Art, science, and technology of outdoor advertising in Ghana

1 author:

Eric Agyarkoh
University of Cape Coast
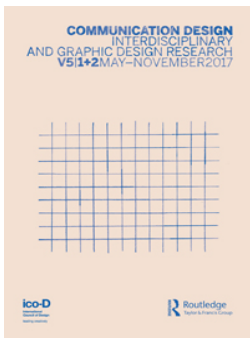**5** PUBLICATIONS   **18** CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:

Historisity of elctronic advertising in Ghana View project

Art, science, and technology of outdoor advertising in Ghana

Eric Agyarkoh

Published online: 16 Feb 2018.

Submit your article to this journal ⬀

View related articles ⬀

View Crossmark data ⬀

Routledge
Taylor & Francis Group

Check for updates

Art, science, and technology of outdoor advertising in Ghana

Eric Agyarkoh

Faculty of Science and Technology Education, Department of Vocational and Technical Education (VOTEC), College of Education Studies, University of Cape Coast, Ghana

ABSTRACT

Outdoor advertising has been the most popular form of visual advertising from ancient times till now. The craft has gone through various stages of metamorphosis from crude painted signs to the present highly scientific and technologically characterized signage visible in towns and cities across the world including Ghana. Even though, the craft is regarded as art in Ghana, a close study of the nitty-gritties of the practice of the craft in Ghana reveals that it has been characterized by multiplicity of artistic, scientific and technological processes and methodologies in design, construction and installation. Using case study research method, unstructured observation and interviews, this article delved into the activities of experienced outdoor advertising practitioners in some of the largest and highly developed outdoor advertising agencies in Accra, Ghana to examine the tools, materials and processes they used in designing, constructing and installing outdoor signage and to identify the extent to which they apply artistic, scientific and technological processes and principles in the production chain. The raw data collated were transcribed, coded and presented using the Focused-by-research question approach and analysed through narrative and descriptive qualitative approaches. The major findings that emerged from the data analysis were also discussed comprehensively through inductive and descriptive analysis. The analysis and discussions revealed that more scientific and technological process and principles are applied in the production chain of outdoor signs in Ghana than artistic processes and most graphic design professionals in the local outdoor advertising industry lacked comprehensive knowledge and skills in the scientific and engineering aspects of construction and installation of outdoor signs. It is therefore recommended that communication design curricular at Senior High School and tertiary levels must be reviewed to include the scientific and engineering processes and principles of signage production. Mandatory industrial attachment programme must also be introduced and properly enforced in the programmes, so as to link the curricular and training to industrial practice and production managers who have only engineering background must be given training in advertising, marketing, social psychology and graphic design.

CONTACT Eric Agyarkoh ✉ eric.agyarkoh@ucc.edu.gh

Introduction

The term outdoor advertising is a generic term used to describe an aspect of one major marketing tool (advertising) which is being applied massively in various facets of economies across the world. This type of advertising applies different advertising products technically called 'posters'. According to Stephen Appiah the word poster is a general term used to describe outdoor signs used to inform, warn, and direct people and create awareness of products, organizations, individuals, concepts, or ideologies. These types of items are often posted publicly.[1] Keith J. Tuckwell also stated that the scope of poster include signposts, signboards, billboards, banners, mural signs, vehicle branding, transit signs, replica signs, door labels, paper posters, etc.[2]

It must be acknowledged that the subject of outdoor advertising has been a dominant component of graphic design curricular in schools and a specialized vocation in signwriting and advertising in Ghana, because of that it is widely regarded as an art in Ghana. However, examination of the nature of outdoor advertising practiced in Ghana indicates that, it is a complex subject that embraces different skills. The researcher would therefore wish to question whether outdoor advertising is an art, science, or technology.

To set the premise for logical argument, the researcher would review the operational terms: 'Art', 'science' and 'technology' and find out how the triad has influenced the practice of outdoor advertising across the world including Ghana. Even though the concept and scope of art has evolved over time and heavily debated by many philosophers, the formalist concept of art which is informed by 'significant form' theorized by Clive Bell shall be examined in this write-up because it resonates with the concept of art being highlighted by the author in this article.

According to Noël significant form is the necessary factor that elicits spontaneous emotional response to an artwork. This necessary factor should be universal to all forms of art works. The author further stated that, in visual arts proper organization of visual elements of design in an artwork is the necessary condition that creates aesthetics.[3] Stephen Appiah is of the view that attractiveness is one of the necessary qualities that enhance the viewership of outdoor signs.[4] This is why formalist principles that require the use of formal rules of design such as balance, variety harmony, rhythm, contrast, etc. to organize graphic elements such as text, illustration, colour, motion devices, etc. to achieve unity (synergy) and harmony in a communication design work is an important factor in commercial art. This helps to boost the aesthetic appeal of signage thereby attracting and sustaining the eye of viewers which can influence the purchasing decisions of viewers. Gallery.sjsu.edu cited examples of the influence of the captivating coloured posters of Jules Cheret on viewership of outdoor advertising signage in nineteenth century France and Europe.[5]

From the era of modern poster design to date scientific principles and processes have also been used in the production chain of outdoor signs. These scientific principles and processes help to achieve precision, accuracy and durability in outdoor signs and they are reflective of the explanation of science given by the National Academy of Sciences as the use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process.[6] These empirical processes generate theories, formulas and principles such as forces and stresses, surface tension, alkali and bases, adhesion and cohesion, saponification and others which are applied massively in signage design, construction, installation and preservation.

Figure 1. Large format printing machine and inks. Source: Fieldwork, 2016, ATSP.
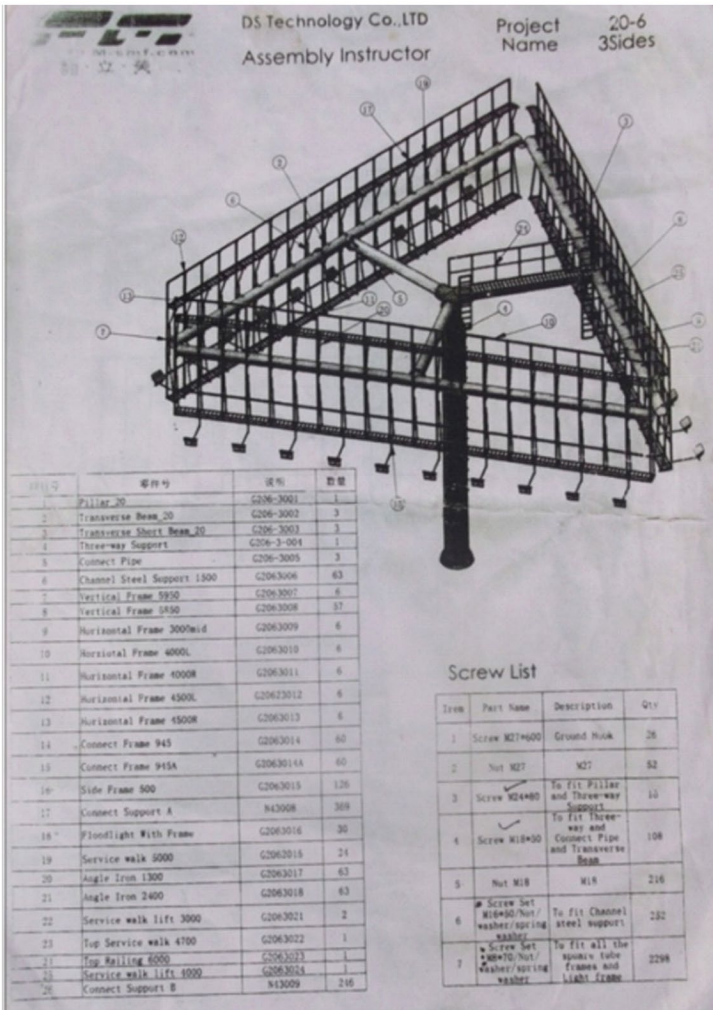
Figure 2. Engineering drawing of unipole. Source: Fieldwork, 2016.

Figure 3. Installation of modern billboards. Source: Fieldwork, 2016.

Reddy and Zhao stated that many researchers have explained the term 'technology' from different perspectives.[7] Kumar et al. opined that technology consists of two primary components: (1) a physical component which comprises items such as products, tooling, equipment, blueprints, techniques, and processes; and (2) the informational component which consists of know-how in management, marketing, production, quality control, reliability, skilled labour and functional areas.[8]

Hold down bolt   Joint of two poles   Angle Irons   Construction of holding down bolt

Figure 4. Materials for installing Unipole. Source: Fieldwork, 2016.
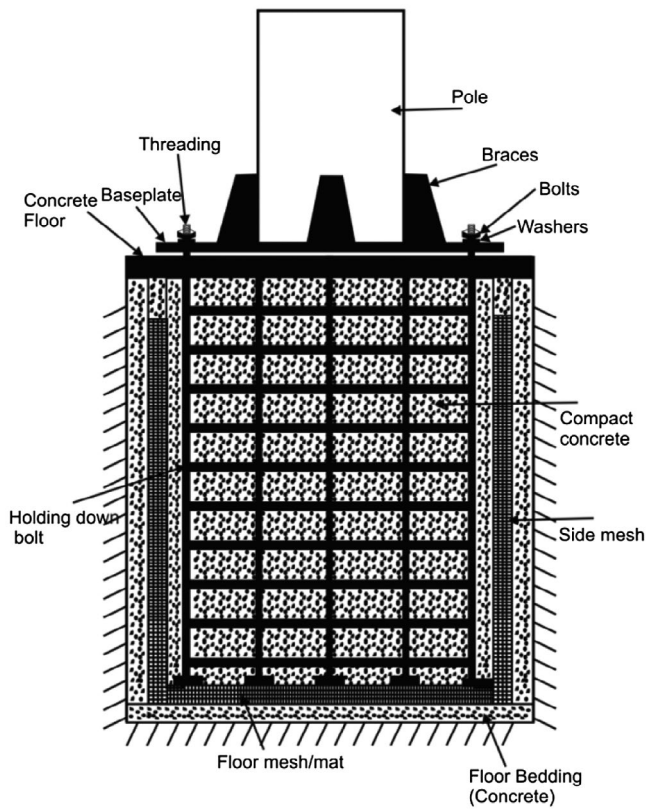
Figure 5. Cross-sectional Drawing of how to Install Unipole. Source: Fieldwork, 2016.

