UNIVERSITY OF EDUCATION, WINNEBA

GRADING OF LADIES' PATTERNS BY SMALL SCALE GARMENT PRODUCERS IN THE SEKONDI -TAKORADI METROPOLIS

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DECLARATION

Student's Declaration

I, Genevieve Nketsiah, declare that this thesis, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and that it has not been submitted, either in part or whole, for another degree elsewhere.

Signature:…….

Date:……

Supervisor's Declaration

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of thesis/dissertation/project as laid down by the University of Education, Winneba.

supervisor"s Name: Professor Phyllis Forster

Signature :……

Date:……

DEDICATION

To my family.

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ABSTRACT

The study investigated the grading of ladies‟ patterns by small scale garment producers in the Sekondi-Takoradi Metropolis. This study employed mixed methods design, specifically the triangulation design. The target population was all the 515 professional dressmakers and tailors (garment producers) in the Sekondi-Takoradi Metropolis. However, 100 active members formed the accessible population. Twenty (20) participants who were garment producers were purposively sampled for the study. Interview schedule, observation guide, and test samples were used to gather data for the study. The quantitative data were analysed using descriptive statistics such as means and standard deviations, and frequencies and percentages, while the qualitative data were analysed using thematic analysis. The study revealed that garment producers did not patronize commercial patterns but produced their own, mainly from freehand cutting method. Garment producers were able to grade patterns for larger sizes than smaller sizes. Products from patterns produced fitted well with shoulder than all other body parts. Dart was poorly fitted from produced patterns. Major challenges of pattern grading were grading for ladies with same hip and waist measurements, grading for ladies with big bust and small hip, grading for small waist with large hip, grading for ladies of hollow chest and exchange of clients‟ measurements. It was recommended that the Government of Ghana provide standardized measurement through the investment in the scanners to create a database of measurements for Ghanaians. The Ghana National Association of Dressmakers and Tailors are entreated to pay more attention on pattern grading to make it key requirement for end of apprentice certification.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The garment industry is one of the oldest and largest of the manufacturing sectors in the world (Women in Informal Employment: Globalizing and Organizing [WIEGO], 2016). For most of human history, garment production has been handmade; each garment is made individually for the person who would wear it. Although the industry can be fully automated, garments are still sewn and pieced together by human hands, using sewing machines, especially in the developing countries of the world and in small-scale home workshops called cottage industries. In this instance, the customer drops off raw materials to the worker‟s home or shop, where production relies on self-pacing and includes low and highly skilled work (Monet,2017). Estimates suggest that as much as 60 per cent of garment production, especially of children and women‟s clothes, is done at home in both Asia and Latin America (Chen, Sebstad, & O'Connell, 1999). Furthermore, women represent a significant majority (three quarters) of the home-workers who cut and stitch garments together for the global apparel trade (Solinger, 2010).

According to Stotz and Kane (2015), throughout the first half of the 20th century, the creation, production, and distribution of clothing remained largely concentrated in the United States and the United Kingdom, while in most other countries, garment making remained a cottage industry. They however added that by the 1950s the Scandinavian countries such as Belgium and the Netherlands as well as other countries like Canada, South Africa, Japan, and Australia began to expand ready-made clothing manufacture. According to them most of the industrialized

countries of Europe and North and South America, as well as Australia, New Zealand, South Africa, and Israel, had clothing and footwear industries capable of meeting virtually all their clothing needs.

In 2014 key statistics about the Global Garment Industry showed that 60 million people were employed in the sector worldwide, compared to 20 million people employed in the industry in 2000 (Stotz & Kane, 2015). This means that with a span of fourteen years, the number of people employed in the garment industry worldwide tripled. Stortz and Kane further observed that the women‟s wear industry was worth $621 billion with the men‟s and children‟s wear industries recording $402 billion and $186 billion respectively. The value of world apparel exports totalled $445 billion in 2015, representing a decrease of 8% from 2014 (WTO, 2016). It is very surprising that as the developed countries are moving forward and advancing with their garment production methods, their Ghanaian counterparts are rather folding up because their industries are collapsing (Oppong, Antiaye, Biney-Aidoo, 2014)

One key sub-sector of garment production which has been getting more attention has been female garments. The female body proportion is a vital factor in garment construction, and as the female figure comes in all shapes and sizes, designers and producers need to have the skills necessary to cater for these ranges of sizes and shapes (Bureau of Labour Statistics, 2010). Every society in the world has developed a general perception of an ideal female body shape. These ideals are reflected in the art and literature produced by or for a society, as well as in popular media such as films and magazines. Despite the assertion that the female body size and shape have varied over time and continue to vary among cultures (Khamsi, 2014), preference for a small waist has remained fairly constant throughout history, and a low waist to hip ratio has often been seen as a sign of good health and reproductive

potential (MacDonald, 2010). Consequently garment producers make effort to produce garments that are suitable for these body shapes.

Garment producers usually use patterns in making custom-made dresses for their clients. These patterns are templates from which the parts of a garment are traced onto fabric before cutting out and assembling into garments (McCall, 2011). Garment balance is an important factor within pattern development in the garment industry; a well-balanced garment hangs in the correct relationship with the wearer‟s size, contour and posture. The posture of the body is determined by the natural stance, which can be influenced by both size and age. According to Fairhurst (2010), there are two main areas that control the balance of a garment. She explained that for garments worn from the upper body, the area is from the shoulder to chest level and for garments worn from the lower body, it is from the waist to hip level. Defects that appear below these control areas are often caused by defects within these areas.

Ashdown, Loker and Rucker (2006) reported that one of the greatest challenges facing apparel companies today is the ability to provide quality fit to a broadly defined target market. These scholars suggested that one issue that has limited the resolution of this problem is lack of data on fit characteristics of garments for different body sizes and shapes. In that wise, the relatively newly discovered two-and three-dimensional (2D and 3D) body scanning systems plus the standard body measurements can be very useful in assessing the figure shape in relation to garment balance.

Again, the editors of *Anthropometry, Apparel Sizing and Design*, posit that, one of the greatest challenges for the apparel industry is to produce garments that fit customers properly (Gupta & Zakaria, 2014). Further, McCormack (2005) cited the fashion industry for ignoring the changing shapes of women's bodies. She further

indicted that designers and manufacturers still insist on making clothes that fit the traditional hourglass figure, when women's shapes are more likely to be top-heavy, rectangular or pear-shaped. McCormack, again, reported that out of 6,000 American women studied, 46% were described as rectangular body type with the waist less than nine inches smaller than the hips or bust. Just over 20% of women were bottom-heavy (spoons), or pear shape, with hips two inches larger than busts or more, while almost 14% were women whose busts were three or more inches bigger than their hips (inverted triangles).

In today‟s apparel market, consumers desire to personalize the style, fit and colour of the clothes they wear. Hence garment producers cannot survive their businesses without satisfying their customers. Custom-made dresses among ladies continue to thrive in the clothing industry because customers have great span of control over the choice of fabric and design (Veblen, 2012). Customers acquire fabrics of their choice, give it to garment producers and expect them to meet their taste of styles with little or no anticipation of unsatisfactory products. According to Fan, Yu, and Hunter (2004) (as cited in Alemany, 2010), clothing fit is the main objective in the garment development process to ensure user comfort and appearance. Clothing fit is influenced on one side by the anthropometry and body dimensions of the customer and, on the other, by the appearance and social trends. The fit of the clothes is closely linked with the body dimensions incorporated in the basic pattern blocks of the clothes, and every production of garments requires the development of corresponding patterns. Also, fit has been cited as one of the major criteria that determine the popularity of a garment producer. In other words, fit could make or mar the business of a garment producer.

Forster (2014) generally noted two types of patterns as commercial patterns and homemade patterns. Gavor (2011) however, identified four methods of coming up with patterns for clothing construction as drafting, draping, flat pattern and then freehand cutting which does not necessarily involve the use of paper pattern and it is used mainly in customized garment production. Customers have varying body sizes of which garment producers are expected to meet this demand. This calls for grading of patterns to suit various figure types. Also, Horlamus (2013) stated that there are three basic methods of grading patterns namely, cut and spread, pattern shifting, and computer grading. No one method is technically superior and all are equally capable of producing a correct grade. It is of great advantage for a professional garment producer to be acquainted with all these methods of grading.

Wijendra (2014) described pattern grading as the process whereby patterns of different sizes are produced from the original master pattern. This process can be performed manually or automatically by a computerized system. According to Wijendra (2014), patterns are graded according to size charts which present the sizes and the average measurements of the population group for which the garments are intended, and the amount by which the pattern increases or decreases, and the direction of these size changes. Meanwhile, the correct proportions of the garment have to be maintained without distorting the style features (Fairhurst, 2010). Thus the need for both custom-made and mass producers of garments to grade their garments well to ensure the best fit for clients.

Body measurements are prerequisite to pattern construction. Though measurement tables and basic block patterns in the industry are already established and fixed, they are not necessarily the best reflection of the body dimensions of some target market groups (Ashdown & Dunne, 2006; Schofield & LaBat, 2005). Since

sizes and proportions of human bodies are constantly changing due to various factors (Karen, 2003) there is a constant need for updating the standard measurements of the fashion industry, by the three dimensional body scanning technique, which definitely would be too expensive for the average dress-maker in the study area.

Singh (2006) observed that most sizing systems in use today are faulty, assuming that human bodies follow a mathematical precision and increments in their shapes and sizes. In other words, each body is supposed to fit one of the sizes which some statistician arrived at by taking the average of a given population- of which one may or may not have been a part. Thus, Gupta and Zakaria (2014) proposed the need for having a systematic and scientific system for measuring and classifying human bodies for the purpose of developing a sizing system for garments as we move into times characterized by unprecedented retail growth in the garment industry. The standardized sizing systems are usually used for pattern making in large scale production of garments. The same cannot be said about small scale garment manufacturers whose clients‟ sizes may fall out of the standard sizes. It is important to establish which grading system best fits the body dimensions of specific market or target groups (Podbevšek, 2014).

1.2 Statement of the Problem

Well-fitting clothes make people look as if they have perfect bodies. Many customers complain that garment made from commercial patterns do not fit them. A cursory look at some locally produced custom-made association uniforms in the Sekondi-Takoradi Metropolis gives an indication that some clothes do not fit their wearers. These garments appear too tight or too loose, some have shifted centre front, back and side seams, riding back, fold lines, to mention a few. These unpleasant faulty fit indicators may occur because the small scale garment producers have

difficulties grading patterns of the same designs to the sizes of their clients or are using unsuitable grading systems to prepare the patterns.

Though, Sekondi-Takoradi market seems to be flooded with different types of imported ladies‟ clothes, the local small scale garment industry is very vibrant producing mainly custom-made clothes. Groups of ladies‟, who decide to wear the same dress design will however, each require a pattern that fits her figure smoothly. Thus, it becomes necessary to scale the same pattern up and down to fit each client‟s figure. The conventional methods of grading patterns in large scale industries are well documented. However, how small scale garment producers who mainly make use of freehand cutting methods, grade their patterns to fit clients has not yet been explored. Since devising a pattern that fits everyone is an impossible task, garment patterns should be graded to fit clients irrespective of the differences in the shape of the ladies. Through the triangulation design, this study therefore, investigated the grading of ladies‟ garment patterns in small scale garment industries in the Sekondi-Takoradi Metropolis.

1.3 Purpose of the Study

The purpose of the study was to investigate how ladies‟ patterns were graded by small scale garment producers in the Sekondi-Takoradi Metropolis.

1.4 Objectives of the Study

The objectives of the study were to:

1. identify the types of patterns used by the garment producers to make ladies‟ garments in the Sekondi-Takoradi Metropolis.

2. investigate how patterns of the same style are made by garment producers to fit different shapes and sizes of their lady clients in the Sekondi-Takoradi Metropolis.
3. examine the challenges faced by garment producers in grading patterns for different shapes and sizes of their lady clients in the Sekondi-Takoradi Metropolis.
4. explore strategies garment producers employ to manage challenges associated with pattern grading for different shapes and sizes of their lady clients in the Sekondi-Takoradi Metropolis.

1.5 Research Questions

The research questions that guided the study were as follows:

1. What types of patterns were used by garment producers to make ladies" garments in the Sekondi-Takoradi Metropolis?
2. How did garment producers obtain patterns of the same style to fit different shapes and sizes of their female clients in the Sekondi-Takoradi Metropolis?
3. What challenges did garment producers face in grading patterns for different shapes and sizes of their lady clients in the Sekondi-Takoradi Metropolis?
4. What strategies did garment producers adopt to manage challenges associated with pattern grading for different shapes and sizes of their lady clients in the Sekondi-Takoradi Metropolis?

1.6 Significance of the Study

Most of the published works on garment production was conducted in Western and Asian countries, which are highly automated. In addition, these works focus on Ready-To-Wear (RTW) market sector. The present study is significant because it

examines the custom-made sector of a city in Ghana, a developing nation in Africa that still uses traditional methods in garment production.

The study has also unearthed techniques/skills small scale garment producers adapted to grade patterns and strategies that has been adopted to improve the pattern grading system for clients.

Again, the study has contributed to teaching, research and extension activities by teachers and stakeholders in the area of pattern grading.

The upshot of this study has profited clients since the use of appropriate pattern grading system by garment producers has resulted in fit satisfaction.

Lastly, the findings of this research effort has provided paradigms for grading patterns to trainers since it has facilitated in helping apprentices in learning how to grade patterns in a suitable manner.

1.7 Delimitation of the Study

The study was delimited to the grading of ladies‟ patterns. It covered only small scale garment producers in the Sekondi-Takoradi Metropolis. This implies that large scale producers and grading of males‟ patterns were excluded from the study.

1.8 Limitations of the Study

The study employed mixed method. The shortcomings associated with this design have to do with the complexity in the use of triangulation. The study could be generalized only to the sampled subjects being used. Also the use of observation and interview is quite time consuming. The sample size used seems relatively small. It has the capacity to limit the statistical power of the data. Nevertheless the details given during the interview gave the opportunity for obtaining in-depth information and clarity on the problem under investigation.

1.9 Definitions of Key Terms

Base pattern: A basic design from which *patterns* for many different styles can be developed.

Base Size: It is the master pattern size that is used when grading patterns.

Basic block pattern: It is a pattern from which all other styles are made.

Basic sloper: It is a set of simple pattern pieces needed to make a close fitting garment, with minimum ease added and no seam allowances.

Body shape: A description of the body contours of different types of human figures based on key body measurements.

Critical fit: The body parts where key measurements are taken from such as Bust, Waist and Hip for ladies clothing

Drape: The way a fabric hangs or falls over a three dimensional form.

Fair fit: This is taken to mean a garment that has few fit problems for the wearer

Fit: This is defined as the way clothing conforms to the body.

Good fit: This is taken to mean a garment that has no fit problems for the wearer

Grade Points: The points on a pattern that are used as landmarks for dimensional change on the outer perimeter of a pattern. Grade points are also called cardinal points for grading pattern.

Grading: The process of systematically increasing or decreasing the size of a master pattern to create a range of sizes for the garment.

Master pattern: This is a pattern that is perfected for fit and then used as a basis for other sizes.

Garment producers: seamstresses and tailors who make garments for ladies.

Pattern: A template from which the parts of a garment are traced onto fabric before being cut out and assembled. They are usually made of paper.

1.10 Organisation of the Study

The study has been organised into five chapters. Chapter One is the introduction and it includes the background to the study, statement of the problem, purpose of study, objectives of the study, research questions, significance of the study, delimitation of the study and limitation of the study. Chapter Two comprises the review of related literature. This was conducted under the following sub-headings: patterns used by garment producers, methods of pattern grading, challenges that may occur when grading patterns and ways of managing those challenges in pattern grading. The methodology of the study is outlined in Chapter Three of the study. It describes the research design, population, sample and sampling procedure as well as the research instruments, its administration and data analysis procedure. Chapter Four presented the results and discussions of the data collected to answer the research questions raised to guide the study. The summary of findings, conclusions and recommendations of the study were presented in Chapter Five.

CHAPTER TWO

LITERATURE REVIEW

2.0 Overview

This chapter reviews existing literature related to the problem under study. It highlights the historical developments and theories in the clothing industry. The review covers small scale garment production in Ghana, factors affecting production and sale of garment, pattern making, methods of pattern making, pattern grading, grading systems, types of grading, methods of grading patterns, grading techniques, grading values, female body types and shapes in grading, characteristics of the female body types, sizing systems, standard clothing sizes, choosing the correct size, garment fit, garment fit preference and concerns, garment fit satisfaction, female consumer fit satisfaction and the body, grading of women‟s garment patterns in Ghana, challenges that may occur when grading patterns, and ways of managing those challenges in pattern grading.

2.1 Small Scale Garment Production in Ghana

The enormous contributions of small scale enterprises in the economic growth of Ghana cannot be overemphasized. Today, in Ghana, over 90 percent of registered businesses are in the small and medium scale sectors, which employ over 80 per cent of industrial workers (Kasim, Zubieru, & Antwi, 2015).

During the Fourth Republican regime, various governments have encouraged the development of small scale enterprises as the engine of growth. Following the Economic Recovery Programme of 1983, the Government of Ghana established the National Board for small scale industries (NBSSI), Ghana Regional Appropriate Technology Industrial Service (GRATIS) and International Technology Transfer Unit

[ITTU] (Arthur, 2001). These bodies were mandated to broaden the institutional support for the small scale industries, with the support of Ghana Export Promotion Authority to spearhead aggressive search for marketing channels for Ghanaian manufactured products. These institutions have embarked on entrepreneurship development as a vital promotional tool to strengthen the operations of the sector. Arthur (2001) noted that programmes of these institutions include utilisation of local raw materials, upgrading and application of appropriate traditional technologies, and transfers of foreign technologies, subcontracting manufacturing operations, facilitating and developing internal and external markets for Ghanaian manufactured products through participation in Trade Fairs. Although these businesses are plagued by various constraints such as lack of access to financial credits and competition from external rivals, the sector continues to create jobs and wealth for the people of Ghana (Arthur, 2001).

2.3 Factors Affecting Production and Sale of Garments

Generally, the production and sale of garments are driven by some key factors namely: impact of fashion, inputs (energy and raw materials), economic factors, and aesthetic concerns (Henderson, 2012). Garments produced must look appealing and fashionable to the potential consumers (wearers). Availability of inputs plays a crucial role in production line of garment manufacturers. In line with the aforementioned factors, Stotz, and Kane (2015), in a case study noted that human resource, management of purchasing, management of raw materials, and quality performance hugely determine the success of garment production. For many consumers in the study area, fashion determines what dress to place an order for and when, and how frequently to replace a dress. Fashion has been a determinant factor for demand for specific type of garment (Emery, 2014).

In addition to fashion, economic factors have also influenced the fashion production industry. Since 2012, Ghana has become a low middle level income country (ISSER, 2015). With the prospect of petroleum production in the Western Region (area of study) from 2011 and subsequent attainment of middle income status, higher Gross Domestic Product (GDP) and by extension, higher income levels for prospective buyers of garment. These macroeconomic situations have resulted in increased purchasing power of individuals and business growth for small scale industry including garment production. More so, availability of credit facility (loans) to the small scale industry aid in the expansion of small scale businesses.

2.4 Pattern Making

The development of a garment comprises of different processes. The appearance and fit of the garment are highly dependent on each of these processes. Pattern making, which is one of the earliest steps in the development of a garment, has grown from customization into skilled process of standardization over the century (Monet, 2017). With the help of extensive research, pattern making can be defined as the process of constructing and manipulating flat pieces of fabric to conform to curves of the human figure (Ashdown, 2007). This art of designing the outline of the plan or arrangement for sewing a garment needs to consider different body shapes. Obinnim and Pongo (2015) explained that pattern making is the foundation in garment manufacturing and plays an important role in deciding how the final appearance of a garment will look like. As fashion changes, the ideal body size and shape also change. As a result, pattern making has become a major aspect of the fashion world.

Cooklin (2004) explained that a sketch can be turned into a garment via a pattern which interprets the design in the form of the garment components. Also, Fischer (2010) noted that the designer can render something flat into a two-

dimensional or a three-dimensional process patterns. Again, MacDonald (2010) described flat-pattern as a design process where a basic pattern is developed to fit a standard dress form.

Pattern making involves the design and creation of templates from which clothing can be sewn. Patterns are made of pieces of paper shapes that are traced onto the fabric to be cut, with each individual pattern piece serving as a form for an individual part of the garment to be sewn. Pattern making can be done at home by more experienced sewers, or pre-made patterns can be purchased for home sewing projects (Kumar, 2012). Horlamus (2013) noted that a system of sizes and patterns made it possible to fit the body without resorting to custom-made garments. Dunlap (2010) also indicated that patterns are needed in dress-making in order to obtain a better fit and to save fabric. Aldrich (2008) justified the use of block patterns in the clothing industry because the blocks are constructed to standard (average) measurements for 13 specific groups of people but could also be drafted to fit an individual figure using personal measurements.

