

Full Length Research Paper

Production of customized electric powered table–led display using engraved Plexiglas

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This paper enunciates the viability and durability of Plexiglas material based on characteristic strength, shatter-proof properties and brilliance. The paper explores the suitability of Plexiglas in the display of information in outdoor advertising. Plexiglas is also appropriate for indoor décor because of its flexibility, easy to shape and not too sharp edges. The paper utilized Plexiglas as a key material in the production of customized electric powered table–led display for selected principal officers of Olabisi Onabanjo University Ago-Iwoye. Questionnaires were administered on six (6) respondents of whom some of the principal officers' images and designation are customized on the LED Lamps. Findings show that the LED lamp adds ambience and aesthetics to the office of the principal officers. Plexiglas material gives durability to the lamp and enhances the allure of its illumination. Also, customization of the souvenirs with images and positions of the university officers celebrates the accomplishments of the principal officers.

Key words: Signage, advertising, aesthetics, engraving.

INTRODUCTION

Plexiglas is a thermoplastic material also known as acrylic glass or Perspex, often used in sheet form as a lightweight or shatter-resistant alternative to glass. The technical name for this material is polymethylmethacrylate (or PMMA for short); other trade names include Perspex, Acrylite, Acrylplast, Lymacryl, Lucite Acrivill, Altuglas, Perclax, Oroglas, Trespex and Vitroflex ((Blandino, 2018). However, its original and most famous trade name is Plexiglas. The material was developed in 1928 by chemists William Chalmers, Otto Rohm, and Walter Bauer ((Blandino, 2018). Plexiglas is a cost-effective alternative to polycarbonate (PC) when tensile strength, flexural strength, transparency,

polishability and Ultra-Violet (UV) tolerance are more important than impact strength, chemical and heat resistance. Plexiglas provides a clear view, lends shape and brilliance to a variety of objects, protects from rain, hail and stormy weather, withstands extreme pressure and heat, is break-resistant and faithfully reflects the world in all its color (Plexiglas, 2019). Plexiglas is a viable substitute for glass and can endure extreme heat in comparison to glass (Plate 1).

Plexiglas offers tailor-made, durably brilliant solution for information display. This material is mainly used in the signage industry because of its durability and transparency which makes it easy for illumination in

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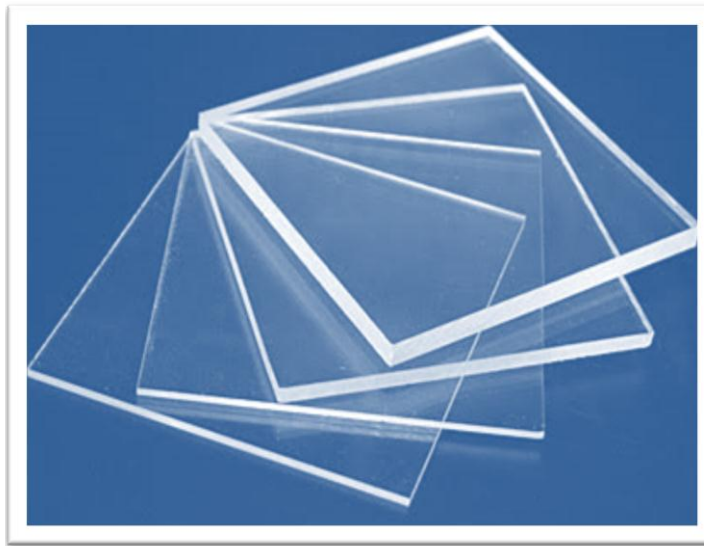


Plate 1. Plexiglas. Source: mindsetonline.co.uk.

signages to shine through even in the dark. It is preferable to glass due to its high transparency, shatter-proof and flexible characteristics. Perspex is half the weight of an equivalent glass panel and is more easily transported, installed and supported (Perspex, n.d). The clarity and physical properties of Plexiglas sheet allow it to form a barrier around the exhibit, through which objects can be seen clearly and enjoyed without restraint, yet preventing them from being touched or damaged (Altuglass, 2000).

