of digital technology on printing in Nigeria, with an emphasis on the practice of screen printing among printers in Akure, Ondo state, Nigeria.

Scope of Study

This study was conducted in Akure, Ondo State, Nigeria. Akure is a city in south western Nigeria and it is the largest city and capital of Ondo State. This study area was selected owing to its robust printing activities as compared to other areas within the state. This study was be limited to the activities of Screen Printers in the city, under the Association of Professional Practicing Artists (APPA). APPA is a major association for registered printers who practice screen printing business on a full time scale in the city.

LITERATURE REVIEW

This section reviews related literature on the theories supporting this study. The review was grouped into three major sections which includes: the origin of screen printing, Screen Printing Techniques, and the Influence of Digital Technology on the practice of screen printing.

Origin of Screen Printing

Screen printing first appeared in a recognizable form in China during the Song Dynasty (960–1279 AD). It was then adapted by other Asian countries like Japan, and was further created using newer methods. Screen printing was largely introduced to Western Europe from Asia sometime in the late 18th century, but did not gain large acceptance or use in Europe until silk mesh was more available for trade from the east and a profitable outlet for the medium discovered (Sheng & Angela, 1999). Early in the 1910s, several printers experimenting with photo-reactive chemicals used the well-known actinic light–activated cross linking or hardening traits of potassium, sodium or ammonium chromate and dichromate chemicals with glues and gelatin compounds. Roy Beck, Charles Peter and Edward Owens studied and experimented with chromic acid salt sensitized emulsions for photo-reactive stencils. This trio of developers would prove to revolutionize the commercial screen printing industry by introducing photo-imaged stencils to the industry, though the acceptance of this method would take many years. Commercial screen printing now uses sensitizers far safer and less toxic than bichromates.

Mishra & Yadav (2014) expressed that serigraphy as a mitography of silk screen printing display posters can easily be produced with an expenditure of few annals only. Its earliest prototype is the Japanese method of stencil making. Only a well-organized stencil is require which can easily be prepared with the help of an art teacher and can be used with great advantage in preparing charts posters maps and graphs. Currently, there are large selections of presensitized and "user mixed" sensitized emulsion chemicals for creating photoreactive stencils. A group of artists who later formed the National Serigraph Society, including WPA artists Max Arthur Cohn and Anthony Velonis, coined the word "serigraphy" in the 1930s to differentiate the artistic application of screen

printing from the industrial use of the process. "Serigraphy" is a compound word formed from Latin"sēricum" (silk) and Greek "graphein" (to write or draw).

The Printers' National Environmental Assistance Center says "Screenprinting is arguably the most versatile of all printing processes. Since rudimentary screen printing materials are so affordable and readily available, it has been used frequently in underground settings and subcultures, and the non-professional look of such DIY culture screen prints have become a significant cultural aesthetic seen on movie posters, record album covers, flyers, shirts, commercial fonts in advertising, in artwork and elsewhere.

Screen Printing Techniques

Materials: Onoja (2014) affirmed that for a successful screen printing process to take place, the following materials are needed. A wooden printing frame, Organdie (a lightweight see-through cotton or silk fabric, often stiffened), Staple gun or drawing pins, A squeegee to force the ink through the mesh to the design surface, Print out of logos, floral designs and other motifs for the transfer to the organdie (This was done using transparency paper. It can also be improvised by printing out on paper and smearing kerosene or olive oil on the surface to achieve transparency), Photo emulsion, Printing inks of various colours, Large cellotapes, Turpentine and silk cleaning solvents, Cleaning rags, Knives and scissors.

Process: The next thing to do is to stretch the organdie or silk on the wooden frame. Ensure that the frame is large enough to give ample space when printing on the t-shirt. Cut the silk material to extend several inches outside the wooden frame and then start the stretching from one side using staple gun or drawing pins. Move across to the direct opposite and staple the other side pulling the fabric tight. Spin the frame around and staple the middle of the other side of the frame and across from the opposite side to give even stretch on all sides. You can then move to any of the sides and staple across completely and across the opposite before moving round the frame pulling tight as you go (Onoja, 2014).

