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Amalgamated Pattern Making as a Creative Resource (Case Study)

Antonio Marcos Barreto

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Orientador: Profº. Doutor José Mendes Lucas
Co-Orientador: Profº e Escritor. Simon Siles lowear

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Dedication

This study is dedicated to my Partner, C.R.Shoebridge, who has been a constant source of support and encouragement during the challenges of graduate University and life. I am truly thankful for having you in my life.

This work is also dedicated to my parents, Maria Neusa and Antonio Barreto, who have always loved me unconditionally and whose good examples have taught me to work hard for the things that I aspire to achieve.

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Epigraph

*"... A fashion designer
Want I to be,
But don't worry,
I shall become
On my own
Resources.*

*A torn jeans,
Patched and darned is ready,
To be worn by me
With the goggles,
If not available
Then the toy glasses will do
And my boots,
Don't bother you.*

*No tension for this,
Take you not,
My eldest brother's
Old and hanging boots,
Abandoned so long,
I am ready to wear it,
A fashion designer,
In the shirt of my grandfather
And the pants of my brother.*

*A fashion designer I,
It's my style.*

"A fashion designer" Bijay Kant Dubey

Abstract

The objective of this dissertation is to investigate and study the connection between the technological development found in the history of fashion clothing and design. A further objective is to consider the importance of anthropometry, ergonomics, volumetrics, geometry and body shape, and to demonstrate, through case study, avenues for adapting and incorporating flat patterning in the creative process of Fashion Design Teaching: “Amalgamated (Hybrid) modelling as a creative resource”.

Every fashion designer needs to think about his personal creative process and how best to stimulate his own creativity. There are some methods that can promote creativity and these need to be made part of the designer’s daily routine in order to develop distinctive and innovative work. When building a collection, the fashion designer must adopt a methodological approach.

Flat patterning reaches the heart of mathematics. It demands logical reasoning and an ability to integrate a number of disciplines. Consequently, it can give the impression of being a rigorous, complex practice, full of often incomprehensible rules, because it can be difficult to grasp its precise theory and practice. But this is an area of knowledge of great significance to students of fashion design while undergoing their academic training because the good professional must have at least a basic understanding of how their design will be put together as a result of flat patterning.

In teaching, flat patterning is often set apart from the creative process and is combined with the later stage of execution. According to Mariano, “it is the process of flat patterning that defines the transformation of flat materials into three-dimensional shapes capable of adaptation to the human body. [...] It also determines whether the clothing can be reproduced”. Mariano (2011, no page)

It is clear that developing a flat pattern is a very important step in the creation of a garment. Its function is not only to configure the garment but also to ensure it can be standardized and reproduced. However, when dealt with as a predominantly technical subject, its application can become divorced from the concept of creation because it appears to have no artistic content.

By approaching flat patterning technique in a composite way, taking advantage of its two-pronged nature to incorporate it in the creative elements of the Fashion Design course, it can become a means of sparking the creative process which has made great names in high fashion in the past. Coelho (2008) argues that patterning should be understood as being more than a technique.

He says that it loses the dynamic sense intrinsic to the concept of a method that is part of a larger process - all the research carried out by the designer - when flat patterning is either not fully understood or taught simply as a technique. Logical reasoning is vital when making flat patterns. But mastery of technique is also essential. Novaes (2008), extends Coelho's reasoning by saying: "Other possible routes in processing a garment result from cross-referencing between standardization methods and production systems. [...] Configuring geometric patterns with three-dimensional modelling when developing a prototype is a further possible method of shaping a garment." (Novaes, 2011, p.93).

A great example of composite patterning as a creative resource in the teaching of Fashion Design is the stylist Tomoko Nakamichi, who teaches at the famous "Bunka" Fashion School in Japan. She departs from the traditional patterning approach and, in effect, offers a hybrid technique which combines and enlarges the ranges of standard flat and three-dimensional modelling.

It follows that educators should bear in mind that a study and understanding of the principles of human anatomy will instil a knowledge of how to evaluate the human profile, so contours can be followed or altered. Concepts of proportion, symmetry and volume (or volumetrics), as well as height and width measurements, are fundamental to producing a technical design and modelling pattern. This information needs to be included in the planning of a garment during graphic design.