An assessment of Kumar et al.'s concept of technology reveals that both the physical and informational components of technology have been applied in outdoor advertising for centuries. However, it is obvious that the physical applications have dominated.

Gallery.sjsu.edu reported that evidence of application of technology in signage production from history can be traced from the use off-set lithography to produce posters by Jules Cheret.[9] Again, the Bauhaus School of Art and Craft established in Weimar, Germany by

Figure 6. Cross-sectional drawing of how to flight flexi on unipole. Source: Fieldwork, 2016.

Walter Gropius in 1919 is recognized by its manifesto that sought to integrate art, science and technology in its training by developing an integrated curriculum that provided foundation training in drawing and painting, creativity, colour theory and application.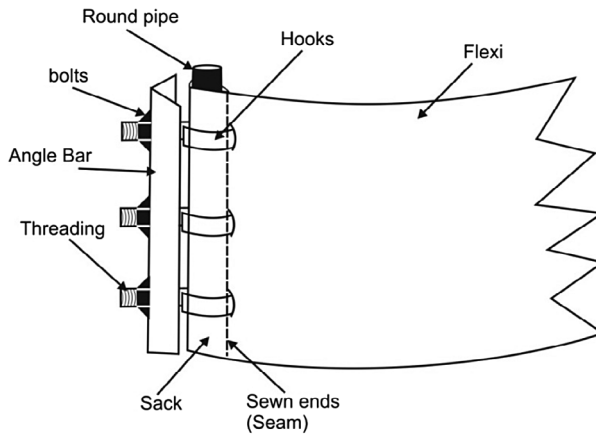 Wick et al. documented that basic design theories, technical drawing, mathematics and science were part of their curriculum and stated further that the curriculum further introduced the art students to different relevant areas of art and technology such as sculpture, textiles, cabinet making, metal work, pottery, typography, architecture and others which subsequently led the students to specialize in one field.[10]

According to Griffith, typography, photography and advertising are areas in commercial art where the Bauhaus school made significant contributions. The author for instance, claimed that the Bauhaus School redesigned the classical Roman lettering by eliminating all the serifs to create a form of san serif typefaces and designed a lot of promotional materials, book covers, pictorial posters and others for organizations.[11]

Even though there is evidence of application of the triad: art, science and technology in the production chain of outdoor signage form world history, anecdotal evidence prove that they are also applied in Ghana. This article delved into the production processes of outdoor signs in Ghana to determine the extent to which art, science and technology are applied in the profession. The exploration examined the tools, equipment, materials, methods and process of designing, constructing, installing and preserving manual and digital outdoor signs in Ghana.

Research questions

The following questions were posed to guide the study:

1. What are the tools, materials, equipment and processes used to produce, install and preserve outdoor signs in Ghana?
2. To what extend is art, science and technology applied in outdoor advertising in Ghana?

Review of related literature

Historical development of outdoor advertising (global perspective)

Outdoor advertising has been integral part of marketing culture in ancient, medieval, modern and contemporary societies across the world. It was reported on Billboard and outdoor consulting. com that available archeological information shows evidence of the practice in ancient Egyptian, sub-Saharan Africa, Europe, Asia, and others. It is regarded as the oldest advertising medium in the world because, it dates back to at least 5000 years ago. The website further reported that, the oldest known billboard was an advertisement posted in the Egyptian city of Thebes over 3000 years ago where notices for reward for the capture of runaway slaves were printed on papyrus paper and posted.[12]

Agnew, cited by Taylor and Chang, also reported that, according to Outdoor Advertising Association of America the Egyptians were also known to have inscribed hieroglyphics on Obelisks to direct travelers and merchants and these messages were carved into stone tablets which were placed along public roads. Taylor and Chang further reported on the website that, according to Sampson (1974), ancient Babylonian merchants were found to have hung a sign above their place of business in order to identify their merchandize.[13] Agnew, and Sampson's claims were also buttressed by Cambell et al., who reported that by 300 BC, shop owners in ancient Babylon had begun hanging outdoor signs carved in stone and wood in front of their stores to catch attention of customers.[14] Taylor and Chang reported again on the website that, according to Presbery, paintings on walls known as 'albums' began to appear indicating the name and profession of the occupant and occasional theatrical announcements spread such as those painted by Callades. Additionally, crude illustrations of gladiatorial contest on walls at places where people congregate were sometimes used to advertise upcoming exhibitions.[15]

The evidence of the use of painted sign in the ancient times was also buttressed by Robbs who reported on Encarta encyclopedia that one of the first known methods of advertising was an outdoor display, usually an eye-catching sign painted on a wall of a building. Archeologists have discovered many of these signs in ancient Rome and Pompeii.[16]

A thorough study of the above data on the history of outdoor advertising reveal to the researcher that painted and stone engraved signs dominated the practice of outdoor advertising across the world. This opinion of the researcher is also buttressed on Trivialibrary.com which documented that even in the middle ages, hand bills and jacked-up notices written in calligraphy and consisted of drawings invaded the advertising field in Europe.[17] The researcher also believes that due, perhaps, to the cumbersome nature and inefficiencies of calligraphy and manual drawing, outdoor advertising remained relatively dormant until the renaissance philosophy moved Johann Guttenberg to invent moveable type in 1450 which led to the development of letter press printing and subsequently ushered in broadsides outdoor posters in Europe.

Commenting on renaissance posters, DesignHistory.org reported that the early broadsides were crudely produced and distributed freely in town squares, taverns, and churches. Most broadsides were produced as ephemera (items printed for short term consumption) and discarded immediately after they have had their impact.[18] Joseph Bartholomew Sebbeh also reported that in order to enhance the communicative power of the broadsides, hand illustrations made by prolific renaissance painters were incorporated. Notable among them is Albrecht Dürer who used small wood cut illustration (engravings) to create pictorial images

on the posters.[19] The emergence of broadside in the fifteenth century is buttressed by Mark Getlein who reported that they were handed out to town dwellers and posted in public places.[20]

Limitations of manual engraving and letterpress which were used to produce broadsides urged on individual humanists to explore different methods of improving the quality of reproducing images. In 1798, Alois Senefelder invented stone lithography which was sub-sequently developed into a mechanical process called off-set lithography. Around that period another invention was made by Joseph Niphore Niepcy in 1824 that was able to develop a chemical that could photograph or transfer images unto a copper-like plate called pewter. Niepcy's technology went through series of reformation for years until a perfect still-picture could be printed on paper. Joseph Niphore Niepcy is therefore accredited as the father of still-picture photography.

The researcher would also like to state that the invention of photography and off-set lithography elevated the level of poster advertising to a higher pedestal in the eighteenth and nineteenth centuries. Gallery.sjsu.edu reported that the flexibilities and dynamisms of these technologies attracted a number of prolific painters in France to apply their skills in drawing and painting in poster art. The website further reported that, the first painter to make this move was Jules Cheret.[21] It was also reported on Art Source International Inc. that in 1867, Cheret used lithographic process to create a highly stylized form of outdoor poster that thoroughly integrated text and image.[22] It was also reported on DesignHistory.org that, Jules Cheret's captivating depiction of the entertainers of Parisian nightlife, rendered in clear, radiant colors, dominated Paris displays for the last 30 years of the nineteenth century and also attracted others to the medium. In fact, Cheret is accredited as the father of modern poster design.[23]

The lucrative nature of poster art during that period attracted the interest of many prolific painters. It was reported on Microsoft® Student that Henri de Toulouse-Lautrec was another poster artist of the nineteenth century who made changes in both the content and the artistic style of posters. He abandoned the lyrical impressionism of earlier styles by leaving large areas of flat color in his posters, a technique he borrowed from Japanese prints. In his work, the text of the poster steadily decreased in prominence as he concentrated all attention on the picture. Toulouse-Lautrec's last works, *Jane Avril* (1899), eliminates the text entirely (except for the name of the entertainer herself); it is the prototype for all modern, purely pictorial posters.[24]

It is believed that Henri de Toulouse-Lautrec introduced dynamism in poster design by creating attractive pictorial theatrical and commercial posters with varying tones of flat and vibrant colour schemes that were accompanied with few texts to amplify the illustration. The production of classic outdoor posters by Cheret and Henri de Toulouse-Lautrec attracted many artists in Europe and America and this led to proliferation of outdoor posters and signs across Europe.

