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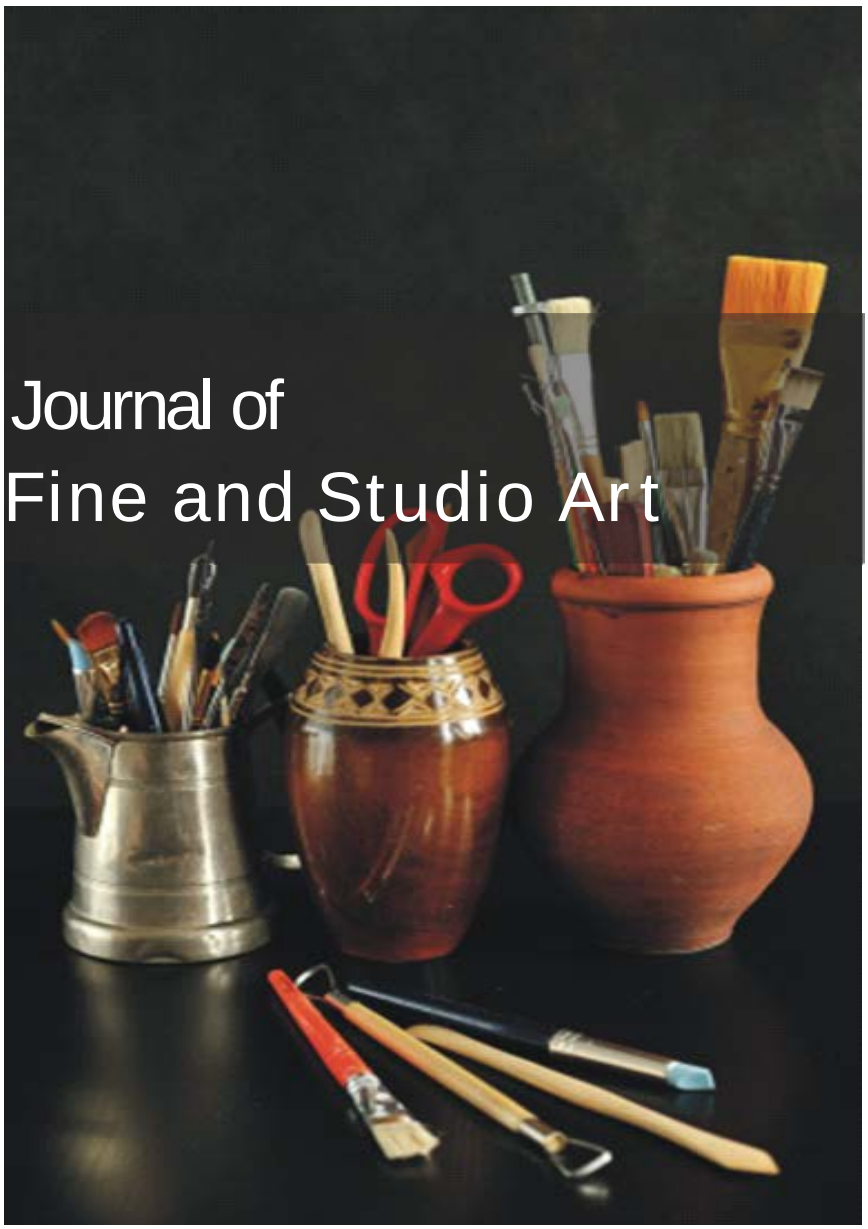

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Review

Elastomer as a feasible alternative to linoleum in the relief printmaking process

