

## Design And Fabrication of a Representational Sculptural-Sign Post for The Metal Product Design Section: Kwame Nkrumah University of Science and Technology

Sam Arthur Sylvester<sup>1,3</sup>, Kissi Samuel Baah<sup>2</sup>, Peggy Ama Fening<sup>3</sup>,  
Owusu Panin Kwame Baah<sup>4</sup>

Kwame Nkrumah University of Science and Technology, Ghana

E-mail: samarthur6000@yahoo.com<sup>1</sup>, kissisamuelbaah@ahoo.com<sup>2</sup>, amafening@yahoo.com<sup>3</sup>,  
pideckcompany@gmail.com<sup>4</sup>

### Abstract

*Signposts are designed to give information to the public. It has been observed that most signposts have a lot of text which makes it difficult and boring to read, especially when the viewer is in a car. There are no instances where information on a signpost and sculpture are put together in a single work of art. The main objective of the study is to design and fabricate a sculptural signpost to give information and also incorporate art for its aesthetics. The study adopted studio-based research under qualitative research design. The research instrument used in data collection was observation and photographs. The findings of the research show that metal forming techniques such as forging, forming and welding could be incorporated in a sculptural signpost for conveyance of message to the public. The study recommends reaching out and collaborating with other artists and sculptors to promote the incorporation of sculpture into signposts.*

**Keywords** Fabrication, Metal Product Design Section, Sculptural-Sign Post, Welding

### INTRODUCTION

Communication is the purposeful exchange of information between two or more participants with the aim of conveying or receiving intended meanings through shared semiotic rules. The form of communication can be physical or virtual and includes images, words or graphic forms (Burlerson and Holmstrom, 2008). Morrell (2011) opines that the way art is understood and analyzed is the number of predictions and explanations that lead to communication. Art encompasses many forms of communication such as paintings, graffiti, signs, labels and murals (Kester, 2004). According to Burk and Lemley (2008), a sign is a board or shaped structure in a public place with patterns and writings that provide information to people. The shape of a sign can help convey its message. Bier (2001) supports the view that shape can be based on a brand or design. Rectangular signs are often used to present general information to the public; circular signs often represent instructions that must be followed, either mandatory or prohibited. However, triangle-shaped signs are often warning signs used to indicate danger or caution. Warnecke (2014) emphasizes that most signs are outdoor signs that can be mounted on the ground or on a building. Ground signs can come in various shapes and sizes and are usually installed near a trail or in an open area where they can attract the attention of passersby. One of the key aspects of setting up a sign is the construction of the structure. When making a metal sign, an appropriate design method for metal products is inevitable (Park et al., 2010). The most common methods are welding and punching. Riveting and arc welding are competing processes for joining sheet materials. Signs are the most effective way to draw attention to campaigns and communicate information. Over the years, students in the metal department produced various batches;



some for the Metal Products Design Department and others for the Industrial Art Department in general. In addition to what it provides, the road sign should be seen as a complete work of art in itself, so there were cases where students in the metal product design department tried to attach sculptures to the sign. For example, the sign made by Wogbloeka (2015) for the Great Hall of KNUST in 2014 was in the form of a sculpture. This idea not only helps inform the public, but also beautifies the environment and saves space overall. A previous study conducted by researchers showed that students at the Institute of Arts and Crafts know less about the activities of the metal product design department than other departments. This can be solved by advertising the billboard in different media, such as a performing sculpture. Therefore, the researchers try to design and produce a representative sculpture, which itself serves as a guide for the department of design products of metal.

## **LITERATURE REVIEW**

### **Theoretical framework**

The study adopted the theory of production for the study. Koskela (2000) opines that the theory of production focuses on the relationship between inputs and outputs in the production process. It explores how different combinations of inputs, such as labour, capital, and technology, can be used to produce goods and services efficiently. The study adopts this theory of production in the design and fabrication of a sculptural signpost for metal product section in KNUST.