Trivialibrary.com also reported that, in the eighteenth century, England was glutted with paste-up notices and posters. London became jammed with large advertising signs announcing merchants' places of business. The signs became so numerous that Charles II proclaimed, "No signs shall be hung across the streets shutting out the air and the light of heavens."[25] A reflection on a Trivialibrary.com report revealed to the researcher that billboard advertising might have started in Europe in the seventeenth century.

Another historic event that facilitated the development of outdoor advertising was the industrial revolution which started in Europe in the 1800s. Jethwaney and Jain claimed that during the period, the spirit of entrepreneurship increased amongst the people and this led to the establishment of many small-scale and large-scale businesses, the invention and use of expensive machinery required production on a mass scale to break even and then make profits. Also, with similar products available, companies needed persuasive communication to create demand for particular brands and this created high demand for poster advertisements.[26]

In the opinion of Getlein, the high demand for outdoor advertisements from entrepreneurs attracted a lot of art nouveau artist such as Alphonse Mucha, Aubrey Bearsley, Gustav Klimt, and Henry Van de Velde in the 1900s, who introduced an alternate pictorial style of poster design distinct from Toulouse's style which further boosted outdoor advertisements in Europe.[27] Microsoft® Student also reported that an extraordinary flowing of poster design occurred in the early part of the twentieth century during the Russian revolution of 1917 which was led by an art movement called 'constructivism'. During the beginning of the First World War in 1914, poster art underwent an abrupt change. Posters became propaganda instruments and were also used to encourage army enlistment and to sell war bonds. Also, during the 1920s and 1930s, poster art attracted different people from different art movements such as cubism, surrealism, Dadaism, and art deco and others.[28]

The German Bauhaus school of design in Weimar, Dessau, and Berlin pioneered modern forms of graphic art, making the text of the poster an integral part of the design and in some cases using the words or letters of the text to create the entire design. During the Second World War (1939–1945), forceful propaganda posters were again produced. Posters of the post-war period adapted and refined earlier trends, attracting the attention of serious painters in Europe and several American graphic artists. The principal artistic innovation of the post-war era has been the purely pictorial poster, which has no advertising or commercial purpose but carries an artistic or aesthetic message.

The researcher would like to state that outdoor advertising spread rapidly in Europe and America because of the commercial nature of the craft which attracted a lot of the prolific painters. Also, the development in printing technology and paper manufacturing offered the opportunity for the production of large papers which could be used to print large colour posters. Again, the rapid technological and economic developments that occurred in Europe and America after the Second World War created a keen competition in the outdoor advertising industry which led to the development of different kinds of outdoor advertising works by outdoor advertising agencies. Tuckwell shared that, apart from the junior posters and sign boards that dominated the industry, new forms of outdoor advertising works such as super boards, back-lit posters, mall posters, shelter posters, pillar posters and mural advertising emerged in Europe and America in the 1950s.[29]

The development of the outdoor advertising media in Europe and America reported by Tuckwell was also confirmed by Bovee and Arens who reported of evidence of bulletins, transit shelters, junior posters (billboards), unipoles, mural advertising and others. They also reported of recent developments such as spectaculars which are large electronic signs that usually incorporate movement, colour and flashy graphics to grab the attention of viewers in high traffic areas.[30]

A thorough study of the systematic developments the outdoor adverting industry has gone through from ancient Egyptian and European cultures to the post-Second World War

era, reveal to the researcher that several factors have contributed to the development of outdoor advertising. The development of industrial printing processes, the industrial revolution, art and craft movements, trade and commerce, modern scientific and technological developments in mechanical, electronic and computer technologies, curiosity, innovation, psychology, creativity and others have all contributed immensely to the development of the industry.

It is also obvious from the historical account of outdoor advertising that the practice has evolved from crude mural and wooden signs in the ancient and medieval periods through the development of crude paper posters (broadsides) in the renaissance period to modern pictorial paper posters, wall branding, wooden and metal signs to the recent complex digital signage technology.

Historical development of outdoor advertising in Ghana

Advertising Association of Ghana reported that British and local merchants imported different kinds of metal signboards from Europe to identify state organizations, institutions, warehouses and stores in commercial towns such as Cape Coast, Saltpond, Accra, Winneba, Axim, Nsawam and others. Some proactive artisans in the public services imitated the signage and gradually developed skills in lettering and stencilling.[31] Edusei 2004 also reported that the British introduced formal art Education in the Gold Coast at Achimota School in 1929. The curriculum consisted of subjects such as drawing and painting, colour, designing, lettering, etc. which equipped the students with basic skills of visual communication design[32] The artisans and the art education graduates continued to experiment their skills which gradually developed to a local craft called 'signwriting'. AAG reported again that, in 1927, the United African Company (UAC) a subsidiary of Unilever Company Limited incorporated the West African Publicity Limited (WAP) as in-house advertising outfit to advertise its imported merchandize. As merchandizing and trading activities continued to increase, the demand for advertising services increased.[33]

Responding to the demand, Unilever Company limited spearheaded the formation of international advertising agency in 1929 which created a network of Lintas advertising and WAP which changed the name of the amalgamated company to Lintas W. A. Limited. The agency worked side by side with one of its affiliates – Afromedia – which specialized in outdoor advertising. Being the pioneer outdoor advertising company in the Gold Coast, Afromedia employed some local people who had developed the skill of signwriting and had talent in drawing and painting and guided them to execute their sign works. The reportage AAG is vehemently supported by Amenuke et al. who claimed that outdoor advertising which is an aspect of graphic design is a form of contemporary African art which started in the Gold Coast in the 1920s.[34]

The analysis of how Afromedia and Lintas obtained signwriters for their operations revealed to the researcher that the agency lacked qualified and highly skilled technical staff since most of them learned the craft through personal practice and apprenticeship. The researcher also believes that the craft of signwriting improved after the introduction of formal visual art education in 1929 at Achimota College.

Takoradi Polytechnic also reported that another initiative that contributed to the development of signwriting in Ghana was the introduction of painting and Decorating Craft at the then Takoradi Technical institute in 1955 which later changed to Takoradi Polytechnic in

1963.[35] City & Guilds of London Institute also states that the curriculum of the programme consisted of lettering and signwriting, drawing and designing and domestic, industrial and decorative plain painting which equipped them to become master signwriters and painting technologists.[36]

These graduates worked as signwriters and painters in state institutions. Some of them were also employed by Afromedia and Lintas Ghana limited. Apart from the painting and decorating students, other visual art graduates from secondary schools, Advanced Technical Teachers' College (ATTC), Winneba and Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, were also employed by the outdoor advertising agencies as art directors and illustrators. The researcher can also conclude that most of these signwriters took commissioned jobs from individuals and organizations and after acquiring enough experience in the industry some of them set up their own agencies.

AAG reported again that, by 1960, the only state owned outdoor advertising agency called Central Advertising Company (CADCO) had been established in Accra. Also, more indigenous outdoor advertising agencies had emerged around that period. These include: Ghana poster services, Apra services, scanert, USAS Limited, Design and Display Publicity (DDP), Apple Pie Publicity, and others. The Association emphasized that DDP and Apple Pie Publicity are the only local outdoor advertising agencies that have been able to survive in the industry and held the mantle of outdoor advertising in Ghana since the 1970s. The association further stated that, outdoor advertising continued to boom until 1968 when the indigenization decree was enacted and enforced in 1971. Under it, advertising and other service oriented businesses were exclusively reserved for Ghanaian citizens. Consequently, the foreign-owned outdoor advertising agencies had to leave, and some were taken over by local entrepreneurs. Lintas W. A. Limited and Afromedia for instance, were taken over by Messrs. Jake Obetsibi-Lamptey, Anthony Dickson, Peter Hasford and other partners and changed the name to Lintas Ghana Limited.[37]

The researcher thinks that even though by 1960 many Ghanaians had acquired the skill of signwriting, the indigenization decree of 1968 encouraged many of the local freelance signwriters who were entrepreneurially-minded to set up commercial signwriting shops across Ghana.

Mr Tabgor Mansah, CEO of DDP, and Mr Mantey, CEO of Apple Pie, who were former employees of CADCO in the 1960s, were some of the local signwriters who took advantage of the decree to set up their businesses.

A careful study of the circumstances that encouraged the two local signwriters to set-up advertising agencies in Accra suggests to the researcher that their initiative encouraged other signwriters to set up small-scale commercial signwriting shops in commercial centres across the country who trained a lot of apprentices. A few years later, some graduates from these shops also set up their own shops in other places, and gradually the craft spread to many towns in Ghana. Presently, there are numerous outdoor advertising related businesses across the country that provide variety of outdoor advertising services to individuals and organizations and whose activities are supposed to be regulated by some agencies and associations.

The historicity of the culture of modern outdoor advertising reviewed above proves that the craft has gone through systematic technological development in all cultures. The ensuing sub-topic is reviewed to highlight the artistic, scientific and technological processes employed in the production chain outdoor advertising.