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The relief printmaking process is essentially expressed in woodcut, wood engraving and linocut, as well as some unconventional media. In this process, linocut is the preferred option, especially, by beginners, because linoleum is soft and easy to manipulate. However, the scarcity and high cost of linoleum in Nigeria present difficulties in carrying out exercises in the material. Based on this, it becomes expedient to look for alternatives, and the elastomer comes in handy as a feasible option. This paper is a comprehensive account of the studio experiences. It was an attempt to offer the elastomer as a feasible alternative to linoleum in the relief printmaking process. The objectives were to present the elastomer as a genuine substitute to linoleum, to unearth the weaknesses and strengths of elastomer against linoleum through studio experiments, and to identify the challenges of using elastomers in the relief printmaking process as well as possible ways of surmounting these challenges. The qualitative research method, through the studio experimental procedure was adopted in the investigation. Results showed that elastomers were not only good alternatives to linoleum, but were, indeed, capable of offering finer and more delicate cuttings than were attainable with linoleum.

Key words: Elastomer, linoleum, alternative, relief printmaking, weaknesses, strengths.

INTRODUCTION

Printmaking is a two-dimensional visual art that offers the potential of creating and/or replicating artworks whether deliberately or inadvertently. Effortless prints such as the footprints left on wet soil or a muddy footpath (Figure 1) are some of the fundamental indicators to the knowledge and understanding of the concept of printmaking. Prints are generally obtained when pressure is applied from the surface of one object onto that of another. Elementarily, deliberate prints can be acquired from leaves (leaf print), yam (yam print), potato (potato print) and other such objects. Prints and the process of making prints are an established and customary component of human daily life occurrences.

Printmaking is the art and process of creating and reproducing artworks by printing. It is, in the view of Mittler and Ragans (1992) “a technique in which an inked image from a prepared surface is transferred onto another surface, such as paper or fabric”. This is usually done by making pictorial images that can be inked onto paper or allied material. In this process, multiples of the same piece of art (a print) can be produced. As averred by Karim and Mohamed (n.d.), “printmaking is a process in which an artist repeatedly transfers an original image from one prepared surface to another”. Thus, each piece

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Figure 1. A footprint.
Photograph: Sampson (2018) 10×15 cm
Source: Author's photo gallery.

Figure 2. Elastomeric print (First Night). Sampson (2008).
Source: Author's art gallery.

produced is considered an original and *not a copy*, since it does not necessitate the reproduction of another work of art. Technically (and more correctly), each piece so produced is known as an impression. Prints are created from a single original surface, known formally as a matrix. There are many kinds of matrices, but the most common types available for use by printmakers include metal plates such as copper or zinc for engraving or etching; stone, used for lithography; fabric plates for screen-printing; blocks of wood for woodcuts and linoleum for linocuts which are relief printmaking techniques, and many others.

RELIEF PRINTMAKING PROCESS

The relief printmaking process is one of the printing methods where the print is obtained from the raised surface of the matrix that has been inked. The matrix, here, could be a block of wood, metal, linoleum, or other related medium; it could, as well, be an unconventional medium such as plastic or elastomer. In the relief printmaking process, the artist carves the image into the matrix (Cole, 2009). Relief printmaking lends itself particularly to a bold conception of design, expressed more in areas than lines (Peterdi, 2016). When the inked matrix is brought into contact with paper, the raised surface of the printing plate bearing ink will register the ink on the paper, and the recessed areas of the printing block (matrix) will leave the paper ink-free, or white (if the paper used for the printing is white).

Fundamentally, the relief printmaking process is articulated in woodcut, wood engraving and linocut, as well as some unconventional mediums and techniques. In the context of this paper, two major approaches were considered viable in the process, namely, the additive and the subtractive. In the additive approach, pre-conceived design is cut and glued or adhered to the matrix. Ink is rolled over the design, and only the raised area – the area in relief – will receive the ink and will, ultimately, print. Conversely, in the subtractive approach, the artist uses knives and/or gouges to cut away lines and areas he does not want to print. So, when he rolls ink on the block (matrix), the ink adheres only to the raised surface, leaving out the areas that have been cut away. To print, the artist places paper over the inked block, and apply pressure on it – either with a printing press, or by rubbing with the hand using any smooth, rounded material. In so doing, the ink (on the raised area of the cut image) is transferred onto the paper with the application of a little pressure. The print, as with most printmaking processes, is expressed as a mirror image of the marks on the block.