Plexiglas is broadly utilized in the advertising industry as a primary material for effective quality signage. It has diverse usage in the outdoor publicity of the physical presence of corporate businesses such as luxury boutiques, financial institutions, shopping malls, eateries, hotels, educational institutions and other businesses in an area. It is a solution for beautifying trade show stands or furnishing household apartments. Plexiglas plaques are suitable for offices. Also, it can be used to create directional signages for both indoors and outdoors. The displayed information on Plexiglas fascinates audience by the brilliance sleek, shiny high gloss exterior of the signage. Visual information is created on Plexiglas using printmaking techniques such as engraving.

Print making in Nigeria

Print making is a variety of media developed to create multiple images. The images are produced by using plate as a matrix and an intermediary to convey ideas (Abidin et al., 2013). As a dynamic medium in visual art, printmaking can be described in three ways, which is the visual language, medium, and techniques. According to Gabor (1979), printmaking is an art form consisting of the

production of images, usually on paper but occasionally on fabric, parchment, plastic, or other support, by various techniques of multiplication. The end products, known as prints, are considered original works of art, even though they can exist in multiples. However, early printmaking was strongly influenced by a desire for multiple prints.

The idea of printmaking make artists realized that when a drawing is translated into a woodcut or engraving it takes on totally new characteristics. Printmaking techniques have their unique style, determined by the tools, materials, and printing methods. However, the transformation that occurs between drawing and print are the main attraction. It is noteworthy that printing methods are arbitrarily based on the capabilities and objectives of an artist. Thus, any of the proofs printed from an original plate is considered an original work of art, and, although most fine prints are pulled in limited quantities, the number has no bearing on originality, only on commercial value. The importance of engraving as an art form cannot be over-emphasized as it cuts across aesthetics, functionality, advertising and signage.

From time immemorial, traditional engraving in Nigeria dates back to the period where red hot knives are used to make marks on items of day-to-day living (Utilitarian objects) (Mildred, 1974). This is still practiced today. It is used to make a case for ownership of an item. In this case, the owner uses a very hot knife to make inscriptions on the object; this they believe will dissuade potential thieves. Mildred further explained that Nigeria Calabash engravers managed to create an almost infinite variety of unique designs but those who patronize them are the ordinary country folks around them and their works have not been generally recognized. Occasionally, calabash engraving is done by simply pressing a pattern on a maturing gourd while it is still growing on the vine;



Figure 1. Calabash engraving in Northern Nigeria. Photo Credit: Raymond W. Konan.

the design is slightly impressed in a subtle shade. This, however, will not affect the growth of the gourd when the gourds have reached full maturity; the patterns become elaborate and more pronounced. Calabash containers have been used in Nigeria for hundreds of years. During this time, different people developed distinctively different ways of carving them. The wide variety of designs and visual effects makes it difficult to believe that each artist started with the same plain golden brown calabash hemisphere. There is, however, a great diversity, even in towns and villages just a few miles apart, reflecting the diversity of the inhabitants and their style of engraving (Mildred, 1974).

Mildred (1974) observed that record of the process of calabash engraving has not been duly documented. Some books that discuss arts and crafts in Nigeria did not give proper account and references to the art of engraving in Nigeria (Figure 1).

However, the earliest documented evidence of printmaking in contemporary Nigerian art was in the late 1950s at the erstwhile Nigerian College of Arts, Science, and Technology, Zaria (now Ahmadu Bello University) when relief printmaking techniques were introduced to the students at Zaria by Ru Van Rossem, an expatriate artist. Rossem also demonstrated some printmaking techniques in Mbari art workshop at Ibadan in 1962; and Mbari Mbayo art workshop at Osogbo in 1963 (Ikpakronyi, 1999).

