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Innovations in Clothing Manufacture: Strategy for Enhancing Clothing Production in Nigeria

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Abstract:
This paper reviewed innovations in clothing manufacture as a strategy for enhancing clothing production in Nigeria. Clothing technology has a long history which started with the discovery of needle.Individual garments were made and all the operations involved were executed by hand with the aid of some primitive tools for many centuries. This problem led to low production such that demand was higher than production and more energy is exerted in clothing manufacturing.The paper highlighted innovations in various aspects of clothing manufacturing using computers and computer-controlled equipment which aid in many functions, such as design, pattern making and cutting. The paper recommends that small, medium and large-scale garment manufacturers should adopt innovations that reduce labour as well as improve efficiency in garment manufacturing needed for improving clothing production in Nigeria.

Keywords: *Innovations, clothing, manufacture, production, Nigeria*

1. Introduction

Innovation is defined as the introduction of something new, a new ideas, methods or device, it could be also regarded as change that creates a new dimension of performance. Cherbrough (2003) defined innovation as a creative idea that is realized, expounding further, and the term innovation may refer to both radical and incremental changes to products, processes or services.

Clothing manufacturing depended almost entirely on human labor in the past; today computers are used in most phases of clothing manufacturing (Weber, 1990). According to Cocklin (1997) 'from the nineteenth century until now, many technological advances were made in the manufacturing of clothes, but the most significant development was the introduction of modern machineries with the bases for developing new concept'.

Computer aided design (CAD) and Computer Aided Manufacturing (CAM) are aspects of innovation in designing patterns. It is a means of designing patterns with the use of computers. It saves time and reduces cost. According to Weber (1990), innovations could be seen in various aspects of clothing production ranging from clothing designing, pattern drafting, grading, pattern layout, cutting, sewing, finishing to pressing.

Innovation in creating pattern marks is by means of moving the pattern pieces around on the display screen. The computer automatically checks the grainlines. The direction of the nap and even notches plaids then a high-speed machine called a PLOTTER, prints the marker on paper.

Innovations in grading can be defined as using digitalizing table. Information about shape of the master pattern is entered into the computer, and then the computer automatically grades the pattern pieces to the different sizes. According to Igbo and Iloeje (2003) grading involves decreasing the pattern to make smaller or increasing the pattern to make it larger. A size 10 pattern can be graded to give size 12, 14, 16 or graded down to give a size of 6 instead of adding or subtracting equal margin around the pattern to increase or decrease. The pattern grader adds or subtracts certain amounts of specific places to reflect the body changes from size to size.

Innovations in cutting is a process used in cutting out garments by a computer. The computer controls the knife used to cut out stacks of garment. The speed of knife is adjusted to match the thickness and the number of layers of fabric to be cut. The computer even instructs the knife when to sharpen itself.

Innovation in sewing is by means of computerized sewing machines or robots which stitch the garments from one type of sewing machine to another, this is done by a computer operator. In the past, garment production depended almost entirely on human labour. Today, computers are used in most phases of garment production.

1.1. Aspects of Innovation in Clothing Production Include the Following

1.1.1. Innovations in Using Computers in the Design Process

1.1.1.1. Computer Aided Designing (CAD)

The application of the CAD to fabric and garment design and other related activities had an equally for reaching impact upon techniques of creative design and product illustration, sample production and product costing. CAD is already

a standard tool in many buyers' offices and manufacturers must ensure that their existing and new systems are fully compatible.

According to Armstrong (2006) high resolution color systems are already widely used for 2-D graphic design, with the ability to scan in images and manipulate them in many different ways. Quinn and Renee (2003), said a key area development is in 3-D/2-D mapping techniques will eventually allow CAD technology to be used right from the creative design stage of three-dimensional sketching and styling through a preparation of markers and cutting instructions for two-dimensional garment panels, trim etc.