A conscious approach to relief printmaking involves the pulling of prints from the raised areas of wood block, linoleum or allied material. Thus, a relief print is an image created by a printmaking process, such as woodcut, linocut, *elastomeric* cut (Figure 2) and wood engraving

Figure 3. Wood engraving (The Skylark).
Bewick (1797)
Source: Microsoft® Encarta® 2009.

Figure 4. A one-colour linocut print (Mbopo)
Sampson (2008).
Source: Author's art gallery.

(Figure 3). The areas of the matrix (plate or block) that are to print black are left in relief (or raised), while the portions that will appear white are cut, scooped, carved out or depressed. Printing the image is, therefore, a matter of inking the surface of the matrix with a brayer (roller) and bringing it in firm contact with the paper. In the absence of a printing press, the back of the paper can be rubbed or pressed by hand with a simple tool such as baren, spoon, bottle, oyster shell, or other smooth and rounded object.

LINOLEUM CUT

Linoleum cut, usually called linocut, is a relief printmaking technique whereby print is obtained by cutting out a design from a sheet of linoleum. Hill (n.d.) notes that it is a variant of woodcut in which a sheet of linoleum (sometimes mounted on a wooden block) is used for the relief surface. Thus, the printing of linocut is similar to the printing of woodcut or wood engraving. Because linoleum is so soft and pliable, it is easier to cut and inscribe images into it, even with lower quality or dull tools (Foster, n.d.). The advantage of linocuts lies in the softness of the material and the consequent ease with which it can be cut. Since less force is necessary for carving, it is easier to make shallow cuts and details. Unlike wood, linoleum has no grain, so, it becomes quite easy to cut lines or curves in all directions (Figure 4). However, since linoleum is easier to work than wood, linocuts yield a greater variety of effects than do woodcuts, and become the preferred option, especially, by beginners and children. Linocuts can be printed by hand rubbing or on a press. The colour printing process follows the woodcut principles whereby lighter colours are printed first and the darkest colour is printed last (Figure 5).

It would be interesting to note that printmaking, vis-à-vis relief printmaking, is not a popular art in Nigeria; besides, the linoleum used for printmaking has no alternative use here. Therefore, very few people engage in the business of selling linoleum, and this makes the item very expensive, scarce and, sometimes, unavailable, thus presenting difficulties in carrying out exercises in the material. In spite of the fact that linoleum is the preferred option for relief printmakers, it becomes not only necessary, but essential to look for alternatives to linoleum.

At this instance, it turns out to be expedient to delve into the rationale for testing and using elastomer as an alternative material in printmaking. Historically, the author started experimenting with elastomer in his elementary school days; he used to play with left-over pieces of elastomer found at shoemakers' shops, to produce rubber stamps. This proved very effective at that time, for it brought out positive results in rubber stamp production (at that level). Later, during the author's postgraduate studies, the dearth and exorbitance of linoleum prompted him to experiment with diverse materials such as ply boards and plastics. At some point, the thought of experimenting with elastomer, as an alternative to

Figure 5. A multi-colour linocut print (Uyai Mbopo) Sampson (2008).
Source: Author's art gallery.

linoleum, came to him, based on his childhood experience with the material. Although he encountered series of obstacles in the course of experimentation, the elastomer proved to be the most viable alternative to linoleum, as documented in this study.

ELASTOMER

An elastomer is a material with elastic properties which, by its composition, offers easy and smooth cutting, just as linoleum. Gent (2017) defines elastomer as "any rubbery material composed of long, chain-like molecules that are capable of recovering their original shape after being stretched to great extents". Under normal conditions, the long molecules making up an elastomeric material are irregularly coiled. With the application of force, however, the molecules straighten out in the direction in which they are being pulled. Upon release, the molecules spontaneously return to their normal compact, random arrangement. In very simple terms, an elastomer (or elastic polymer) is a natural material such as rubber or a synthetic material such as polyvinyl that has elastic properties.