Once the screen is ready and properly stretched evenly, the next thing to do is to get the photo emulsion. (This is a blue emulsion but turns green with the addition of a sensitizer to make it light sensitive). The squeegee (rubber slipper) is used to evenly and thinly spread the photo emulsion on the silk screen mesh. Cover the screen right to the edge of the frame, and turn over to the other side and repeat the same process for even spread. Smoothen the spread starting from the outside part of the frame and finishing with the inside. After that, keep the frame in a cool dark place to dry out well. (Overnight is usually advisable, this demonstration is just for workshop purpose). The photo emulsion chemical can be kept in a safe place or the refrigerator to preserve it over a long period of time (Onoja, 2014).

Source: https://www.midwestsign.com/blog/2019/04/17/determining-mesh-count/

The process of transfer of the logo or the floral motif is more of art than science. The more you practice the time of exposure to light, the better you will become. The natural source of light which is the sun can be used with regulated time and artificial incandescent light bulb can also be used indoors. The image is placed on the screen and transparent flat glass is used to hold the image flat on the screen before exposure to light. The green area exposed to light will harden and won't wash out while the areas of the image masked out in black will wash out and serve as the stencil for the print. The process takes between 15 to 20 seconds under the sun and 20 to 25 minutes using light bulb. Perfection comes with practice as earlier stressed. The mesh is the then moved (after removing the glass and the transparency) to under running tap water or spraying with a bowl of water to reveal the design. A clean rag can be used to gently wash off the weak emulsion to reveal the clean design. The mesh is allowed to dry and afterward cello tapes can be used to mask off the edge of the frame to define the printing area. At the end of the afore-mentioned procedures, the screen printing mesh is ready for the printing process (Onoja, 2014).

Influence of Digital Technology on the practice of Screen Printing

In Nigeria, screen printing and other relevant design oriented crafts play a vital role in the social and economic life of the country. This technique which is a modern adaptation of western form of design is gaining grounds in the printing industries; creating vocational skills and at the same time reducing the unemployment rate in the country.

The standard of any product is determined by its quality (Nwachukwu, 2004). The quality of job and its durability gives the customer a great confidence in the printing industry. In the 80's to 90's the standard of printing was very shabby in Nigerian. There was no diversity in printing. The processing of colour jobs is usually by handicraft. Hand was used to separate the colours especially the half tone jobs. Using a case of almanac, planned and printed by this ugly system, the job cannot in any way be compared with that aided, designed and planned by the computer. The introduction of CAD may have brought a new era in how designers deal with their design tasks and generate creative ideas (Oladumiye, Tanimu, & Adelabu, 2018). Computer Aided Design is the use of computer technology for design of objects, real or virtual to achieve precise drawing (Adiji & Ibiwoye, 2017). The computer programme written to achieve this feat are known as software. These software are used to create visuals which are transferred to the mesh for print. There is a maxim that visuals make very complex things and ideas simple, they also make it

possible to absorb large amounts of data quickly, and thus they are economic and time saving (Safer, 2012). Recently, the acceptability of the new techniques is spreading faster than one would imagine. The new techniques ensures good and improved quality. The former however is preferred to the later because of its quality improvements (Nwachukwu, 2004).

METHODOLOGY

The design of this research is descriptive survey.

Study area and Target Population

Akure is a city in south-western Nigeria and is the largest city and capital of Ondo State. The city had a population of 484,798 as at the 2006 population census. This study area is selected owing to its robust printing activities as compared to other areas within the state. For Screen Printers, the Association of Professional Practicing Artists in Akure (APPA) is a major association for registered printers who practice screen printing business on a full time scale. This association was established to promote unity and progress among printers in the state. This association is headed by the chairman, who is also a screen printer in Akure city. The association as at October 2019 has a total of 120 members (2019 Attendance list of APPA).

Digital Technological Products adopted in Printing

As there are a wide range of technological advancements and innovations in the printing profession, it is expedient to figure out the set of digital tools/machines adopted by the screen printers. To achieve this, an oral interview was conducted by the researcher to affirm the types of digital technology adopted by the screen printers. The responses revealed that the major machine in use is the Direct Image Printing Machine (popularly addressed by the printers as D.I. Machine). This machine is used for most of the handbills and business cards that were commonly printed using the screen printing technique. In addition to this, the respondents also identified the Large Format printing machine which is used for printing stickers, banners and flag materials, the Flex cutting machine which is used for customizing t-shirts it is used for cutting both the flex and flock materials. These were the major digital printing machines adopted in screen printing as 92% of the respondents mentioned Direct Image Printing, 74% of the respondents mentioned Large Format Printing, 65% of the respondents mentioned Flex cutting machine while other digital printing machines identified by the printers were Laserjet printer, Eyelet Machine, and Inkjet printer. Respondents were allowed to mention more than one machine to express their choice. The machines used were represented in the bar chart below.