Techniques already exist for mapping out colors and printed design on to drawing or photographs of models (or in the case of household textiles and floor covering onto pieces of furniture and room sets). However, specifying the shape and texture of the areas to be illustrated and realistically stimulating body contours and fabric drape remain largely manual tasks for a skilled operator and are not yet within the reach of, for example, a retail assistant or an untrained customer.

A further stage, the use of moving computer-generated images to create a virtual reality electronic catwalk modeling of new garments and design ideas has also received a lot of attention but is still constrained by the current generation of computer processing power. Progress in the development of modeling algorithms, improved human interface and availability of ever greater computing power at lower cost can ultimately be exposed to improve the scope of application of CAD into retail and home shopping environments and thereby stimulates a market for manufactured products(Gray,1998).

1.1.1.2. Computer Aided Marker Planning

CAD systems are widely used in sample rooms when large numbers of new sample markers have to be produced continuously systems have two alternative mode of operation and the choice between them is dictated by the amount of time available for planning and the accessibility of the system during the regular working day (Coates, 2003).Computer Aided Marker planning involves two modes of operation which are interactive and automatic modes.

- Interactive Mode: This is two-way electronic communication functions between the planner and the system which enables the operator to plan markers with the aid of a computer.
- During planning process, the system automatically applies the relevant constraints and also indicates the planner the length of the marker at any given stage. As the system controls all the important details, the planner can concentrate on efficient positioning reiterations (Bourley, 2005).
- Automatic Mode: This system plans the markers without any manual intervention and automatically rejects markers which exceed the permissible length. This length is an estimate based on experience and can sometimes lead to the excess usage of material, but if marker production is more important than the little wastage, the waste has to be accepted (Solinger, 1998).

1.1.1.3. Computer Integrated Manufacture (CIM)

The penetration of microprocessor and computer measurement, control and information systems into almost every aspect of design manufacturing and distribution poses an urgent need for their intercommunication and integration through both hardware and software links. Hagan, Howard and Beale (2002)documented that computer integrated manufacturing (CIM) provides a philosophy and pathway for moving beyond individual CAD and CAM application by ensuring that all existing systems can talk to one another within both local and wide area networks and that future work stations and foreseeable information needs to be accommodated as they are developed or as a business grows.

There has been progress in the area of fabric cutting where a number of leading systems and equipment suppliers have already cooperated to develop compatible systems. Computer modeling and simulation is an area which has progressed rapidly. In recent years with the introduction of object-oriented programming and graphical interfacing techniques.

1.1.1.3.1. Fabric Preparation

The preparation of fabrics for sewing includes final inspection for the elimination or minimization of defects and the applications of any finishes which will facilitate later operations, including cutting fusing, sewing pressing and garment coloration (Moore and Margret, 2001).

1.1.1.3.2. Innovations in Cutting of Fabrics

Cutting is the only garment manufactured operation to have been fully automated. Advanced robotics have also been introduced into this area for retrieving fabric from store, leading it to laying up carriage and removing cut material (Winifred, 2002). Virtually all cutters still use the knife system in spite of extensive research over the years with lasers, water and plasma jets. Lasers have found relatively limited application so far in bed spoke tailoring and lace cutting.

The samples are bulk work are to be cut by a CAM (Computer Aided Machine) system, the patterns used for all materials should have a small modification made to their external corners in order to slightly reduce cutting time (Palomo, 2008). However, before the sample garment can be mass produced its practicability and efficiency as regards cutting have to be ensured. The four preparatory processes have to be carried out before starting to cut the sample they deal with the pattern, grain lines, pile direction and fabric patter (Cooklin, 1996).

Currently, cutting involves the use of various cutting machines such as:

1.1.1.3.2.1. Round Knife

A round knife is base plate which is mounted on an electric motor, a handler for the cutter to direct the blade and a circular blade rotating so that the lending edge cuts downwards into the fabric. Round knives are not suitable for cutting curved lines in high lays because the blade does not strike all the piles surrounding simultaneously at the same point as a vertical blade does.