Types of elastomer

There are more than 20 different types of elastomer which are, basically, bifurcated into the natural and the synthetic varieties (engplastics.com.au, n.d.), or the saturated and the unsaturated elastomers. In saturated elastomers, sulphur vulcanization cannot cure them. They showcase superior stability against oxygen, radiation, heat, and ozone. Comparably, they are less reactive, and their reactivity is limited to certain circumstances and conditions. Polyacrylic rubber and silicone rubber are examples of saturated elastomers. Unsaturated elastomers, on the other hand, can be cured with the sulphur vulcanization process. Butyl rubber and natural polyisoprene are examples of unsaturated elastomers (byjus.com).

Uses of the elastomer

Elastomers are used in several significant ways, principally, due to their elasticity, suppleness, insolubility, lack of liquefaction and other outstanding attributes. Elastomers are available in different grades, depending on their application. The various grades of the elastomer are a function of the manufacturing process. The performance of the different elastomers also varies according to the structural integrity of the substance (engplastics.com.au, n.d.). Notably, and as offered by brenntag.com, the primary uses of elastomer are for – industrial products, medical products, wire and cable, moulded flexible parts used in vehicle manufacturing, for adhesives and sealants, in the construction industry, and as consumer products, as summarized follow:

(i) *Industrial products:* Industrial products and tools often contain or require various elastomers, such as neoprene used in industrial belts, silicone for required lubricants and mold and natural rubber applied to gaskets and polyurethane.
(ii) *Medical products:* Medical prosthetics, moulds, lubricants and other products that require a superior level of thermal and chemical resistance make use of silicone, which is an elastomer; it is also used for other goods.
(iii) *Wire and cable:* Elastomers, like neoprene, are highly heat-resistant and easily elongated: this makes them perfect for wire insulation.
(iv) *Motor vehicles:* Thermoset elastomers are much more resistant to melting which makes them valuable in motor vehicles for tires, certain seals throughout the automobile's design and several other components exposed to heat during operation. Versions like polybutadiene offer extraordinary wear resistance, which is even more useful on tires.
(v) *Adhesives and sealants:* There are some adhesives based on silicones, some with two-component polyurethane or one-component polyurethane of which elastomer is availed in each one of them, including sealants and more, to form highly effective material.
(vi) *Construction industry:* In the construction industry, the adhesives often made from a wide variety of elastomers

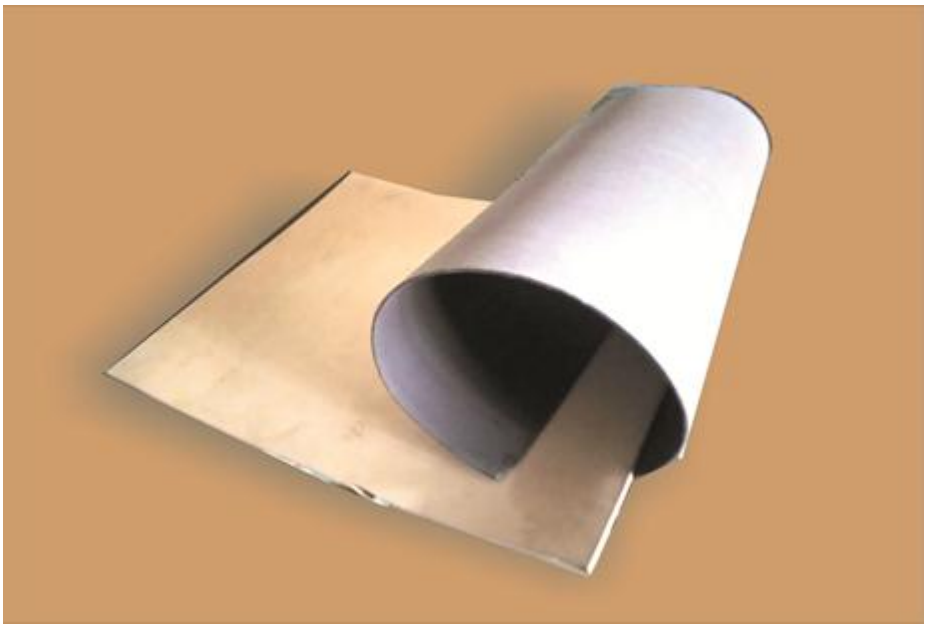

Figure 6. An example of the elastomer used for shoe soles.