The printmaking techniques explored by Nigerian printmakers include woodcuts, linocut, engraving, deep etching, drypoint, lithography, screen-printing, collagraphy, and plastograph among others. The techniques are generally classified according to the type of surface or matrix used to make them. The matrix could be blocks of wood for woodcuts and wood engraving; linoleum for linocuts; copper or zinc plates for engraving

or etching; stone, used for lithography; and fabric plates for screen-printing.

Engraving of Plexiglas

Engraving is the process of creating print impressions from incised metal plates. The incisions are achieved with the aid of a tool referred to as *burin*. Impressions are formed from the drawn lines which are artistically marked on the metal plates. Tones and shading are achieved by making parallel lines or crosshatching. Silver, gold, steel or glass can also be customized through engraving. Engraving is one of the oldest, most popular and important techniques in printmaking. Plexiglas can be engraved manually using burin; the strength required for pressing the tools against the surface is minimal and forceful pressing of *burin* can cause breakage.

Burin, also called graver is the tool used in engraving. It has a metal shaft that is cut diagonally downward on the ground to form a diamond-shaped point at the tip. The angle of the point of a particular tool affects the width and depth of the engraved lines. The shaft of the tool is fixed in a flat handle that can be held close to the surface being worked on. It also has a wide rounded end for bracing against the palm of the hand while the point is steered by thumb and forefingers. Engraving is categorized into the following:

Intaglio engraving

Grooves or pits are incised into a plate using either a sharp instrument or the action of a strong acid solution (Kelber, 2019). Greasy inks are filled into depressions, and the surface of the plate is wiped clean. The high

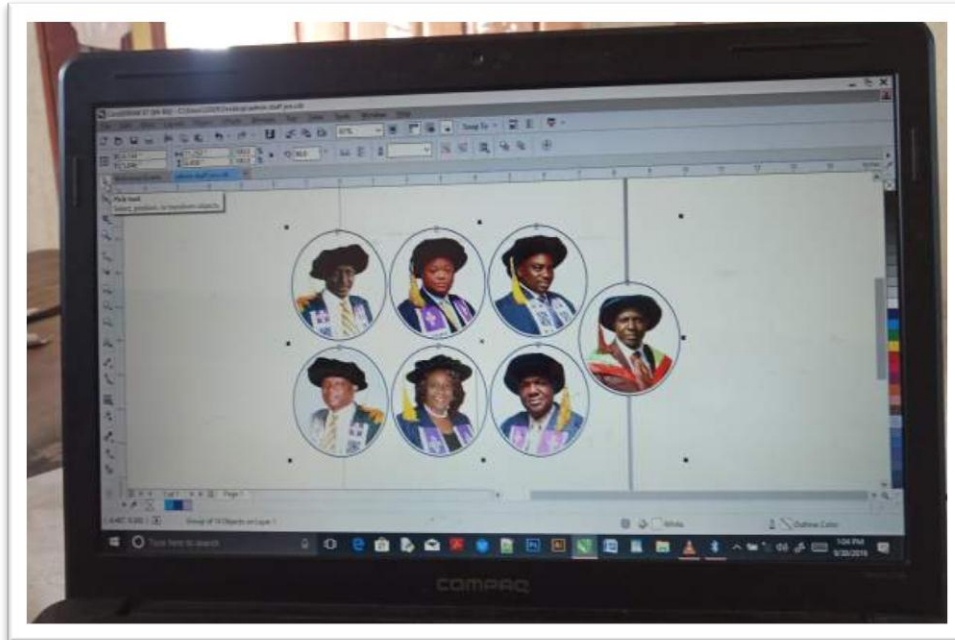


Plate 2. A screenshot of their portraits being worked on in CorelDraw. Author's fieldwork (2019).

pressure of a press enables soft, dampened paper to reach and take on the ink (Kelber, 2019). Basic intaglio techniques include etching, engraving, drypoint, and mezzotint. Ijisakin (2019) revealed that the techniques of printmaking used by printmakers in Nigeria to produce enthralling works of arts include the conventional relief, intaglio and planographic methods.