A common way to make a pattern at home is to replicate a garment that one already owns. For example, if one has a particular clothing item that has worn out or aged and a replacement is desired, a pattern can be cut from that garment. This often involves taking apart the garment by ripping out the seams and dismantling the item into individual pieces (Kumar, 2012). The first step in pattern making for sewing garment is taking of body measurements. MacDonald (2010) stated that when taking measurements for pattern making, the person should just wear normal underclothes, and if a lady, normal pantyhose and normal bra. Patterns are made of pieces of paper shapes that are traced onto the fabric needed to be cut with each pattern piece serving as a form for an individual part of the garment or item to be sewn (Walsh, 1979).

Sometimes a number of attempts are made in making the correct pattern to achieve the right fit that gets approved at the end (Kumar, 2012).

A garment producer frequently employs one of three pattern creation methods. First, a trial garment called toile, is made to check the proportions and shapes (Armstrong, 2009). Then several fittings are done to perfect the garment before cutting the fabric accordingly. Second, in developed countries, most garments are made using commercial patterns except in few cases where individuals order customised garments. The foundation block is drafted to fit individual figures by using personal measurements instead of standard ones found in size charts. The final sloper can be used in turn to create patterns for many styles of garments with varying necklines, sleeves and dart placements (MacDonald, 2010).

Modern patterns are available in a wide range of prices, sizes, styles and sewing skill levels to meet the needs of consumers. Sewing patterns are again graded, to fit either larger or smaller sizes than the original design. Most original designs are made to fit average, standard or ideal figures. According to Armstrong (2009), the ideal figure is a form or a set of measurements, whose silhouette changes at the slightest whim of fashion. Patterns that are made from an individual‟s measurements are checked for accuracy by cutting out in sample fabrics and the resulting garments are fit tested for accuracy. Pattern sizes are also arranged into marker, which is laid on top of layers of fabric and cut. Once the style fits the customer well and it has been approved by the designer, the pattern of that style becomes a block which helps the dressmaker to develop subsequent generations of patterns from it.

On the other hand, making of industrial patterns began with an existing block pattern that most closely resembles the designer's vision (Monet, 2017). The pattern is first checked for accuracy, then it is cut out of sample fabrics and the resulting

garment is fit tested. Once the pattern meets the designer's approval, a small production run of selling samples are made and the style is presented to buyers in wholesale markets. If the style has demonstrated sales potential, the pattern is graded for sizes, usually by computer with an apparel industry specific Computer Aided Design (CAD) technology (Aldrich, 2008; & Cooklin, 2004). Graded patterns are vetted for accuracy of size and direct comparison in seam lines. After these steps have been followed and errors corrected, the pattern is approved for production. When the garment producer is ready to manufacture the style, all the sizes of each given pattern piece are arranged into a marker, usually by computer. The marker is then laid on top of the layers of fabric and cut. Once the style has been sold and delivered to stores, and if it proves to be quite popular, the pattern of this style becomes a block, with subsequent generations of patterns developed from it (Veblen, 2012).

2.5 Methods of Pattern Making

There are several methods for making patterns. Gavor (2011) and Forster (2014) in their separate works generally identified drafting, draping, freehand cutting, copying, and commercial patterns.

2.5.1 Pattern drafting

Pattern cutting methods include draping, drafting, copying from existing patterns and freehand cutting (direct cutting on fabric). Drafting refers to the direct drawing of patterns on the paper using construction „formulae" based on linear measurements (also known as pattern construction procedure) such as length, and girth. For the basic pattern of custom fit of men"s wear (shirt and trousers), McCall (2011) recommends (for shirt patterns) measurements of neck, neckband, shoulder, chest, centre front length, centre back, back width, waist, arm length, arm

circumference, and sleeve length; for trousers, the required measurements are the waist, seat (hip), high hip, thigh, knee, out-seam (side lengths), inseam, and hemline.

Drafted patterns usually rely on basic master pattern to produce a graded paper pattern for sewing. Using body measurements, a pattern maker converts individual specifics into a series of straight lines and curves on template paper (Holman, 2004). During subsequent stages, those lines and curves determine how the garment is broken down into sections, cut and tested for fit, and ultimately converted to a reusable pattern. Specific methods and stages of pattern drafting vary from pattern maker to pattern maker, depending on each professional's chosen approach, any software used, and if the pattern is intended for eventual mass production (Fairhurst, 2010).

A typical pattern drafter starts with a sketch, drawing, or photographic image of a particular article of clothing. From there, the drafter measures a form or an individual person to facilitate breaking the garment into sections. Trained pattern makers create an initial template, known as a block or sloper, by first drawing straight lines relevant to specific body measurements and then shaping the template using curved lines and further measurements. Fabric is cut from the block to form a trial garment also known as toile (McCall, 2011).

Before the advent of computers, all pattern drafting was done by hand. Today, software helps pattern makers in both industrial applications and in the home sewing industry through automating computations and providing 3-D computer models (Aldrich, 2008). Unlike traditional hand pattern drafting, computerized programmes allow users to input raw measurements, create blocks, and test toiles in a virtual environment before printing and cutting actual pattern templates. It helps to

perpetuate the popularity of hand pattern drafting as part of the creative process (Aldrich, 2008).

Drafting has several advantages, including the ability to design patterns to fit into economical fabric layouts; the possibility of restyling old patterns and out-of-date clothing into new ones; the ease for determining causes of mistakes and how to correct them; and flexible planning for new procedures and efficient organization of work (Knowles, 2005). Direct drafting is a popular method for the industrial pattern makers due to the fact that it has been the most efficient way to produce pattern for mass production (McCall, 2011).

2.5.2 Pattern draping

Draping is the process of positioning and pinning fabric on a standard size dress form to develop the structure of a garment design. It is the oldest method used in pattern making since the 18th century. Currently, it is considered to be an important part in fashion designing. A dress can be draped using a design sketch as a basis, or a fashion designer can play with the way fabric falls to create new designs at the start of the dress design process (McCall, 2011). Tools and equipment for draping include, draped-cloth, dress form, scissors, armhole curve, graduated-square, pins, marking-chalk, pencils, sharpeners, notches, French-curves, foot-ruler, grade-ruler, dark coloured twill tape, measuring tape, hip curve, and sleeve curve are the tools required for draping (Joseph-Armstrong, 2005). The method of fashion draping includes stitching the garment by the use of loosely hanging material to create a flowing effect. Sometimes, basic sloper patterns (master-patterns) are also used to create draped and stylized garments. The fabric is manipulated, moulded, and shaped through the skilful use of the draper/designer's hand, until the design is replicated in three-dimensional form (Cooklin, 2004).

Modern computer technologies have rendered easy ways of draping. The use of software applications such as 2D and 3D CAD-systems enable the designers to prepare a collection more quickly and accurately. The computer applications could influence the drape behaviour of the fabric, the deformational behaviour of fabrics when covering defined surfaces and also technical textiles (Rödel, Schenk, Herzberg & Krzywinski, 2001).

Although draping does not rely on the aid of a pattern to create designs, a draper may choose to incorporate parts of an existing pattern in the preparation of the toile to assist in the drape. This does not minimize the value of either pattern making method, but it does enhance the pattern maker's ability to create design patterns accurately and within time constraints. In modern days women prefer to wear draped style garments. The pattern draping method is used when the pattern maker's skill is not matched with the difficulty of the design (Monet, 2017). In the Ghanaian fashion production industry, draping does not seem to be a popular method of acquiring patterns.

2.5.3 Freehand cutting

Freehand cutting is a method of cutting a style of a garment directly on the fabric without the use of a paper pattern. The fabric is marked with chalk based on the measurement and cut directly without the use of a paper pattern. While using the freehand cutting and there is a mistake, the fabric will be wasted. Mac Donald (2010) maintained that freehand method of garment construction is time consuming and slow, therefore cannot be conveniently used for mass production. Mostly, freehand cutting has resulted to unfitted garments and quarrels among dressmakers and their clients, leading to a lot of people to prefer RTW and second-hand garments. Also, this

has made the budget for clothing to increase for most individuals thus affecting the output of the tailoring institutes (Chattaraman & Rudd, 2006).

2.5.4 Copying from patterns

Copying from patterns involves unpicking the seams in a garment to get the sections in pieces. Sections are then placed on paper for tracing out. Traced sections are cut out to obtain patterns (Forster, 2014). The pattern process involves pinning patterns (copied) on fabric and tracing each seam by poking through the seam and the paper beneath with a needle, or next to it with a pencil if it‟s on an edge, leaving a row of holes in the paper. Further, the holes in the pieces are traced out to create new pattern outline with seam allowances. Testing with toiles is the final stage.

2.5.5 Commercial pattern

Commercial patterns are full-scale tissue paper patterns used by the home-sewer to create garments and accessories. Forster (2014) indicated that commercial pattern makes garment production easy for both experienced and inexperienced garment producers to make garment. Commercial patterns save time and prevent frustration. Again, they may give a better fit than a home-made or drafted pattern if one is inexperienced. Those ready-made pattern tissues come with instructions for placing and cutting and further explained the steps involved in using the patterns to cut out the garment, transferring patterning markings and constructing the garment. They are placed on fabrics for cutting out and sewing (Forster, 2014). However, commercial patterns are said to be expensive and good patterns for different types of garments are not readily available on the market (MacDonald, 2010). Although commercial patterns are not commonly seen on the Ghanaian market, most garment producers do not seem to prefer using them in garment production. In conclusion,

competence in pattern cutting is a major factor in the production of well-fitting garments.

2.6 Pattern Grading

Significant confusion still surrounds grading of women‟s garment patterns despite decades of research on the subject. For the case of Ghana, a possible reason for the lack of consensus is that until recently garment producers and vendors had complete monopoly over what was available on the market. Currently, with globalization and the inherent shifting of power, consumers set the terms for what is to be produced by whom, where, when, and at what price (Dunlap, 2010). Further, changes in technology, coupled with shifts in social and cultural influences produce patterns which reflect the fashion and demands of the market (Emery, 2014).

Dunlap (2010) proposed four valid arguments as to why the grading patterns of ladies‟ garments are varied. On one hand, the modesty theory maintains that clothing was originally worn to conceal the genital organs in order to prevent shame, embarrassment, or some other form of sexual self-consciousness. According to this theory, sizing and fit were the prime purpose of neither the dressmaker nor the consumer. An ill-fitting dress will serve the same purpose of covering as a fitting one. However, it has become more refined that modesty and fashion have become more of concern these days.

Also, the immodesty theory of Ellis (2012) contended that the intent and purpose of clothing in the beginning was for designing to attract attention to sexual organs. This practice bred indifference manner in the choice of what garment to sew and to wear. The prime motive of both dressmaker and wearer was to increase interest in pretended or partial concealment of the bust, waist and hip. Dresses in that category included halter dress, tube/bandeau dress and bodycon dress, and slit dress.

On the other hand, Dunlap (2010) adornment theory holds that clothing begins in the wish for attracting attention, and or secure superiority, but not necessarily promoting act of sexual sort. The prime motive of clothing, according to this theory is conspicuously ornamented. This theory contends that sizing and fitting are the most important concern of garment producers and consumers. Finally, the utility or protection theory presumes that clothing had its original attempt of protecting the body from harmful or unpleasant features of the environment (Henderson, 2012).

Despite the fact that globalization and technology have made it possible to fuse clothing styles, the forms and functions of ladies‟ garment, patterns are also influenced by cultural practices, social laws and customs (Dzramedo, 2011). Also, the uniqueness of clothing lies in the fact that it communicates about the wearer. Again, Henderson (2012) opined that different pattern grading methods for different body shapes are the most favourable practice for garment production. Other studies recommended that the standard sizes and measurements method for pattern grading in line with body shapes should not be limited to mass production alone but be extended to custom-made production as well (Cooklin, 2004). Wijendra (2014) went further to produce grade rule size chart for misses (Appendix I) Pattern grading for misses with size eight for example, are graded by adding one inch/2.5cm to the measurement of

their bust, waist and hip. On the other hand, misses that fit size 16 should be graded by adding 1.5 inches/3.8cm to their bust, waist and hip measurements.

On the contrary, in a study of contemporary grading of female skirt using anthropometric data method in Slovenia, Podbevšek (2014), found significant difference in the anthropological measurement of waist-to-hip and those measurements obtained from the tables of the contemporary standard systems. More significantly, the range of measured waist-to-hip distances in each size group was substantial. He concluded that measurement tables and basic block patterns in the industry are already established and fixed, but they are not necessarily the best reflection of the body dimensions of their target market groups. Podbevšek (2014) further recommended the use of traditional measurement instead of the standard size for the manufacturing of women‟s garment for the local Slovenians.

In a survey by Daanen and Reffeltrath (2007) to gain understanding of body proportions and dimensions in young Indian women and men, it was shown that only 20% matched the dimensions of „average figure“ while the remaining 80% did not match their dimensions. Most sizing systems used today could be faulty as they usually depend on a sort of mathematical precision and increments due to the fact that human bodies do not always follow definite shapes and sizes.

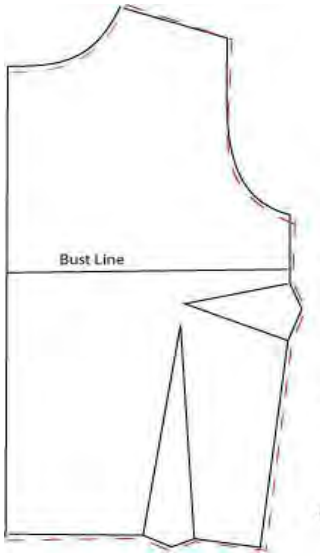
A third dimension of the argument was provided by Schofield (2007) as they tested the assumptions and outcome in an anthropometric survey compared contemporary and traditional grading rules and found that using the traditional assumptions for sized Ready-to-Wear (RTW) garments do not reflect the actual measurements and proportions of the human body.

In Ghana, most studies on grading patterns are focused on that of Europe and America. There is generally, insignificant information on history and development of

grading patterns of women‟s garments in Ghana. The lack of this historical knowledge partly affects modern trends in the small scale garment production industry (Dzramedo, 2011). This phenomenon of insignificant empirical studies on the local garment industry could be attributed to high dominance of small scale and custom-made garment producers in the industry.

2.7 Grading Systems

Grading is the process used to create sized patterns (Schofield & LaBat, 2005). In other words, it is the process used to accomplish the sizing of manufactured clothing (Schofield, 2016). Some researchers describe grading as the process of systematically increasing and decreasing the size of a master pattern to create a range of sizes (Wijendra, 2014; & Mullet, Moore, & Young, 2009). Pattern grading can be performed manually or automatically by a computerized system. Patterns are graded according to size charts which present the sizes and the average measurements of the population group for which the garments are intended (Aldrich, 2008). A grading system specifies both the distribution of the grade within the pattern block and the total grade (Mullet, Moore, & Young, 2009). The amount of inches (centimetres) required can be 1inch (2.5cm.), 1.5 inches (3.8cm.), or 2-inches (5.0cm.) and this is used between specific sizes (Aldrich, 2008). A general example of grading pattern is shown in Figure 1 (p. 25). The upper part of the figure depicts the upper part of the garment while the lower part depicts the down part of the garment. The sketch shows the base size with the broken lines being the graded part.



Grading a pattern –

The dashed line represents the larger size. The pattern is lengthened by 1/4"" at the waist, widened ¼"" at the side, and the armhole and neckline are scooped out to make them a bit larger.

Figure 1: Grading pattern

Source: (Bye, LaBat, McKinney, & Kim, 2008)

The purpose of grading is to proportionally increase or decrease the size of a pattern while maintaining shape, fit, balance, and scale of style details (Simplicity Pattern Company, 2009). In order to maintain such proportions, a designer needs to have established grade rules. Unfortunately, grade rules vary from company to company and from one dressmaker to another. Grade rules may also change depending on the fabric. For example, the grade rule for the neck opening for a knit top may be different for the neck opening for a woven top. It is important therefore, to take into account that knit will stretch more than woven and therefore, may require different rules (Gavor, 2011).

Again, one company may grade the sample size"s waist measurement up 4cm to make a size 6 to become a size 8, while another company may grade the sample size"s waist measurement up 3cm to make a size 6 to become a size 8. Since there is no apparel industry standardization, manufacturers and designers have the opportunity to decide how their production patterns are graded. They determine their standard sample measurement as well as their specific grade rules (Ashdown, 2007).

Today, most pattern companies and clothing manufacturers use size 10 as the starting point for a pattern design, and then grade the pattern up or down to different sizes (Horlamus, 2013). If a pattern size that is smaller or larger than the range in which the pattern has been made is required, it can easily be graded up or down to the pattern to suit the need. Grading alters the overall size of a design, but not its general shape and appearance (Eberle, Hermeling, Hornberger, Kilgus, Menzer & Ring 2002). Different techniques can be adopted for grading and can change only the pattern size; it cannot alter the pattern for a personalised fit. Therefore, grading is suitable for those who require patterns smaller or larger than the regular size pattern range.

Mullet, Moore and Young (2009) noted that although grading of patterns is meant to make garments fit, it is not always so. Garments fit the wearer differently when different grading systems are used. They concluded, therefore that grading does not improve fit and it is recommended that no more than two sizes should be graded from a fitted sample size. However, grading is done to save time and money in the development of other sizes from one sample size. Grading systems are developed to translate the body changes from size to size to corresponding pattern pieces (Solinger, 2010).

2.8 Types of Grading

Aldrich (2008) stated that there are two types of grading, including Individual size grading for the bespoke trade, and Standard size grading for mass production. Individual size grading is the type with which grading is made to a selected standard size. The individual size is graded by (a) using graphic options in the pattern design menus; and (b) using alteration codes applied at specific places.

Standard size grading for mass production is the science of grading that goes hand-in-hand with the advent of commercial patterns and the mass-production of

pattern-built clothing about 150 years ago (Handford, 2003). The standard size grading is obtained by using instructions to draft the pattern shape which are held in the computer memory. The body pattern on a digitizer works as an electronic grid and records special points around the shape by means of a cursor (Scofield, 2016). She explained that the cursor button is pressed to send signals to the computer which are translated into a numerical record of the shape and information for the piece. Once the basic shape is acquired its significant features and grading information is stored in the computer memory and a range of sizes can be graded and plotted out onto pattern paper or used to construct lay plans for production markers.

Sewing patterns were earlier on made to fit an individual (Camp, 2011). According to Camp (2011), one size was created by measuring various parts of the individual's body. The key parts of the individual's body that were measured are the bust, waist, and hip. Solinger (2010) indicated that the pattern pieces are made of cut out papers. The patterns did not include directions for orienting the pattern pieces on fabric, nor did they identify what part of the garment each piece represented. Solinger (2010) added that re-sizing or grading the pattern was a complicated task for even the most skilled seamstress.

2.9 Methods of Grading Patterns

Pattern grading is an essential part of pattern making. In creating additional sizes from a single style, garment makers grade the master pattern or base size (Mullet et al., 2009). They further pointed out that pattern grading is the manipulation of the two dimensional pattern or flat pattern into multiple sizes. This is done for speed and simplicity and the grading rules determine how patterns increase or decrease to create different sizes. They added that grade rules are developed keeping in view the market

segment for which the product is intended. Further men, women, youth, child, toddler, and fabric type also influence the pattern grading standards.

Although many small firms still use traditional grading method, grading is becoming increasingly computerized (Handford, 2003). Using a Computer Aided Design (CAD) system, the pattern can be resized according to a predetermined table of sizing increments (grade rules). The computerized plotter can then print out the pattern in each size. The productivity gains are so great that small to medium-sized manufacturers are beginning to acquire their own CAD systems for grading (Handford, 2003). Alternatively, some of them may resort to outside grading service at a fee to perform the computerized-aided grading functions.

The traditional grading practices distribute the changes in body dimension to point on the pattern perimeter that are called cardinal points or grade points (Schofield & LaBat, 2005). They posit that grade points relate to individual body measurements or size specifications and most often when grading, a large range of sizes are derived from a single pattern. Schofield and LaBat (2005) said after grading the pattern, each pattern size is checked to make sure that the seam lines that sew together are the same length. The disadvantage of this practice is that patterns extended beyond more than two sizes from the base size may lose the visual effect presented in the base size (Bye & DeLong, 1994). For example, a base pattern of size 6 may be graded in a large range to size 22. Wijendra (2014) recorded three basic methods of grading including cut and spread, pattern shifting and computer grading. However, no one method is technically superior as all are equally capable of producing a correct grade.