Production of outdoor signs

The signage used in outdoor advertising goes through various processes in the production chain and at each stage different hand tools, equipment and processes are used. Bill Stewards suggested that the processes of signage production include construction, ground preparation, designing and installation.[38] Fulcher et al. also stated that manual wooden signs, wall branding, metal and plastic signs require proper treatment of the ground in other to improve durability[39] Fulcher et al. further stated that proper preparatory tools, materials and processes must be employed in the ground preparation and this must be based on the type of support been used.[40] Goodier for instance advised that, sound and seasoned hard woods must be used for outdoor signs.[41] Goodier's opinion is also supported by Hurst who admonished that highly resinous and knotty woods must be treated before painting to curtail bleeding of the paint film. To secure the durability of wall branding, plaster surfaces must be sealed before painting with oil paint so as to avoid the occurrence of saponification.[42]

Tubb also claimed that new metal sheets are often protected from rusting by coating the surface with a thin layer of grease. To improve the adhesion of paint on such grounds, the surface must be degreased with white spirit. The author also suggested that plastic sheets are sometimes contaminated with grease and dust and must also be washed down with soap and water and rinsed well before using it for a sign.[43]

Tubb's opinion is also buttressed by J. Hess who contended that failure to degrease the ground will lead to poor adhesion of paint and subsequently cause the paint film to peel and flake off.[44] In an attempt to describe how outdoor advertising messages are designed, Dannis and Jenkins stressed only on the copy. They suggested that an advertising message must be well laid out to the comprehensive state before it is reproduced by scaling to actual size.[45] Dannis' idea is vehemently supported by Appiah, who stated that lay out planning must start with series of thumbnail sketches.[46] Even though the researcher agrees with these suggestions, he thinks that too much emphasis was put on the layout planning without tackling how the cartoon or comprehensive layout would be reproduced. Goodier for instance, suggested the following methods of transferring a cartoon onto a prepared ground for painting: chalking, pouncing and scaling.[47] These methods are also stipulated by Bill Stewards who referred to them as manual methods of transferring.[48] Adams et al. also suggested scanning and xerography as some electronic methods of transferring designs.[49]

After transferring, the outlines of the design are painted with sable brushes and enamel paints. Bill Steward again stated that the production of sticker and Perspex signs require high proficiency in lettering so as to achieve good spacing that can enhance clarity and legibility of the advertising message.[50] Even though Perspex and sticker signs are more advanced than wood, cement and metal signs, according to Tuckwell, the production of modern digital outdoor signs require complex scientific and technical processes.[51]

An examination of the above literature on the nature and evolution of manual and digital outdoor advertising reveals to the researcher that the craft has gone through systematic metamorphosis over many years, and that the design, construction and installation processes of the craft across the world have been characterized by artistic, scientific and technological processes and principles.

Methodology

The study adopted a qualitative research approach and case and field study methods, as well as descriptive research methods. These methods were adopted because, according to Kusi, they are flexible and ideal for this type of research problem.[52] A purposive sampling technique was used to select the four oldest, largest and most developed outdoor advertising agencies in the Accra metropolis, the capital city of Ghana and used them for the case study. Yin, for instance, recommends the use of these this type of sampling technique in qualitative research.[53] The researcher thinks that all these qualitative research methods were aligned with the aim and research questions of the study as recommended by Yin.

A total of eight respondents consisting of two experienced production managers, graphic designers and signage production technicians respectively, were used for the study. Unstructured interview and observation guides and still-picture photography were used to gather primary data through short industrial attachments in all the study agencies to gather the data and after transcribing and sifting the raw data, the data was presented in relevant themes.

Descriptive qualitative analysis methods and narrative analysis were used to analyse the data and discussed the major findings that emerged from the analysis. These qualitative data analysis methods were used because; in the opinion of Rubin and Rubin they are ideal for such research works.[54]To justify the internal and external validity and reliability of the instrumentation and data collection procedures used for the study, samples of the questions posed to the respondents and a guide for the unstructured observation were provided at Appendix 1 and 2 respectively.

Findings from field studies

The major findings that emerged from the transcriptions and analyses of the responses, field notes and photographs were presented in relevant themes using the focused-by-research question approach. To indicate the credibility and authenticity of the data collected, and further justify the validity of the findings, the biographies of the respondents were provided before the actual analysis and discussion of the findings were made. Table 1 provides information on the biography of the respondents:

Table 1. Bio data of production managers, graphic designers and technicians of outdoor advertising companies used for the study.

Category of Respondent	Gender	Age (years)	Highest Qualification	Work experience (years)
Production Manager A	Male	54	HND Civil Eng.	33
Production Manager B	Male	48	BSc. Marketing	25
Graphic Designer A	Male	36	B. A Comm. Design	10
Graphic Designer B	Male	42	HND Comm. Art	15
Technician A	Male	52	Craft Cert. in Welding	30
Technician B	Male	42	Advanced cert. in P & D	20
Technician C	Male	46	Craft Cert. in Mech.	21
Technician D	Male	54	M.E. T. 1	32

Source: Fieldwork, 2016.

Tools, materials, equipment and processes of producing and installing manual outdoor signs

All the technicians who were interviewed emphasized that because most signage is posted publicly, exposed to elements such as rain, sun, dust, acids, saline, etc. these elements have harmful effects on the types of materials used to produce outdoor signs. These include wood, metal, fabric, cement walls, plastics, paints, etc. It is therefore imperative that materials that can resist these atmospheric elements are used to produce outdoor signs and the ground on which the advertising message is painted is well prepared so as to prolong the life span of the sign. The responses and field observations revealed the following tools, materials, equipment and processes involved in the design, construction and installation of different types of manual and digital signage:

Preparation of ground for wooden signs

It emerged from the findings that, two major types of wood are used to construct outdoor signage in Ghana: softwood and hardwood. The respondents pointed out that wood, especially hard woods contain resin and resinous knots must be treated before the ground is prepared so as to avoid bleeding of the paint film. To treat the knot, loose ones are hacked out with mallet and chisel and replaced with a piece of sound wood. The entire substrate is abraded across the grains with medium grade glass or sand paper and along the grains with fine grade abrasive paper. Two coats of shellac Knotting are applied to the knotty areas and allowed to dry. For highly resinous wood, the entire substrate is washed with acetone to neutralize the chemical. The treated ground is primed with two coats of aluminum wood primer and allowed to dry. Upon drying, all indentations or holes are filled and when dried, the filler is cut down and the entire ground is slightly abraded with smooth abrasive paper and dust off to obtain a smooth and even ground. An undercoat is applied and allowed to dry then cut off slightly with fine grade abrasive paper and dusted off and then a coat of enamel paint is applied as the finishing coat.

Preparation of ground for cement wall signs

The responses and the field observation also revealed that, to prepare a new dried wall, mortar splashes are first scrapped off to obtain an even and leveled ground. For old cracked walls, the cracks are hacked out with a hacking knife and filled-in with mortar and allowed to dry. The entire surface is abraded with medium grade glass paper and dusted off. Two sharp coats of alkaline-resistant primer or acrylic paint are applied onto the surface to seal the ground against the alkaline contained in the clinker used to manufacture the cement. An undercoat is applied and allowed to dry then the ground is cut off slightly with fine grade abrasive paper and dusted off. A coat of enamel paint is applied as finishing coat. The technicians pointed out that the alkaline contained in the cement is activated by moisture and since cement walls always contain some amount of moisture the chemical can always be activated. When the alkaline is activated, it attacks the linseed oil used as binder in the enamel paint chemically and converts it to a thick soft sticky brown soapy substance scientifically known as 'saponification' on the paint film which eventually cause the paint film to peel and flake off.

Preparation of ground for metal signs

The results of the analysis revealed that, the surface of a new ferrous metal is washed with white spirit to remove a grease coating on it. It is then wet abraded with white spirit and fine grade emery clothe to provide key and then wiped off with clean rag and primed immediately with red lead primer or zinc rich primer. An undercoat is applied and then enamel paint as finishing coat. For a corroded metal, the corrosion is removed by sanding, blasting or flame-cleaning and the surface is dusted off and primed immediately. After priming, all indentations are filled with putty and upon drying filled or sanded down and slightly rubbed with fine grade emery clothe to obtain smooth and leveled ground. Undercoat and finishing coats are applied. For non-ferrous metals such as zinc, aluminum, and others, the ground is prepared as the new ferrous metal described above. However, such metals are primed with an etch primer or zinc rich primer. The respondents claimed that the etch primer contain an acid base which can etch the smooth surface of such metals to provide key for reception of the undercoat and the finishing coats.

Preparation of ground for plastic (Perspex) and glass signs

The researcher observed that since both materials have smooth surfaces, and are not corrodible, they are washed down with soapy water to remove grease and dirt contamination and rinsed with clean water and allowed to dry then painted straight with the finishing paint which is always oil-based.

Designing and rendering the copy of painted outdoor signs

The transcriptions revealed that four main processes are involved: layout planning, setting out, transferring and painting. After the copy is determined, various thumbnail sketches are made to generate visual ideas of how the graphic elements will be organized or composed. These ideas are developed further to rough layouts and finally developed to one comprehensive layout. The comprehensive layout is always a prototype of the actual work.

After layout planning, the comprehensive layout is used as guide to set out the design onto the prepared ground. The design is either set out direct or transferred onto the ground. With direct setting out, the signwriter uses drawing tools such as HB pencil, a pair of compass and divider, metric rule, chalk line, straight-edge, French curves, templates, eraser, etc. to construct the letters and sketch illustrations manually onto the ground. The enamel paint is thinned to a medium consistency into cans and the setting out is gradually painted with sable brushes.

In respect of the indirect setting out method, the copy can be prepared into sheet stencils and dubbed, or it can be manually set out onto a sheet sizeable to the actual sign. Usually, brown paper, bond paper or tracing paper is used depending on the size of the work. The setting out is then transferred onto the ground by chalking or reverse pencil shading and painted.