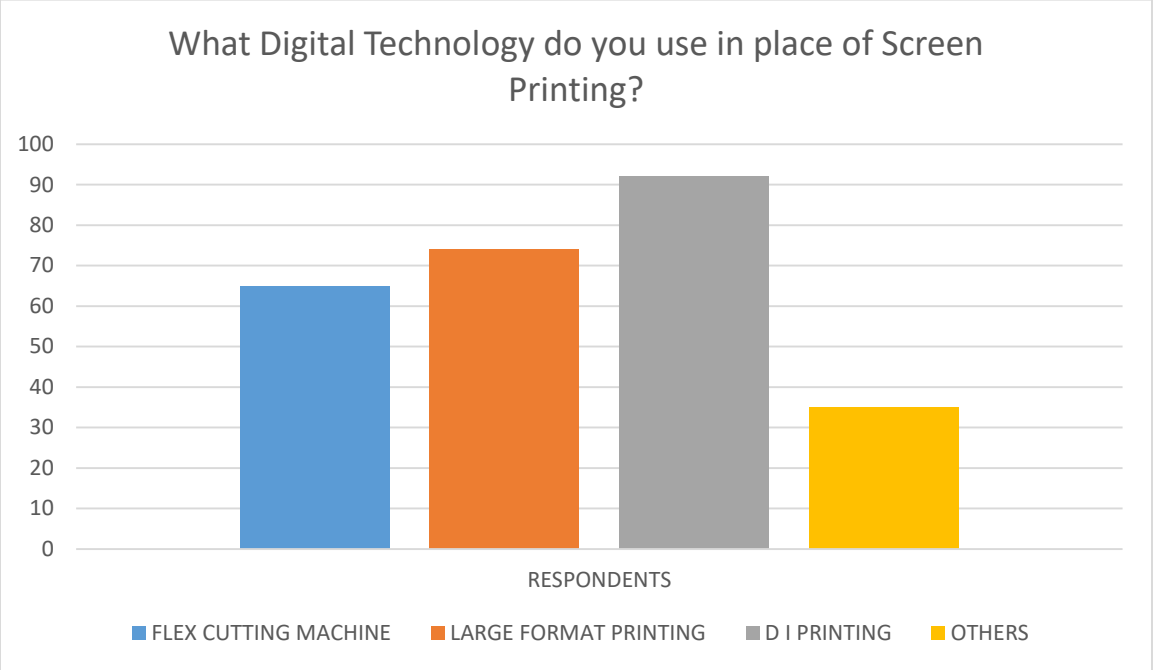

Fig. 1: Digital Technology used in place of screen printing. Source: Researcher

As part of this study, the researcher figured out that the adoption of digital technology actually makes printing more defined, accurate, precise and more beautiful. It was also revealed that some of the printed works could be combined as a subset to the works manually done with screen printing method. A total 95% of the respondents affirmed that digital technology helps to generate more accurate prints.

To contextually understand the essence of this study, an opinion poll was conducted using a well-structured questionnaire. This helped to generate answers to the research questions and reinforce the justification for the research. A total of three research questions were posed to screen printers between ages 18 and 45 years practicing screen printing in Akure, Nigeria. They were asked to consider research participants' adoption of digital technology techniques. The survey had a total of 15 respondents, of which 65% were formally educated (minimum of B.Tech/B.A) while 32.4% were not formally educated.

Observation from the respondents reveal that most screen printers prefer to adopt digital technology method in their printing jobs as 80% of the respondents liked to engage with digital technology while 13.33% do not. Respondents also engage with digital printing means mainly for T-shirt Customization, full colour illustration/Image printing; and for the production of Stickers.