Relief engraving

Relief engraving is a more accurate surface printing. The ink is applied on the left part in relief (as in printing from type), while in the former the ink is extracted by dint of great pressure from the engraved lines themselves. Engraving, in its widest signification, is no discovery of the modern world. Goldsmith and metal-chaser have flourished amongst almost every cultured people of antiquity of whom we have any knowledge, and the engraved line is one of the simplest and most universal modes of ornamentation in their craft. But there is no evidence that the art was used as a basis for taking impressions on paper before the fifteenth century.

However, technology is shaping the techniques and processes in which works of art are made and the art of engraving is inclusive.

METHODOLOGY

The research is product development and experimental in design.

Eight pieces of round shaped Plexiglas were engraved and fused with an experimental lightning wooden base to create table lamp souvenirs for eight principal management officers of Olabisi Onabanjo University. Questionnaires were administered on six of the principal officers to ascertain the effectiveness and efficiency of LED display. The results were analyzed using simple percentage. The procedures of production are classified as follows:

Designing and editing the portraits

The portraits of the principal officers which are to be printed on the Plexiglas were photographed with digital camera, edited and enhanced on both Adobe Photoshop and CorelDraw software installed on the computer system (Plate 2)

Pre-engraving

The file for engraving was first of all prepared using CorelDraw and was sent to the engraving machine. The outline shape of the Plexiglas, textual information and Olabisi Onabanjo University logotype were also created on CorelDraw graphic package and connected to engraving machine (Plate 3).

Process of engraving

Each of the seven Plexiglas was engraved using the engraving machine (Plate 4).

Production of the Plexiglas base with plywood

The plywood was measured and cut to sizes according to the width of the engraved Plexiglas needed for each of the LED display stand



Plate 3. Outlined CAD file ready for engraving (13.4cm x 17.8cm). Author's fieldwork (2019).

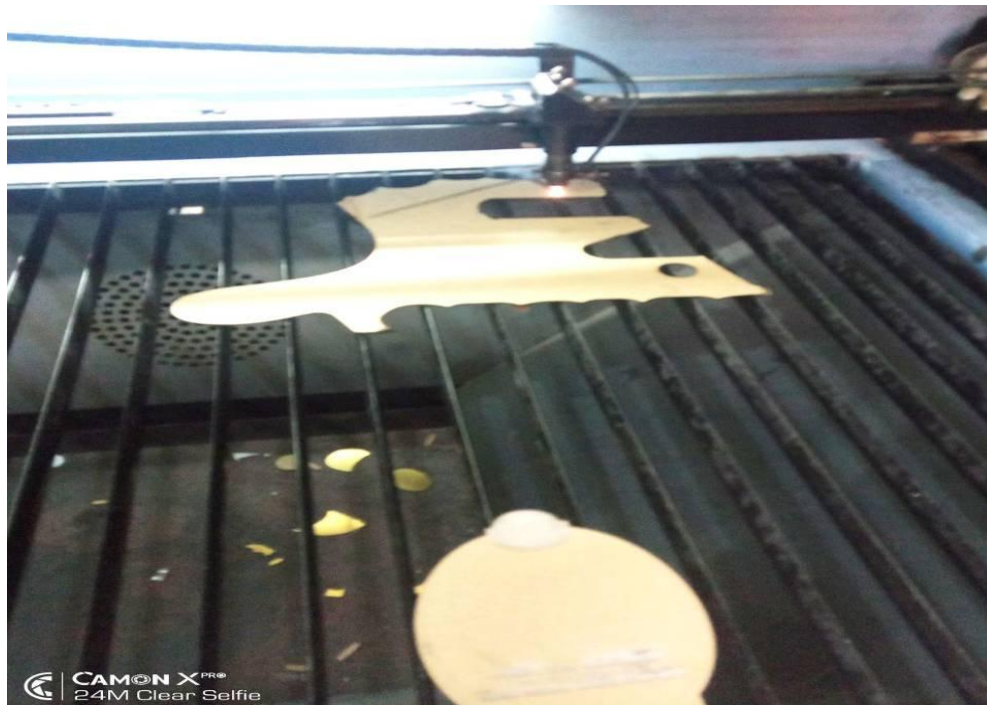


Plate 4. Engraving of Plexiglas. Author's fieldwork (2019).