1.1.1.3.2.2. Band Knife

A band knife comprises of series of three or more pulleys, powered by an electric motor, with a continuously rotating steel blade mounted on them one edge of the blade is sharpened. The knife passes through a slot of cutting table in a fixed position and the section of lay to be cut is moved to past (Carr&Pomery, 1992).

1.1.1.3.2.3. NotchingMachines

Many garment parts require that notches are cut into the edges of them to enable alignment during sewing with other garments parts. Specialized notching equipment provides greater accuracy because a guide lines up the notches with the cut edge to give consistent depth of notches at a consistent right angle to the edge (Chung, 2004).

2. Innovations in Handling of Materials

In order to reduce handling of materials and speed the flow of work round a clothing factory, various conveyor systems have been developed, ranging from relatively simple moving belts and manual push-pill rail system to extremely sophisticated computer controlled automatic overhead conveyors.

These are increasingly to be found in all areas of clothing factories from cutting through sewing and finishing to warehousing and dispatch. For example, one important area of current R&TD for materials handling in the cutting room is the robotic picking of cut pieces from the table and their placing onto automatic conveyor systems. Fully computer-controlled transport and picking systems are already established in modern garment warehouses.

In garment assembly, the most modern unit production system, (UPS) provides the capacity to locate and track individual pieces and others around a factory as well as re-allocate work in the light of changing resources styles and work contents. However, they can be expensive to install and operate and there have been some spectacular and costly failures arising from attempts to introduce inappropriate system (Paula, 2004).

2.1.Innovations in Sewing

Various innovative methods of joining fabrics and creating garment shapes have been researched in the past (example ultrasonic welding, molding and adhesives) but it is likely that for the foreseeable future, clothing will continue to be assembled using sewing as the principal method of joining, nor is any major breakthrough in sewing technology likely. (McDonalds, 2002; Beazley & Bound, 2000; Vogue, 2000).

In particular, the facility to pre-programmed individual sewing machines from a central computer will be incorporated into more ambitious systems of computer integrated manufacture (CIM). Ultimately, the capacity will exist to programme machines with fabric specific setting (Quinn and Renee, 2003).

2.2.Innovations in Sewing Machines

Apart from the ultrasonic wielding and resin bounding systems which have been developed as an alternative method, sewing still remains the most pre-dominant method of garment assembling of all types. In every sector of clothing industry, sewing operations are performed by a great variety of machines, each of which has the capacity for specific operations on a particular category of garment (Fredrick, 2003).

Many technological advances have been made to the sewing machinery which is used for the manufacturing of clothing. New construction materials and improved electronic systems have played an important role in these advances (Babara, 2002).These machines include:

2.3. Dry-machines

These machines are manufactured with sealed antifriction bearings, which eliminates oil changes during normal working life.

3. Variable Speed Electronic Motors

Machines such as barrackers and automatic steamers have to do over considerably different thickness of materials and seam constructions. Where the machine had one sewing speed only, snapped threads and broken needles were frequently occurrence. When sewing speed according to what has to be sewn, and this capability makes a positive contribution to the improvement of productivity (Ewa&Andrzej.Grandys, 2007).

3.1. Integrated Motor

This type of machine has its drive motor mounted under the table; it is now integrated with the machine head as one unit instead of being separately.

3.2. Lockstitch Bartaker

This type of machine has a wide range of application apart from regular bartacking operations. It can easily be converted to serve as an endless variety of stitch pattern sin an area of 6cm X 6cm where the pattern contains up to 72 stitches. The sewing speed can be adjusted according to the thickness of the part to sewn and it has a free cylinder arm which makes it easy to handle when bartacking on cylindrical sections of the garments such as belt loops, pocket corners and trousers flies (Byrne, 2000).