### **Signal post**

Behnia and Munro (2005) define a sign as an object, quality, event or entity whose presence or absence indicates the probable presence or absence of something else. Jackson (2014) also defined a sign as paper, wood, etc., which provides information about something through words or images. St. Augustine was the first person to synthesize classical and Hellenistic theories about signs. For him a sign is something that is used to represent and remind other things (Kammereret al., 2016). Based on these definitions, therefore, it can be said that a sign is anything that is used to indicate something communicated to people. It can be pictorial, pictorial or purely graphic. Raymond et al., (2011) defines a message as: to put something out, announce, publish, show, advertise, declare, publish, distribute, embed, insert something and make something known, add something. Define a signpost, a sign and the post above it is a structure that is installed mainly outdoors to communicate information to people. Information can be pictorial (symbols), text or a combination of text and symbols (pictographic). The structure bearing these marks can be made of wood, metal or plastic, depending on the environment to which the structure is exposed. Typical examples of roadside signs are driver and Vehicle Licensing Authority (DVLA) road signs that appear at the side of the road. An example of this road sign is shown Figure1 (DVLA General Road Signs).



**Figure 1:** Common DVLA signs  
Source: Behnia and Munro (2005)

## Sculpture

According to Howard et al., (2006), sculpture is one of the oldest forms of visual art known to man. It is derived from the Latin word "Sculptura" which means to carve or cut from stone. It is a branch of fine art that works in three dimensions. Potts (2001) supports the view that sculpture processes originally involved engraving, also known as subtractive (removing material) and modeling (adding material such as clay), in stone, metal, ceramic, wood and other materials, but since modernism there has been almost complete freedom of materials and processes. Various materials can be processed by removal, such as carving, joining by welding or modeling, or molding or casting. Arthur (2007) makes it clear that stone sculpture survives much better than works of art made from perishable materials and often represents the majority of surviving works (except ceramics) of ancient cultures, although, conversely, traditions of wood sculpture can be almost saved completely disappeared. However, most of the ancient sculptures were brightly painted and have disappeared. In the early days, sculpture in many cultures focused on religious practice, and until recent centuries, large sculptures were an expression of religion or politics. Several sculptures from the ancient Mediterranean, China, India and many cultures such as South America and Africa have withstood the test of time (Gardner 2011). The sculpture has seen many changes and developments over time. The history of sculpture began from the prehistoric period to the ancient Near East, Ancient Egypt, Ancient Greece (classical and Hellenistic period), Roman sculpture, Early Middle Ages and Byzantium, Renaissance, Mannerism, Baroque and Rococo, Neoclassical, Asian (Greco-Buddhist sculpture, China, Japan, India, Southeast Asia), Islam, Africa and many others (Segy, 2018).



## Materials in Sculpture

Materials have been very used to serve purposes throughout history. Some of these materials are considered permanent and others perishable. Metal, especially bronze, stone and ceramic are considered classic and durable, while wood, bone and horn are less durable but less expensive options (Epstein, 2014). According to Jenkins (2006), precious materials such as gold, silver, jade and ivory are often used in small luxurious and sometimes larger works. The sculptures generally used cheaper materials for wider consumption, including hardwoods (e.g. oak, box and basswood); terracotta and other ceramics, wax (a very common material for casting models and for receiving copies of cylinder seals and engraved gems) and cast metals such as tin and zinc (spelter).

## METHOD

The study was aimed to capture the special insight of producing a representational sculptural signpost that geared in solving the problem location of metal product design section. The study employed studio-based research using photographs and observation as research instruments. Participatory observations allowed the researchers to gain knowledge on sculpture pieces produced by sculptors in the painting and sculpture department which served as inspiration for the production of the sculptural signpost for the metal product design. Photographs of each sculpture produced by students at the department of painting and sculpture served as guide and helped in the documentation of this study. The study gives a descriptive analysis and working processes of the entire sculptural signpost. The study shows a detailed description of the tools and materials used in producing the artwork.

## Tools and Materials

### Tools

Tools are the basic machines and appliances which are used for executing a specific work. They help to make work easier. The choice of the tools may depend on the kind of work it is supposed to perform. The human hand is a basic tool since it is the one which manipulates the tools for them to perform their duties. Some of the tools for this study include: a Hacksaw, chipping hammer, Scriber Chainsaw, welding machine, Grinding machine, Gas cutter, Ruler, Lathe machine, set of pencils, cutter, plane, Mathematical set and Sketchbook.