using measuring tape (Plate 5). Precision was ensured in the cutting of the plywood by holding the jigsaw machine firmly to avoid vibration which could create rough edges on the plywood (Plate 6). Thereafter, sandpaper was used to smoothen the surfaces and

blunt the edges of the cut plywood. The plywood was joined together with gum (Plate 7). The LED strip with lightning bulbs was soldered to the wire and passed and connected to the AC power adaptor affixed into the base of the plywood casements of the



Plate 5. Measuring the plywood to size before cutting. Author's fieldwork (2019).



Plate 6. Cutting the plywood with electric jigsaw. Author's fieldwork (2019).



Plate 7. Assembling plywood to create the base Author's fieldwork (2019).



Plate 8. Soldering the LED strip to the wire. Author's fieldwork (2019).

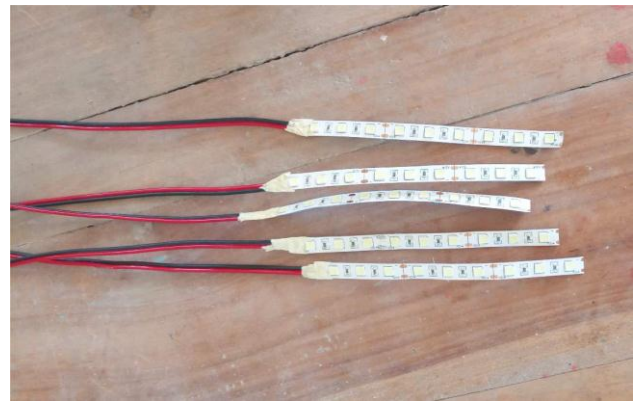


Plate 9. Soldered and insulated LED strips. Author's fieldwork (2019).



Plate 10. Testing of the LED strips after soldering. Author's fieldwork (2019).

seven lamps (Plates 8 and 9) . The LED strips were tested one after the other before proceeding to the next stage (Plate 10). After installing the LED strip, the base was wrapped with the reflective. LED strip was laid in the base of the built casement (Plate 11) and Navy Blue geometric-patterned leather (Plate 12). Navy blue acrylic

paint was applied to the portion where the names of the principal officers have been engraved on the Plexiglas, masking out other exposed area to prevent staining. Laid exposed wires on the casements were covered with leather to protect against electric shock (Plate 13).



Plate 11. The LED strip being layed into the base casement. Author's fieldwork (2019).



Plate 12. Wrapping lamp casing with leather. Author's fieldwork (2019).

Testing

The LED multifunctional table top display was tested after coupling it (Plate 14). The scratch-proof paper wrapped on the Plexiglas was removed halfway to confirm its illumination.

Maintenance

The electric powered table top LED display can even be repaired. The top of the base on which the engraved Plexiglas rests was screwed to the main base which can be unscrewed to reveal the LED strip that lights the Plexiglas for repairs and replacement of the LED strip in case it somehow get damaged. When this is done, the display stand starts working again. One should ensure that the AC/DC Power is well plugged into power socket and shows the red power indicator at all time.

The lamp should not be plugged directly on its own to the power socket without the adaptor; it will burn the LED strip instantly as it will be taking in more than 12V from the socket and its maximum capacity is 12 voltage.

RESULTS AND DISCUSSION

This is presented in Table 1 as follows:

1. Does the information on the electric powered table-led Display appropriately convey your official designation in Olabisi Onabanjo University?