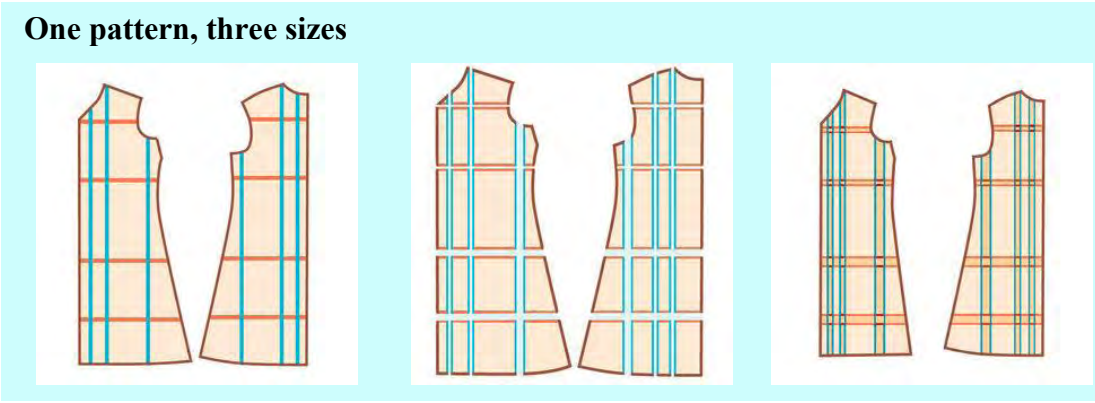


Figure 2: One pattern, three sizes

Source: "Pattern in threads""magazine (p.66) (2008)

1. Cut-and-spread method: This is the basis of the other two methods. The dressmaker cuts the pattern and spreads the pieces by a specific amount to grade up, or overlap them to grade down. No special training or tools are required in this process; just scissors, a pencil, tape, and a ruler, (Bye, LaBat, McKinney, & Kim, 2008).
2. Pattern shifting: This is the process of increasing the overall dimensions of a pattern by moving it a measured distance up and down, left and right (using a specially designed ruler) and redrawing the outline, to produce the same results as the cut-and-spread (Bye *et al*., 2008).
3. Computer grading: Pattern grading on the computer is accurate and efficient. This is the method used almost exclusively by larger firms in the industry (Ashdown, 2007). However, these days, home computer software is available on the market and smaller firms use them to check the accuracy of the grades (Wilson, 2005).

Before the pattern can be graded on the computer, the pattern piece is entered into the computer by digitizing the cardinal points of the perimeter of the pattern on

the Cartesian graph. The process begins by establishing the (0, 0) cardinal points of reference. Most changes within a pattern piece are fractions of an inch. Digitized pattern pieces can be viewed on the computer screen, and the grade rule assigned to each cardinal point determines the movement of the cardinal point during the grading process (Ashdown, 2007).

In making the grades, the pattern producer guides a cursor around the edges of the sample pattern on a digitized table. At each of the key points, a button is pushed to record a grade point. Each point is cross referenced by a pre-programmed grade-rule table stored in the computer, which enlarges or reduces the pattern automatically according to the predetermined direction or location (Kumar, 2012). Then the computer can store and/or print out the pattern in each new size.

2.10 Grading Techniques

The types of grading techniques identified include draft grade and track grade. First, draft grading applies when the pattern is returned to its original block form or when the increment is applied to the actual pattern draft (Fischer, 2010). This results in the entire size range being superimposed on top of another and can also be described by the term 'Nested'. The individual pieces of pattern for each size are then picked or traced off onto card. A draft grade can be either two or three dimensional. The three dimensional draft grade is considered to be the ultimate method for applying grade increments (Fischer, 2010).

Secondly, track grade is used when grade increments are applied to individual pieces of pattern by moving the base pattern pieces along with the predetermined tracks. Making the pattern section-by-section and thus altering its size. This system is usually two dimensional but can be adapted to a three dimensional system with difficulty (Cooklin, 2004).

2.11 Grading Values

Ashdown, Loker and Rucker (2006) identified four values of grading which are cross or width grades, mixed grade, increment values and relative grading and incremental grading. Cross or width grade is where the body increases or decreases occur between sizes and how those changes affect the grade at the cardinal points of a pattern piece. The simplified pattern grading system is based on the assumption that all changes occur equally around the body. The bust, waist, and hip are the three primary body girth measurements applied to pattern grading (Ashdown, Loker & Rucker, 2006). Generally, the amount of total body girth change is the same for the bust, the waist, and the hip. This difference assigns the amount of grade for the garment and is referred to as a uniform grade. If the change in all three body areas is one inch, then the pattern has a one inch grade.

Secondly, mixed grade occurs if the change in measurement of one of the three body areas, such as the waist, hip and bust is proportionally different from that of the others (Ashdown, Loker & Rucker, 2006). In a mixed grade, each area is assigned as having its own grade for instance the, bust of two inches (5.0cm) grade; waist of 1.5 inches (3.8cm.) grade; hip of two inches (5.1cm.) grade. Since the change in girth measurements varies between sizes generally one inch, 1.5 inches, or 2 inches, these areas are selected as variable grades. Dimensions for length grades do not tend to vary between sizes therefore, they are usually designated as standard grades (Ashdown, Loker & Rucker, 2006). Though the primary body measurements indicate the total increase or decrease of the pattern dimensions, the grading system used determines how the total change is distributed within the pattern piece. The grading may be accomplished through manual, machine, or computer grading techniques (Ashdown, Loker, & Rucker, 2006).

Incremental sizing intervals have a constant value that is applied to all sizes in the size chart. On the other hand relative sizing intervals have different values for each of the three grade breaks (Schofield, 2007). With increment values, positive or negative adjustments are made to the base (master) size depending on the required size. Positive adjustment can be made to the base size when the required size is bigger than the base size. The inverse is true where negative adjustment is made for sizes smaller than the base size.

Grade rule tables may be written using either relative or incremental grades for both manual and computer grading. In the relative grading method, grade rules reflect the changes in the pattern dimensions from the master size to each of the graded sizes; that is, all changes are related to the master size. In the incremental grading method, the grade rules reflect the change from the adjacent size; that is, they give the increments of change for only one size. These increments remain constant for all areas that reflect a standard grade but change for variable grades. The variable grades are constant for one inch grades, for 1.5 inch grades, and so on, with changes occurring only when the total girth grade changes (Arnold & Reynolds, 2003).

2.12 Female Body Types and Shapes in Grading

Different body types and shapes are seen among females. The differences are accounted for by several factors. Among the factors is genetics. According to Camp (2011), body types are largely dependent on genetics. Some people have body types and shapes which are reproductions of their parents. A person‟s body type, be it ectomorph, mesomorph or endomorph, is a factor of their parents‟ body type (Kumar, 2012).

However, many other people fall into combinations of these categories. Kumar (2012) explained that an ectomorph has a lean and angular body shape, long limbs,

slender, slim, narrow waist. Ectomorphs can lose weight easily and have lower levels of body fat but find it more difficult to gain lean muscle mass. On the other hand, a mesomorph has a strong athletic body type, muscular build, well-developed shoulders and slim hips. Mesomorphs have a faster metabolism than other body types and can lose weight and gain muscle mass easily. The endomorph is a round body shape, short and tapering limbs, larger boned than other body types. They have plump/stocky appearance, usually with round faces, large thighs and hips, small hands and feet and high waist. Endomorphs have higher levels of body fat than other body types, but they can also easily build muscle. Weight loss is difficult.

Whitt (2010) categorised female body shapes into one of four elementary geometric shapes: banana, apple, pear, and hourglass. Also, Dabbs and Dabbs (2000) identified the female body shape as Lean or Column, Rectangle, Apple or Inverted Apple, Inverted Triangle, Neat Hour Glass and Full Hour Glass (Appendix J, p. 122). Furthermore, Karen (2003) proposed six basic body frames, which intercept with the body shapes. On the other hand, some women, for instance one with a round stomach might not be able to identify her group. Karen (2003) identified nine dominant body shapes. However, this study was based on Rasband and Liechty‟s (2006) eight body shapes: Ideal, Triangular, Inverted Triangular, Rectangular, Hourglass, Diamond, Tubular and Rounded (Appendix J, p. 122).

2.13 Characteristics of the Female Body Types

Ideal Body Shape portrays the first image Appendix J (p.122). The Ideal figure shape is rare. They are average in weight with similar width in the shoulders and hips. They also have medium bust size and small waist with flat to slightly curved abdomen. More so, they have moderately curved buttocks and slim thighs. The ideal body is well balanced with no exaggerated area present. The shape is made up of

proportional areas that are harmonious or pleasing to look at in length and width. The ideal body shape was rarely seen in the study area.

The Triangle figure shape is the second from left on the Appendix J (p. 122). It is also referred to as pear shape**.** Triangle figure appears narrower in the shoulders and wider in the hips-thigh areas. It often has smaller to medium bust or chest and waist. In addition, it is narrower in the back and rounder in the buttocks. Generally, triangles have straight body lines above the waist with curved lines below. According to Rasband and Liechty (2006), the triangle body shape has hips which are proportionately wide and rounded. The triangular body shape appears unbalanced from top to bottom and more weight carried below the waist. For this body shape, the hip measurement is greater than the bust measurement; the distribution of fat varies, with fat tending to deposit first in the buttocks, hips, and thighs. Women of this body type tend to have a relatively larger rear, thicker thighs, and a small bosom. As body fat percentage increases, an increasing proportion of body fat is distributed around the waist and upper abdomen (McCormack, 2005). Based on its outlook, Karen (2003) referred to this shape as the "A Frame." These individuals carry extra weight in the lower region of the body, mainly in the hips, thighs and buttocks, while their waist and bust are small; thus balance needs to be met by widening the shoulder girth and the back.

Inverted triangular body shape, the third on Appendix J (p.122), is referred to as apple or cone shape. The women of this body shape have the appearance of being heavy or wider above the waist and smaller or narrower below. The shoulder area is comparatively wider than the hip area and the legs are proportionally long (Rasband & Liechty, 2006). The apple shaped woman tends to have broad shoulders and narrower hips. They also have slim legs/thighs, while the abdomen and chest look

larger compared to the rest of the body. They often have larger bust or chest, wider in the back, and flatter in the buttocks. Generally, they have curved lines above the waist and straighter body lines below. Fat is mainly distributed in the chest. Karen (2003) described this shape as the "V Frame" with shoulders that are two or more inches wider than the hips. She further suggested that balance needs to be met by bringing the lower body up to speed with the upper body.

The Rectangle figure shape fourth on (Appendix J, p. 122) is the type of shape that has average weight with its height and it appears to be almost the same width at the shoulders, waist and hips-thigh areas - nearly straight up. Rectangle body shape is characterized by not having a clear defined waistline (Rasband & Liechty, 2006). The bust is small to medium, and the figure is balanced top to bottom. It has little to no defined waist curve or indentation.

Hourglass figure type shows two opposing triangles. This body shape appears larger or full-rounded in the bust area and hip area. It is proportionately very small in the waist. The hip and bust are almost of equal size with a narrow waist. This body type enlarges at the arms, chest, hips, and rear before other parts. Body fat distribution tends to be around both the upper body and lower body. According to Karen (2003), the „X" frame is said to be the perfect figure for modelling due to its proper height and weight for their body; bust and hips are the same size with waist being 10 inches smaller. Females with such shape are considered to be genetically gifted. The Hourglass figure type may be considered the feminine ideal by some, but it presents real fitting problems (McCall, 2011).

The Diamond figure type is much wider in the midriff and waist areas. They have narrower shoulders and hips-thigh areas with a high hip curve and slim legs. The bust or chest and buttocks sizes vary but they are often smaller (Rasband & Liechty,

2006). They may also have several rolls of flesh in the midsection of the body that protrude away from the body at the waist area, and the waist is undefined. The bottom may be smaller and legs are proportionately thinner.

The Tubular figure type, the seventh on (Appendix J, p. 122), depicts those female figures that are slim to thin and below average weight range for their height. They generally have straight body lines and bony angles. They have few obvious curves. The tubular body shape is described as a body shape similar to the rectangular body shape, only thinner because weight is considerably below the ideal range (Rasband & Liechty, 2006). This body shape appears more nearly straight up and down with comparatively narrow shoulders and hips; small bust, waist and buttocks; and thin arms and legs. McCormack (2005) reported that the rectangular body shape normally has waist measurement less than 25 percent smaller than the shoulder or bust measurements and the waist measures from one inch to eight inches (1″ to 8″) smaller than the bust. The body fat is distributed predominantly in the abdomen, buttocks and chest. This overall fat distribution creates the typical ruler (straight) shape (Whitt, 2010). For Karen (2003), the measurements of chest, waist, and hips of this ruler-like body frame are fairly equal. Such ladies are lean, have high metabolism, and do not gain weight very easily.

The Oval or Rounded figure type, which comes last on (Appendix J, p. 122), has oval body shape is also referred to as an apple shape. It appears full-round all over. Typically, the upper back and upper arms are larger and rounding. The oval or round body shape is generally above the average weight range for their height. The bodies of females of this kind have large frames and their body lines are full-rounded curves. Generally, they have wider back and waist (Karen, 2003). According to Rasband and Liechty (2006), the oval body shape, has an overall appearance of being

round at the waistline. The bust, midriff, waist, stomach, hips and upper legs are larger and round, and the waistline is undefined. This figure has average height or is shorter, large busted, has thin legs. An individual with an oval body shape may also have rolls of flesh in the midsection in comparison to the rest of the body. In other words, this figure type gains weight in the midsection (Laitala, Klepp & Hauge, 2011).

Joseph-Armstrong (2006) observed that most apparel fit problem arise because mostly, women‟s garments are designed to fit the ideal body shape. Meanwhile, women with other body shapes may experience problems due to anatomical differences between the ideal body shape and the other four body shapes (Lee, 2006). Understanding of the physical differences among body shapes is essential to the design and sizing of apparel, because the differences in the body shapes pose difficulties to dressmakers in terms of fit measurement (Alexander, Connell & Presley, 2005).

The differences in body shape often determine how a garment hangs on a figure, how comfortable that garment is and ultimately, how that garment is perceived to fit by the consumer. For emphasis on the importance of body shapes in the fashion industry, Camp (2011) posited that clothes which will flatter females best will depend on their body shapes. According to Chen and Swalm (1998), clothing companies still use measurements based on the old National Bureau of Standards (NBS) (1942) without recognition to changes in the female body shape over the years. They argued that though consumers may have similar body measurements, their shapes may be different because consumers reflect a variety of body shapes and sizes.

Today the choice of clothes is so varied that there's something for everyone no matter what the shape. Wearing the right clothes is not about following the latest

fashion trends; it is about choosing what actually suits one and what makes one feel comfortable and confident. Horlamus (2013), stated that dress must follow the body of a woman, not the body following the shape of the dress. That means that a female must know her basic body shape and understand the types of clothes that will bring out her good features such as shape, scale, proportions, colouring, personality and life style while minimising the less perfect bits such as rectangular or diamond figure shape. However, the problem with understanding one‟s body shape is that most women focus on specific areas that are problem zones such as the tummy, arms, hip, thighs which can cloud their judgment when it comes to seeing the whole picture (Dabbs & Dabbs, 2000). They further advised that it is important for females to view themselves on the whole so that they can define their body shapes.

Body types largely influence the grading of garments. Each of the three body types, ectomorph, mesomorph or endomorph, matches a different grading pattern and corresponding sizes (Daanen & Reffeltrath, 2007). Garment producers need to consider the body type of their clients in order to produce garments to fit them. The situation is not different from Ghana. Studies by Adu-Boakye, Power, Wallace, & Chen, 2012; & Forster & Ampong, 2012 indicated that different body types and shapes as exhibited through anthropometric, are determining factors for grading of patterns. Female body shape has to do with the cumulative product of a woman's skeletal structure and the quantity and distribution of muscle and fat on the body (Rasband & Liechty, 2006).

On the contrary, Horlamus (2013) posited that the female body has rather been focused as a source of aesthetic pleasure, sexual attraction, fertility, and reproduction in most human societies. These societies have given acceptance to what they consider as an ideal or preferred body shape, both for attractiveness and for

health reasons. Petrova (2007) and Ashdown (2007), reported that consumers with different body shapes might perceive clothes negatively if they have to try many different sizes from mass production clothes. They further recommended that developing a sizing system that does not have too many sizes or too few will be optimum.

2.14 Sizing Systems

Sizing is an aspect of garment quality that determines good fit. Accurate sizing of a garment plays an important role in garment or clothing fit (Brown & Rice, 2001; Kinley, 2003). Fitting is adjusting design to human figure. This depends on several body measurements like waist, hips, length of shoulder and measurements of other parts of the body, depending on the design requirements, which are generally termed as garment size (Khamsi, 2014).

Sizing system is defined as a set of sizes derived using common assumptions and methods of development. The size categories within a system are the various groupings of sizes as they are presented in a retail situation (Ashdown, 2007). She further stated that clothing that fits the population is a critical issue for any designer and manufacturer of apparel; hence she provided a range of sizes to fit the population. Examples of size categories include misses‟ sizes, petite sizes, and plus sizes. However, consumers are discontent with the use of these systems because size designations are not accurate enough to find fitting clothing, and different sizes are poorly available (Ashdown & Loker , 2010). In particular, large women, very large women, hunchbacks, and women with limb deficiency syndrome experience less priority in clothing stores and have more difficulties in finding clothes that fit (Laitala, Klepp & Hauge, 2011). Women‟s dressing requires finding clothes that fit the body and the way they look, as well as the society and occasions to which they belong

(Entwistle, 2000). The fit of a garment contributes, among other things, to the confidence and comfort of the wearer and is therefore important to consumers (Petrova, 2007).

2.15 Standard Clothing Sizes

In sewing and fashion design, clothing size refers to the label sizes used for garments. Prior to the inception of clothing sizes in the early 18th century all clothing were made to fit individuals by dressmakers in homes (Horlamus, 2013). It can be observed that the range of human body dimensions was relatively small. For centuries, obtaining fashionable clothing that also fitted properly was difficult to do, but the wealthy in societies hired tailors and professional dressmakers to sew custom-fit garments for them and their families (Kumar, 2012). Innovations in the pattern industry since the late 19th century included the development of different product style lines, and the addition of designer lines based on the pattern of a couture creation (McCall, 2011).

Between 1949 and 1952, the National Institute of Standards and Technology (NIST) (formerly National Bureau of Standards [NBS]) reviewed the results of an earlier study in 1941, of 15,000 women‟s sizes published in USDA Miscellaneous Publication. Eventually the institute came up with sizes that would fit the greatest number of women without requiring alternations (Rangnath, 2008). These were distributed by NBS to the garment industry in 1953. It was formally accepted by the industry in 1957, and published as Commercial Standard (CS). The size recommendations combined a figure for bust ranging in even sizes from 8 - 38, figures for height were: T (tall), R (regular) or S (short), and a symbol for hip girth: slender (-), average (no symbol), or full (+). For example, a short woman with a size 12 bust and slender hips would wear a size 12S-. A woman‟s size would place her

into one of four wider classifications: misses, women‟s, half-sizes (for short women), or juniors (Khamsi, 2014). The Commercial Standard was designed as a trade custom rather than as a law, and the clothing industry had a choice whether to follow the guidelines or to continue making clothes based on their own arbitrary measurement systems. Europe and America over the years have accepted and adopted the sizing standards of NIST (2004). Tables 1, 2, and 3 depict some of the standard sizes for Europe and America.

The UK standard is taken in perspective as far as this study is concerned. In relation to Table 1, the standard sizes derived for using measurements for bust, waist and hip are presented in Table 2. Tables 1 and 2 represent Women‟s sizes (UK‟s Standard Size measurements) and Women‟s sizes (American Standard Size measurements) typical measurements which are different.