In conclusion, teaching flat patterning in a creative way, combining its different elements, can be a force to promote creativity, giving the student the opportunity to see a garment, or fashion product, in three dimensions. This modelling technique allows the fashion professional greater creative freedom thanks to immediate three-dimensional visual contact with the product. It also benefits the student who gains greater control over the creation of a garment in a liberating way that also facilitates improvements to the final results.

Keywords

Pattern making, design, fashion, creative process

Resumo

Esta dissertação objectiva estudar e investigar a relação do desenvolvimento tecnológico velados na história da indumentária, moda e design, assim como antropometria, ergonomia volumetria, geometria, corpo e formas para fins, de buscar e exemplificar através de estudo de caso a possibilidade de incorporar e adequar a modelagem no processo criativo do ensino de design de moda “modelagem híbrida como recurso criativo”.

Nesse contexto, todo criador precisa pensar sobre seu processo criativo na moda e como estimular sua própria criatividade. Existem algumas ferramentas que podem ser usadas para promover a criatividade, e estas devem ser incorporadas à rotina diária para que o designer possa desenvolver um trabalho diferenciado e inovador. O designer de moda deve estabelecer uma abordagem metodológica para desenvolver uma colecção.

A modelagem por passar pelo cerne da matemática, esta requer raciocínio lógico e a capacidade de articular uma série de disciplinas dando a impressão de ser uma prática complexa, rigorosa e cheia de regras, muitas vezes incompreensível devido a uma certa dificuldade de assimilação do seu teor prático e exacto. Por conseguinte esta área do conhecimento se faz de grande importância na formação académica dos alunos de cursos de design de moda pois o bom profissional deve pelo menos deter o conhecimento básico do produto que se vai construir através da modelagem. A modelagem no ensino é frequentemente separada do processo criativo, sendo incorporada mais tarde na etapa do processo de execução.

Segundo Mariano (2011), “a modelagem e o processo que determina a transformação dos materiais planos em formas tridimensionais adaptáveis ao corpo humano [...] e também por determinar a reprodutibilidade do vestuário” [...].

É certo que a elaboração da modelagem é um estágio muito importante, com uma função não apenas de configurar, mas também de garantir que a roupa possa ser reproduzida e padronizada. No entanto, tratando-a como um assunto predominantemente técnico, sua aplicação pode se tornar divorciada da concepção criativa, uma vez que a mesma parece ser desprovida de conteúdo artístico.

Abordar e incorporar as técnicas de modelagem de uma forma híbrida e de maneira criativa no ensino do design de moda, através de suas técnicas ramificadas, desta forma a mesma pode se tornar uma ferramenta capaz de potencializar o processo criativo assim como já no passado fazia grandes nomes da alta costura. Coelho (2008), explica que modelagem não deve ser entendida apenas como técnica porque, quando a modelagem sendo ela plana ou não é compreendida ou ensinada apenas como uma técnica, ela perde o sentido dinâmico amplo

consagrado no conceito de um método que é parte de um processo maior, que é toda a pesquisa feita pelo o designer. O raciocínio lógico é essencial para realizar a modelagem plana. Mas o domínio da técnica também é essencial. Novaes, completa os pensamentos de Coelho nos dizendo que “outros caminhos possíveis no processamento de uma peça de roupa são o resultado de cruzamentos entre métodos de padronização e sistemas de produção [...] já que a configuração de padrões geométricos com modelagem tridimensional no desenvolvimento de um protótipo é outro método possível para modelar peças de vestuário.

Um grande exemplo de uma modelagem híbrida como recurso criativo no ensino de design de moda é a professora e designer da famosa escola de moda japonesa “Bunka” Tomoko Nakamichi, cujo oferece uma ruptura com a padronização da modelagem tradicional e oferece efectivamente uma técnica híbrida que mescla padrões recursos de modelagem plana e tridimensionais.

Portanto, educadores não podem esquecer-se que com o estudo e a compreensão dos princípios da anatomia humana é possível transmitir ideias através do conhecimento de como avaliar o perfil, para que os contornos possam ser seguidos ou alterados, conceitos de proporção, simetria e volume (ou volumetrics), bem como medidas de altura e largura, são fundamentais para a realização do desenho técnico e padrão da modelagem e devem ser trazidos para o planejamento do item como informação durante o design gráfico.