5(83.3%) agreed and 1(17.7%) disagreed. This shows

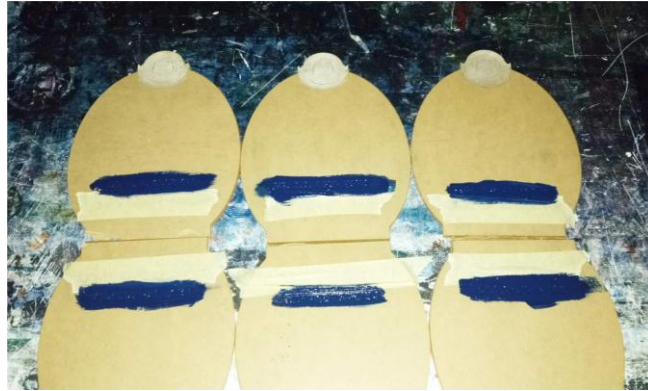


Plate 13. Leather was used to cover the laid exposed wires on the casement for insulation. Author's fieldwork (2019).



Plate 14. Completed table top LED display being tested. Author's fieldwork (2019).

that the information displayed on the surface of the Plexiglas appropriately reflects the portfolio of the selected university principal officers senior. Apparently, the customization of the Electric Powered Table–Led Display enhances its desirability.

2. Does the positioning image and text on the Table–Led Display appeal to you?

Most of the respondents agreed that the arrangement of the individual image and supporting texts add value to the

Table 1. Questions regarding the electric powered table top LED display.

S/N	Question	Yes	No
1	Does the information on the electric powered table–led display appropriately convey your official designation in Olabisi Onabanjo University?	5 (83.3%)	1 (16.7%)
2	Does the positioning image and text on the table–led display appeal to you?	4 (66.7%)	2 (33.3%)
3.	Does the table–led display create an exciting ambience in your office?	6 (100%)	0
4	Does the compact size and lightweight of the table–led display make it suitable as an office furniture	5 (83.3%)	1 (16.7%)
5	Is the Electric Powered Table–Led Display Using Engraved Plexiglas a high end premium souvenir that enhances the environmental aesthetics of a particular place	6 (100%)	0

usability of the product. 4(66.7%) agreed while 2 (33.3%) disagreed.

3. Does the table-led display create an exciting ambience in your office?

All the respondents (100%) agreed that the lightning display from the products create an ambience which excites and appeals to the audience. The brilliance display of the customized electric powered table–led display stimulates a unique sense of place wherever it is placed. The display is enhanced by the high translucent quality of Plexiglas. According to Craftics (n.d), clear and colourless Plexiglas has light transmittance of 92%; it is clearer than glass and will not turn yellow.

4. Does the compact size and lightweight of the Table–Led Display make it suitable as an office furniture?

The compact size and weight of the product make it suitable for an office environment and support good usage of space. 5(83.3%) agreed while 1(16.7%) disagreed.

5. Is the Electric Powered Table–Led Display using engraved Plexiglas a high end premium souvenir that enhances the environmental aesthetics of a particular place?

The respondents 5(100%) agreed that the Electric Powered Table–Led Display is a premium souvenir of high value that fascinates and enhances the beauty, charm and splendor of an environment. Plexiglas (2019) posited that Plexiglas reflects the world in colours. Plexiglas appeals to the target audience and creates positive indelible impressions in their minds.

The followings are found in this study:

- i. The LED lamp adds ambience and aesthetics to the office of the principal officers.
- ii. Plexiglas material gives durability to the lamp and enhances the allure of its illumination.
- iii. Customization of the souvenirs with images and

positions of the university officers celebrates the accomplishments of the individuals.

iv. The lamp does not generate extreme heat and it is shock proof.

v. The lamp is compatible, movable and suitable for office décor.

Conclusion

Souvenirs are items of value given to people held in high esteem. Plexiglas made souvenirs are premium and high-end. The luxuriant features of Plexiglas make it suitable for diverse purposes including souvenirs. Transparency and clarity of the material add brilliance to lamp illumination. Plexiglas is durable to withstand extreme pressure and heat emitting from the lamp lightening. It is break-resistant and display colours in its distinctness. The illumination from the developed table lamp radiates an ambience of aesthetics when viewed. Laser cutting and Plexiglas engraving is an emerging technique of printing that is being utilized by professionals in the art and design industry to enhance the value of their crafts.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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