Table 1: Clothing - international single-size conversion

UK	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
US	00	0	2	4	6	8	10	12	14	16	18	20	22	24	26
EU	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
IT	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62
AU	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
RU	36/38	38	38/40	40	42/44	46	48	50	54	58	60/62	64	66/68	70	72/74

Source: ASOS (2014)

UK: United Kingdom

US: United States

EU: European

IT: International

AU: Australia

RU: Russia

Table 2: Women's sizes (UK's Standard Size measurements)

Size	Bust		Waist		Hips	
	Inches	Cm	Inches	Cm	Inches	Cm
4	31	78	24	60	33	83.5
6	32	80.5	25	62.5	34	86
8	33	83	26	65	35	88.5
10	35	88	28	70	37	93.5
12	37	93	30	75	39	98.5
14	39	98	31	80	41	103.5
16	41	103	33	85	43	108.5
18	44	110.5	36	92.5	46	116

Source: ASOS (2014)

Table 3: Women's sizes (American Standard Size measurements)

Dimension/Size	34	36	38	40	42	44	46	48	50
Bust	38	40	42	44	46	48	50	52	54
Waist	30	32	34	35.5	37.5	39.5	41.5	43.5	45.5
Hip	39	41	43	46	48	50	52	54	56
Back-waist length	17¼	17⅜	17½	17⅝	17¾	17⅞	18		

Source: US standard clothing size (2014)

2.15.1 Choosing the correct size

Women have varied body sizes and therefore, choosing the correct size when sewing their dresses is very important in the fashion industry. McCall (2014), stated that before a dressmaker selects a pattern size from the Standard Body Measurement Chart, the dressmaker should do the following:

1. Measure the body: Only basic body measurements are needed to determine the pattern type and size. The person should wear proper undergarments and shoes when being measured. Also, the dress maker should make sure the tape measure is held snugly and firmly (not tightly) against your body and is always parallel to the floor for circumference measurements.

2. Select the size category: The dressmaker then compares the height and body measurements of the person to the measurement charts to select the size category.
3. Select the pattern size: Pattern size is determined by the circumference (width) measurements. Again, reference is made to the Measurement Charts to select the size corresponding to the bust, waist and hip measurements closest to your measurements. The following are some of the tips to help dressmakers and women to select size easily:

i. For dresses, blouses, tops, vests, jackets, and coats, the dress maker has to select size to correspond with the bust/chest measurement. Adjust the waist and/or hip, if necessary. If there is more than 2 inches (5cm) difference between the bust and chest measurement, the dress maker has to select pattern size by the chest measurement, because better fit can be achieved through shoulders, chest and upper back; the bust can be adjusted if necessary (McCall, 2014).

ii. For skirts, pants, shorts, and culottes, the dressmaker has to select size to correspond with the waist measurement. The hip can be adjusted if necessary. If the hips are much larger than the waist, the dress maker has to select the size closest to the hip measurement and adjust the waist (McCall, 2014).

iii. When purchasing a pattern that includes a blouse, jacket, skirt and/or pants, one has to select size by his/her bust/chest measurement and adjust the waist and/or hips if necessary.

iv. If the measurements fall between two sizes, the person has to consider her bone structure. If she is thin and small-boned, she has to choose the smaller

of the two sizes. If she is larger boned, she should choose the larger size. Personal preference may also influence the size selection depending on whether she prefers a looser or a closer fit.

v. For maternity patterns are selected according the measurements before pregnancy.

2.16 Garment Fit

Garment fit cannot be underestimated in the fashion and clothing industries. Song and Ashdown (2010) reported that garment fit has long been of interest in clothing research because it is considered a crucial element of clothing quality and customer satisfaction. While the majority of studies on garment fit focus on various designer-mediated perspectives a small number of researchers have focused on fit from the consumer perspective (Plutt, 2011). Many researchers have defined apparel fit in multiple dimensions as Workman and Lentz (2000) who defined fit as the way a clothing item conforms to the body. A garment with a good fit ought to conceal the wearer‟s figure faults, compliment the body and provide well-balanced proportions (Tate, 2004). Further, Fan, Yu and Hunter (2004) maintained that, good fit depends on fashion trends, standardized sizes in the fashion industry and individuals‟ perceptions of fit. From these definitions, it could be observed that, the fit of clothes is closely linked to the body dimensions incorporated in the basic pattern blocks of the clothes, while every production of garments requires the development of corresponding patterns (Plutt, 2011).

2.17 Garment Fit Preference and Concerns

Fit preference is defined by each consumer as to how they want a particular garment to conform to the shape of their bodies (Manual, Connell & Presley, 2012). Consumers perceive clothing fit from two perspectives: the visual (when looking in a mirror or looking down at themselves and the tactile (when feeling the clothing as they wear it) (Manual, Connell & Presley, 2012). LaBat (2007) added that consumers‟ perceptions of clothing fit could be examined from two points comprising nominal and operational viewpoints. Nominal fit is the degree to which the clothing differs from the body. Operational fit is evaluated by using standards and concepts of fit. It must be noted that while operational fit has not been examined by researchers, nominal fit has been extensively used in studies of fit preferences to shed light on the degree of difference between clothing and body and consumers and the physical body dimensions and shapes (Pisut, & Connell, 2007; & Plutt, 2011).

Also, two scales have been designed to measure consumers‟ preferred fit. These are: (1) a fit preference scale (Anderson, Brannon, Ulrich, Presley, Worondka, Grasso & Stevenson, 2000) and (2) an aesthetic attribute preference scale (Chattaraman & Rudd, 2006). A good number of studies have used the fit preference scale, which measures consumers‟ preferred fit using line drawings to represent six separate garment categories specifically jackets, skirts, dresses, tops, jeans, and pants. Three different scales that measure the above articles of clothing are: fitted, semi-fitted and loosely fitted (Alexander, Connell & Presley, 2005). The aesthetic attribute preference scale, depends on measuring the top half of a woman‟s body and the lower half of a woman‟s body at seven preference measurement sites namely; top length, top silhouette, sleeve length, neckline, bottom length, bottom silhouette, and waist (Chattaraman & Rudd, 2006). Plutt (2011) has used this scale in a published study

that measured plus-sized women‟s clothing fit preference. Other studies on fit preference have detailed that consumers‟ fit preference is affected by many factors. These factors include: body image, body cathexis, and personal comfort preference (Pisut & Connell,2007); social message (LaBat, 2007); aesthetics (Pisut & Connell, 2007); and current fashion trends, age, gender, body shape, and lifestyle (Brown & Rice, 2001). On the whole, researchers generally found that, ladies who are relatively old have the proclivity to go in for what would fit them and may be said to be using the fit preference scale (Anderson, Brannon, Ulrich, Presley, Worondka, Grasso & Stevenson, 2000), while younger ladies have the tendency to choose what is trendy and fashionable and so may be said to be using the aesthetic preference scale (Chattaraman & Rudd, 2006). The present research constructed a checklist of nine measurement sites including body size, armhole, neckline, dart position, bust, waist line, hip, shoulder and across chest for assessment. In line with these nine dimensions of garment aesthetic fit preference, 20 demonstrations of grading patterns were considered for this study.

2.18 Garment Fit Satisfaction

Feather, Ford, and Herr (1996) defined fit satisfaction as the extent to which the consumer is satisfied with fit and selection of size. LaBat and DeLong (1990) stated that both personal and external factors influence consumers‟ satisfaction with fit. They further indicated that personal influences are the physical dimensions of the body and body cathexis, which is the positive or negative feeling towards one‟s own body. Moreover, women tend to blame their own bodies rather than the article of clothing when a garment does not fit well; this contributes to a negative body image. They are of the view that external influences are current fashion figures and the socially accepted ideal body type. Body ideals promoted by the garment industry can

affect consumers‟ physical and psychological comfort, which can cause consumers to have fit problems with clothing while the socially idealized body can affect consumers‟ psychological and social comfort, causing body dissatisfaction and self-discrepancy from the ideal body (LaBat & DeLong, 1990).

2.19 Female Consumer Fit Satisfaction and the Body

Several studies have explored women‟s body cachexia and clothing fit satisfaction with respect to different body parts and concluded that there existed significant relationships between the female consumer‟s body and clothing fit (Heaton, 2000). Also, the appearance of the consumer‟s body can be enhanced by well-fitted garments, creating the illusion that the individual‟s body is symmetrical and well proportioned (Hazen, 1998). LaBat and DeLong (1990) examined body sizes commonly associated with fit dissatisfaction, including pant length, crotch area, thigh, buttocks, and hip and came to the conclusion that, women on the whole are becoming broader hipped and have greater degrees of fit satisfaction in their upper bodies than in their lower bodies. Therefore, they are experiencing difficulty wearing garments that had been designed for smaller hipped, more hourglass-figured women. Also, Kind and Hathcote (2000) stated that larger-sized women in the United States suffer the most dissatisfaction in shopping for clothing in terms of available sizes, pricing, styles and fit.

2.20 Grading of Ladies' Garment Patterns in Ghana

For the last three to four decades, Europe had led the movement to standardize the human body to a slimmer shape by dieting and exercising. The ectomorph body type was endorsed scientifically as healthy. This led to the decline of home dressmaking or private dressmakers, serving individuals from their homes. However,

during the past decade, the new wave of considering ectomorphic figure as a standardized human figure accepts obesity as socially accepted among men and women (Dzramedo, 2011). This has triggered the rise in custom-made apparel, especially the *kaba* and skirt and frock designed and sewed by designers and dressmakers, contributing to the promotion of local textile fabrics. The "Friday Wear" initiative by the Ministry of Trade and Industry and the collaboration of the private sector was given a legal backing on 12th November, 2004 in Ghana. This legislative provision, which has designated every Friday for the wearing of made-in-Ghana fabrics by workers, has contributed immensely towards custom-made apparels. This does not necessarily result from more endomorphic figure types which perhaps do not fit into the standardized body shapes but rather to a desire to have a fitting and unique style of design using „African print" fabrics (Dzramedo, 2011). This, many believe, promotes the true Ghanaian identity and mostly designed to conceal „private parts" of the female body unlike the RTW or second-hand clothes from Europe and America.

2.21 Challenges that May Occur in Grading Patterns

According to Anikweze (2012), the grading of patterns, like every other thing, has its challenges. She noted that these challenges need to be identified and overcome if any success in garment production is to be achieved. Accordingly, she identified the challenge of figure and styles and the challenge of pattern measurements, among others as those that should be surmounted if any meaningful pattern grading is to be obtained.

Figure type is explained as the different shapes seen on human beings or a representation of a person (Spenser, 1998). Anyakoha and Eluwa (1999) identified the proportionate tall and slender, short and plumb, flat chest, large bust, short neck, long neck and large hips as examples of figure types. They further indicated that the best of

the figure types is the proportionate and thus any individual who does fall within this category is considered as having figure problem. In this connection, they said figure problems included flat chest, large bust, short neck, and large hips.

The challenge of pattern measurement is regarded as a formidable one since it relates to consumer satisfaction of garment fit (Anikweze,2012). Iloeje (1995) expressed the conviction that patterns are basic essentials in the construction of perfectly fitted garments. Yet there have been unresolved issues with respect to the form the grading or measurement should take. According to Anikweze (2012), patterns, in general, are made for three common groups of sizes based on standard measurements. These three major categories, based on somatotype, are the endomorph for largest category; mesomorph for the middle category; and ectomorph for slim lanky figures. The issue, for Anikweze (2012), is the paucity of patterns developed by indigenous pattern makers for different categories of individuals. Another issue has to do with the accuracy of pattern measurement by garment producers Anikweze (2012). This challenge has a dire consequence for garment fit since custom fit of garments starts with accurate measurements (Monet, 2017). The difficulty in measurement is attributed to differences in the use of the tape measure. Mullet (2015) stated that it is difficult to replicate body measurements “because each person has a different hand with the tape measure”.

2.22 Ways of Managing Challenges

It is important that pattern grading challenges are overcome so that the correct garment fits are obtained. According to Aldrich (2008) if pattern grading challenges are addressed, a window of opportunity would be created for obtaining the appropriate garment fit for clients. Therefore, the following strategies have been suggested as effective in dealing with pattern grading challenges. The problem of

same hip and waist measurements is said to be addressed by introducing fullness at the waistline as well as using designs that hide the hip of the client (Datta & Seal, 2018). The challenge of big bust and small hip is addressed by the introduction of underarm dart to support the breast as well as introducing yoke at the bodice (Schofield, 2016). To deal with the challenge of small waist with large hip, double dart at the waist is to be introduced (Cole & Czachor, 2014). Also, the width of the dart is to be increased. Besides, there is the need to introduce fullness (gathering, pleats) at the waistline (Armstrong, 2009). For hollow chest, there is the need to lower front neck and shoulder point, measures across back and subtract from across chest, redraw the neckline and joint new shoulder point to outer shoulder (Aldrich, 2008).

For pattern making and grading, knowledge of basic geometry is a must, because pattern making and grading are totally based on logic and mathematical calculation (Datta & Seal, 2018). Thus the challenge of arithmetic in measurement needs to be surmounted if patterns are to be graded appositely (Cole, & Czachor, 2014). It is suggested that there is need for accurate body measurement to be taken and well labelled for each client as well as reviewing client measurement periodically (Aldrich, 2008).

2.23 Summary of the Review

This study investigated the grading of ladies‟ patterns in small scale garment industries in the Sekondi-Takoradi metropolis. The common thread that binds the reviewed literature together is that grading of patterns is a necessary aspect of every garment production. It is even more crucial for the making of ladies‟ garment because of the nature of their physique. However, due to the uniqueness of ladies‟ body shapes and sizes, peculiar styles demanded for and the necessity of measurements, certain related challenges emerge. Even though literature abounds in pattern making (Aldrich,

2008; Dunlap, 2010; Horlamus, 2013; Kumar, 2012; Monet, 2017; Obinnim & Pongo, 2015), pattern grading is an area that has very little information. The few studies conducted on pattern grading usually focuses on comparing the CAD system with the manual system (Datta & Seal, 2018; Ondogan & Erdogan, 2006). This state of affairs may be due to the complexity and ambiguity in the quantification of fits as well as the inadequacy of linear measurements (Ondogan & Erdogan, 2006). This work is therefore an effort to address the dearth of data in such a critical area in garment production especially in the case of Sekondi-Takoradi metropolis.

CHAPTER THREE

METHODOLOGY

3.0 Overview

This chapter presents the research methodology used to conduct the study. It comprises the research design, study population, sample and sampling techniques, instruments for data collection, data collection, data analysis and ethical consideration of the study.

3.1 Research Design

Research design is said to be a blueprint or plan for conducting a study with maximum control over factors that may interfere with the validity of the findings (Creswell & Plano Clark, 2011). It describes how, when and where data are to be collected and analyzed. It indicates how data are collected for answering the research questions raised or testing the research hypothesis.

This study employed the mixed methods design, specifically using the triangulation design. The triangulation design is a type of mixed method design in which the researcher uses both quantitative and qualitative methods to study the same phenomenon to determine if the two converge upon a single understanding of the research problem being investigated (Fraenkel, Wallen & Hyun, 2012). In such a study quantitative and qualitative questions are given equal priority and all data are collected simultaneously. In triangulation design, data may be analysed together or separately. In this study data were analysed together and the convergence or divergence of the results were then discussed. In this case, details on how patterns are graded for ladies‟ garments in the Sekondi-Takoradi Metropolis were studied using the triangulation design to understand the phenomenon. Thus descriptions of grading

of patterns in the Sekondi-Takoradi Metropolis and the findings were organized and described in line with testing or validating those descriptions.

The underlying reason for using the triangulation design in this study was that the strengths of the two methods would complement each other and offset each method‟s respective weaknesses (Greene *et al*., 1989). According to Dornyei (2007), the use of the triangulation design increases research validity and overcome the limitations and biases of using one research method. Olsen (2004) adds that the use of triangulation design enables diverse viewpoints or standpoints elucidate a topic. Moreover, triangulation provides an in-depth understanding of a research enquiry (Creswell, 2009).

However, triangulation design has some limitations. It is difficult for one researcher to conduct it and so it usually requires a team of researchers. Therefore its use results in complexity of interpreting conflicting data. It is also expensive and time consuming to use.

In line with triangulation usage, structured interview schedule (questionnaire) and observational checklist were used to evaluate current small scale industry grading of ladies‟ garment patterns and to propose ways to improve fit of finished garments. The data collection involved gathering both numerical information (measurements) as well as text information (methods of grading patterns and fit measurements) so that the final database represents both quantitative and qualitative information which could help the study to overcome the limitations of a single design (Creswell, 2009).

3.2 Population of the Study

The target population for the study was all professional dressmakers and tailors (garment producers) in the Sekondi-Takoradi Metropolis of the Western Region of Ghana. They constituted the population of the study because they make ladies‟ garments in the small scale garment production industry in the Metropolis. Consequently, they were in the best position to provide accurate information on the problem which was investigated. Besides, they all belong to the local professional Association of Tailors and Dressmakers. The total population of dressmakers in the study area was 515. However, an average of 100 active members was assumed to be regular at their weekly meetings and so formed the accessible population.

3.3 Sample and Sampling Procedure

The sample size for the study was twenty (20) garment producers. According to Gay and Airasian (2003) if the population is large a minimum sample of 10% is adequate for a study. The researcher purposively sampled the garment producers based on their peculiar characteristics of sewing for ladies and their willingness to participate in the study. According to Fraenkel *et al* (2012), a researcher can use his/her judgement to select a sample he/she believes can provide the needed data based on prior information. Thus the sample was selected based on the knowledge that they were garment producers who sewed ladies‟ garments.

3.4 Instrumentation

The research instruments used to collect data for the study were interview schedule, observation guide and test samples (copy).

3.4.1 Semi-structured interview guide

Semi-structured interview guide is a tool employed to obtain both quantitative and qualitative data. The aim for using this instrument is to ensure that each garment producer (interviewee) is presented with exactly the same questions in the same order, while making provision for them to express themselves simultaneously (Creswell & Plano-Clark, 2011).

The use of this interview guide was deemed advantageous since it led to a high response rate because the researcher scheduled the interviews in advance, and the garment producers accepted to participate in the exercise to completion. Also, all the interviews were conducted in English and local language (*Fante*). The administration of the instrument was very easy since the garment producers were not required to have the ability to read and write. Besides, the use of this research tool gave the researcher the opportunity to observe the non-verbal behaviour of garment producers. Besides, opportunity existed for clarification to be sought in the event questions or answers were not well understood. These merits notwithstanding, the use of the interview was time-consuming and inconvenient. Also, transcribing responses from participants was quite tedious.

The interview guide used in this study was personally prepared. The guide was designed based on the research questions to collect data on the knowledge level on pattern grading methods as well as their challenges to the garment producers in the study area and the strategies used to manage those challenges.

This interview schedule had five sections: Section A contained three (3) items that elicited data on demographic characteristics of garment producers (participants). Section B had four (4) items covering methods of patterns. Section C had one (1) open-end question item soliciting information on pattern grading methods and their

modes of acquisition. Section D had five (5) items covering challenges garment producers faced when producing patterns for clients; Section E had eleven (11) items on ways of managing challenges (See Appendix C).

3.4.2 The observation guide

The observation guide was developed to collect data on how construction and grading of patterns was done by the garment producers. The researcher observed the garment producers at their shops, listened to them and recorded their views and experiences. Making optimum use of the observation guide enables researchers to capture the true vivid data from the field (Amoah, 2014). Pictures were taken and recorded for analysis of findings. The use of this tool allowed the researcher to obtain first-hand information on grading practices of garment producers as well as to study garment producers in their natural settings. Besides, it was relatively inexpensive to use. However, its use was laborious and time-consuming. It was also difficult to obtain past and future information on garment producers through this tool.

3.4.3 Pre-testing of research instrument

The study instruments were pre-tested at Agona Nkwanta in the Ahanta West Municipality of the Western Region. The place is a few kilometres away from Sekondi-Takoradi, the Regional capital of the Western Region. The garment producers in that area have similar characteristics in terms of professional practices, knowledge and skill acquisition to that of those within the study area. Five (5) garment producers were selected by adopting purposive sampling technique. The researcher used her dressmaker to identify four additional garment producers for the pretesting of the instruments. The interview was conducted for the garment producers following the guide. After that the garment producers were asked to make the test

copies for the various sizes (8, 10 and 12). The researcher observed the procedure and recorded the findings following the observational guide.

The interviews were coded and transcribed onto paper. In doing so, care was taken to ensure that the responses were transcribed verbatim as they were audio recorded and pictures were also taken with a camera to avoid any oversight. As the pre-testing of the instruments brought out some shortcomings in the research instruments, the necessary corrections were made to ensure validity and reliability of the instruments.

The content validity of the instruments was determined by two lecturers whose special area is in Clothing and Textiles from the Home Economics Department of the University of Education, Winneba. The views of the lecturers were sought because, according to Gall, Borg and Gall (2003), the validity of an instrument is improved by expert judgement. The comments and suggestions they made were incorporated and the necessary corrections were made for the instruments to be adjudged suitable to be used for the study. For example, the item on the demographic concerning years of experience was completely rearranged following their suggestions.