How to execute manual banners

It emerged from the transcriptions and field notes that two main methods are used to produce manual banners in Ghana: stencil method and painting method. In respect of the painting method, the fabric is first stretched and pinned onto a smooth flat surface (Wall or

table). The copy is then set out direct onto the fabric after layout planning with drawing tools such as chalk, HB pencil, a pair of compass, metric rule, straight-edge, chalk line, eraser, etc. and filled-in with varying sizes of pure bristle art brushes and acrylic paints. Often two coats are applied.

With the stencil method, sheet stencils are mostly used. Before the stencil is prepared, the size of the banner is first taken and used it to plan the layout of the copy. In planning the layout, the copy is written on a sheet of paper. Appropriate heights are assigned to each line of text and each character is also allotted an appropriate width size. Letter, word and line spaces are mechanically assigned and measurements are also indicated to balance the layout. The sizes of the characters, heights of the characters and spaces are summed up respectively and these three values are added up to obtain the size of the positive space of the banner. The positive space is compared with the remaining negative space and makes adjustments for balancing. When the planning is completed, a number of A1 or A2 sizes of manila card are joined together with transparent tape to the size of the banner and then the copy is set out directly onto the sheet by using the measurements in the layout planning as a guide. Professionally, optical spacing method is used when constructing or drawing the letters and balancing the copy.

After setting out, positions of ties or bridges are indicated and the sheet is preserved by applying plain tape over the entire surface of the design before it is cut into a stencil. Often, two or more - coloured logos or illustrations are prepared as separate stencil sheets through colour separation. When the stencils are done, the fabric is stretched and pinned onto a table. The stencil is positioned appropriately onto the fabric and then the design is dubbed with foam and acrylic paint or screen printing ink.

How to execute sticker signs

The responses and the observation revealed that the production of manual sticker signs follows the same layout planning as manual banner design. However, the setting out is made direct at the back of the sticker sheet in reverse. The design could also be set on a manila card in right reading, cut into stencil and traced in reverse unto the back of the sticker before the individual letters are cut into letter templates with a sharp stencil knife or scissors.

The ground of the sign which could be a metal or Perspex sheet is degreased to obtain a clean dry surface. Sticker sheet is pasted onto the entire ground and rolled over with a metal roller to press the sticker firmly onto the ground. Using the layout planning as a guide, the heights of the letters are measured on the sticker and lines are ruled. Soapy water (Omo solution) is prepared into a small container and the letter templates are selected and put on the ground, a piece of foam is used to fetch and apply some of the solution onto the ground, the backing sheet of the letter templates are carefully peeled off and pasted at their appropriate positions one after another. Optical spacing principles (the rule of thumb) are used to arrange the letter templates to form the words and sentences before pasting.

Apart from the manual method of preparing letter templates for sticker signs, the text can also be digitally generated with Corel Draw or Adobe illustrator and saved in outline then cut with a plotter. Different sizes of digital plotters are used. For example, an A4 size plotter called Robo plotter or printer machine was used by some of the agencies. The text is generated with software called Robo Master on a PC to the actual size of the job and saved in outlines. The sticker sheets are fed face-up into a Robo plotter or printer machine. The

plotter is connected to the PC and switched on and the software is used to command the plotter to cut the letters. The head of the plotter cuts through the outlines of the letters and leave the backing paper. The sticker is peeled off from the backing sheet leaving the text to stick to the backing sheet. After that masking tape is applied onto the text on the backing sheet to pick the text and stick them together with the masking tape onto the ground and rubbed over it with a piece of rag to stick the sticker firmly onto the surface. The masking tape is peeled off from the sticker to leave the text on the surface. Two types of coloured opaque sticker sheets are used (scotch sticker which is reflective at night and ordinary sticker which is non-reflective at night) and both are available in variety of colours.

How to execute Perspex signs

The transcriptions also indicated that, previously, the sign makers used different blade sizes of jigsaw to cut Perspex into letter templates but now there are electronic cutting machines called Laser engraver and C & C Router with unique software that is commanded by PC. The design or text is generated with Corel Draw or Adobe Illustrator in vector image to the actual size of the work and saved in TIF format. The PC is connected to the plotter and the Perspex sheet is placed on a board inside the machine and the head of the plotter is commanded through the PC to cut the Perspex into letter templates. The head uses different sizes and shapes of blades according to the thickness of the Perspex. After cutting, the surface of the Perspex is washed with soapy water and rinsed with clean water to remove grease and dust contamination and allowed to dry. Using the layout planning as a guide, lines are ruled on the sheet to determine the heights of the letters then the letter templates are fixed onto the Perspex sheet with a strong liquidized adhesive called 'chromophone'. Again, the principles of optical spacing are used to arrange the letter templates before gluing.

How to produce neon signs

The transcriptions revealed that neon signs are stickers or Perspex signs which have been mounted into a metal case and illuminated with lights. With neon signs, Perspex sheet is used as the support and either sticker or Perspex is used to create the copy or the message and past onto the ground. The sign is fixed into illuminated aluminum case which is lit at night.

Tools, materials, equipment and processes of producing and installing digital outdoor signs

From the perspective of the signage designers and technicians, digital signs are signage that carries computer generated and electronic printed copy. The transcriptions of the interview responses and the field notes made from the observations revealed detailed practical information on how digital signs are produced in Ghana. Below are the details of the information:

Electronic printing equipment and materials
It emerged from the transcriptions of the field notes and the interviews that, there are different types of electronic printing equipment used in digital signage production in Ghana,

but the major one is the large format ink-jet printer. The lengths of these printers range from four feet to thirty feet and above. According to the technicians, the printers are produced with software which is installed onto a PC which is connected to the printer. Apart from printing, most large format printing machines have a cutting device called 'plotter' which is used to cut stickers to design or letter templates. The machines have different software which operates the plotter. The printer uses a type of liquidized ink called 'Eco Solvent' which is available in six colours: cyan, magenta, yellow, black, light cyan and light magenta.

Operative principle of large format ink-jet electronic printing machines

The narratives of the technicians and findings from the field notes revealed that, when the printer is switched on, the printing media (sheet) is loaded into it. The saved design (soft copy) is opened on a PC and commanded to print through the printer. The media is fed into the printer through metal rollers and upon entering, it is transferred through series of oscillating metal rollers where a light sensor identifies the colours in the design whiles the printer head moves left and right along the length of the roller that carries the media and spray the colours gradually onto the sheet to print the image into a hard copy. The gradual spraying of the colours slows down the printing process. The machine prints with all the colours so when one colour gets finished the other colours cannot print. It also prints on only one side of the sheet. Also, when the design is bigger than the length of the printer, the printer can be commanded to break the design into smaller units (a method known as tiling) and print them onto separate media so that they will be joined to form the full design before and during mounting. Below are pictures of large format ink-jet electronic printing machine and inks:

Types of large format ink-jet printing media

The responses indicated that different types of large format ink-jet printing media are used in Ghana. These include *Self-adhesive vinyl stickers (SAV)* which is available in two types: White opaque stickers and transparent sticker. The white opaque type has white or black backing material. The white backing type is used for signboards, sticker labels, posters etc. whiles the black backing type is used to print designs for vehicle branding. The transparent sticker has black or yellow opaque paper backing. It is used to print designs for corporate branding, sticker labels, indoor displays and specialty advertising works. *Flexi*: These are tarpaulin materials available in different thickness. Two major types are used: Front lit and back lit. The front lit material is opaque whiles the back lit is translucent. Both are used for printing billboards and bulletins. The front lit type is specifically used for billboards which would be illuminated with halogen light at the front whiles the back lit is used for billboards that would be illuminated from behind. The thicker ones are also used to print backdrop designs for stages. *Mesh*: White tarpaulin material with white paper backing which has small perforations in it. It is used for printing billboards and bulletins. *Canvas*: White tarpaulin material with matt surface texture and white backing paper. It is used for printing billboards and bulletins.

Banner material: A medium gram white tarpaulin material with smooth surface texture which is used for printing banners. *One-way vision***:** A translucent white sticker with white paper backing which has spots of opaque white ink printed on it. It is used to print posters which would be pasted in front of glass. It is often used for glass doors used in offices, commercial shops, vehicle wind screens and others. The white opaque ink spots printed on the sticker create the illusion of translucency on the sticker which makes someone inside the

office sees outside but cannot see the design printed on the sticker and people outside the office could see the design but cannot see the inside of the office. *Flag material*: Light gram white tarpaulin material with smooth surface texture which is used for printing street flags. *Photo paper*: This is a white paper available in gloss and matt finish and used to print photographs.

How to design and reproduce digital signs

The field observation and transcriptions of the interviews revealed that different types of electronic gadgets and design software are used to generate the copy for outdoor signs in Ghana. These include high speed PCs, laptops, digital cameras, CDs, flush drives and Corel Draw, Adobe Illustrator, Adobe Photoshop, etc. To create the digital design, the design is first laid out, and appropriate photographs are taken and downloaded onto PC, edited with Adobe Photoshop and saved in a file with resolutions ranging from 300 dpi to 600 dpi depending on the size of the sign. The resolution helps to avoid pixilation of the images used in copy.