are heavily used during day-to-day operations. Sealants and caulking are used to fill cracks and gaps.
(vii) *Consumer products:* There is a plethora of consumer products that use elastomer due to its desirable characteristics. Some examples, among others, are wetsuits from neoprene, baby pacifiers from silicone, elastic clothing made from polyurethane and shoe soles made from natural rubber (Figure 6).

Sample of elastomer used in this study

The sample of elastomer used in this study belongs to the group of silicone rubbers. Silicone rubber (or silicone elastomer) is a range of heat stable elastic silicone materials used for electrical insulation as sheet, tape, wire and cable coverings, extruded sleevings and mouldings, unsupported, but more extensively as coated glassfibre cloths, tapes and braided glass sleevings (Pearmain and Haddad, 2003). It is a versatile material and easy to handle. The ingredients from which it is formed are thick liquids that vulcanize at room temperature within a short period of time after the catalyst is added. Depending upon the relative amounts of solid and foam ingredients, the consistency of the resultant rubber may range from a hard solid to soft foam (Hodge, BSME and Yeakel, n.d.). Shit and Shah (2013) submit that silicone rubbers are a rubber-like material composed of silicone – itself a polymer – containing silicon together with carbon, hydrogen, and oxygen.

Silicone rubbers are widely used in industry, and there are multiple formulations. Silicone rubbers are often one- or two-part polymers, and may contain fillers to improve properties or reduce cost. They are generally non-reactive, stable, and resistant to extreme environments and temperatures from −55 to 300°C (−70 to 570°F) while still maintaining their useful properties. Due to these properties and its ease of manufacturing and shaping, silicone rubber can be found in a wide variety of products, including ... apparel such as undergarments, sportswear, and footwear. Other elastomeric variants, technically known as thermoplastic polyurethane (or thermoset rubbers), are also used in forming shoe soles (Ames, 2004). The sample used in this study comes under the trade name of *NORA* (there are other variants and trade names). Some of these elastomers are hard while others are soft. The hardness, or otherwise, of silicone elastomers can be measured by durometer shore A scale ranging from zero to 100, where the grade zero indicates the softness and the grade 100 means the hardest (Kati, 2019). The soft elastomers proved quite appropriate for the exercises in printmaking.

STUDIO EXPERIMENTS WITH ELASTOMER

In the studio experimental process, the elastomer offered effortless and soft cuttings in much the same way as linoleum. However, being endowed with certain elastic and rubbery properties, the elastomer yielded finer and more intricate cuttings than linoleum which, by nature, is brittle. Having gained sufficient practical experience with linoleum, it became very easy to work with the elastomer. Thus, it became rather exciting to experiment with convoluted visuals, first, using one colour (Figure 7). The success of the one-colour experimental prints lent

Figure 7. A one-colour elastomeric print (Body Decoration).
Source: Author's art gallery.

Figure 9. A multi-colour elastomeric print (Akparawa).
Source: Author's art gallery.

Figure 8. A two-colour elastomeric print (Man, Mask and Myth).
Source: Author's art gallery.

credence to, and impetus for, experimenting with two-colour prints which equally came out successful (Figure 8).