### Materials

The materials selected for the project were very carefully chosen based on their durability and strength. These include metal rods, log of wood, Perspex, Strawboard, Mild steel (6mm, 10mm), Electrode (grade 10), white glue, shaft, Paint, Lacquer, Cardboard, and Filler. For this study, the researchers' choices of materials were based on critical considerations of their ability to be manipulated and work efficiently for the execution of the project. Each material played an important role.

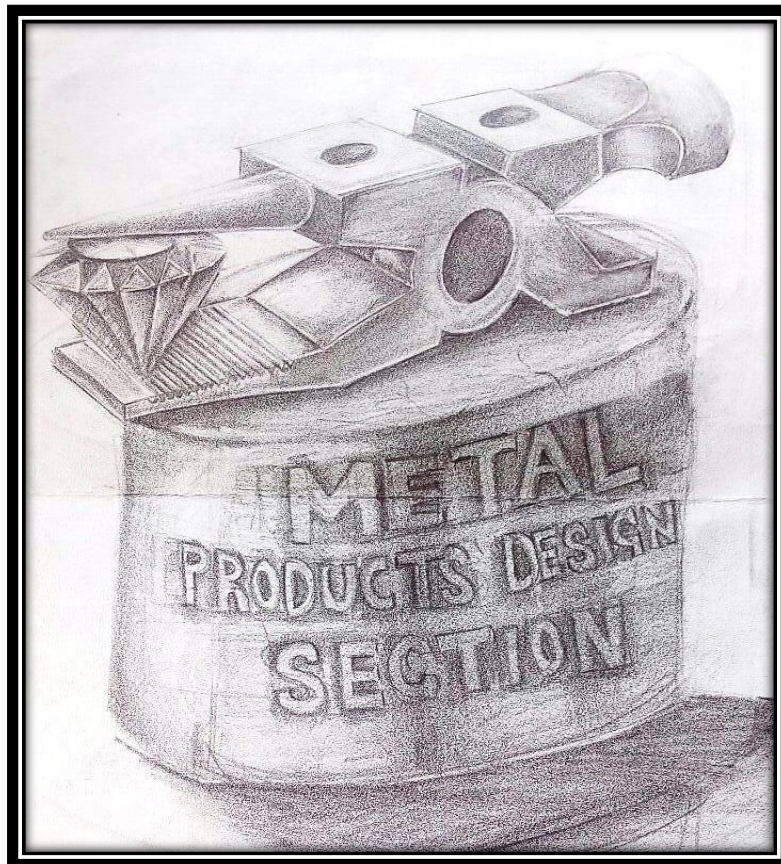
## RESULTS AND DISCUSSIONS

### Pre-designing Stage

The pre-designing stage of the studio-based design saw the procedural steps in sketches right from design 1 to the finished product.

### *Concept Development*

Various ideas came to mind at this stage, and they were expressed in a sketchbook. After making series of designs, one was selected and developed for the project. Each sketch during the development stage had a peculiar quality and different patterns which made them all interesting. After making a series of sketches, final design was selected as shown in Figure 2.