The textual and other supporting visual elements are generated on a PC with Corel Draw or Adobe Illustrator to the actual size of the sign and the edited photographs are imported onto the page. The elements are creatively organized on the page with appropriate commands to obtain two or more rough lay outs. The roughs are further developed to obtain a final design. The final design is reproduced with laser or large format electronic printing depending on the type and size of the work. Different types of computer generated signage are available in Ghana. These include banners, sign boards, bill boards (standard bill boards, super bill boards, bulletins or spectacular etc.), wall wraps, vehicle branding, bus shelters, replica signs, etc.

How to produce electronic signs

It emerged from the transcriptions that, electronic signage are signs in which the copy is made of programmed light emitting diodes. They are popularly called LED signs in Ghana. It consists of software which is installed onto a PC and operated to programme the sign. The software is used to generate the copy (text and vector images) to the required size, font and colour(s) to fit into the surface area of the sign and programme the copy with a well-timed transition(s). The copy is displayed on the sign in programmed lights, generated by low voltage diodes powered by electricity. They are used for both outdoor and indoor signs. Below are some charges and pictures of LED signs used in Ghana:

Construction and installation of billboards

Findings from the transcripts and field observations revealed that the outdoor advertising agencies in Ghana import the framework or metal structure of large bill boards especially, spectaculars from large-scale international mechanical companies in Europe, America and Asia for assemblage and installation in Ghana. However, some large scale outdoor advertising agencies construct their own structures. Various scientific processes such as galvanizing and others are used to treat the metals to render them non-ferrous before, during and after manufacture.

In respect of how the agencies construct their own structures, it emerged from the transcriptions of the field notes and the interviews that, the agencies construct their structures in their workshops and convey to the site where crane is used to lift it during installation. I also discovered that sometimes all the metal components of the signs are constructed (welded and bolted) at the site by technicians with a scaffold during installation. The signage they construct has a single pole called Unipole or two or more poles.

In respect of the construction and installation of unipoles, it was observed that the unipoles ranged from one-face to four-face. Different sizes of round iron pipes are used to construct the poles and the sizes are selected based on the diameter and the weight of the billboard. The diameter of the poles ranges from 26 inches to 50 inches whiles the height ranges from 20 feet to 40 feet. The poles could be one or two pipes joined together with bolts and nuts. When two poles are joined the base one is slightly bigger than the top one.

With the question of how the pole is fixed into the earth, it emerged that a concrete foundation is prepared on which the pole is erected. The length, breadth and depth of the foundation are determined by the total weight, size and height of the billboard to be erected on it as well as the nature of the soil. Heavier and bigger billboards require wider and deeper pit and the mass weight of the foundation are supposed to be in equilibrium to the total weight of the billboard, so as to avoid falling over during a storm.

According to one of the outdoor advertising technicians in one of the large-scale outdoor advertising agencies, a six metre by 20 metre double-face billboard which has a total weight of 12 tons must be erected on a foundation which has a volume of 27 metre cubed, including wind breaks. This means that the width and length of the pit are to be three metres square respectively and the depth being nine metres. Another technician also gave an example that, a nine metre by six metre double-face billboard could be erected on a nine feet deep foundation casted with eighteen bags of cement.

To erect the pole, the pit is dug to the required size. The respondent said that clay and sandy soils must be dug deeper and the base must be filled with sand before the bedding is cast. The bedding is cast with concrete mixed in a ratio of 1:2:3 (one pan of Portland cement to two pans of sand and three pans of stone chippings). A floor mesh/mat made of three-quarters inches iron rods interwoven and welded together to take the shape of a square or circle is put on the bed and the holding down bolt or iron cage constructed with one and quarter or one and half inches iron rods to take the shape of the floor mesh with a number of stakes with rough threaded ends which projects beyond the foundation for four or five inches is placed on the floor mesh and welded to it or tie to it with bending wires.

Side mesh welded in the same form as the floor mesh is packed at the sides of the holding down bolt and welded or tie to it. After that a compact concrete of the same ratio as the bedding is cast into the pit to fill it completely. A wooden molding box of two to four feet height is formed and placed on the concrete pit and cast with compact concrete to obtain a levelled floor for the foundation and then left it to cure completely for a period between 21 to 60 days.

When the foundation is dried, one and half inches thick cast iron sheet of the size of the floor called 'base plate' is cut and the positions of the projected threading of the holding down bolt are marked out on it. Gas fire is used to drill the holes on the plate. The base of the pole is welded exactly in the middle of the base plate and a number of six by four inches metal braces are welded to the base plate around the circumference of the pole at equal intervals. The number of braces depends on the size of the pole. Example, 12, 16, 18, etc.

could be used. The pole is lifted and the base plate is placed on the floor by fixing the holding down bolts through the drilled holes. Small square metal sheets called washers are cut for each holding down bolt and drilled. The washers are fixed on the base plate and nuts are used to screw them to the plate through the threading of the holding down bolts. One or two nuts could be used depending on the length of the threads. After that a small concrete is cast to conceal the base plate. Below are pictures of the engineering drawings of unipoles retrieved from the practitioners, construction of a billboard and a cross-sectional diagram of the installation process:

Regarding how a flexi is stretched on a billboard, the transcriptions indicated that, the design is always printed to the exact size of the billboard and a borderline of six inches is left around it. After printing, all the four sides of the flexi ire folded over once and sewn to create tunnel hems of about one-inch diameter. The flexi is folded and a number of threaded end hooks made from half inch iron roads are inserted into the top tunnel to hold the pipe to the top angle iron and nut from behind to secure it. The flexi is unfolded and the round pipe is inserted into the bottom tunnel. The bottom pipe is hooked just like the top pipe and the top and bottom nuts screwed to stretch the flexi tightly. The round pipes are inserted into the left and right tunnels and the pipes hooked and screwed to stretch the flexi to a drum tight. Below is a cross-sectional illustration of how flexi is stretched on a billboard:

Discussion of findings

The findings have been discussed with reference to major issues that emerged in the data presentation and analysis as well as the literature. It has been organized to reflect the research questions of the study.

What are the tools, materials, equipment and processes used to produce and install outdoor signs in Ghana?

Several technical tools and equipment are used to produce manual and digital outdoor signs in the local outdoor advertising industry. These range from simple hand tools to power tools. The dexterity in which the outdoor advertising technicians handled these tools and equipment on the field proved the depth of knowledge and competencies they have acquired in the craft. This proves that the selection and application of the tools and equipment require special skills which must be acquired through prolong practice. For instance, according to Fulcher et al., knowledge on hand tools such as scrappers, filling knifes, hacking knives, and power tools such as disc sanders, blow touches, industrial spray guns, etc. fall in the domain of painting technology.[55]

Findings from the data indicated that several of these tools and processes were used to prepare grounds for signage. This indicates that some of the outdoor advertising technicians may be professional painting technologists or they might have acquired the skills of painting technology through apprenticeship. This inference of the researcher is confirmed by the bio data of the outdoor advertising technicians. Also, the analysis of the researcher could be justified because, in the opinion of Hurst among the building trades, it is painters and decorators who are trained to acquire high competencies in painting technology. For instance, preparatory processes such as rubbing down, degreasing, filling, scrapping, hacking,

knotting, sanding, flame cleaning, priming, sealing, industrial spraying, etc. are all skills taught in painting technology.[56]

It can also be induced from the analysis that effective preparation of grounds for manual outdoor signs depends on the outdoor advertiser's knowledge in materials technology because it will help him/her to understand the characteristics and specific uses of supports and preparatory materials that are used to produce outdoor signs. For example, knowledge on causes and prevention of paint film defects such as saponification, bristling, flaking, bleeding, peeling, blooming, etc. can help an outdoor advertising technician to select and apply good materials and processes to produce outdoor signs that will guarantee the durability of the sign. Goodier therefore vehemently proposed the use of appropriate materials and processes to execute outdoor signs.[57]

The researcher can also conclude that, the processes of executing manual signage in Ghana can also be likened to the manual methods used to produce outdoor signs and posters in the medieval, renaissance and the modern era in Europe. This is because digital technology of producing outdoor signage had not been developed by then, so they might have used manual methods. Also, the painting and decorating and the visual art programmes that provided signwriting, painting, drawing and designing skills to the local artisans as reported by Edusei and City & Guilds of London Institute might also be an important contributing factor to the development of the art of outdoor advertising in Ghana. It is also obvious from the analysis that the triad (art, science and technology) were applied in the manual processes and being a member of the commonwealth, the Gold coast had trade, political and economic contact with many European countries at that time.

The production of digital and electronic outdoor signs also required basic knowledge and skills in welding and fabrication, building construction, electrical, electronics, and computer hardware and software management. Apparently, these skills were exhibited by the outdoor advertising technicians and graphic designers on the field especially, in respect of how the technicians constructed and installed outdoor signs into the ground and installed electric cables in metal cases for neon and LED signs. The graphic designers could also manipulate the software proficiently to generate the copy. Manual and digital artistic processes such as brain storming, layout planning, letter construction and illustration; transferring, filling-in, painting, image capturing, image editing, text generation and management, composition of visual elements, etc. are also applied in outdoor advertising in Ghana. Even though the artistic processes are very important in the production chain as suggested by Dannis, they play minor role as compared to the technical processes.[58]

This observation of the researcher could be justified because, apart from the planning and designing of the advertising message, all other processes that are involved in the production chain are scientific and technical.

It is obvious from the discussions of the findings of this research question that, theories, principles, and technical skills of painting technology, building construction, electrical and electronics, welding and fabrication, and computer applications are highly applied in the production of both manual and digital outdoor signage design, construction and installation. This obviously proves that the craft of outdoor advertising goes beyond aesthetic or artistic skills.