Exploration of possibilities in multi-colour prints followed the successful experimentations in two-colour prints. Here, the experiment on the elastomer drew on both simple detailed themes. For instance, the theme *Akparawa* (Figure 9) involved a sole subject (a man dressed in *Ibibio* traditional attire) presented in four colours against an uncomplicated background. A more complex theme, *Afe Eyop*, (Figure 10) necessitated the use of more subjects such as human forms, shrub in the background, palm produce utensils, palm fruits and fire. This, too, was rendered in four colours. *Ibom Connection* – an expression of a complex of multiple forms ranging from humans, trees, architecture, automobile and electrification to road network – was another intricate multi-colour print executed in three colours (Figure 11).

Challenges of the elastomer

The studio experimental process of producing elastomeric relief prints required a sampling of an assortment of elastomer types/grades. Some varieties of elastomer are stiff and hard to cut while others are soft and yield very

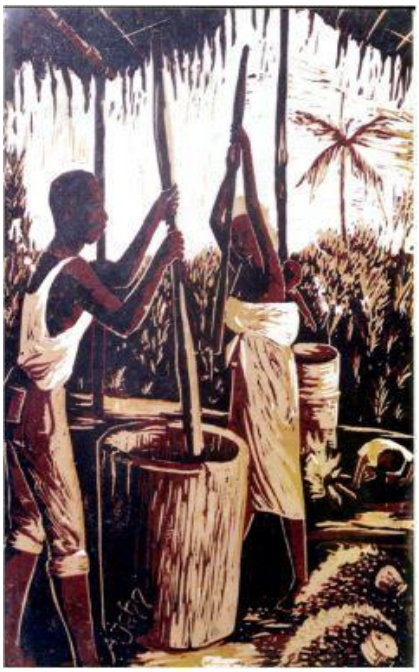

Figure 10. A multi-colour elastomeric print (Afe Eyop).
Source: Author's art gallery.

easily to cutting. In any case, they are graded in thickness by millimetres, such as 2, 3 and 4 mm. Thus, the challenges faced in this process were based on the consistency and the thickness of the material. Stiff and hard elastomers presented difficulties in cutting out the desired design: this was more so when working with knives (gauges) which were not quite sharp: knives easily went blunt when working with hard grades of elastomer. A possible danger here was that, if not well handled, accidents, such as injury to one's hand, could occur when the knife slipped unexpectedly.

Elastomers, by their composition and properties, are elastic and rubbery, capable of picking up their original form after being stretched to great levels. When it came in contact with a solvent such as turpentine or kerosene, it had a tendency to expand. By this characteristic, therefore, it became difficult, and sometimes impossible, to achieve perfect registration of colours during multi-colour printing. This happened because after registering the first colour, the ink that was left on the matrix had to be washed off, usually with turpentine or kerosene. The action of the chemical properties of turpentine or kerosene on the elastomer would cause its long, chain-like molecules to dilate, thereby triggering its expansion.

Surmounting the challenges

One of the easiest ways of surmounting the problem of possible accident during cutting from an elastomer was to choose a soft grade. In a situation where the stiff/hard grade of elastomer was used, the blade had to be very sharp for effective cuttings. At any rate, blunt or fairly sharp knives had to be sharpened regularly, or avoided.

The use of kerosene or other thinner for washing off ink from the elastomer caused an expansion of the matrix, thereby bringing about the problem of registration in multi-colour printing. This challenge could be surmounted in a number of ways. First, it was advisable to use a thick grade of soft elastomer – say – that of 4 mm or above. After washing off the ink with a thinner, the elastomer had to be quickly washed with soapy water to remove any trace of the solvent used. This would now abort the chemical action of the thinner on the elastomer. Although another problem erupted in this approach wherein the design on the matrix, to some extent, was washed off in the process, this setback was overcome by re-tracing into the faint lines that were left.

Affixing the elastomer, irrespective of the grade, with an adhesive onto a piece of wooden board, (typically, ply board) proved to be the easiest and, indeed, more permanent solution to the problem of expansion of the elastomer, and of registration. This way, the matrix (elastomer) would be tightly stuck onto the board, thus, upsetting its expansion which arose from its interaction with kerosene or other solvent while washing the matrix. This development engendered effective and effortless registration of multiple colours.