**Figure 2:** Final design to be constructed.  
(Source: Studio Work 2022)

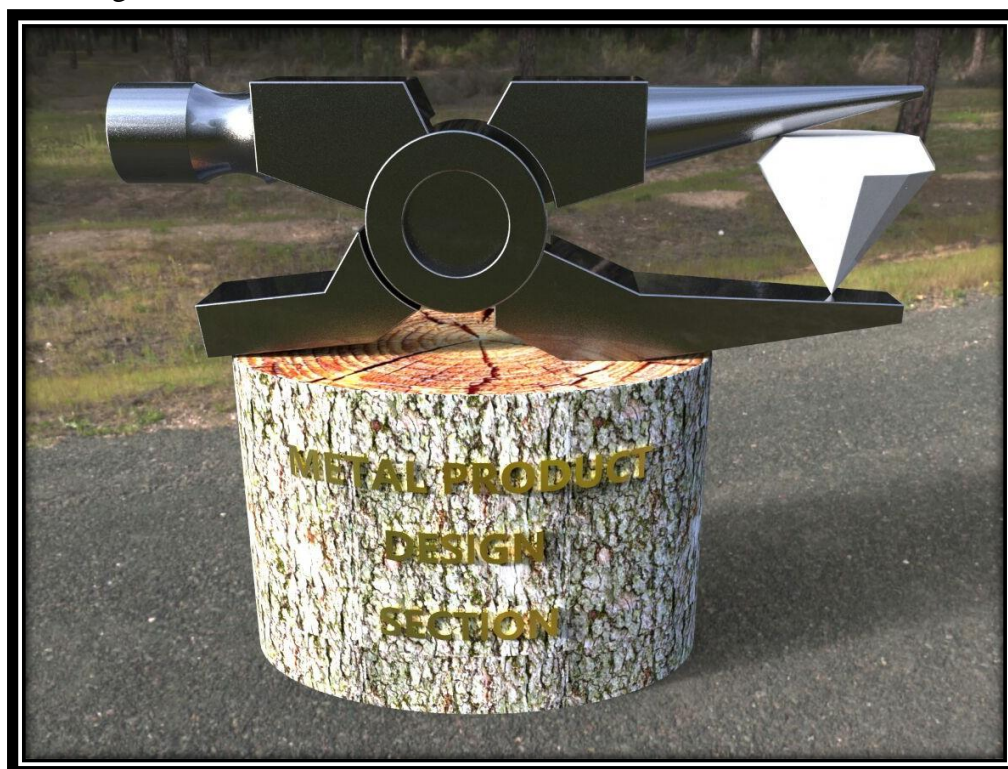
### Designing Stage

The designing stage of fabricating a sculptural signpost involved taking the sketches which were manipulated to the final sketch and transforming them to a finished work. The tools and materials discussed are being used in the designing stage for the fabrication process of the sculptural signpost, which is given a suitable finish.



### *Working Procedure*

Before starting the actual work, a technical drawing was developed based on the approved design and also a 3D computer aided rendering was made using software known as Rhinoceros. Based on these developments a fair knowledge of how the work is going to be done and how it will look like after is completed was gained. There were four stages involved in producing the work. The first was making a prototype; the second was forming the metal parts of the work, the third was working on the wooden part and ultimately, Perspex was used in forming the letterings and also the diamond. Below in Figure 3 is the computer aided rendering.



**Figure 3:** Computer aided rendering  
(Source: Studio Work 2022)

### *Making the prototype (Model)*

The selected materials for making the prototype (model) involved: strawboard, white glue, cardboard, cutter, pencil, ruler, mathematical set. The process began by gluing cardboard to the surface of strawboard with white glue to create a smooth finish for the model. Cardboard was chosen because it is a bit harder than normal paper, so it does not warp upon applying the glue. Also, strawboard was used because of its hard nature.

The design was transferred onto the strawboard based on the required measurements using a pencil, ruler and a mathematical set. A cutter was then used to cut out the shapes that were drawn on the strawboard and these were joined together with the white glue to get the desired form. Figure 4 shows the finished model.



**Figure 4:** finished model  
(Source: Studio Work 2022)

#### *Fabricating the metal part of the design*

At this stage of the project, the design was drawn to size on manila card with a pencil and labeled according to the various parts and then cut out with a cutter to serve as templates. The templates were then placed on mild steel of 6mm and 10mm thickness and the shapes were marked on the steel with a scribe. After the shapes had been transferred onto the metal sheet, they were then cut out with a gas cutter. The cut-out pieces were then welded together bit by bit, using the electrode (grade 10) and the arc welding machine. A Chipping hammer was used to remove the welding slag and spatter formed from on the surface of the work due to the welding. Grinding was then done using the grinder to level and smoothing the joints. For areas such as the cone of the round nose plier, the hammer head and the pivot joining the pieces at the center of the work were formed using the Lathe machine. The Lathe machine was used to shape the shaft to conform to the shapes of the design. The parts formed from the lathe machine were then welded to the other parts welded early on, making the design complete. Metallic rods were fixed at the base of the design which would be fixed into the wood on which the design will be seated. This was done to make it sit firmly on the wood. The work piece was then smoothed with sandpaper and emery paper, and then filler was applied to it before the whole piece was sprayed with paint displayed in Figure 5.