Desta forma então conclui-se que o ensino da modelagem de forma híbrida e criativa pode ser usada para promover a criatividade, proporcionando ao aluno a possibilidade de ver a roupa ou produto de moda em três dimensões. Pode-se dizer que essa técnica de modelagem dá maior liberdade criativa ao profissional da moda devido ao contacto visual tridimensional imediata do produto e que também beneficiará o aluno sob um maior controle sobre a criação da roupa de uma maneira incomum e que também facilitará os ajustes finais.

Palavras-Chave

Modelagem, design, moda, processo criativo

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Comments:

- 1 - This dissertation is written in English according to the Portuguese (APA) orthographic norms.
- 2 - The texts and quotations are mostly from Portuguese, translated by the author.
- 3 - The original Spanish texts translated by the author are in appendix II.

Introduction

According to Treptow (2005), “Flat patterning is to fashion design what engineering is to architecture.”

In dressing the human body, the Fashion Designer needs a knowledge of both its anatomy and what this signifies. To learn the craft of flat patterning and its orientation is to know how to dress it.

The world has gone through, and continues to go through, great changes at a global level. Such a transformative process has been possible because, at the same time, there have been great changes in society in organizational, technological, educational, economic, family and personal relations. Nowadays, we live in a society of Knowledge in which there is an increasing demand for the individual to become more critical, creative and reflective. We live within new paradigms in all fields.

We live in an age of globalized markets, and with globalization comes an increasing tendency towards intellectualization and creativity in the whole economic, political, social and ethical/aesthetic process. In the field of education greater knowledge is needed, with extended skills and flexibility in information technology, mastery of languages, communicative and cognitive abilities, adaptability in reasoning, along with the ability to develop entrepreneurial skills, administrate and run projects, teach, create and innovate.

In this society of Knowledge where it is necessary for the individual to be critical, creative and reflective, it is not the objective of this dissertation to criticize current methods of teaching flat patterning in Fashion Design courses but, instead, to make a contribution to reflection concerning the relevance of a hybrid, interdisciplinary teaching in Fashion Design, so that the teaching and learning of flat patterning is made more comprehensive and interesting by integrating its theoretical and creative elements.

Clearly, flat patterning has great importance in the production process of garment making, because, while the productive process takes in several stages including research, creation, patterning, cutting, assembling (or sewing) and finishing (Araujo, 1996), it is in the patterning that the definition takes place in two-dimensional form of what will be produced as an eventual three-dimensional artefact to be made up as a garment.

This dissertation therefore takes the study of flat patterning and its fundamental methods, introduced in the creative sector as a means of teaching in undergraduate Fashion Design courses in Higher Education, as its starting point. These are studies in which the lecturer

introduces concepts which guide the whole narrative, such as hybrid processes, normative, performative and productive processes included in the field of developing fashion products.

Fashion design is essentially a hybrid field forging a link between body and information, luxury and junk, beauty and ugliness. In this instance, creative and innovative solutions are the guiding principles for this dissertation, enabling freedom in the creative process.

This focus makes a comprehensive study of the facts concerning fashion history of the utmost importance to this research. This includes tailoring and patterning, as well as the importance of an in-depth study of the theoretical content of such disciplines as anthropometry, ergonomics, anatomy, geometry and volumetrics.

According to Gonçalves, (2012), from the historical viewpoint, it is known that, since the Middle Ages, tailoring has been the art of making garments specifically for a particular client, made in the manner of the private craftsman which includes the patterning, cutting and sewing, as well the aesthetic aspect of the garments.

To speak of the tailor's profession in the eighteenth century is to speak of a highly specialized profession with regard to know-how because it required a great knowledge of the patterning and making of clothing, translated into the beauty, refinement and quality of the final product, because these can easily be seen in the perfection of workmanship, the way in which the garment hangs and how it adapts to the body. (Silva, 2012, p.6)

According to Soares (2009, s.p), tailors were the specialists who developed the profession's knowledge bases and technical domain and gave "fashion" its great importance as a form of visual and aesthetic expression. The tailor gained an elevated recognition in society and, even today, is looked on as an inspiration for Haute Couture designers. During the nineteenth century, great advances were made in flat patterning involving knowledge of geometry and arithmetic related to the proportions of the human body.