CONCLUSION

Printmaking is a very interesting two-dimensional visual art, especially, as it offers the potential of producing many original copies. Of the many printmaking techniques available to printmakers, the relief printmaking process presented very exciting possibilities, especially, when working with unconventional materials. Through studio experiments, the elastomer offered to be a viable alternative to linoleum in the relief printmaking process. The cutting of elastomer is similar to the cutting of linoleum because both are so soft and pliable that cutting and inscribing images into them is quite easy. A great benefit of taking prints from elastomer, as in linoleum, situates in the softness of the material and the attending ease with which it can be cut: less force is needed for carving, and it is easier to make thin cuts and details.

Despite the advantages that elastomer has as a viable alternative to linoleum, the elastomer presented some challenges. By its very structure, an elastomer is resilient. Using kerosene or other solvent to wash off ink from it caused the matrix to expand, and created the problem of registration in multi-colour printing. This challenge was overcome by quickly washing the elastomer with soapy water to remove any trace of the solvent used after washing off the ink. A more sustainable option was to

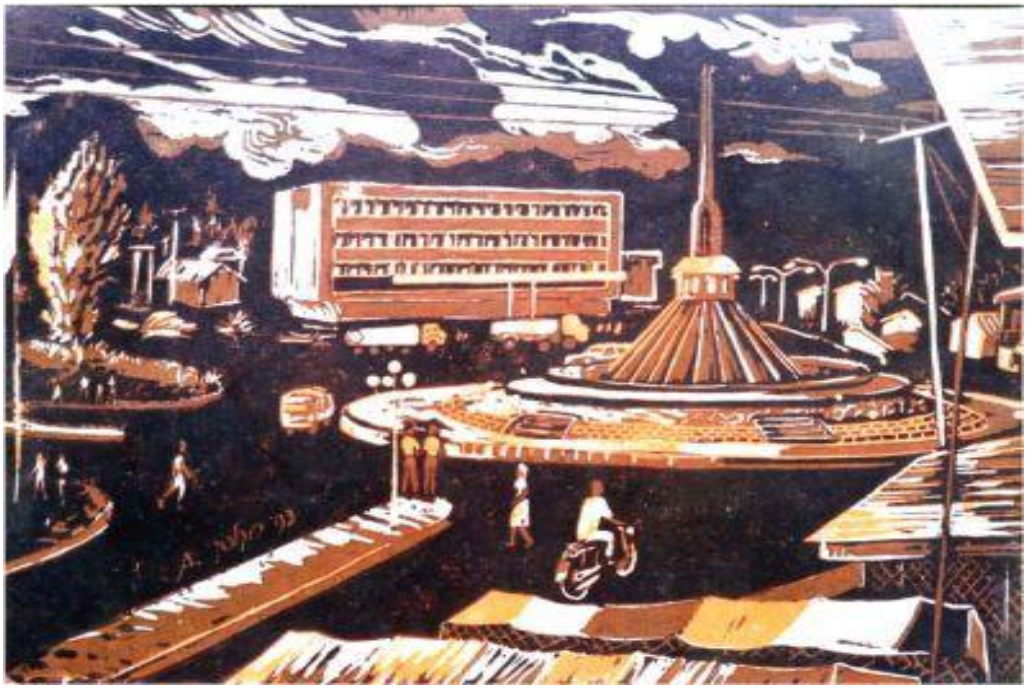

Figure 11. A multi-colour elastomeric print (Ibom Connection).
Source: Author's art gallery.