The reliability of the test copy was determined by the use of Cronbach alpha reliability method. This was done to ensure the internal consistency of the items on the instrument and also to ensure that the items were free from error. The reliability coefficients for the various subscales ranged from 0.68 to 0.77 (See Table 4). These were deemed appropriate for the study because according to Gravetter and Forzano (2009), a reliability coefficient of 0.70 and above is suitable for a study. Also they fall within the apt reliability estimates set by Nunnally (1978) and Creswell (2002) which range from 0.67 to 0.87.

Table 4: Reliability estimates

Size	Number of items	Alpha
8	13	0.68
10	13	0.77
12	13	0.70

Source: Field survey (2018)

3.5 Data Collection Procedures

The researcher sought permission for access through the secretary of the association with an introduction letter obtained from the Department of Home Economics, UEW. The secretary introduced the researcher to the garment producers at one of their association meetings. The researcher took the opportunity to inform the members about the study and explained the purpose of the study to them. The researcher also assured the potential garment producers (participants) of confidentiality. After the selection of the garment producers, their contact addresses and mobile numbers were taken. Separate appointments were booked with each of them. In line with the schedule, a minimum of two hours of interview and observation sessions were undertaken at each garment producers‟ workplace. In each session, garment producers were interviewed for an average of 20 minutes, and subsequently given brown paper and base measurements for size 10 to produce sizes 12 and 8 then to make final drafted test copies for a sheath garment with opening at the back. The drafted copies were then used by the garment producers to produce the test copies for analysis on fit. The main seam used for joining the various parts was open/plain seam. The researcher observed the procedures during the production of the patterns and the test copies.

In all sixty (60) simple straight sleeveless dresses were sewn. These were sewn by the garment producers (three from each garment producer) based on the grading done by the garment producers and instructions given by the researcher. The dresses were worn by the models following their sizes. The dresses were then observed by two raters for fit in relation to the measurements given for the grading. The observation was based on front dress-neckline, shoulder, armhole, bust, hip, darts, dress length, back dress-darts and back neckline analysis.

3.6 Data Analysis Procedure

The analysis was done based on the data collected from the 20 garment producers. The researcher made sure that the interview schedule and the observation guide were all available to be used. Scott and Usher (2011) posited that coding of observations or interview transcripts should be accessible for scrutiny before analysis of data. Statistical Package for Social Sciences (SPSS) version 20 was used to generate data analysis that demanded quantitative analysis. Quantitative data on Research Question One were analysed using frequencies and percentages. Data collected on Research Question Two were analysed using frequencies and percentages, mean and standard deviation. Data on Research Question Three were analysed using frequencies and percentages. Data gathered on Research Question Four were analysed using frequency counts and percentages.

Qualitative data obtained from the interview were manually transcribed onto sheets of paper and coded. This was done after the recordings were played and listened to by the researcher over and over again. Data were analysed based on four (4) main themes, namely, types of patterns used by garment producers, how patterns of the same style were made by garment producers to fit different shapes and sizes of

their lady clients , challenges garment producers faced in grading patterns and strategies employed by garment producers to manage the challenges.

3.7 Ethical Consideration

The researcher applied, in writing, to the local Association of Tailors and Dressmakers and each participant asking for permission to obtain the necessary data for the study, having given them assurance of confidentiality and anonymity. The letter to each participant sought also sought their informed consent. Thus a meeting to introduce the researcher to its members was scheduled and they were asked for their support. In order not to disturb their production, the garment producers were informed to schedule their participation time when they were less busy. The dress design on which the patterns would be graded was also shown to them in order not to cause any embarrassment on the observation day. Garment producers were also asked for a list of materials needed for the grading demonstrations to enable the researcher prepare in order not to burden the garment producers with the provision of materials for the demonstration. Again, the garment producers were informed that their demonstrations would be snapped with a camera. Following, appointments were booked with individual garment producers for interview schedules, demonstrations and sewn fit samples of the way the garment producers grade their patterns when making garments for their lady clients. Finally, the researcher promised to provide a copy of the findings to the Association for decision making.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Overview

This chapter presents the results and discussion of the data collected. The results covers the demographic data of garment producers who made ladies garments, the types of patterns they used, how these garment producers graded patterns to obtain larger and smaller patterns from a base size, the challenges they faced in grading patterns and ways of managing the challenges. Consequently the following research questions were answered:

1. What methods of patterns were used by the garment producers to make ladies‟ garments in the Sekondi-Takoradi Metropolis?
2. How did garment producers obtain patterns of the same style to fit different shapes and sizes of their lady clients in the Sekondi-Takoradi Metropolis?
3. What challenges did garment producers face in grading patterns for their lady clients in the Sekondi–Takoradi Metropolis?
4. What strategies may be employed by the garment producers to manage challenges associated with ladies‟ pattern grading?

The analysis has been conducted together: the analysis of quantitative data and the analysis of qualitative data.

4.1 Results

This section presents results of quantitative and qualitative data obtained from the structured interview after data had been quantisized (Fraenkel,Wallen &Hyun, 2012).

4.2 Demographic Information on the Garment Producers

Table 5 outlines the demographic distribution of the garment producers‟ gender, years of experience in sewing and highest academic/ professional qualification.

Table 5: Demographic distribution of the garments producers

Characteristic	Frequency	Percentage (%)
Gender		
Male	3	15
Female	17	85
Total	**20**	**100**
Years of sewing experience		
1-5	6	30
6-10	2	10
11-15	3	15
16years and above	9	45
Total	**20**	**100**
Academic/Professional Qualification		
Apprenticeship after JHS	6	30.0
Apprenticeship after SHS	5	25.0
NVTI Proficiency Dressmaking	3	15.0
NVTI Intermediate	3	15.0
HND Fashion	1	5.0
First Degree in Fashion	2	10.0
Total	**20**	**100.0**

Source: Field survey (2018)

4.2.1 Gender

More females, 17 (85%) than males, 3 (15%) participated in the study. Females were therefore into ladies‟ pattern grading as compared with males. A UNDP report on Sub-Saharan Africa (1995) indicated that small scale garment manufacturing in Ghana was dominated by women. This study was corroborated by Obinnim and Pongo (2015) who added that through small scale garment manufacturing women made immense contributions towards economic development of the sub-region despite the fact that they attain relatively lower level of education than the male. Few reasons account for less men than women taking up dressmaking in the study area. Firstly, the socio-cultural representation of women as inferior to men does not allow men to venture into production of ladies‟ garment. Ghana is a highly masculine society (Dadds & Dabbs, 2000) and any man who involves in direct „so-called‟ feminine services such as sewing or cooking for women is tagged as „a woman-man‟. The male garment producers of this study explained that the making of ladies‟ clothes is time consuming and more complicated than men‟s clothes. These factors may plausibly explain the presence of less number of men willing to sew ladies‟ garment. [Comment on what the male garment producers said whether I agree or not]

4.2.2 Level of experience of garment producers

The number of years garment producers have worked in the sewing industry can have some influence on their pattern grading decisions. Their years of experience in sewing range from 1-5 years (30%), 6-10 years (10%), 11-15 years (15%) 16 years and above (45%). A high percentage of 60% have more than 10 years working experience in the industry. With this high percentage of experienced professional, the views from the garments producers were not dominated by views of novices. There is

an interception between the gender and experience demographics in that all the three male garments producers were found in the 1- 5 year experience bracket. The possible explanation for this phenomenon is that stereotyping for women is gradually dying down and that probably the Ghanaian society‟s view is gradually changing to accepting sewing as a professional‟s work, no matter who the consumer is (Solinger, 2010).

4.2.3 Level of education of garments producers

Education and training acquired inform a garment producer‟s decisions regarding pattern grading. The largest group of dressmakers in the study, six (30%), finished Basic 9 (JHS), and went into apprenticeship with small scale garment producers for three (3) years. The second largest group was those who completed Senior High School (SHS), five (25 %). Following that were two groups, three (15 %) each had NVTI Proficiency and NVTI Intermediate training in garment production. Meanwhile, two (10%) and one (5%) indicated they had First Degree and HND in Fashion respectively.

From the personal interviews, it was clear that education played a significant contribution in the use of patterns and standardized grading systems among the garment producers. This is because most of the garment producers said they learnt how to make paper patterns and grading from the fashion schools they attended. Those with basic and secondary school education expressed that their trainers taught them how to grade patterns. This was ascertained by Arthur (2001) that all garment producers need to acquire basic skills for their work.

Research Question One

What methods of patterns were used by garment producers to make ladies" garments in the Sekondi-Takoradi Metropolis?

4.3 Methods of Patterns Used

Table 6 presents data on the types of patterns used by garment producers to make ladies" garments.

Table 6: Methods of pattern used by garment producers

Patterns used	Frequency	Percentage (%)
Freehand method	12	60
Copying from already sewn garment	4	20
Flat Pattern Designs	3	15
Draping	1	5
Total	**20**	**100**

Source: Field survey (2018)

Garment producers who used freehand cutting were 12 (60%). Four (20%) indicated that they used copying. Three (15%) used drafting whilst only one (5%) used draped method. Most of the garment producers preferred „freehand method" to other types of patterns. The likely explanation for this could be the obvious merits associated with the use of freehand cutting. According to Forster (2014), freehand cutting is fast and easy to use because it does not require much instruction for use and moreover, the desired style could be plotted and cut directly from the fabric. Nonetheless, she cautioned that when a complicated style is involved, its use is hard and also, fabrics are easily damaged when care is not taken. Draping was the type that was least preferred. This could also be attributed to its inappropriateness for the African figure when dressed form is used as well as its expensiveness (Gavor, 2011).

Research Question Two

How did garment producers obtain patterns of the same style to fit different shapes and sizes of their lady clients in the Sekondi-Takoradi Metropolis?

The main focus of this question was pattern grading process and methods which were used by the garment producers in obtaining graded patterns. In this question, the study addressed materials used by garment producers for grading patterns, the type of patterns garment producers used when cutting out, how garment producers acquired the patterns and how they graded patterns to obtain smaller and larger sizes.

4.4 Materials Used in Pattern Grading

Materials and tools used for grading pattern were many and varied. Table 7 presents an observed checklist of materials used by garment producers for pattern grading.

Table 7: Tools used in pattern grading

Material	Usage	Frequency	Percentage (%)
Tape measure	Taking measurements of the body and transferring to fabric or paper	20	20.4
Scissor	Cutting out of paper and fabrics	20	20.4
Pins	Holding fabric and paper stable for transferring pattern markings	16	16.3
Tailor"s chalk/ Black board	Plotting measurements on paper	12	12.3
Chalk	Making straight lines	11	11.2
Metre rule	Drawing lines and patterns on paper	8	8.2
Pencils			
French curves	Shaping patterns on paper	6	6.2
Tracing wheel	Transferring pattern markings onto fabric	4	4.0
Eraser	Cleaning of pencil marks	1	1.0
CAD	Using computer to grade	0	0
Total		**98***	**100**

Source: Field survey (2018) *Multiple responses, N=20

It was observed that all the 20 (20.4%) garment producers used both a tape measure and a pair of scissors, while 16 (16.3%) used pins. Eraser was the tool least used. Only one (1.0%) respondent was observed to have used eraser. None of the garment producers was observed to have used computer aided design (CAD). A tape measure and a pair of scissors were used by all garment producers as basic and critical materials in pattern grading. Without a tape measure and a pair of scissor, it would be extremely difficult for dressmakers to estimate and cut out correct measurements that would fit their clients (Aldrich, 2008). Additionally, the use of these materials could be plausibly attributed to the absolute dependence of pattern making and grading on logic and mathematical calculation whether manually or digitally (Datta & Seal, 2018). Many garment producers also used pins to hold paper patterns or fabric in position when transferring pattern markings in pattern grading. The results imply that garment producers in the Sekondi-Takoradi Metropolis employed only traditional manual methods at the expense of speed and accuracy that could have resulted from the use of computer aided design. This situation could be attributable to the comparable effectiveness of manual basic tools. For, according to Cooklin (2004) manually, basic tools for grading can give similar effect as in computer aided design. The data from the interview provides evidence to the fact that apart from the tape measure, scissors, pins, tailors chalk and metre rule, less than half of garment producers were observed as adequately using other basic grading tools such as pencil, French curve, tracing wheel and eraser. Garment producer (R8) said that:

> *I prefer using my freehand for shaping and it makes me work faster".* Also R7 expressed that" *I am not comfortable using the tracing wheel to transfer pattern markings, I fold and use the pressing iron to press to get it transferred.*

Using freehand for shaping could be that the garment producer has been practicing that for a long time and has become competent. Further, the French curves were also used in the pattern grading. The curvature shape of the female body requires that bends and curves are defined in pattern grading (Cooklin, 2004). With the use of French curve neckline, armhole, and hipline are easily catered for in grading.

Garment producers limited themselves to the use of some materials (see Table 7). They however could not make use of modern and sophisticated pattern grading machines such as the 2D and 3D computerized machines. The interview with the garment producers revealed that although the computerized machines make efficient pattern grading, they were very expensive and required huge capital injection as indicated by Ashdown, Loker and Rucker (2006). Also one of the garment producers (R6) indicated that small scale garment producers in the study area had limited capital. She said:

> *"We do not have the capacity to invest in capital intensive pattern grading machines such as the 2D and 3D which can increase speed and accuracy of grading patterns."*

Another garment producer, (R 10), said that:

> *"2D and 3D machines make work fast, easy and neat but we do not have enough money to rent spacious shops to install them".*

From the statements by the garment producers, it seems they recognized the usefulness and efficiency of the CAD. However, lack of financial and capital wherewithal made it difficult to try to obtain one to use. These concerns notwithstanding, the observation by Handford (2003) is worthwhile to note. He observed that even though many small firms still use traditional grading method, grading is becoming increasingly computerized and garment producers should learn to be abreast with the CAD system.

4.5 Grading Patterns with Size 10 as Base Size

The garment producers were initially given measurements to make a simple straight dress pattern for size 10. Subsequently, they scaled down the size 10 pattern to produce size 8, and then scaled the same base pattern up to size 12. The critical body parts under consideration were six cardinal points. They were neck size, shoulder length, armhole, bust, waist level, and hip. Twelve garment producers extended the patterns by adding either 2.5cm or 4 centimetres all round with the exception of the centre front to grade up and folded the base pattern with the same measurements used to increase to grade down.

Table 8: Grading values of neck size

Values Cm	Size 8 Freq	%	Values Cm	Size 10 Freq	%	Values Cm	Size 12 Freq	%
34	1	5.0	39.5	1	5.0	38	1	5.0
38.5	2	10.0	39.7	1	5.0	40	1	5.0
42	1	5.0	40.5	1	5.0	46	1	5.0
43	1	5.0	41	1	5.0	48	2	10.0
44.5	2	10.0	42	2	10.0	49	1	5.0
47	1	5.0	43.5	1	5.0	49.5	1	5.0
48	2	10.0	51	3	5.0	50	1	5.0
49	1	5.0	51.2	2	10.0	51.5	1	5.0
50.5	1	5.0	51.5	1	5.0	54.5	2	10.0
51	1	5.0	53	1	5.0	56	2	10.0
54.5	2	10.0	55.5	1	5.0	56.5	1	5.0
55	1	5.0	57.3	1	5.0	57	2	10.0
56	2	10.0	58	1	5.0	58	1	5.0
57	2	10.0	59	2	10.0	59	1	5.0
						60	1	5.0
						64	1	5.0
Total	**20**	**100.0**		**20**	**100.0**		**20**	**100.0**

Source: Field survey (2018)

From Table 8, for size 10, the most frequently recorded measurement was 51cm which was used by 3(15%) garment producers. The second highest used was 59 cm which was used by 2(10%) garment producers. A garment producer each used the measurements: 39.5cm, 39.7cm, 40.5cm, 41cm, 42cm, 43.5cm, 51.2cm, 51.5cm, 53cm, 55.5cm, 57.3cm and 58cm.

All the 20 garment producers arrived at grading values higher than the base value of UK size 10, which is 36cm. Having been given the measurements for base size 10, one would have expected that the garment producers would stick to the prescribed measurement. All of them, 20 (100%) rather used measurements above the stipulated dimensions. It could be plausibly explained that the neck size of Ghanaian ladies might be broader than the European counterparts.

For size 8 the most frequently recorded measurement was 38.5cm, 44.5cm, 48cm, 54.5cm, 56cm and 57cm which was used by 2(10%) garment producers. The least measurement were 34cm, 42cm, 43cm, 47cm, 49cm, 50.5cm, 51cm, and 55cm was used by 1 (5%) garment producers. According to Aldrich (1997), UK standard neck size for size 8 is 35cm.

Two garment producers (10%) used 38.5cm, 44.5cm, 48cm, 54.5cm, 56cm and 57cm each. The other measurements used included 34cm, 42cm, 43cm, 47cm, 49cm, 50.5cm, 51cm and 55cm. These were the neck size measurements used by 1 (5%) garment producers each. This is an indication that the garment producers used the incremental valuing as stated by Schofield (2007) that relative sizing intervals have different values for each grade breaks.

Most of the neck sizes were not having the same measurements of neck size as indicated by Aldrich (1997). Moving away from standard grading values will adversely affect consumer satisfaction for, as indicated by Heaton (2000), there is

significant relationship between female consumers‟ body and clothing fit. Making grading values higher than standard measurements could lead to loose fitting. According to Arnold and Reynolds (2003) the standard values for the neck size for the sizes 8, 10 and 12 are 35, 36 and 37 respectively. The smallest value for ease is the neck width that fits very snugly around the back of the neck, while the larger value would permit the head to pass through the opening. Results from Table 8 showed that overall; the neck sizes were slightly bigger or bigger than the UK standard size for neck size (see Appendices H & I).

4.6 Shoulder

Table 9 presents data on the measurements made for shoulder in the study. The pattern grading methods that the garment producers were using in the study area produced good results as shown in Table 9.

Table 9: Grade values for shoulder

Values	Size 8		Values	Size 10		Values	Size 12	
Cm	Freq	%	Cm	Freq	%	Cm	Freq	%
7.0	1	5.0	7.0	1	5.0	8.0	4	20.0
8.0	3	15.0	7.5	1	5.0	9.0	3	15.0
9.0	2	10.0	8.0	3	15.0	9.5	1	5.0
9.5	3	15.0	9.0	1	5.0	10.0	5	25.0
10.0	5	25.0	10.0	6	30.0	10.5	2	10.0
10.5	3	15.0	10.5	2	10.0	11.0	4	20.0
11.0	1	5.0	11.0	3	15.0	12.0	1	5.0
11.5	1	5.0	11.5	2	10.0			
12.0	1	5.0	14.0	1	5.0			
Total	**20**	**100.0**		**20.00**	**100.0**		**20.00**	**100.0**

Source: Field survey (2018)

For size 8, the most frequent recorded measurement for shoulder was 10cm which was used by 5 (25%) garment producers. The least recorded measurement was

7cm, 11cm, 11.5cm and 12cm which were used by 1 (5%) garment producers each (see Table 9). According to Aldrich (1997) UK standard body measurement for shoulder of size 8 is 11.75cm. From the results obtained only 3 (15%) came close to the standard measurement. These measurements were 11.0cm, 11.5cm and 12cm. The rest 17 (85%) used measurements that were lower than what the UK standard body measurements stipulated.

For size 10 the most frequently recorded measurement for shoulder was 10.0 cm which was used by 6 (30%) garment producers. The least frequently recorded measurements for shoulder were 7cm, 7.5cm, 9cm and 14cm. A utilized measurement which came close to the UK standard body measurement of 12cm for shoulder was 11.5cm. The results indicate that most garment producers 19 (95%) used measurements lower than the UK standard measurement of 12cm. Only 1 (5%) used a measurement that was 14cm. This measurement was way too high than the standard measurement.

For size 12 the most frequently recorded measurement was 10cm which was used by 5 (25%) garment producers. This was followed by 8cm and 11cm which were used by 4 garment producers each. None of the garment producers used 12.25cm measurement which is UK standard measurement for shoulder. Only 1 (5%) used 12cm that came close to the UK standard measurement of shoulder being 12.25cm. (See Appendix N).

Results on measuring size 8 showed that one of the fit samples was larger by 3cm, two were 0.5cm smaller, three were 1cm and 4 cm smaller respectively, two were 1.5cm smaller, six garment producers made the shoulder measurement smaller by 2cm and one made it either 5cm, 4.5cm and 3 cm smaller and finally, three garment producers made the shoulder measurement 4cm smaller. None of the garment

producers made the shoulder measurement for size 10 to be 12cm as indicated by Adu Boakye *et al* (2012). There was a vast deviation from the standard shoulder measurements this could make the shoulder length of the fit samples either short or drop from the shoulder bone. In grading the shoulder length from base size 10 to size 8 and 12 garment producers deviated from their original base 10 making the shoulder length of size 8 either shorter or longer.