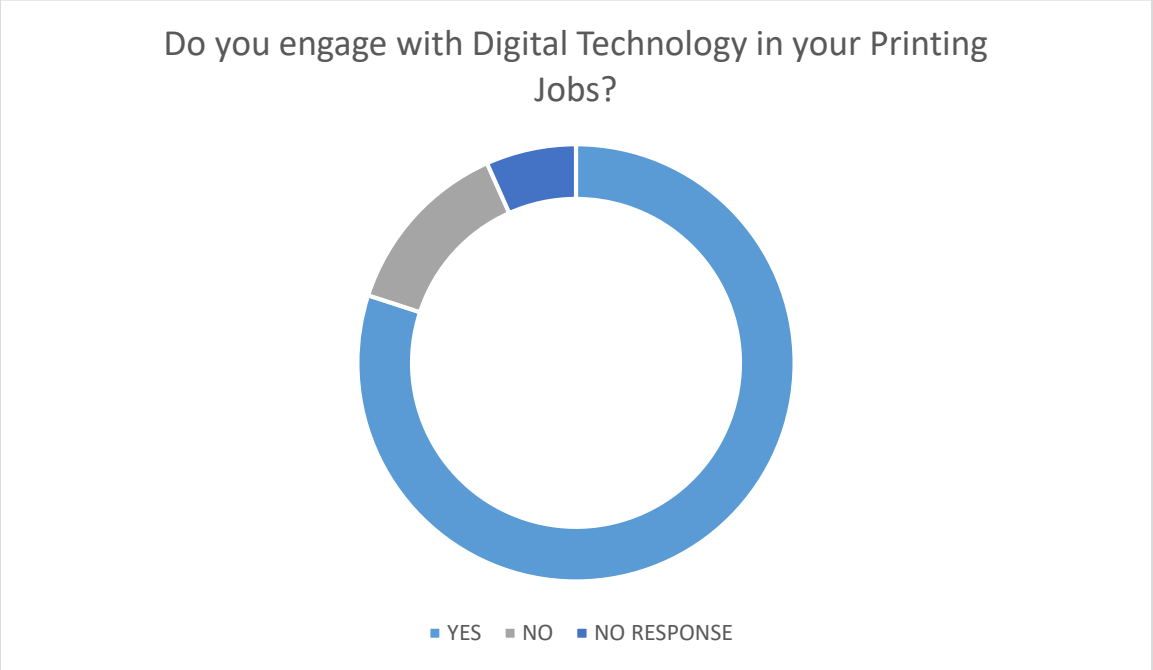

Fig. 2: Printers' engagement with digital technology Source: Researcher

Influence of Digital Technology on Screen Printing

Having established the adoption of digital technology in screen printing, the researcher identifies a need to determine the influence which digital technology has on the practice of screen printing as a profession. An oral interview session was conducted to assess the printers' opinions about the influence of digital technology on screen printing. The major points identified during the study are expressed below.

Printing Quality: The major influence of digital technology on screen printing is the significant difference in the quality of printed jobs. The graphic designers produce accurate and colourful designs with illustrations by using the various applications (Computer Aided Design software) on the computer system. The prints are designed digitally and sent directly to the printing machine; hence, the prints have better visual quality. In addition to this, the digital printing machines produce large quantities of prints without change or variations in the quality of the design output, which is usually difficult to achieve manually by using the mesh.

Costing and Billings: It was gathered that digital printing machines produce large quantities of prints within a short period of time. Hence the price is relatively cheaper compared with the screen printing method, particularly when a large volume of prints is required. For example, a printer, who pleaded anonymity, explained that the printing of 2000 copies of T-shirt would cost about NGN30000 (thirty thousand naira) when using the screen printing mesh, while the same volume of task will cost about NGN15000 (fifteen thousand Naira) to procure the materials and produce the job from start to finish by adopting the heat transfer process (using the flock cutting machine). This was achievable because the former would need to purchase materials and also work manually

on each of the T-shirt, while in the latter, the flock cutting machine does most of the task and the printer only impress the customized items (done by the printer) on the t-shirts. As a result, it was concluded that the introduction of digital technology has affected the price of jobs.

Enrolment for apprenticeship: Meanwhile, printers also stressed that digital technology has greatly influenced screen printing in the areas of apprenticeship. They stated that since the computer system and printing machines were introduced into the printing business, people (particularly the youths) do no longer enroll for trainings to learn and understand the principles and practices of screen printing. They further stressed that this has affected the practice of screen printing in the country, particularly among youths, as youths of nowadays would rather prefer to work on the computer system and the printing machines.

Extent of Practice of Screen Printing despite Digital Technology

Having justified that that the introduction of digital technology in printing has greatly influenced screen printing practices in terms of costing and billing, location and source for raw materials, the researcher conducted another research to ascertain whether screen printing is still well practiced in among printers despite technological invasion. The research conducted to determine the extent of screen printing in practice is represented in the chart below.