To what extend is art, science, and technology applied in outdoor advertising in Ghana?

It can be induced form the data analysis that various forms of scientific, technological and artistic principles and processes are applied in outdoor advertising. The application of simple scientific principles can be identified in how chemicals such as acetone are used to neutralize resinous chemicals in hard woods which have a potential of causing paint films to bleed therefore discolouring the paint. Hurst therefore recommends this form of chemical treatment.[59] Also, the use of shellac knotting as a buffer for resins in knots is indicative of the fact that scientific applications are applied in manual signage production in Ghana.

Again, examination of how outdoor advertising practitioners treat plaster surfaces with alkaline resistant paints to prevent saponification of paint films is indicative of application of chemistry in the process. It must be emphasized that it is this scientific principle that prolong the durability of the wall mural that carries the advertising message. This is why Fulcher, et al. recommended that cement surfaces must be sealed with two coats of alkaline resistant primer before finishing in enamel paints.[60] It can also be identified from the treatment of new metal and plastic surfaces that scientifically, grease do not dry and that it will repel any paint that is applied onto it. So, to facilitate the adhesion of paint on such substrates, grease contaminated substrates must be degreased. Goodier also prescribed this scientific application.[61] The analysis of the types of paints used by the practitioners to prepare and preserve the metal surfaces also prove to the fact that, the practitioners have high technological knowledge in paint technology with respect to compositions, specification and uses of paints for ground preparations. Fulcher et al. for instance, specifies a number of preparatory and finishing paints used for ground preparation and all this information is passed on in the teaching of painting and decorating.[62]

The authors specify that ferrous metals must be primed with red lead primer and non-ferrous metals be primed with etch primer or zinc rich primer. Further analysis of the chemical composition of such paints reveals that, the red lead primer containers a metallic pigment called red lead which has the ability to resist rusting. The etch primer also contains an acid base which can etch the smooth surfaces of aluminum, and zinc, etc. so as to provide key for adhesion of the paint system. Also, the chemical processes of galvanizing applied in the treatment of outdoor advertising metal structures further confirms the application of high scientific and technological principles and processes in the craft. Tubb also confirmed the application of these principles outdoor signage production[63]

A study of the processes of constructing and installing bill boards in Ghana also reveal application of many scientific and technological principles and processes in the craft of outdoor advertising. For instance, the structural calculations made to determine the diameter of an upright (pole) in comparison with the total load of the sign as well as the width and depth of the pit in which the sign are erected are indicative of application of applied physics in the craft. The ratio of sand, cement and stones use to mix concrete and the volume of concrete use to fill the pit when installing the billboard to the holding down bolt further proves application of structural and mechanical engineering in the craft. Since the field study revealed that, the complex mathematical and physics applications used in the installation of outdoor signs in Ghana were performed by production managers, the researcher could conclude that it was their background in civil and mechanical engineering reported in their biography that equipped them with the mental acumen to perform those functions. This

presupposes that, ideally, production managers of outdoor advertising agencies across the world must have engineering background.

Furthermore, analysis of the design process of the advertising message reveals that the graphic designers follow the concept of 'significant form' which is the cardinal principle of aesthetic theory of formalism which has dominated the design of graphic communication items for centuries including outdoor signage. Amenuke et al. claimed that according to formalism, elements of designs used for any artwork must be carefully selected and composed based on relevant design principles such as harmony, rhythm, repetition, balance, emphasis, dominance, contrast etc[64] agree that, it is the perfect application of the elements that creates a synergy of the elements to achieve beauty in the work. It is the spontaneous arousal of desire and interest in the work when seen that creates the significant form. Hanfling and Oswald recommended the need to apply aesthetic theories of formalism and significant form in poster design[65] Chandrasekhar also has an opinion similar to that of Hanfling and Oswald.[66] It is also clear from visual analysis of outdoor bill boards that the designers apply a marketing strategy known as 'celebrity endorsement' to select their images for some of their designs. Keller prescribed this type of psychological application in poster design.[67]

A thorough scrutiny of the discussions that ensued from the analysis of the research questions finally proved that scientific, technological and artistic and psychological principles are applied in the design, construction and installation of manual and digital outdoor signs. It emerged that only artistic skills and principles were possessed by the graphic designers and however, lacked the technological and scientific knowledge and skills exhibited by the outdoor advertising technicians.

Conclusion

The outcome of the analysis and discussions of literature, field notes and interviews proved that the craft of outdoor advertising has been a global marketing culture in all ancient, medieval, and contemporary traditions. Cambell shared a similar as the researcher.[68]

The craft has also developed systematically over the years from hand painted signs to the current digital signs. It can also be concluded form the findings and discussions that complex mechanical and civil engineering processes and scientific applications have characterized the production and installation of outdoor signs in Ghana and these have dominated the execution processes of outdoor signs. Even though artistic principles and processes are applied in the production chain of outdoor advertising, they play minor role as compared to the engineering and scientific applications.

The researcher will therefore conclude that the design, reproduction, construction and installation of outdoor signs in Ghana have always been dominated by scientific and technological processes. However, aesthetics and social psychology plays a minor role in the production chain.

Recommendations

Based on the findings that emerged from the discussions, the researcher recommends that the scope of communication design curricular in Ghanaian institutions must be broadened to include the engineering and scientific aspects of contemporary outdoor advertising

construction, installation and preservation so as to equip the graduates holistically in the vocation.

Also, communication design students in second cycle and tertiary institutions must be compelled to go on compulsory industrial attachments in large scale outdoor advertising agencies to acquaint themselves with scientific and technological processes and principles applied in signage production and installation in industry. Practicing graphic designers who lack the technological and scientific knowledge and skills in outdoor signage construction and installation must be proactive and learn. Likewise, production managers of outdoor advertising agencies in Ghana who have only engineering background, must be given in-service training in advertising theory, social psychology, marketing and graphic design to enable them supervise all the activities in the production chain of outdoor advertising efficiently in other to achieve quality output.

Notes

1. Appiah, "Communication Design," 45–48.
2. Tuckwell, "Canadian Advertising in Action," 403–406.
3. Noël, "Formalism."
4. Appiah, "Qualities of a Good Poster," in *A Complete Guide to Graphic Design*.
5. Gallery.sjsu.edu. *History of posters*. Available from: http://gallery.sjsu.edu/paris/mass_produced_art/PostersOpening.htm.
6. National Academy of Sciences, *Science, Evolution and Creationism*.
7. Reddy and Zhao, "International Technology Transfer: A Review. Research Policy," 285–307.
8. Kumar, Kumar and Persaud, "Building Technological Capability through Importing Technology," 81–96.
9. Gallery.sjsu.edu. *History of Posters*.
10. Wick, Rainer and Grawe, *Teaching at the Bauhaus.*
11. Griffith, *The Bauhaus, 1919–1933*.
12. Billboard and Outdoor Consulting.com, "Brief History of Billboards and Outdoor Advertising." Available from: http://billboardandoutdoorconsulting.com/brief_history_of_billboards_and_outdoor_advertising.
13. Taylor and Chang, "Early History of Outdoor Advertising Medium." Available from: http://faculty.quinnipiac.edu/charm/CHARM%20proceedings/CHARM%20article%20archive%20pdf%20format/Volume%206%201993/283%20taylor%20chang.pdf.
14. Cambell, Martin and Fabos, *Media and Culture,* 39.
15. Taylor and Chang, "Early History of Outdoor Advertising Medium."
16. Robbs. *Advertising*.
17. Trivialibrary.com. History of Advertising: Ancient History, Middle Ages and the Early Days. Available from: http://www.trivia-library.com/a/history-of-advertising ancient-history-middle-ages-and-the-early-days.htm.
18. DesignHistory.org. *History of Posters*. Available from: http://www.designhistory.org/Poster_pages/Braodsides.html.
19. Joseph Bartholomew Sebbeh, "Notes on Design History." Unpublished teaching notes, Takoradi Polytechnic, School of Applied Arts, 15–16.
20. Getlein, "Gilbert's Living With Art," 248.
21. Gallery.sjsu.edu, *History of Posters*.
22. Art Source International Inc. History of the Poster. Available from: http://www.rare-maps.com/poster_history.cfm.
23. DesignHistory.org, *History of Posters.*
24. Microsoft Student. *Posters*. Redmond, WA: Microsoft Corporation, 2008, 2009.
25. Trivialibrary.com. *History of Advertising: Ancient History, Middle Ages and the Early Days.*
26. Jethwaney and Jain, "The Evolution of Advertising," 48–50.