**Figure 5:** sprayed metal work  
(Source: Studio Work 2022)

### **Cutting the Wooden Base and Forming the Diamond and Lettering from Perspex**

A log of wood was purchased, and a chainsaw was used to cut an oval shape out of the round wood. The bark of the log was then taken off using a jack plane, giving the wood a neat and smooth appearance. Four holes were created on top of the wood for a firm grip of the metal when placed on it. The wood was then treated with starpyrisos, a chemical that was added to a bucket of water and then applied to the wood to serve as protection against termites and other wood destroying insects. The wood was left in the sun to dry, afterwards oil paint was applied to the wood to make textures and then it was sprayed with lacquer.

The letterings were first made and cut out from strawboard, this served as a template which helped in transferring the shapes to the Perspex using pencil. Perspex originally came with a protective coating which prevents scratching, so it made it easier to get the outlines clearly without having to scratch the surface. The Perspex was then placed on a CNC router which cuts out the lettering. In order to get lettering three-dimensional form (3D), some of the Perspex were cut into strips and joined around the letterings giving them length, width and height. LED lights were fixed to them to help them illuminate at night. The diamond was produced using the same technique and to make it proportional the shape was drawn using a dodecagon shape. Chlorophyll was the adhesive used in the joining process. Figure 6 shows the letterings in 3D form; Figure 7 also shows the formed gemstone.





**Figure 6:** forming the letters  
(Source: Studio Work 2022)



**Figure 7:** formed gemstone.  
(Source: Studio Work 2022)

### *Finishing*

Four Rods were welded at the ends beneath the metal part so that when it is being placed on the wooden stand, it fixes into the holes drilled on top of the stand. The metal parts were sanded upon application filler to get a smooth finish and auto based paint (K10 silver metal and ETA Gris magnum metal/R) was used to spray it. The pivot, the hammer head and the round nose plier were sprayed with the K10 silver metal, and the other parts were sprayed with the ETA Gris magnum metal/R. The wooden stand was finished by applying oil paint to get an effect of textured wood and then lacquered. The Perspex part was fixed last because of its delicate nature. The Perspex was fixed on the wood with LED light fixed inside. The sculptural piece is fixed on the wooden stand depicting the final work shown in (Figure 8)



**Figure 8:** Sculptural signpost for the metal product section  
(Source: Studio Work 2022)

### **Post-designing Stage**

This stage lays emphasis on sculptural signpost and also outlines the findings of the study.

### **Emphasis on Sculptural Signpost**

Numerous activities take place in metal product design and trying to enumerate all the activities on a signpost makes it crowded and boring to look at. Therefore, there was a need to create something simple and attractive which will also give out the need information. Based on this, a series of designs were produced, and one was selected for fabrication. The concept for the design was developed from some of the tools and materials used at the section. These are: hammer, round nose plier, flat nose plier an anvil and diamond. The above listed tools were selected because they are used in the day-to-day activities of the section and are easy for anybody to identify them. The signpost was formed out of mild steel sheet of thickness 6mm and 10mm, a log of wood and Perspex. It was formed mostly by welding, use of adhesives and woodwork techniques. The thickness of metal was selected

because it gave a smooth joint without any holes. Part of the work such as the hammer head and the round nose plier were formed using lathing because it gives a perfect result, and it makes the work more solid. The colours used were carefully selected because they are the natural colours of the actual tools, therefore making the work more realistic. In order to make the sign post visible at night, LED lights were also fixed in the lettering and the diamond. The simplicity of the work makes it more attractive and unique. The final work being mounted is illustrated in Figure 9.



**Figure 9:** Final work being mounted.  
(Source: Studio Work 2022)

### **Findings on Sculptural Signpost**

The researchers were able to come out with these findings:

1. The researchers through series of idea development were able to represent the section based on the work and tools they use and by so doing only the name of the section was needed and upon seeing the design one can tell what goes on there.
2. The researchers found out that using various materials such as metal, wood and Perspex could also inform people that the section is not limited to the use of only metal in producing works.



3. The researchers discovered that in order to get a solid and a good, finished piece that will best represent the actual tools intended to depict there was a need to use thick metal sheets since they cannot be easily dented and also, they could be welded smoothly without any holes being created at the joints.
4. The researchers discovered that subjecting the metal and the wood to harsh weather conditions without any treatment led to rust and decay respectively.