From the Table 9, eight garment producers made the shoulder length measurement the same, which was indicated by Brooke (2013) as shoulder length for size 8 should be 11.75cm and 12.25cm for size 12. The Garment producers on grading of size 12 comparing the base size 10 and grading of shoulder length in size 12, 16 garment producers graded the same as the measurement of base size 10. On the other hand one garment producers graded two centimetres higher than the base size10. None of the garment producers graded to scale as indicated by Brooke (2013) in the standard grading.

Table 10: Measurements for armhole grading from garment producers

Values	Size 8		Values	Size 10		Values	Size 12	
Cm	**Freq**	**%**	**Cm**	**Freq**	**%**	**Cm**	**Freq**	**%**
13.7	1	5.0	19	4	20.0	18	1	5.0
14.3	2	10.0	19.2	2	10.0	18.5	1	5.0
14.8	1	5.0	20.4	3	15.0	18.7	2	10.0
15.1	1	5.0	20.5	4	20.0	19	2	10.0
16.2	1	5.0	20.7	1	5.0	19.2	2	10.0
16.4	1	5.0	20.8	3	15.0	19.4	2	10.0
18	1	5.0	21.5	1	5.0	20.7	3	15.0
18.6	2	10.0	21.7	1	5.0	21	4	20.0
20	3	15.0	22	1	5.0	21.5	1	5.0
20.13	1	5.0				21.8	1	5.0
20.1	2	10.0				22.0	1	5.0
20.21	3	15.0						
23	1	5.0						
Total	**20**	**100.0**		**20**	**100.0**		**20**	**100.0**

Source: Field survey (2018)

Table 10 presents data on the measurements made for armhole grading from garment producers in the study.

4.7 Armhole

Measurements for armhole grading are shown in Table 10. For the 20 fit samples that were presented for Size 8, (11) 55% were either too tight or loose, and only 45% representing 9 garment producers fitted well. For sizes 10 and 12, the fit samples that fitted well were (11)55% and (8) 40% respectively. There is an indication that most measurements for grading the armhole, especially for sizes eight and 10 were inappropriate since the majority of the fit samples appeared to be „too tight" and did not fit. On the whole, more than half of the garment producers were able to get measurements for grading the armhole of ladies" garment correct as specified by Aldrich (2008).

This confirms standard measurement given by Aldrich (2008) for the Armhole for base size 10 is 20.05 cm (see Appendix I). Garment producers could grade the armhole to scale this could be that garment producers are conversant in drawing in or cutting the armhole curve. This will make armhole of ladies garments fit well.

Table 11: Measurements for side seam from the garment producers

Values	Size 8		Values	Size 10		Values	Size 12	
Cm	Freq	%	Cm	Freq	%	Cm	Freq	%
1.0	1	5.0	1.0	1	5.0	1.0	1	5.0
1.5	2	10.0	1.5	2	10.0	1.5	2	10.0
2.5	1	5.0	2.5	2	10.0	2.5	2	10.0
3.0	10	50.0	3.0	10	50.0	3.0	9	45.0
3.5	1	5.0	3.5	1	5.0	4.0	6	30.0
4.0	4	20.0	4.0	2	10.0			
6.5	1	5.0	5.0	2	10.0			
Total	**20**	**100.0**		**20**	**100.0**		**20**	**100.0**

Source: Field survey (2018)

Table 11 represents garment producers‟ measurement of side seam. One garment producer, representing five percent used 3.5cm, and one centimetre respectively; (9)45% used three centimetres, while three garment producers representing 15% used 2.5cm; 10% of garment producers used five centimetres, four centimetres and 1.5cm for the side seam. Ninety-five per cent of the garment producers could not grade to scale.

From the foregoing results, the first consideration of fit is seam allowance. It is imperative, therefore, to check for correctness or excess of the seam allowance. According to Adaden-Crawford (2012), sewing accurate seam allowances is an important key to having pattern pieces fit together thus when the seam allowance is not accurate the intended outcome of the pattern is changed. For Schofield (2016) seam allowances contribute to how a garment hangs so changing the seam allowance can change how the finished garment will hang.

Table 12: Measurements for length of dart from the garment producers

Values	Size 8		Values	Size 10		Values	Size 12	
Cm	Freq	%	Cm	Freq	%	Cm	Freq	%
21.0	1	5.0	21	1	5.0	21	1	5.0
22.0	1	5.0	22	1	5.0	23	2	10.0
23.0	1	5.0	23	2	10.0	25	1	5.0
25.0	1	5.0	25	1	5.0	26	4	20.0
26.0	4	20.0	26	3	15.0	28	1	5.0
29.0	2	10.0	27	1	5.0	29	2	10.0
30.0	1	5.0	28	1	5.0	30	1	5.0
31.0	1	5.0	30	1	5.0	33	1	5.0
33.0	3	15.0	33	1	5.0	34	1	5.0
36.0	1	5.0	35	2	10.0	36	2	10.0
37.0	2	10.0	36	3	15.0	37	1	5.0
44.0	1	5.0	38	1	5.0	38	1	5.0
62.0	1	5.0	40	1	5.0	39	1	5.0
			62	1	5.0	62	1	5.0
Total	**20**	**100.0**		**20**	**100.0**		**20**	**100.0**

Source: Field survey (2018)

Table 12 shows the outcomes of the fit samples of the 20 garment producers regarding the position and length of the dart. Two garment producers (10%) used 26cm. One garment producer representing five percent, got it totally out of proportion as she used 61.5cm for all three sizes. Darts are essential for good fit (Cole & Czachor, 2014). Since the human body is 3-dimensional but the fabric is a flat (2-dimensional) piece. Darts are needed to control the shape of the fabric and allow it to conform to the wearer‟s body. For example, a dart pinned at the side bust lifts the side, eliminating diagonal pull lines, creating a shallow cone for the breast and making the top hangs better. However, the range in the measurements of the dart of the garment producers is 39 cm instead of 18 cm. This evidently would cause fit problems in sewing ladies‟ garment.

Almost all respondents could not get it right with valuing both back and front necklines. For back neckline of the three sizes in perspective, only three garment producers got the valuing right for back and front neckline with ascending increases among the three sizes. Front neckline had four garment producers who had proportional increases among the three sizes. Values for shoulder were not properly done as all respondents could not make a clear progression among the three sizes. Armhole valuing was also poorly done. Only 20% were able to produce armhole values that were in relation to the three sizes they created. Grading dart was poorly valued as only 5% of respondent had a proportional increase among the three sizes. Side seam had uniformity across the sizes and 75% had uniform value of side seam for the three sizes. However, only one among them had the standard value of 1cm for all three sizes.

Table 13: Measurements for front length of dart from garment producers

Size 8			Size 10			Size 12		
Length(cm)	**Freq.**	**%**	**Length(cm)**	**Freq.**	**%**	**Length(cm)**	**Freq.**	**%**
21	2	10.0	21	2	10.0	21	1	5.0
22.5	1	5.0	22.5	1	5.0	22.5	1	5.0
25	1	5.0	23	1	5.0	23	1	5.0
26	3	15.0	25	1	5.0	23.5	1	5.0
26.5	1	5.0	26	3	15.0	24	1	5.0
27.5	1	5.0	28	2	10.0	25	1	5.0
29	1	5.0	30	1	5.0	26	3	15.0
30	2	10.0	32	2	10.0	26.5	1	5.0
31	1	5.0	34.5	1	5.0	28	1	5.0
32	2	10.0	35	2	10.0	29.5	2	10.0
33	1	5.0	37	2	10.0	30	1	5.0
35.5	1	5.0	40	1	5.0	32.5	1	5.0
37	1	5.0	61.5	1	5.0	35	1	5.0
43.5	1	5.0				37	1	5.0
61.5	1	5.0				38.5	1	5.0
						39.5	1	5.0
						61.5	1	5.0
Total	**20**	**100.0**		**20**	**100.0**		**20**	**100.0**

Source: Field survey (2018)

Table 14: Measurements for Back Length of Dart from Garment Producers

Size 8			Size 10			Size 12		
Length(cm)	Freq.	%	Length(cm)	Freq.	%	Length(cm)	Freq.	%
19.5	1	5.0	19.5	1	5.0	19.5	1	5.0
21	1	5.0	22	2	10.0	22	1	5.0
22	1	5.0	25	1	5.0	25	1	5.0
24	1	5.0	25.5	1	5.0	25.5	1	5.0
25	2	10.0	26.5	1	5.0	26.5	1	5.0
26.5	1	5.0	28	2	10.0	28	1	5.0
27.5	1	5.0	29.5	2	10.0	29	1	5.0
28.5	1	5.0						
29	1	5.0	30	1	5.0	30	1	5.0
30	1	5.0	31	1	5.0	30.5	1	5.0
31	1	5.0	31.5	1	5.0	31.5	1	5.0
31.5	1	5.0	32	1	5.0	32	2	10.0
33	3	15.0	33	1	5.0	32.5	1	5.0
35	1	5.0	36	1	5.0	33	1	5.0
36	1	5.0	38.5	1	5.0	34.5	1	5.0
43.5	1	5.0	41.5	1	5.0	36	1	5.0
66.5	1	5.0	42	1	5.0	38.5	1	5.0
			66.5	1	5.0	41.5	1	5.0
						42	1	5.0
						66.5	1	5.0
Total	**20**	**100.0**		**20**	**100.0**		**20**	**100.0**

Source: Field survey (2018)

Table 15: Measurements for width of dart from garment producers

Size 8			Size 10			Size 12		
Length (cm)	**Freq.**	**%**	**Length (cm)**	**Freq.**	**%**	**Length (cm)**	**Freq.**	**%**
1	18	90.0	1	15	75.0	1	15	75.0
1.5	1	5.0	1.5	2	10.0	1.5	2	10.0
2	1	5.0	2	3	15.0	2	3	15.0
Total	**20**	**100.0**		**20**	**100.0**		**20**	**100.0**

Source: Field survey (2018)

4.8 Fitting of the Sheath Dresses from the Graded Pattern with Models

The fit samples Appendix M were based on checklist shown in Appendix N. The three grading patterns prepared by each of the 20 garment producers were fitted with three models of sizes used (8, 10 & 12). The fitting results are as shown in Table

16. The fittings were rated as to whether they were well fitting or poorly fitting. Figures on Table 16 indicated the numbers of garment producers whose products fitted well.

Table 16: Fit of the sample sheath dress

Body size	Armhole	Neck size	Dart	Bust	Waist	Hip	Shoulder	Across chest
8	15	11	2	11	3	11	19	17
10	20	18	3	20	6	6	19	20
12	9	14	1	18	4	4	20	18

Source: Field survey (2018)

Armhole

From Table 16, for the 20 fit samples that were presented for size eight, 75% fitted well while only 25% did not fit well. Those that did not fit well were either too tight or too loose. For size 10 all 20 fit samples fitted well at the armhole. That of size, 12 the fit samples that fitted well were 45% and 55 % fitted too tight or tight.

Neckline

As shown in Table 16, the neckline produced for most of the models had fit problems. For size eight only 55% fitted well, while 45% had the neckline being slightly wider or just above the collar bone. Most of the necklines 90% were either too tight or tight, with as low as 30% of size 12 being too high.

Waist

The fit measurement of the samples in terms of the waist ranged from too tight to too wide with tight, loose and correct fit. For all the sizes about 65% fit the waist. Those that had fit problems at the waist were either too wide or too tight (see Table 16).

Bust

From the 60 samples produced only 5% of them had fit problem around the bust. The bust was either wide or too wide in the default cases. This means that, the majority of garment producers in the study area use grading rules that produce normal fit for the bust for the clients (see Table 16).

Hip

The construction of the hip of ladies‟ garment in different sizes posed challenges for most of the garment producers in the study area. A third of the fit samples 35% had normal fit in terms of the hip, whereas two-thirds 65% had fit problems of either too tight or too large. Consequently, the grading rules that the small scale garment producers in this study were using may have to be changed to enable them compete favourably with the RTW and second-hand clothing on the market (Brown & Rice, 2001).

Shoulder

In grading the shoulder slope of the 60 fit samples, the outcome was almost normal fit for the three sizes. Sizes 12 produced a perfect 100 % fit, while sizes eight and 10 had 95 % perfect fit each. Therefore, the methods of grading patterns that the garment producers were using in the study area produced good results.

Across chest

The fit samples showed that 92% normal fit was achieved for the across chest and only 8% showed fit problem across the chest. It could be deduced that the grading methods used by garment producers in the study area were good enough to ensure fit.

Dart

The application of dart in terms of position and width posed challenges for the 20 garment producers as various degrees of fit problem were noticed. The darts were

between 2.5 cm. to 8cm above, below or away from the nipple towards the side. Sometimes the darts were too long, too wide, or too short. Only 30% of the fit samples had darts that fitted all the sizes (8, 10 and 12). Cole and Czachor (2014) said that darts are made in ladies‟ garments to make it fit the contours of the ladies‟ body in a flattering way. Darts that are not in their right position cannot meet this purpose and will rather spoil the appearance of the garment. Thus the garment producers in this study area may require some skill training in dart application to improve female garment production in the metropolis.

Fit was assessed to identify any fitting issues that might be related to the grading. Patterns were measured to verify if the grades for the neckline, shoulder, armhole, side seam and dart were in accordance with standardized body measurements. The results clearly indicated that current sizing of garment producers in the Sekondi-Takoradi Metropolis do not conform to the varied body shape of today‟s lady consumers and the fit needs of a significant part of the sample are unmet with current pattern grading offerings. There are significant differences in the fit of the different garment producers. Results showed that the majority of the garment producers (82%) products failed to contain the ideal fit and sizing lack uniformity in the study area in line with Lietchty, Rasband and Pottberg (2010) that the ideal figure shape is rare.

In sum, for size 10, all products from all (100%) garment producers fitted well for three body parts namely armhole, bust and across chest. However, only three (15%) fitted well for dart. For size 8, the highest of 19 (95%) for shoulder and 17 (85%) for across chest fitted well. However, only two (10%) fitted well for dart. For size 12, shoulder fitted well with 100%, followed by bust and across chest each having 18 (90%) well fit. Shoulder is the part that was well fitted among the body

parts. It had 19, 19, and 20 for the three sizes respectively. On the other hand, the dart was the part that did not fit well. It had three (3), two (2), and one (1) for the three sizes respectively.

4.9 Grading of Patterns by Garment Producers

Tables 17 to 19 present results on how two raters scored the garment producers‟ graded sheath dresses on the models. The criteria used were as follows: Excellent fit =5, Good fit = 4, Fair fit=3, Poor fit=2 and Very poor fit =1.

Table 17: Descriptive statistics on the scores for size 8

		Rater 1		Rater 2	
Fit Areas	N	Mean	SD	Mean	SD
Front View of dress	20	4.84	0.37	4.65	0.67
Back view of dress	20	4.37	0.68	4.35	0.67
Sides of Dress	20	4.58	0.61	4.50	0.61
Underam darts	20	4.11	0.88	4.30	0.66
Front darts	20	3.90	0.88	3.95	0.76
Back darts	20	4.16	0.96	4.25	0.72
Waist level	20	3.95	0.91	3.85	0.88
Neckline	20	4.32	1.00	4.20	0.95
Arm hole	20	3.84	0.83	3.95	0.76
Shoulder	20	5.00	0.00	5.00	0.32
Bust	20	4.89	0.32	4.80	0.52
Waist	20	4.05	0.97	4.00	0.86
Hip	20	3.84	0.76	4.25	0.79

Source: Field survey (2018)

The results in Table 17 show the descriptive analysis of the various styles of patterns for ladies in the Sekondi-Takoradi. From Table 17, the twenty (20) garment producers scored from good to excellent. Out of the thirteen fit areas scored, four were rated good, eight were rated very good and only one which is the shoulder length was rated excellent. Table 18 presents the results on size 10.

Table 18: Descriptive statistics on size 10

		Rater 1		Rater 2	
	N	**Mean**	**SD**	**Mean**	**SD**
Front View of the Dress	20	4.90	0.45	4.95	0.22
Back view of dress	20	4.75	0.44	4.45	0.51
Sides of Dress	20	4.45	0.51	4.35	0.67
Underarm darts	20	4.35	0.93	4.50	0.76
Front darts	20	4.35	0.93	4.35	0.75
Back darts	20	4.35	0.875	4.35	0.88
Waist level	20	4.30	0.80	4.50	0.69
Neck size	20	4.40	0.88	4.20	0.89
Arm hole	20	4.10	0.85	4.20	0.83
Shoulder	20	5.00	0.00	4.95	0.32
Bust	20	4.95	0.22	4.85	0.49
Waist	20	4.00	0.79	4.30	0.86
Hip	20	4.10	0.97	4.20	0.89

Source: Field survey (2018)

As presented in Table 18, twenty (20) fit areas scored from very good to excellent. Out of thirteen fit areas scored, twelve were rated very good and only one which is the shoulder style was rated excellent. The two raters generally rated the various fit areas as very good fit. One particular area that was rated excellent (5) was the shoulder. The mean score was 5.0. The only difference was with the second rater who indicated a variability score of 32% (M=5.0, SD=0.32). Other areas, the front and the back views of the sheath dresses and the hip were highly rated. The mean scores for the front view of the sheath dresses were 4.84 and 4.65 front rater one and rater two respectively. The back view received mean scores of 4.90 and 4.95 from rater one and rater two respectively.

From rater one and rater two mean scores of 4.10 and 4.20 respectively were obtained for the hip. The possible explanation for the almost perfect scores given to the shoulder is that shoulder measurements are, by all standards, easy to handle by

dressmakers. Similarly, the raters had little problem since the criteria for evaluating was easily followed. This was determined by its ability for the shoulder seam to lie flat on the shoulder. The front view also obtained high mean scores. This could be attributed to the fact that the front view had no opening. The back view also obtained good mean scores. Raters varied significantly in the scores they gave that were 4.75 and 4.45 respectively. This could be possibly explained from the fact that the back has an opening. The photographs obtained (see Appendix M) indicated that three of the dresses had back view fit problems. The hip comparably obtained lower scores from both raters. This could be attributed to the inadequate skills of the garment producers in sharpening the hipline appropriately.

Table 19: Descriptive statistics on size 12

		Rater 1		Rater 2	
	N	**Mean**	**SD**	**Mean**	**SD**
Front View of dress	20	5.00	0.22	4.85	0.37
Back view of dress	20	4.60	0.50	4.65	0.49
Sides of Dress	20	4.30	0.57	4.45	0.69
Underarm darts	20	4.15	1.04	4.40	0.82
Front darts	20	4.00	0.92	4.30	0.80
Back darts	20	4.30	0.93	4.45	0.76
Waist level	20	4.35	0.81	4.40	0.68
Neck Size	20	4.20	1.06	4.60	0.47
Arm hole	20	4.20	0.83	4.10	0.85
Shoulder	20	5.00	0.22	4.95	0.23
Bust	20	4.90	0.45	4.90	0.31
Waist	20	4.10	0.79	4.30	0.80
Hip	20	3.85	0.93	4.05	0.89

Source: Field survey (2018)

Table 19 shows the descriptive analysis of the various fit areas of size twelve (12) for ladies in the Sekondi-Takoradi Metropolis. From Table 19, all the twenty (20) seamstress styles scored from good to excellent. Out of thirteen styles, one was rated

good, ten were rated very good and rest of the style were rated excellent. The results in Table 19 indicate that size 12 was rated as very good. The scores ranged from 4.0 to 5.0. This means that the scorers viewed the various parts they graded as fitting well. The significant revelation in the data was that for the shoulder, again, Rater One scored (M = 5.0, SD = 0.22) and Rater Two scored (M = 4.95, SD = 0.23). This means that both raters viewed the shoulder of size 12 as an excellent fit.

Research Question Three

What challenges did garment producers face in grading patterns for different shapes and size of their lady clients in the Sekondi-Takoradi Metropolis?

Major challenges faced by the garment producers are presented in Table 20.