Along the same lines, the university courses we now know as Fashion Design, which are contextualized in historical studies and thinking, were concentrated in the workshops and workplaces of professionals until the mid-nineteenth century.

The first School of Fashion was founded in France in 1789, exclusively for tailors and shoemakers. But in Europe, the tradition of tailoring was first put into a specific context in England, through Charles Frederick Worth, an English tailor, who gave rise to Haute Couture in Paris.

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The Guerre-Lavigne school was opened in Paris In 1841 by the then famous Alexis Lavigne. It later became known as ESMOD, the École Supérieure des Arts et Techniques de la Mode. This is regarded as “the world's first and oldest fashion design school” and was noted for its method of teaching flat patterning, developed by Lavigne himself. Lavigne, known as the master-tailor to the Empress Eugénie, invented the wooden mannequin and the flexible metric tape measure.

The first schools to teach sewing were opened in the 19th century but training, given to apprentices, practitioners and assistants, continued to be based essentially in the workplace until the middle of the 20th century.

At that time, the great names in the world of Fashion Design, Paul Poiret, Jeanne Lanvin, Madeleine Vionnet, Karl Lagerfeld and Gianni Versace, were trained in the fashion houses where they worked; they learned their craft on an empirical basis working in fashion houses and family businesses. Miuccia Prada started in the Prada company founded by his uncle; Paco Rabanne was the son of the manager of one of Balenciaga's ateliers.

Worth and Poiret were tailors and masters of the techniques of cutting and sewing but not all fashion designers could draw, cut and sew well, for example, Elsa Schiaparelli was not well trained nor did she have great technical knowledge of these skills.

The practice of flat patterning is a praxis and must therefore be based on a sound theoretical foundation, without casting aside creative content which has yet to be developed.

The patterning of clothing is intrinsically linked to the design concept with all its design and aesthetic overtones. It is a specific design where the interface of the object with the user takes place on a more intimate and all-embracing level than with any other object of personal use.

It is important to point out that, technically, the great change brought about by Haute Couture happened mainly in the flat patterning of garments. In earlier times, the general outline of garments was more or less set and only certain parts of the garment underwent cutting changes. Most alterations were made to the outside of the garment with the addition of adornments and accessories such as trimmings, ribbons and feathers among other things.

It is this artifice that was to be brutally modified by Haute Couture, from the moment the designer's principal vocation came to rest in the constant creation of original prototypes. What came to the fore was the line of the garment itself, the original idea, no longer simply on the level of adornments and accessories, but at the level of the 'design' itself. Chanel would later

say: “Make the dress first; do not make the accessory first”. (Lipovetsky, 1989, p.80)

Until the end of Second World War, the fashion market was split into two divisions diametrically opposed in their approaches: on the one hand, the refined, glamorous and exclusive fashion of Haute Couture, and on the other, low quality mass produced clothes lacking aesthetic appeal in their manufacture.

However, in 1949, the “prêt-à-porter” system came into being to integrate the fashion industry. The French expression “prêt-à-porter”, introduced by J C Weill, means “ready to wear”. As Lipovetsky explains, unlike traditional clothing, the “prêt-à-porter” system was a matter of producing clothes on an industrial scale, inspired by the latest trends in fashion, but at affordable prices.

While clothing was often poorly cut and lacked finish, quality and style, prêt-à-porter sought to bring fashion and industry together, to put novelty, style and aesthetics on the streets. (Lipovetsky, 2008, pp.109 and 110)

This system revolutionized the way clothes were put together and manufactured, breaking the hegemony of Haute Couture. In this new situation, improvements in patterning assisted in making styles easier to reproduce and better suited to consumers’ different sizes. Care with the patterns became essential as these matrices were responsible for standardizing all the production, as is still the case today.

At this point, the present research will undertake a brief analysis of the teaching of Fashion and Design in Portugal, indicating some facts concerning the history of the country, both recent and further back, with regard to the teaching of Fashion Design in its teaching institutions.