27. Getlein, "Posters," in *Gilbert's Living with Art*, 248.
28. Microsoft Student. *Posters*.
29. Tuckwell, "Outdoor Advertising," 403–406.
30. Bovee and Arens, "Types of Outdoor Advertising Structures," 511–517.
31. Advertising Association of Ghana. *Advertising in Ghana*.
32. Edusei, "An Over View of Visual Art Education in Ghana," 116–120.
33. Advertising Association of Ghana. *Advertising in Ghana*
34. Amenuke et al., *General Knowledge in Art for Senior Secondary Schools*, 116.
35. Takoradi Polytechnic, "History of Takoradi Polytechnic."
36. City & Guilds of London Institute, *Teaching Syllabus for Painting and Decorating Craft*.
37. AAG, *Advertising in Ghana*.
38. Steward, *Sign Work – A Craftsman's Manual*.
39. Fulcher et al., "Surface Preparations."
40. Fulcher et al., "Preparatory Tools and Equipment."
41. Goodier, "Wood."
42. Hurst, "Surface Preparation."
43. Tubb, "Surface Tension," 127–134.
44. Hess, "Degreasing."
45. Dennis and Jenkins, "Planning, Design and Layout," 37–62.
46. Appiah. *A Complete Guide to Graphic Design*.
47. Goodier, "Transferring," *Dictionary of Painting and Decorating*.
48. Steward, "Enlarging," 59.
49. Adams, Faux and Rieber, "Electronic Printing Processes," 493–498.
50. Stewards, "Sign Work – A Craftsman's Manual."
51. Tuckwell, "Outdoor Advertising," *Canadian Advertising in Action*.
52. Kusi, "What is Qualitative Research and Overview of Qualitative Research Approaches," 1–7.
53. Yin. *Case Study Research: Design and Method*.
54. Rubin and Rubin, *Qualitative Interviewing: The Art of Hearing Data*.
55. Fulcher et al, "Preparatory Tools and Equipment."
56. Hurst, "Surface Preparation," *Painting and Decoration*.
57. Goodier, "Preparatory Materials," *Dictionary of Painting and Decorating*..
58. Dannis and Jenkins, *Comprehensive Graphic Arts*.
59. Hurst, "Surface Preparation," *Painting and Decoration*.
60. Fulcher et al., "Surface Preparations."
61. Goodier. "Wood," *Dictionary of Painting and Decorating*.
62. Fulcher et al., "Preparatory Tools and Equipment," *Painting and Decorating: An Information Manual*.
63. Tubb, "Surface Tension.
64. Amenuke et al., *General Knowledge in Art for Senior Secondary Schools*.
65. Oswald, ed. *Philosophical Aesthetics*.
66. Chandrasekhar, *Truth and Beauty: Aesthetics and Motivations in Science*.
67. Keller, *Strategic Brand Management*.
68. Cambell et al., *Media and Culture: An Introduction to Mass Communication*.

Disclosure statement

No potential conflict of interest was reported by the author.

References

Adams, M. J., D. D. Faux, and L. J. Rieber. "Electronic Printing Processes." In *Printing Technology*, 3rd ed, 493–498. New York: Delmar Publishers Inc, 1980.

Advertising Association of Ghana. *Advertising in Ghana: Growth, Development and Focus*. Unpublished Manuscript. Accra: AAG Head Office, 2016.

Amenuke, S. K., B. K. Dogbe, F. D. K. Asare, R. K. Ayiku, and A. Baffoe. *General Knowledge in Art for Senior Secondary Schools*. Accra: Ministry of Education, 1999.

Appiah, S. "Communication Design." In *A Complete Guide to Graphic Design: For Junior and Senior Secondary Schools*, 45–48. Winneba: University College of Education, Department of Art Education, North Campus, 1997.

Bovee, C. I. and W. F. Arens. 1989. "Types of Outdoor Advertising Structures." In *Contemporary Advertising*, 3th ed, 511–517. IL: Richard D. Irwin Inc.

Cambell, R., C. R. Martin, and B. Fabos. 2009. *Media and Culture: An Introduction to Mass Communication*, 6th ed, 39. Boston, MA: Bedford/St. Martin's.

Chandrasekhar, S. 1987. *Truth and Beauty: Aesthetics and Motivations in Science*. Chicago, IL: University of Chicago Press.

City & Guilds of London Institute. 1986. *Teaching Syllabus for Painting and Decorating Craft*. Accra: Ministry of Education, Technical Examinations Unit.

Dennis, E. A. and J. D. Jenkins. 1988. "Planning, Design and Layout." In *Comprehensive Graphic Arts*, 3rd ed, 37–62. New York: Glencoe McGraw-Hill Company Ltd.

Edusei, K. "An Over View of Visual Art Education in Ghana." *Journal of Science and Technology* 24, no. 2. 116–120. 2004. Accessed May 9, 2016. http://www.ajol.info/index.php/just/article/view/32923

Fulcher, A., D. Tickle, B. Rholes, and W. Steward. "Surface Preparations." In *Painting and Decorating: An Information Manual*, 4th ed, London: BSP Professional Books, 1998.

Fulcher, A., B. Rhodes, W. Stewart, D. Tickle, and J. Windsor. "Preparatory Tools and Equipment." In *Painting and Decorating: An Information Manual*, 4th ed. London: BSP Professional Books, 1998.

Getlein, M. *Gilbert's Living With Art*, 6th ed, 248. New York: McGraw-Hill Companies Inc, 2002.

Goodier, J. A. "Preparatory Materials." In *Dictionary of Painting and Decorating*, 3rd ed, London, Athenaeum Press, 1990.

Goodier, J. A. "Wood". In *Dictionary of Painting and Decorating*, 3rd ed. London: Athenaeum Press Ltd, 1990.

Griffith, A. W. "The Bauhaus, 1919–1933." In *Heilbrunn Timeline of Art History*. New York: The Metropolitan Museum of Art, 2007.

Hess, J. "Degreasing." In *Defects: Their Causes and Cure*. 2nd ed, edited by J. Hess. London: W&J & Company Ltd, 1965.

Hurst, A. E. "Surface Preparation." In *Painting and Decoration*, 9th ed, London: Charles Griffin Company Ltd, 1987.

Jethwaney, J. and S. Jain. "The Evolution of Advertising." In *Advertising Management*, 48–50. New Delhi: Oxford University Press, 2006.

de Jong, C. W. *Type. A Visual History of Typefaces and Graphic Styles.* Cologne: Taschen GmbH, 2010.

Keller, K. L. *Strategic Brand Management: Building, Measuring, and Managing Brand Equity*. London: Pearson Education Inc, 2013.

Kumar, V., A. Kumar, and A. Persaud. "Building Technological Capability Through Importing Technology: "The Case of Indonesian Manufacturing Industry." *Journal of Technology Transfer* 24. 81–96. Accessed 16 February 2016. 1999. doi:10.1023/A:1007728921126.

Kusi, H. "What is Qualitative Research and Overview of Qualitative Research Approaches." In *Doing Qualitative Research: A Guide for Researchers*, 1–7. Accra: Emmpong Press, 2012.

National Academy of Sciences. *Science, Evolution and Creationism*. Washington, DC: NAS Press, 2008.

Noël, C. "Formalism." In *The Routledge Companion to Aesthetics*, edited by B. Gaut and D. McIver Lopes. London and New York: Routledge, 2001.

Oswald, H., ed. *Philosophical Aesthetics*. Cambridge: Blackwell Publishers, in association with the Open University, 1992.

Reddy, N. M., and L. Zhao. "International Technology Transfer: A Review." *Research Policy* 19. 285–307. Accessed 2 February 2016. 1990. doi:10.1016/0048-73330048-7333(90)90015-X.

Robbs, B. *Advertising*. Microsoft® Student 2009 [DVD]. Redmond, WA: Microsoft Corporation, 2008.

Rubin, J. H. and S. I. Rubin. *Qualitative Interviewing: The Art of Hearing Data*. Thousand Oaks, CA: Sage Publications, 1995.

Steward, B. *Sign Work – A Craftsman's Manual*. London: Collins Professional and Technical Books, 1984.

Takoradi Polytechnic. "History of Takoradi Polytechnic," *4th Congregation Brochure*. Takoradi, Takoradi Polytechnic, 2005.

Tubb, L. F. J. "Surface Tension." In *Painters' Craft Science*, 127–134. London: Cleaver-Home Press Ltd, 1954.

Tuckwell, K. J. *Canadian Advertising in Action*. 2nd ed, 403–406. Ontario: Prentice-Hall Canada Inc., 1992.

Yin, R. K. *Case Study Research: Design and Method*. 4th ed. London: Sage Publications, 2009.

Appendix 1: Samples of Questions Posed and Probed During Data Collection Process.

Part A: Biographical information of respondents

1. Gender
2. What is your age?
3. What position do you hold in this company?
4. How many years have you worked in the outdoor advertising industry?
5. What is your highest academic qualification?

Part B: Technical information

1. *Questions posed to graphic designers:*

   a) What processes do you go through to plan and design a billboard for reproduction?
   b) What tools and equipment do you use in the planning and designing process?
   c) What quality control measures do you observer during the designing process?
   d) What computer application software do you use to design the posters?
   e) What tools, materials and equipment do you use to reproduce designs for outdoor signage?

2. *Questions posed to production managers:*

   a) What tools, materials, equipment and production processes do your company goes through to plan, design and reproduction designs for outdoor signage?
   b) What quality control measures does your company employ to ensure quality output of designs?
   c) What technical methods and processes does your company apply to construct and install outdoor signage?
   d) What artistic, psychological, technical and scientific principles are involved in the production chain of outdoor advertising?

3. *Questions posed to construction and installation technicians*

   a) What materials, tools, equipment, methods and processes you use to construct and install outdoor signs in this company?
   b) How do you ensure quality standards in the construction and installation of outdoor signs?

Appendix 2: Sample of unstructured observation guide used during data collection.

Personnel observed	Specific skills observed
Graphic designers	Manual and digital layout planning, text management, composition, colour selection and application, digital drawing, photo-editing, reproduction etc.
Technicians	Welding, sanding and grinding, cutting, bending, joining, finishing, etc.