Table 20: Pattern grading challenges of the garment producers

Challenges	Frequency	Percentage (%)
Grading for ladies with same hip and waist measurements	16	25.0
Grading for ladies with big bust and small hip	14	21.9
Grading for small waist with large hip	14	21.9
Grading for ladies with hollow chest	10	15.6
Difficulty in dealing with figures	10	15.6
Total	***64**	**100**

Source: Field survey (2018); *Multiple responses, N=20

The majority 16 (25%) of the garment producers had challenge with ladies with same hip and waist measurements. The same hip and waist measurement are said to have rectangular body shape. This shape appears nearly the same as those with same width at the bust, waist and hip measurements. This challenge has been noted by Pisut et al (2007) who recorded that this body shape presented problems for garment producers. The waist of such body shape is barely indented at the side, therefore, appearing wide in proportion. The rectangular body shape may experience tight fit around the waistline (Mastamet-Mason, 2008). As high as 25% of the garment

producers reporting difficulty in grading for ladies with same hip and waist makes it a great challenge. The garment producers were further asked to explain why a figure with the same hip and waist measurement was a challenge, the excerpts of their responses are illustrated as follows:

A garment producer (R2) stated that:

> "*when I am grading for a number of people, I do it according to sizes without recognition of figure types, it makes it difficult for my pattern to fit"*.

A garment producer (R12) indicated:

> "*I find it difficult in making dresses for such clients who have same hip and waist measurements. Sometimes there wouldn"t be enough fabric left from the bulk of fabric brought to me to make a new dress for such clients and I need to join pieces to make the dress fit*".

These assertions by the garment producers give the indication that same waist and hip measurements posed a huge challenge for garment producers. Big bust and small hips shape also posed challenges in pattern grading for 14 (21.9%) of the garment producers. This body shape is also referred to as inverted triangle (Rasband & Liechty, 2006).Garment producer R9 stated that:

> „*I just don"t like making dresses for my clients with big bust and small hip. For example a client with bust two sizes bigger than the hip would cause me a lot of fitting problems in the sense that I would need to adjust her pattern for it to fit her figure type".*

The inverted triangular body shape has a big bust tapered with a small hip. Mastamet-Mason (2008) described it as an unbalanced shape in that it appears larger above the waistline and smaller below the waistline due to a larger bust and narrow hip. He argued that ladies with inverted triangular shape may experience loose fit in the lower body when a garment fits the upper body due to the upper body being larger than the lower body. No wonder many of the garment producers indicated inverted triangle figure type as a problem.

Another challenge reported by the garment producers in Sekondi-Takoradi Metropolis as a drawback to pattern grading was small waist and large hip. Fourteen (21.9%) said they have a challenge grading for this figure type. Rasband (1994) called small waist and large hip the hourglass shape. According to her, the hourglass shape is balanced above and below the waist, and the very small waist makes the bust and hip appear proportionally larger than they are. This body shape may experience loose fit around the waist due to the well indented waist (Mastamet-Mason, 2008).

Two more challenges stated by the garment producers were hollow chest and difficulty in dealing with figures. Ten (15.6%) reported that both hollow chest and difficulty in dealing with figures were problems in pattern grading. Hollow chest is when a lady has tiny breasts and the chest is too shallow to hold up the bodice, excess fabric gathers on the front bodice between the nipple and neckline. This is because the centre front neck line does not sit against the chest. Garment producer R2 stated that:

> *„Idon"tlike making garments for clients with hollow chest. Their back looks rounded as well but all the same I have to find a way of making their dress to fit".*Again R1 said *„I try to do my best to get their dresses to fit them.*

With respect to the challenge of difficulty in dealing with figures, it could plausibly be attributed to the fact that many of the patterns companies state their measurements in metric system and garment producers have to do the conversion into the imperial units. It was observed in the study that garment producers, especially those with only Basic and Secondary school backgrounds, found it difficult to do conversion, division, additions and subtraction in measurement without mistakes. As such wrong measurements were at times used for making garments for their clients. Garment producer R3 stated that: *„I never liked mathematics at school but I have come to know that there is a bit of mathematics in everything. „Garment producer R15 said: „I tried to ran away from Maths but I have met it in my profession"*

Research Question Four

What strategies were employed by the garment producers to manage challenges associated with pattern grading for their lady clients in the Sekondi-Takoradi Metropolis?

This research question sought to find out ways by which garment producers managed the challenges they faced with pattern grading for lady clients in the Sekondi-Takoradi Metropolis. Participants were asked to respond to some items on the strategies they used. Responses of garment producers are presented in Table 21.

Table 21 show the various strategies garment producers used to address the stated challenges in grading patterns. They reported varied views which have been categorized based on the challenges they encountered. To rectify the problem of clients with same hip and waist measurements, the preferred strategy was the introduction of fullness at the waist line. Out of the 20 garment producers, 16 (16.2%) of them introduced fullness at the waistline. Only four (4%) reported using design to hide the hip of the client.

Table 21: Strategies to manage pattern grading challenges by the garment producers

Responses	Frequency	Percentage (%)
Same Hip and Waist measurements		
Introduce fullness at the waistline	16	16.2
Use designs that will hide the hip of the client	4	4.2
Big Bust and Small Hip		
Introduce underarm dart to support breast	15	15.2
Introduce yoke at the bodice	12	12.2
Small Waist with Large Hips		
Introduce double dart at the waist	10	10.1
Increase the width of dart	13	13.2
Introduce fullness (gathering, pleats, etc.) at the waistline	6	6.1
Hollow Chest		
Lower front neck and shoulder point	4	4.0
Measure across back and subtract from across chest	8	8.0
Arithmetic in measurements		
Accurate body measurement is taken and well labelled for each client	5	5.0
Clients measurements is reviewed from time to time	6	6.0
Total	***99**	**100**

Source: Field survey (2018) *Multiple responses, N=20

Clients who have big bust and small hip had underarm dart introduced at the bust to support the breast. This was used by 15 (15.2%) garment producers. The introduction of yoke at the bodice was also used by 12 (12.2%) garment producers (Table 21).

Garment producer, R15, suggested that *„wedge dart is introduced to accommodate the bust"*. Another garment producer, R20, mentioned that *„I bring in tucks at the waistline to make room for the unbalanced bust to waist measurement"*. In such instances the garment producers need to identify the client"s specific body shape (as in the case of custom-made against mass production) in order to apply the

appropriate underarm dart to support the breast. The idea of knowing and considering client body shape is in line with the assertion of Pisut and Connell (2007) that understanding the physical differences among body shapes is essential to the sizing and grading of pattern for apparel.

Challenges related to small waist with large hip were managed by 10 of the garment producers by introducing double dart at the waist which represents 10.1%. Increasing the width of dart was also used by 13 (13.2%) garment producers to address the challenge this represents 13.2%. Six of the garment producers introduce fullness at the waistline this represents 6.1%. Garment producer R3 stated that *„fullness like pleats is applied at the waist line to make up for the small waist"*. Further, R6 stated that *„I increase the width of the wedge dart to give room for the large hips"*. This assertion corroborates what was said by Cole and Czachor, (2014) that darts are used to add a feminine shape to a garment since it gives room to accommodate the large hip shaping.

The study revealed that challenges relating to clients with hollow chest were managed by strategies such as lowering the front neckline and shoulder points. Four (4.0%) garment producers reported using lowering front neckline and shoulder points to manage hollow chest challenges. Also, eight (8.0%) garment producers indicated measuring across back and subtracting from across chest to address hollow chest related challenges. A garment producer R5 confessed *„initially, it was not easy for me when making dresses for such clients, but I just increase the front neckline a little*. Another said *„I have resolved in taking every point of the body measurements of such clients into consideration when making their garments, he added that this helps me to get close to an excellent fit*".

For difficulty in dealing with figures, five (5.0%) garment producers reported they managed such challenges by taking accurate body measurements and labelling them for each client. Finally, six (6.0%) garment producers said that the measurements of their clients should be reviewed from time to time. *A garment producer R1 admitted that when she misses -1 or +1 it distorts the fit of the dress since every inch counts in making dresses.* Garment producer R1 said:

> *„I just fold the tape measure into the required measurement I need. For instance if the length of what I am measuring is 3inches but I need half of it, I pick the 3 inches on the tape measure and fold it for the metal tip to reach the 3 then fold, where the tip of the fold is will be half of the required length I need. This relieves me from mathematical calculations".*

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Overview

The study investigated the grading of ladies‟ patterns by small scale garment producers in the Sekondi -Takoradi Metropolis. The questions that guided the study focused on types of patterns used by garment producers, how garment producers obtained patterns of the same style to fit different shapes and sizes of ladies, challenges faced in grading ladies‟ patterns, strategies to overcome challenges associated with grading of ladies‟ patterns. The study adopted mixed method approach using triangulation design. Purposive sampling procedure was used to sample 20 participants for the study. Interview, observation and test copy were used to collect data. This chapter presents the summary, conclusions and recommendations of the study.

5.1 Summary of Findings

The key findings of the study were as follows:

1. With respect to the types of patterns used for ladies‟ garments, garment producers used different types of patterns in their trade. The type mostly used was the freehand cutting method and the type least used was the draping.
2. To obtain patterns of the same style to fit different shapes and sizes of ladies, the garment producers in Sekondi-Takoradi used different kinds of tools, the most popular among them being scissors and tape measure. Numerical values for increasing and decreasing patterns during grading varied from one garment

producer to the other. These values were not proportional to the sizes and deviated from the UK grading values significantly.

3. The most prominent challenge reported by garment producers was grading for ladies with same hip and waist measurement.
4. To overcome challenges that associated with pattern grading, the garment producers used strategies that were suited to each challenge such as introduction of fullness at the waistline, introduction of underarm dart to support the breast.

5.2 Conclusions

Based on the findings of the study, it was therefore concluded in the study that;

1. Simple and less costly methods and tools were used more than sophisticated ones in pattern grading.
2. Garment producers in Sekondi-Takoradi Metropolis displayed differences in grading patterns

5.3 Recommendations

On the basis of the findings of the study, the following recommendations were made:

1. The executive of garment producers Association should include training of pattern grading methods during their refresher courses to equip the members for mass production.
2. Clothing tutors should organize refresher courses and workshops to upgrade and update the professional knowledge, skills and competence of garment producers.

3. National Board for Small Scale Industries (NBSSI) should support the garment industry to create database of measurements for ladies in Sekondi-Takoradi Metropolis and invest in research works aimed at establishing sizing systems for ladies in the metropolis.

4. Ghana National Tailors/ Dressmakers Association examination should make pattern grading a requirement in dress making apprenticeship or education for one to qualify to be certified as a garment producer in Sekondi-Takoradi metropolis.

5.4 Suggestions for Further Research

1. Perception of garment producers of the use of Computerized Aided Designs in pattern grading.
2. Educational background and garment producer‟s measurement competence in pattern grading.

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APPENDICES

APPENDIX A

INTRODUCTORY LETTER

Request to conduct research on members of the Association of Tailors and Dressmakers (Local Branch)

University of Education, Winneba
Home Economics Department
Winneba
29th July, 2018

The Chairperson
Association of Tailors and Dressmakers
Sekondi-Takoradi Branch
Dear Chairperson,

REQUEST TO CONDUCT RESEARCH ON YOUR MEMBERS

I am a final year student of the above university. I am studying Home Economics (Clothing and Textiles) at the Masters level. The Department of Home Economics at the university has assigned me to carry out a research on, "Grading of ladies" patterns by small scale garment producers in the Sekondi-Takoradi Metropolis"". This research is part of my requirement to complete my MPhil in Clothing and Textiles. It is also intended to make a contribution to understanding and supporting best practice in the sewing industry in the Sekondi-Takoradi Metropolis. I am therefore, requesting you to permit me to collect data from your members and to introduce me to them.

Data analysis and reports of research findings will focus on summary of statistics, with no information reported that would enable detection of individual participants. Thus, participants" identity and confidentiality will be protected in presentations and publications of research reports.

Also, I will present a copy of the results to your association before presentation and publication

Thanking you in advance.

Yours sincerely,

……..
(Genevieve Nketsiah).

APPENDIX B

GARMENT PRODUCER'S CONSENT

Dear Participant,

My name is Genevieve Nketsiah from the Department of Home Economics, University of Education, Winneba. I would like to invite you to participate in a research project on the topic: "Grading of ladies" patterns by small scale garment producers in the Sekondi -Takoradi Metropolis"". This research is part of a requirement to complete my MPhil in Clothing and Textiles. It is also intended to make a contribution to understanding and supporting best practices in the sewing industry in the Sekondi-Takoradi Metropolis.

Your participation in this study is completely voluntary. Besides, any information you give would be regarded with utmost confidentiality and that no information you give would be used against you whatsoever.

I would therefore be grateful if you would indicate your consent and availability for the research. Thank you for your time.

……..
(Signature)

APPENDIX C

INTERVIEW GUIDE FOR GARMENT PRODUCERS

PART A: Demographic Information

(Please tick if applicable [√]

1. Gender: Male [ ] Female [ ]

2. How many years have you practised as a full-fledge dressmaker/tailor?

i. 1-5years [ ] ii. 6-10 years [ ] iii. 11-15years [ ] 16 years and above [ ]

3. What is your academic / professional qualification?

i. Apprenticeship after JHS [ ]

ii. Apprenticeship after SHS [ ]

iii. NVTI Proficiency Dressmaking [ ]

iv. NVTI Intermediate [ ]

v. HND Fashion [ ]

vi. First Degree in Fashion [ ]

PART B: Pattern making

4 What method of pattern do you use to make ladies garments?

S/N	Pattern(s) used	[√]	REMARK(S)
1.	Freehand method		
2.	Copying from already sewn garment		
3.	Flat Pattern Designs		
4.	Draping		

PART C: Pattern Grading Methods

How do you obtain smaller and larger pattern sizes from a base size pattern?

PART D: Pattern Grading Challenges

What challenges do you face when grading patterns for ladies?

(Tick [√] where applicable)

S/N	Challenges	[√]	Remark(s)
1.	Grading for ladies with same hip and waist measurements		
2.	Grading for ladies with big bust and small hip		
3.	Grading for small waist with large hip		
4.	Grading for ladies with hollow chest		
5.	Difficulty in dealing with figures		

PART E: Strategies for Managing Challenges of Pattern Grading

How do you manage the challenges you face when grading pattern for ladies?

(Tick **[√]** where applicable)

Same Hip and Waist measurements	**[√]**	Remarks
Introduce fullness at the waistline Use designs that will hide the hip of the client		
Big Bust and Small Hip		
Introduce underarm dart to support breast		
Introduce yoke at the bodice		
Small Waist with Large Hips		
Introduce double dart at the waist		
Increase the width of dart		
Introduce fullness (gathering, pleats, etc.) at the waistline		

Hollow Chest		
Lower front neck and shoulder point		
Measure across back and subtract from across chest		
Difficulty in dealing with figures		
Accurate body measurement is taken and well labelled for each client		
Clients measurements is reviewed from time to time		

OBSERVATION CHECKLIST FOR TOOLS/ MATERIALS USED BY GARMENT PRODUCERS

S/N	TOOLS/ MATERIALS	[√]	REMARK(S)
1.	Tape measure		
2.	Scissor		
3.	Pins		
4.	Tailor‟s chalk/Pencils/ Blackboard Chalk		
5.	Metre rule		
6.	French curves		
7.	Tracing wheel		
8.	Eraser		
9.	CAD		

APPENDIX D

OBSERVATION CHECKLIST FOR PROTOTYPE MODEL

DRESSES

Garment producer	Body size	Arm hole	Neckline	Dart position	Bust	Waist line	Hip	Shoulder	Across chest

APPENDIX E

OBSERVATION CHECKLIST FOR SAMPLE DRESS

Armhole	Front dress neckline,	Dart Position	Bust	Hip	Shoulder	Dress length,	Back dress-darts	Back neckline.

APPENDIX F

OBSERVATION CHECKLIST FOR GRADING PATTERNS

Pattern cutting methods and tools	Units of measures	Marking of grade points	Dart positions and width	Body shape and size	Shoulder slope	Side seam	Total time spent on cutting, grading and sewing	Fit

APPENDIX G

GRAPHICAL REPRESENTATIONS OF RESULTS OF DEMONSTRATIONS

McCall (2011) explained garment production processes from the manufacturing stage to the final consumer as in Figure 1, p27.

Table 1: Garment Production Process

S/N	Process	Description
1	Designing the sketch	Designer provides several rough sketches including measurements for selection
2	Sample making	First patterns are sent to the sewing unit for approval or rectification of faults
3	Pattern production	Pattern design is taken for creating the production patterns
4	Grading	Designer creates patterns in different standard sizes.
5	Maker making	Required sizes are arranged in such a way that maximum number of garments. Markers are made for 6, 12, 18, 24
6	Spreading	Arranging fabrics on the spreading table as per length and width of the marker in stack form
7	Fabric cutting	Marker paper is placed carefully and accurately on the fabric, and pinned to avoid unwanted movement or displacement of the marker paper. Normally straight knife cutting machine is used to cut out the garment component as per exact dimension of each pattern in stack form.
8	Sorting	Garment components in stack form are sorted out as per size and colour.
9	Sewing or assembling	Sewing machines of different types are arranged to assemble the garments
10	Inspection	Thorough and careful check to detect any defect. If the defect cannot be corrected, then the garment is separated as wastage.
11	Folding	The garments are bundled and poly-packed in dozens, according to colour, size or ratio, and labelled with important information
12	Dispatch	Ready for collection

Source: McCall, 2011

APPENDIX H

SIZE CHART

Table 1. Size Chart

	Grade rule between sizes Misses 4 – 18 in cm.							
Measurement Point	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**
Bust	+/-1	+/-1	+/-1	+/-1	+/-1.5	+/-1.5	+/-1.5	+/-2
Waist	+/-1	+/-1	+/-1	+/-1	+/-1.5	+/-1.5	+/-1.5	+/-2
Hip	+/-1	+/-1	+/-1	+/-1	+/-1.5	+/-1.5	+/-1.5	+/-2
CB waist length	+/-1/4	+/- 1/4	+/- 1/4	+/- 1/4	+/- 1/4	+/- 1/4	+/- 1/4	+/- 1/4
CB skirt length	+/-1/4	+/- 1/4	+/- 1/4	+/- 1/4	+/- 1/4	+/- 1/4	+/- 1/4	+/- 1/4
Sleeve length from shoulder	+/-1/4	+/- 1/4	+/- 1/4	+/- 1/4	+/- 1/4	+/- 1/4	+/- 1/4	+/- 1/4

Source: Wijendra (2014)

APPENDIX I

GRAPHICAL REPRESENTATIONS OF STANDARD BODY MEASUREMENT COMPILED BY ALDRICH (1994)

Table 2:

Body parts	Size 8	Size 10	Size 12
Necksize	35cm	36cm	37cm
Armhole	20cm	20.5cm	21cm
Dart position	5.8cm	6.4cm	7cm
Bust	80cm	84cm	88cm
Waist line	60cm	60cm	64cm
Hip	85cm	89cm	93cm
Shoulder	11.75	12cm	12.25cm

APPENDIX J

FEMALE BODY SIZE AND SHAPE

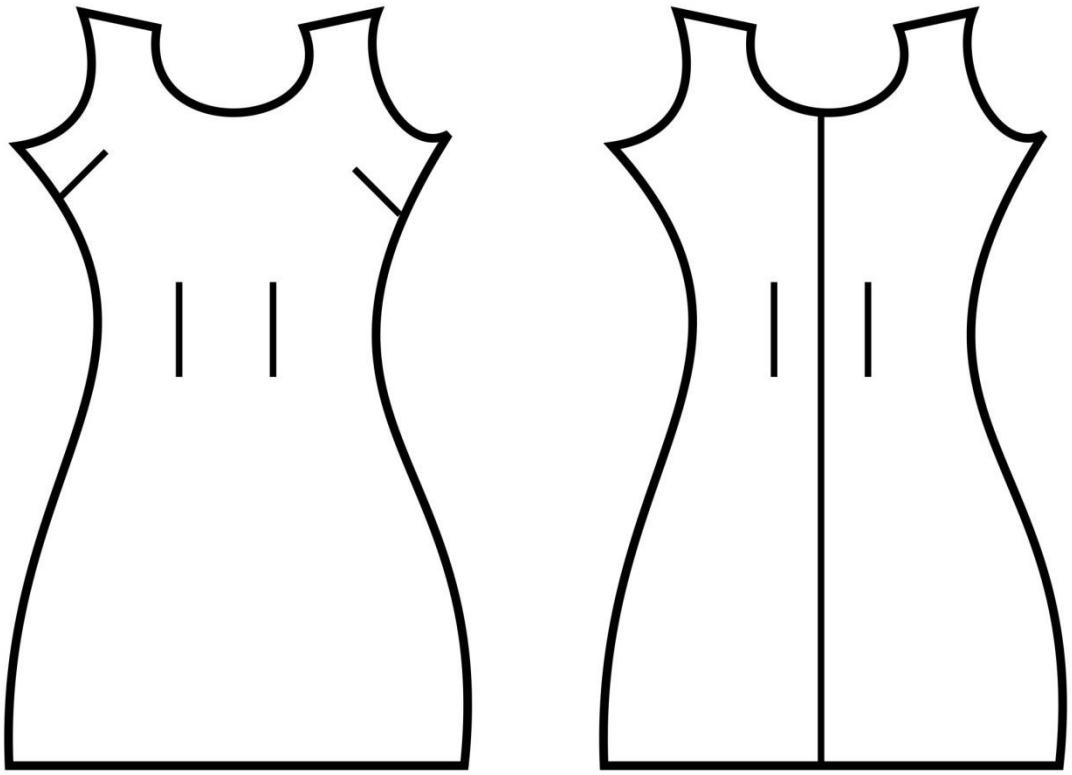
Source: Shape in Design Newsletter (April 2011)