3.3. Single-Thread Button Machine

This type of machine has an electronically controlled system which automatically feeds correctly positioned buttons directly from the button directly from the button hopper on the right into the button clamp according to Cooklin, (1997)'this machine can be easily adjusted for sewing two or four button holes and changes the number it stitches from 0.6 to 0.12, this requires pressing a knob on the front of the machine'.

3.4. JUK Industrial Sewing Machine

JUK industrial sewing machine is core business of JUK which supplies the entire range of apparel and non-apparel (leather and interior design, goods for example) processes from planning to cutting, sewing, finishing and they also support for their industrial customers in form of service and software, such as assisting apparel manufacturer in developing highly efficient production system, and improving work environment (Stover,2002).

3.4.1. Brother Industrial Sewing Machine

In the field of ready-to-wear garment, brother machine is responding to change in the modern apparel industry where sensitivity to customer needs premium product quality and cost reduction are watchword. Brother machine optimal environment for each facility ranging from design of hardware and software to the sewing machine(Toledo,2000).

3.5. Innovations in Pressing of Garments

According to Krause (2003), pressing of garment is the changes in the geometric fiber structure of the area being pressed by the controlled application of heat, steam and pressure. The process of pressing serves to highlight the variety and extremes which exist within the clothing industry across the difficult garment types, the levels of style change and the volumes of a style that are produced.

Although, pressing is labour intensive, yet it is essential to the final quality and value of the garment. Current technology developments are aimed at reducing processing times while improving performance and consistency of this operation.Innovations makes pressing of garment more technological. Also, this gives rise to the application of high-technological systems, microprocessors among others which provides the optimum combination of quality and quantity.
Special pressing equipment are often expensive, the types if garment and shape require the type of machine to be used. Pressing machines need flexibility and the skill of the operator is regarded (Carr and Latham, 1989). Pressing is an important process which gives an impact to the final finish of a garment.
The different types of modern pressing machine include:

3.5.1. High-Technology Pressing Machine

This type is a type programmer and presses the shoulder sleeves head and sleeve cuff in one set-up (Li and Fung, 2010). The machine is available for men and women clothing.

3.5.2. Form Finishing Machine

This type is also referred to as a puffer, a form press or a dolly press. It consists of a frame caring a steam distribution system, compressed air distribution system and a pressing form which is a canvas bag in approximate shapes of the garment to be pressed-that is a body shape with no sleeves (Cooklin, 1995). There are controls for steam and air release and timers controlling the steam. This machine helps to reduce the positioning and repositioning in the pressing operations by pressing the whole garment at the same time. Ashelford (1996) reported that the form finishing machine is one of the types used for finishing men's and women's jacket, blouse and shirts. During the pressing operation, the body and sleeves are precisely tensioned by pneumatically operated clamps or pressure pads which can be set for individual forms. A microprocessor monitors and regulates the programmed times, temperature and the sequence or combination of stem, hot air, cold air and vacuum.

3.5.3. Small Cabinet Press

This machine is designed to press and heat set shirts before they are buttoned, thus preventing button mark on the finished article. During the pressing process the back and front are tensioned by air filled bags, which ensures an even pressing surface when the shirt is between the two shaped pressing plates. This machine can be efficiently operated by one person only when there is a reasonable balance between the handling and pressing cycle times (Bergn, 2000).

4. Summary

Innovations in clothing manufacturing improves efficiency in garment manufacturing and will drastically reduce labour in clothing manufacturing. Innovation in clothing manufacturing leads to increasingly technical training for workers and providing job opportunities throughout the industry. Computers and computer-controlled equipment aid in

many functions, such as design, pattern making and cutting. Other emerging innovations which improveefficiencyin clothing industry includes wider looms and computerized equipment. Also, the use of Computer Aided Design (CAD) systems has led to the development of 'products life cycle management' under which potential new fashions can now be transmitted around the clothing industry over the internet such changes may help the apparel manufacturing industry meet the growing competition and continue to supply the nation's consumers with garments at an acceptable cost.

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