Portugal and its Relationship with Fashion

Tailoring had its “golden age” (Silva, 2012, p.6)

According to Silva (2012), the craft was highly esteemed across the country during the eighteenth century. The first cutting schools for those professionals began to emerge at the start of the nineteenth century and training began to be systematized outside the workplace. At the same time, technical-professional education appeared, including training in industrial areas, training for women and institutes of vocational training.

However, graduation courses in fashion design at bachelor or licentiate degree level are a recent innovation in Portugal and Portuguese-speaking countries. Until the 1980s, a defining

period in the teaching of Fashion and Design in Portugal, self-teaching and learning in the workplace were still the most usual forms of training for Portuguese designers.

Portugal's first degree course in Fashion Design was initiated 1992 under the auspices of the Faculty of Architecture (FAUL) Lisbon, a course lasting five years plus a curricular traineeship.

[...] the higher education institutions are now offering courses in Fashion Design (as opposed to Fashion or Styling as they were previously known). These include disciplines with methodological content related to the field of Design and are now attracting more subsidies for the development of fashion products. (Rybalowsky, 2010, p.3)

These new professionals, the fashion designers, gained “an increasingly important role in a business sector characterized by low qualifications and difficulties of affirmation, in a global market becoming more and more competitive” (Paulos, 2009, pp.1-2)

However, dynamic technical-professional courses from that time still continue and new undergraduate courses were introduced at the turn of the millennium at Castelo Branco, Covilhã, Porto and Guimarães. At the same time, the Bologna Declaration of 1999 marked entry into the new millennium by standardizing higher education courses across the European Union.

The School of Applied Arts (ESART) was founded at the Polytechnic Institute of Castelo Branco in 1999 incorporating aspects of Music and Design. In this environment, the Degree in Fashion and Textile Design arose linked to degrees in Graphic Design, Interior Design and Music.

Following the restructuring of the Bologna Declaration in 2005, UBI's degree in Textile Design and Clothing was renamed Fashion Design, while continuing under the auspices of the Department of Textile Science and Technology.

The School of Arts and Design at Matosinhos (ESAD), a higher education institute founded in 1989, opened its first-degree course in Fashion Design in 2004. The University of Minho also opened a degree course in Fashion Design and Marketing the following year as part of the School of Engineering.

In 2011, MODATEX was formed by the merging of CITEX with CIVEC and CILAN (The Professional Training Centre for the Wool Industry). MODATEX is The Centre for Professional Training in the Textile Industry and the Production of Clothing and Wool.

At a time of great cultural and social change in the global society, the fashion designer's profession in relation to higher education is under discussion in Portugal and Portuguese-speaking countries.

Fashion Design can be seen as the discipline that deals with the design activity of fashion products and services, in conjunction with the aesthetic trends of users and their requirements in a sociocultural culture and marketplace.

The choice of a college course is an important life decision for every individual as it is potentially the means of access to a possible professional career stemming from the chosen course. Several factors about this choice can motivate a person to choose a particular course.

What to be? What to do? Individual expectation when choosing a course is incredibly strong, to say nothing of the excitement and euphoria. It could hardly be otherwise when one is about to make a decision that will have a bearing on one's entire life.

According to Miranda (2001), the choice of a profession is usually made during adolescence, when a young person is really not ready to make a decision at such a level. In most cases, this important decision is taken by young people who, as yet, have no clear direction or plan for the future.

Pinheiro (2008) to make a decision about which college to choose without knowing what they really "want to be" in the future, only highlights how significant it is that, at the time young people make their choice, they have only the sketchiest knowledge regarding the work of the profession they propose to follow.

According to Santos (2005), adolescence is the stage at which human individuality is developed. Childishness is put aside, and the behaviour of the adult world is adopted. It is the time of the onset of adulthood and the loss of childhood; a time when young people cannot be adult in all things but are criticized when their attitudes are thought childish. It is a time when young people are experimenting all the time; it is a time of internal conflicts and crises. In this period, it seems that decisions about the choice of a profession are decisive in an adolescent's life and will guide the paths to be covered and the choices to be made.

An important point in the choice of a profession is the matter of vocation, which is a personal construct unique to each individual. A person's vocation is determined socially and implies a unique combination of their genetic, personal, family and cultural history. The process of choice requires stimuli which are part of the learning process, which is the general objective of Professional Guidance.