From Left to Right:

- Ideal figure Shape
- Triangle figure shape
- Inverted triangular figure shape
- The Rectangle figure shape
- Hourglass figure type (opposing triangles)
- The Diamond figure types
- The Tubular figure types
- The Oval or Rounded figure types

APPENDIX K

STRAIGHT DRESS DESIGN



Front View of Dress Back View of Dress

Figure 3 : straight dress design

APPENDIX L

DRESSMAKERS AT VARIOUS STAGES OF PATTERN MAKING AND PATTERN GRADING PROCESS

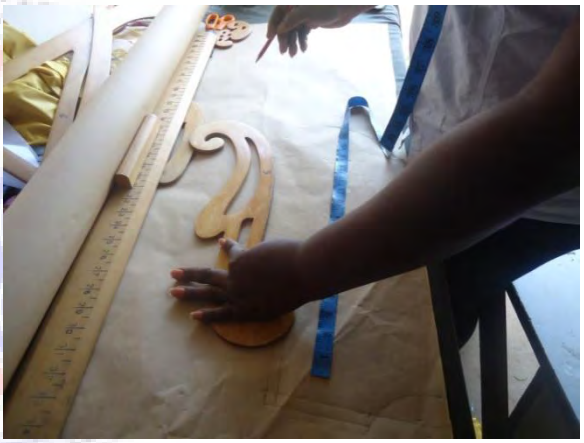
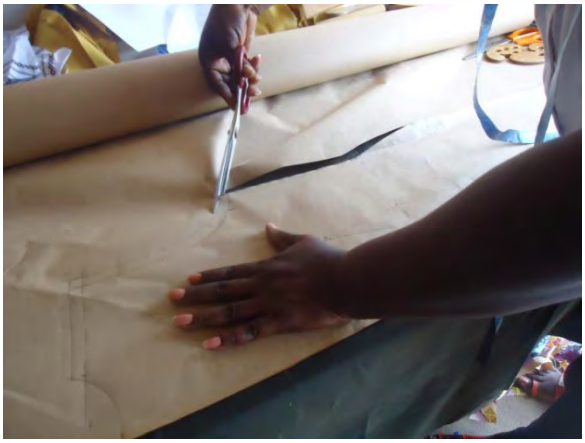





Source: Field photograph 2019

DRESSMAKERS AT VARIOUS STAGES OF PATTERN MAKING AND PATTERN GRADING PROCESS CONT'D




Source: Field photograph 2019

DRESSMAKERS AT VARIOUS STAGES OF PATTERN MAKING AND PATTERN GRADING PROCESS CONT'D






DRESSMAKERS AT VARIOUS STAGES OF PATTERN MAKING AND PATTERN GRADING PROCESS CONT'D

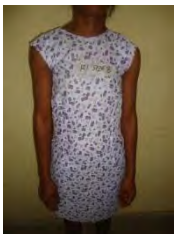
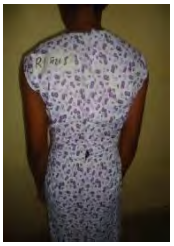
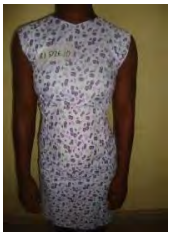
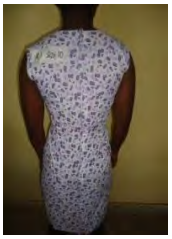
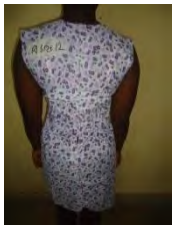
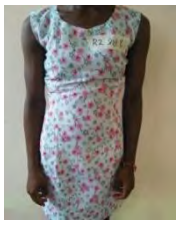
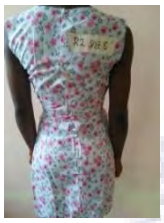
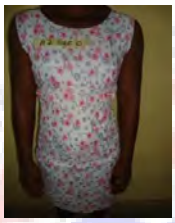
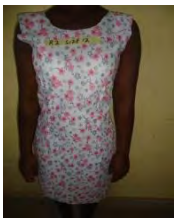
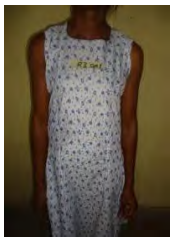
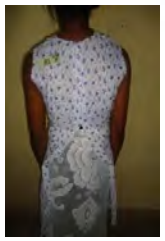
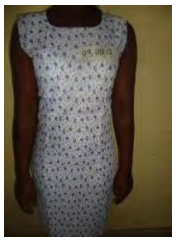
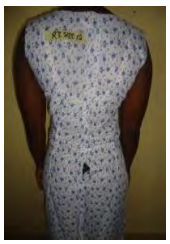
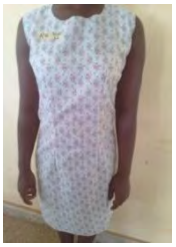
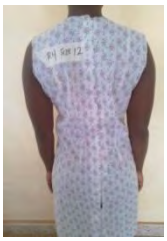


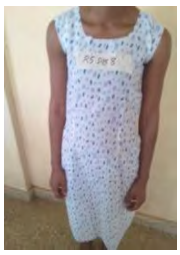
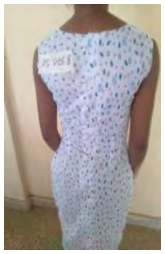
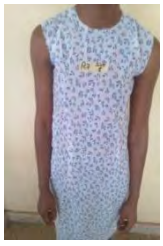
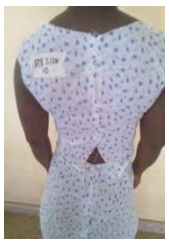


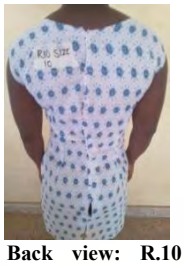

Source: Field photograph 2019

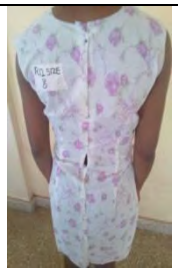
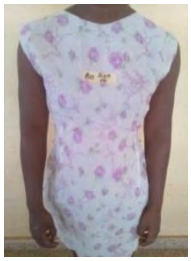
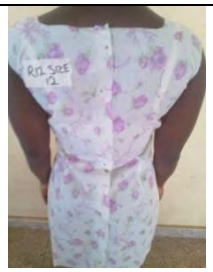
APPENDIX M

PROTOTYPE MODELS OF 20 GARMENT PRODUCERS (SIZES 8, 10, & 12)

 **Front view: R.1** **Size 8**	 **Back view: R.1** **Size 8**	 **Front view: R.1** **Size 10**	 **Back view: R.1** **Size 10**	 **Front view: R.1** **Size 12**	 **Back view:R.1** **Size 12**
 **Front view: R.2** **Size 8**	 **Back view: R.2** **Size 8**	 **Front view: R.2** **Size 10**	 **Back view: R.2** **Size 10**	 **Front view: R.2** **Size 12**	 **Back view: R.2** **Size 12**
 **Front view: R.3** **Size 8**	 **Back view: R.3** **Size 8**	 **Front view: R.3** **Size 10**	 **Back view: R.3** **Size 10**	 **Front view: R.3** **Size 12**	 **Back view: R.3** **Size 12**
 **Front view: R.4** **Size 8**	 **Back view: R.4** **Size 8**	 **Front view: R.4** **Size 10**	 **Back view: R.4** **Size 10**	 **Front view: R.4** **Size 12**	 **Back view: R.4** **Size 12**

 **Front view: R.5** **Size 8**	 **Back view: R.5** **Size 8**	 **Front view: R.5** **Size 10**	 **Back view: R.5** **Size 10**	 **Front view: R.5** **Size 12**	 **Back view: R.5** **Size 12**
 **Front view: R.6** **Size 8**	 **Back view: R.6** **Size 8**	 **Front view: R.6** **Size 10**	 **Back view: R.6** **Size 10**	 **Front view: R.6** **Size 12**	 **Back view: R.6** **Size 12**
 **Front view: R.7** **Size 8**	 **Back view: R.7** **Size 8**	 **Front view: R.7** **Size 10**	 **Back view: R.7** **Size 10**	 **Front view: R.7** **Size 12**	 **Back view: R.7** **Size 12**
 **Front view: R.8** **Size 8**	 **Back view: R.8** **Size 8**	 **Front view: R.8** **Size 10**	 **Back view: R.8** **Size 10**	 **Front view: R.8** **Size 12**	 **Back view: R.8** **Size 12**

 **Front view: R.9** **Size 8**	 **Back view: R.9** **Size 8**	 **Front view: R.9** **Size 10**	 **Back view: R.9** **Size 10**	 **Front view: R.9** **Size 12**	 **Back view: R.9** **Size 12**
 **Front view: R.10** **Size 8**	 **Back view: R.10** **Size 8**	 **Front view: R.10** **Size 10**	 **Back view: R.10** **Size 10**	 **Front view: R.10** **Size 12**	 **Back view: R.10** **Size 12**

					
Front view: R.11 **Size 8**	**Back view: R.11** **Size 8**	**Front view: R.11** **Size 10**	**Back view: R.11** **Size 10**	**Front view: R.11** **Size 12**	**Back view: R.11** **Size 12**
					
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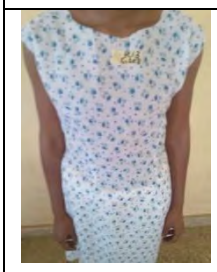
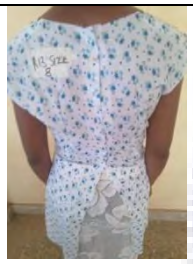
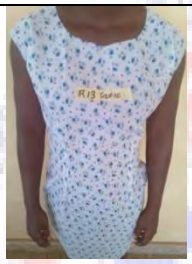
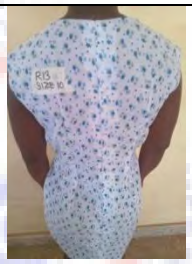
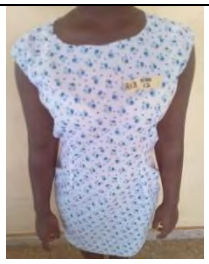
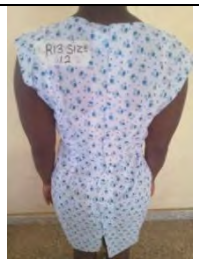
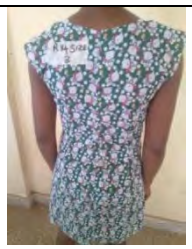
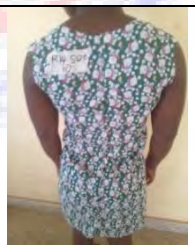
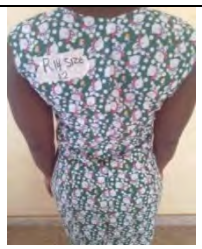
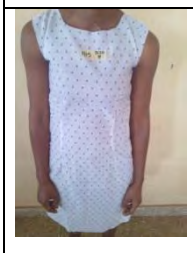
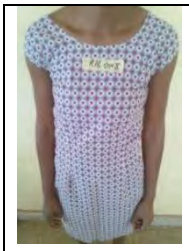
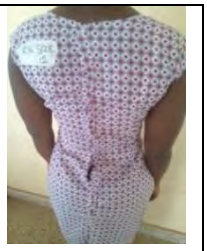
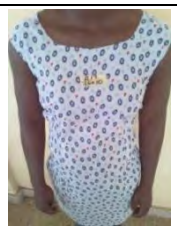
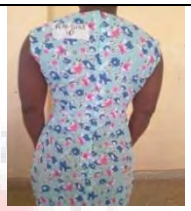
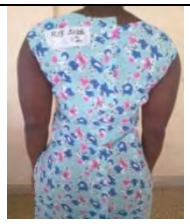
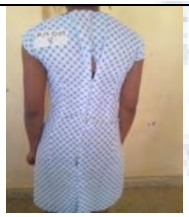
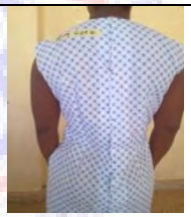
					
Front view: R.13 **Size 8**	**Back view: R.13** **Size 8**	**Front view: R.13** **Size 10**	**Back view: R.13** **Size 10**	**Front view: R.13** **Size 12**	**Back view: R.13** **Size 12**
					
Front view: R.14 **Size 8**	**Back view: R.14** **Size 8**	**Front view: R.14** **Size 10**	**Back view: R.14** **Size 10**	**Front view: R.14** **Size 12**	**Back view: R.14** **Size 12**
					
Front view: R.15 **Size 8**	**Back view: R.15** **Size 8**	**Front view: R.15** **Size 10**	**Back view: R.15** **Size 10**	**Front view: R.15** **Size 12**	**Back view: R.15** **Size 12**

 **Front view: R.16** **Size 8**	 **Back view: R.16** **Size 8**	 **Front view: R.16** **Size 10**	 **Back view: R.16** **Size 10**	 **Front view: R.16** **Size 12**	 **Back view: R.16** **Size 12**
 **Front view: R.17** **Size 8**	 **Back view: R.17** **Size 8**	 **Front view: R.17** **Size 10**	 **Back view: R.17** **Size 10**	 **Front view: R17** **Size 12**	 **Back view: R.17** **Size 12**
 **Front view: R.18** **Size 8**	 **Back view: R.18** **Size 8**	 **Front view: R.18** **Size 10**	 **Back view: R.18** **Size 10**	 **Front view: R.18** **Size 12**	 **Back view: R.18** **Size 12**
 **Front view: R.19** **Size 8**	 **Back view: R.19** **Size 8**	 **Front view: R.19** **Size 10**	 **Back view: R.19** **Size 10**	 **Front view: R.19** **Size 12**	 **Back view: R.19** **Size 12**
 **Front view: R.20** **Size 8**	 **Back view: R.20** **Size 8**	 **Front view: R.20** **Size 10**	 **Back view:R.20** **Size 10**	 **Front view: R.20** **Size 12**	 **Back view: R.20** **Size 12**

Source: Field photo, 2019

APPENDIX N

RESULTS OF 20 DEMONSTRATIONS OF PATTERN GRADING

Respondents	Body size	Armhole	Neckline	Dart position	Bust	Waist line	Hip	Shoulder	Across chest
R1	8	Normal	Too high	8cm above nipple	Normal	Too tight	Normal	Normal	Long
	10	Normal	Too high	8cm from nipple	Normal	Too tight Too tight	Normal	Normal	Normal
	12	Tight	Too high	5cm from nipple	Normal		Normal	Normal	Normal
R2	8	Normal	Low	8cm from nipple	Normal	Fit well	Too tight	Normal	Normal
	10	Normal	Low	Normal	Normal	Fit well	Normal	Normal	Normal
	12	Normal	Low	Normal	Normal		Normal	Normal	Normal
R3	8	Normal	Normal	Normal	Normal	Fit well	Too tight	Normal	Normal
	10	Normal	Normal	2.5 cm above nipple	Normal	Too tight Fit well	Too tight	Normal	Normal
	12	Normal	Normal	2.5cm from nipple	Normal		Fit well	Normal	Normal

R4	8	Too tight	Normal	2.5cm below nipple	Normal	Normal	Too tight	Normal	Long
	10	Normal	Normal	2.5cm from nipple	Normal	Loose	Normal	Normal	Normal
	12	Normal	Normal	Normal	Normal	Loose	Normal	Normal	Normal
R5	8	Too tight	Normal	Normal	Normal	Normal	Loose	Normal	Little long
	10	Normal	Normal	Normal	Normal	Normal Too tight	Normal	Normal	Normal
	12	Normal	Normal	Normal	Normal		Normal	Normal	Normal
R6	8	Too tight	Normal	2.5cm from nipple	Normal	Fit	Too tight	Normal	Long
	10	Too tight	Normal	2.5cm from nipple	Normal	Too tight	Too tight	Normal	Normal
	12	Normal	Normal	2.5cm from nipple	Normal	Too tight	Tight	Normal	Normal
R7	8	Too tight	Too high	5cm from nipple	Normal	Too tight Too tight	Too tight	Normal	Normal
	10	Normal	Normal	5cm from nipple	Normal	Too tight	Too tight	Normal	Normal
	12	Normal	Too high	5cm from Nipple	Normal		Too tight	Normal	Normal
R 8	8	Too tight	Normal	Too close	Normal	Too tight Too tight	Tight	Normal	Normal
	10	Normal	Normal	Normal	Normal	Tight	Too tight	Normal	Normal
	12	Normal	Normal	Normal	Normal		Tight	Normal	Normal

R 9	8	Too tight	Normal	5cm above nipple	Normal	Too tight	Too tight	Normal	Normal
	10	Too tight	Normal	5cm above nipple	Normal	Too tight	Too tight	Normal	Normal
	12	Too tight	Normal	5cm above nipple	Normal	Tight	Too tight	Normal	Normal
R 10	8	Too tight	Normal	2.5cm below nipple	Normal	Tight	Tight	Normal	Long
	10	Too tight	Too low	Normal	Normal	Tight	Tight	Normal	Normal
	12	Too tight	Normal	2.5cm away from nipple	Normal	Tight	Tight	Normal	Normal
R 11	8	Too tight	Normal	Wide,5cm above nipple	Normal	Too tight	Loose	Normal	Long
	10	Too tight	Too high	Wide,5cm above nipple	Normal	Tight	Tight	Normal	Long
	12	Normal	Normal	Normal	Normal	Tight	Tight	Normal	Normal
R 12	8	Too high	Back too low	Wide	Normal	Fitting Close	Loose	Normal	Normal
	10	Normal	Too high	Too wide	Normal	fitting	Wide slope	Normal	Normal
	12	Too tight	Normal	Normal	Normal	Close fitting	Normal	Normal	Normal
R 13	8	Normal	Normal	Wide	Normal	Normal	Too tight	Normal	Normal
	10	Too tight	Normal	Wide and low2.5cm	Normal	Loose	Tight	Normal	Normal
	12	Too tight	Normal	Short	Normal	Too loose	Tight	Normal	Normal
R 14	8	Tight	Normal	Normal	Normal	Normal	Normal	Normal	Normal

	10	Tight	Normal	Too high and wide	Normal	Loose	Fault with shaping	Normal	Normal
	12	Too tight	Normal	Wide	Normal	Loose	Loose	Normal	Normal
R 15	8	Tight	Normal	Back low and wide	Normal	Too tight	Too tight	Normal	Normal
	10	Too tight	Normal	Back low and wide	Normal	Normal	Normal	Normal	Normal
	12	Tight	Low back neck	High with small width	Normal	Normal	Loose	Normal	Normal
R 16	8	Too tight	Wide back neck low	Normal	Normal	Normal	Normal	Normal	Normal
	10	Tight	Wide	Wide	Normal	Normal	Shaping not well set	Normal	Normal
	12	Too tight	Normal	Wide and short	Normal	Normal	Shaping not well set	Normal	Normal
R 17	8	Too tight	Too wide	Too wide	Normal	Tight	Tight	Normal	Normal
	10	Tight	Too wide	Too wide	Normal	Normal	Normal	Normal	Normal
	12	Tight	Too wide		Normal	Loose	Normal	Normal	Normal
R 18	8	Too tight	Too wide	Wide interval	Normal	Too tight	Too	Normal	Normal

	10 12	Too tight Tight	Too high Tight	Normal width Too wide	Normal Normal	Normal Normal	tight Loose Inadequate shaping	Normal Normal	Normal Normal
R 19	8 10 12	Too tight Normal Too tight	Wide Prefect neckline Wide	Wide Too wide Wide	Wide Too wide Wide	Tight Loose Normal	Tight Loose Normal	Normal Long normal	Normal Long Normal
R 20	8 10 12	Tight Tight Tight	Normal Right Not well shaped	Dart length long Wide Wide	Normal Normal Normal	Normal Normal Normal	Normal Normal Normal	Normal Normal Normal	Normal Normal Normal