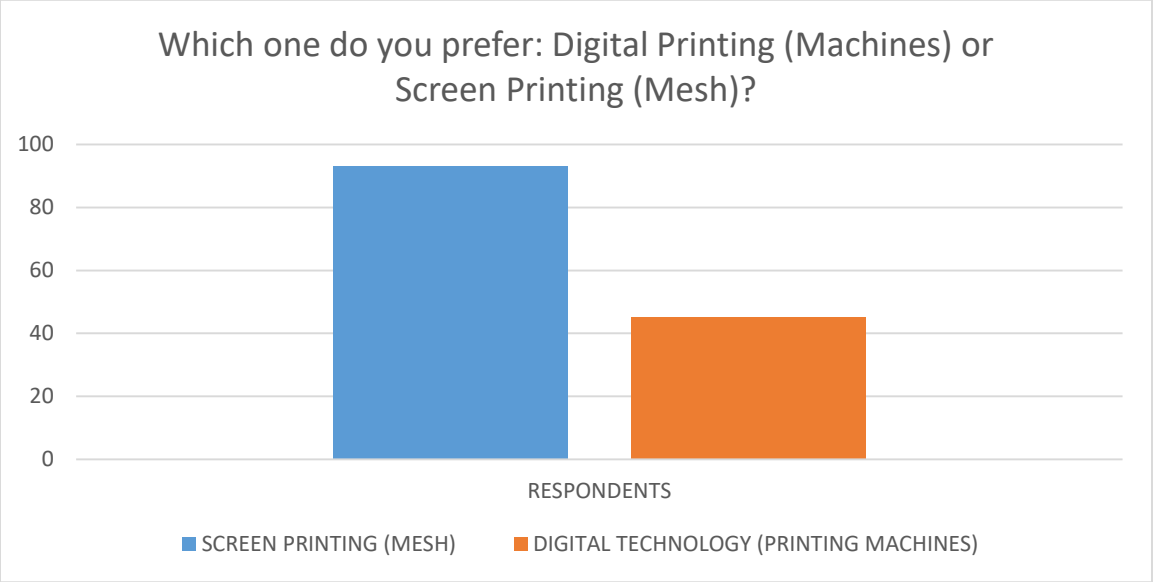

Fig. 3: Printers' preference for printing method Source: Researcher

From the chart above, 93% of the respondents prefer the use of mesh in screen printing. This suggested that despite adopting the digital technology, most of the screen printers preferred to use the printing screen (mesh) for majority of their jobs. The respondents' reason for their preference (screen/mesh or digital printing machines) were captured and printers who had preference for the digital printing machines claim the printing machines could achieve colourful prints and that the process is faster. Meanwhile, printers who preferred the printing screen (mesh) referred to it as natural, flexible and cheap. They further stressed that it is natural as it could be easily moved from

one place to the other, flexible in operation as it could print almost on any surface (clothing materials, plastics, leather, walls, etc), cheap as the cost of producing a mesh is relatively less expensive compared to the price of printing machines.

CONCLUSION

Screen printing (also called serigraphy) is a method of printing where a mesh is used to apply ink to a surface through a mesh screen. It is basically the transfer of image by allowing ink to pass through an opening or stencil. Stencil is just the type of mask that passes ink in the image areas and block ink passage in non-Image areas. As there are a lot of technological advancements and innovations in the printing profession, this study figured out that the major machines used in place of screen printing are the Direct Image printing machine, the large format printing machine, and the Flex cutting machine. The printers adopted or more of this in place of the screen printing mesh as they are identified to be more accurate, precise, and productive.

The research findings suggest that digital technology has influenced the practice of screen printing in terms of costing and billings, print quality, raw materials etc. Despite this, the screen printing profession is still well practiced in Nigeria as it has unique attributes (such as printing on diverse surfaces and accessibility to raw materials) which were difficult to replace (if not irreplaceable) by the adoption of digital technology in printing.

With the introduction of new technological innovations in the country, there is a greater increase of diversity in the activities carried out in the printing industry. As a result of this study, the researcher concludes that despite the adoption of digital technology in printing, screen printing is still well practiced among printers in Nigeria.

Recommendations

Having gone through this descriptive research, the researchers hereby recommends that the practice of screen printing should be encouraged, so that up and coming printers in Nigeria can find them interesting to learn and use.

Secondly, the study of Screen printing technology as an art/design module should be encouraged for design students both at the secondary schools and tertiary institutions.

Finally, the technological developments should be introduced in Screen printing and its tools, rather than creating more machines that threatens to replace its practice.

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