affix the elastomer to a piece of ply board: this proved to be the easiest and, indeed, more permanent solution to the problem of expansion of the elastomer, and of registration. The studio experiment demonstrated that elastomers are not only feasible alternatives to linoleum, but are, indeed, capable of offering finer and more delicate cuttings than are attainable with linoleum.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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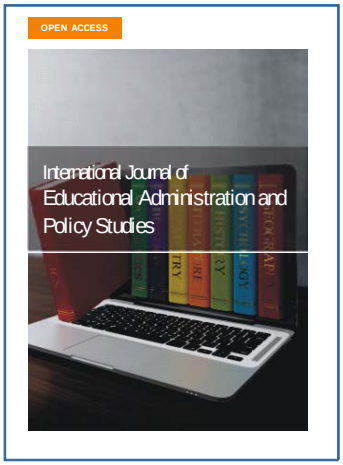

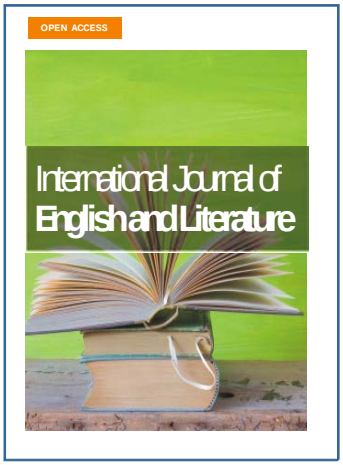

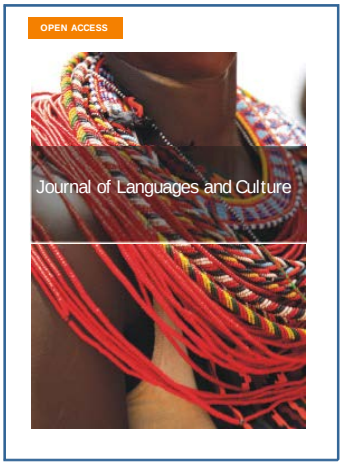

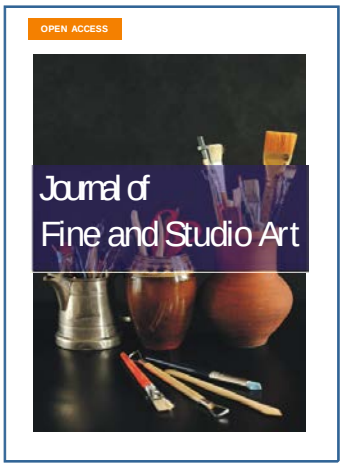

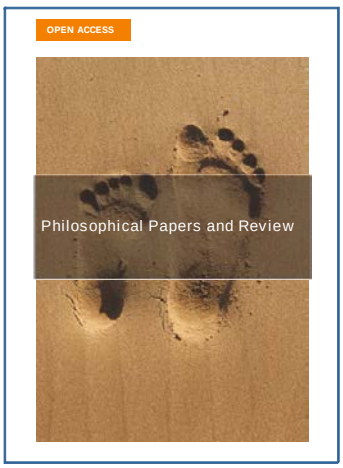

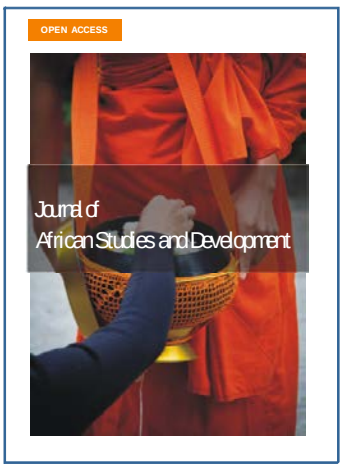

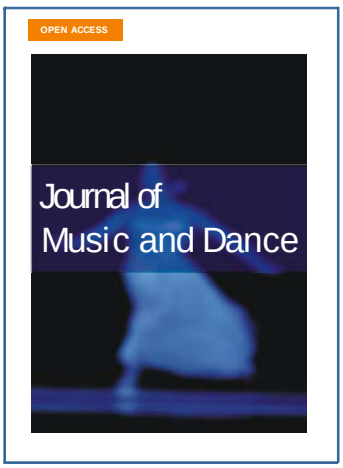

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