## CLOSING

### Conclusion

The quest to develop a signpost that utilise no or less text for the metal product design section led to series of reviews and idea developments, but where there is a will there is always a way. The researchers were able to come out with a sculptural signpost that met their requirement, this was a simple signpost that utilised less text and also had good aesthetic qualities yet gives out all the necessary information needed to be known about the Metal Product Design Section. It will be of great importance to our communities if we could adopt this method of signpost since is simple and is not too huge to block the sight of road users yet communicate perfectly and also beautifies the environment.

### Recommendations

The study recommends that wood works which are meant to be posted outside must be treated to prevent insect attack which can cause degradation. Thick metal sheets should be used when welding works that weight does not count but rather smooth and perfect finish is needed. Metal works that are meant to be posted outside must be treated with anti-rust coatings before the final coat is done. Lastly, the research recommends reaching out to artists for the collaboration of the idea of incorporating sculpture into a signpost for the promotion of sculptural designs and fabrications in signposts.

## REFERENCES

- Arthur, V. (2023). *Aspiring to Inspire: Interpreting Nature Through Painting and Sculpture in Today's Contemporary Art World* (Doctoral dissertation, Pratt Institute).
- Behnia, R., & Munro, S. (2005). Organelle identity and the signposts for membrane traffic. *Nature*, 438(7068), 597-604.
- Bier, V. M. (2001). On the state of the art: risk communication to the public. *Reliability engineering & system safety*, 71(2), 139-150.
- Burk, D. L., & Lemley, M. A. (2008). Fence posts or signposts-rethinking patient claim construction. *U. Pa. L. Rev.*, 157, 1743.
- Burleson, B. R., & Holmstrom, A. J. (2008). Comforting communication. *The international encyclopedia of communication*.
- Epstein, J. (2014). *Let there be Sculpture*. Read Books Ltd.
- Fening, P. ., & Kwabena Agyei, I. . (2023). Unmasking The Scar Of Covid-19 Pandemic On The Traditional Gold Jewellery Industry In Ashanti, Ghana For Quick Recovery And Growth Output. *Sibatik Journal: Jurnal Ilmiah Bidang Sosial, Ekonomi, Budaya*,

- Teknologi, Dan Pendidikan, 2(10), 2961–2974.  
<https://doi.org/10.54443/sibatik.v2i10.1361>
- Gardner, A. (2011). English medieval sculpture. Cambridge University Press.
- Howard, A. F., Hung, W., Song, L., & Hong, Y. (2006). *Chinese sculpture*. Yale University Press.
- Jackson, R. (2014). Signposts-policy and practice for teaching about religions and non-religious world views in intercultural education. Council of Europe.
- Jenkins, I., & Jenkins, I. D. (2006). Greek architecture and its sculpture. Harvard University Press.
- Kammerer, Y., Nairn, R., Pirolli, P., & Chi, E. H. (2009). Signpost from the masses: learning effects in an exploratory social tag search browser. In *Proceedings of the SIGCHI conference on human factors in computing systems* (pp. 625-634).
- Kester, G. H. (2004). *Conversation pieces: Community and communication in modern art*. Univ of California Press.
- Koskela, L. (2000). *An exploration towards a production theory and its application to construction*. VTT Technical Research Centre of Finland.
- Morell, M. F. (2011). Advantages, Challenges and New Frontiers in Using Information Communication Technologies in Societal and Social Movement Research. *tripleC: Communication, Capitalism & Critique. Open Access Journal for a Global Sustainable Information Society*, 9(2), 632-643.
- Park, C. W., MacInnis, D. J., Priester, J., Eisingerich, A. B., & Iacobucci, D. (2010). Brand attachment and brand attitude strength: Conceptual and empirical differentiation of two critical brand equity drivers. *Journal of marketing*, 74(6), 1-17.
- Potts, A. (2001). Installation and sculpture. *Oxford Art Journal*, 24(2), 5-23.
- Raymond, S. N., Armitage, P. J., Moro-Martín, A., Booth, M., Wyatt, M. C., Armstrong, J. C., ... & West, A. A. (2011). Debris disks as signposts of terrestrial planet formation. *Astronomy & Astrophysics*, 530, A62.
- Segy, L. (2018). African sculpture speaks. Pickle Partners Publishing.
- Warnecke, E. (2014). The art of communication. *Australian Family Physician*, 43(3), 156-158.