The professional world and the professions have become vast and complex both for those entering the world of work and for those already developing their careers. Technological advances and new professions are full of challenges, especially to newcomers who suffer many misgivings in the face of so many options.

The field of fashion design has taken a leading place in cultural development, industrial structure and the economy as part of the complex growth in today's society. Design history has trodden a path replete with individuals, groups, associations and institutions that sought to bring to the many what once belonged to a small elite. An industrial system based on the designer's individuality and consumer culture has emerged.

In Raizman (2003), design developed against the background of Henry Ford's uniformity and the manifestoes of Ruskin and Morris, a conflict between art, the crafts, industry, social reform and commercial culture.

According to Pires, (2012) Historically, teaching in the field of fashion design has been linked to the mechanization of operations to do with the production of fashion goods and professionalizing these processes. Professional training has progressively moved from the domestic environment to places of work and, subsequently, to vocational training in colleges and universities.

Fashion Design then appeared in the universities, more closely linked to Design and Arts. Bringing these educational systems together is based on the argument that "progressive changes were taking place in capitalist economies on a global scale." (Young 2008, p.318)

Fashion systems have developed fast and in a complex way, and the process of creating fashion products has also been shown to be increasingly demanding, requiring professionals to be ever more qualified in different areas of technological knowledge, up to speed with methodological projects and having specific dynamic skills.

Gomes (2009) and Kunz & Garner (2007) point out that the textile and clothing industry has become extremely flexible, profitable and influential in the global society.

Influenced by such comments, the fashion schools aim to provide a suitable grounding for professional activity in an academic context so that professionals are able to adapt and anticipate in the face of new global and highly competitive realities. At the present time, the range and amount of training available in the field has grown to meet the needs of the market, comprehending new professional profiles, training and the professionalization of the industry, as well as scientific development.

The teaching of Fashion Design thus outlines and defines a wide-ranging but thought-provoking scheme of training, in addition to providing necessary technical and practical knowledge of different disciplines concerned with creativity and critical, humanistic training, usually attributed to higher education. (Sant 'Anna, 2012, p.3061)

New courses of study arise in the field of fashion design that fit in with the higher education institutions' objectives and also seek to respond to the demands of the textile and clothing industry. The development of fashion design teaching is highlighted in Lauder's thoughts:

“These are some of the most relevant issues of our time: the division between the academic and vocational worlds (...), the legitimacy of qualification frameworks, the nature of professional knowledge in education, status (...) and, above all, the role of knowledge and curriculum in the current test-oriented, competency-based approaches to education”. (Lauder, 2008, p.11).

The urgent need to delimit the subject area of Fashion Design is becoming more apparent along with the assimilation of its own methodological principles and the development of a theoretical foundation that aims at irrevocable specifics and dimensions for academic recognition and the legitimation of the professional paradigm. (Christo & Cipiniuk, 2012; Fletcher & Grose, 2012; Nicchelle & Moreira, 2011; Silva & Nascimento, 2012; Pires, 2003)

Continuing with the ideas of Christo & Cipiniuk (2012); Fletcher & Grose, (2012); Nicchelle & Moreira, (2011); Silva & Nascimento, (2012) and Pires, (2003), the author of this dissertation stresses the great importance of flat pattern teaching as a creative process, embracing and demonstrating the possibility of delimiting the field of the fashion designer by assimilating his own methods of development and theoretical basis.

This process can be carried out through an amalgam of unified thinking about the teaching area bringing together flat patterning, three-dimensional modelling, computer-aided designing (CadCam), and complementary theoretical content such as anthropometry, ergonomics, geometry and volumetrics.

It can stimulate a good learning environment, generating creative thinking while the pattern is being created, to complement aspects considered in research and creation disciplines, with the addition of developing patterning techniques.

This focus is advocated by such authors as Novaes 2011, who writes:

“Other possible paths [in the processing of garments] result from crossovers between patterning methods and production systems. But these paths have not yet been exhausted. Combining geometric patterning and three-dimensional modelling in the development of a prototype is another possible way of creating clothes” (Novaes, 2011, p.93)

So, to reflect analytically on the teaching methods and practices of flat patterning in graduation courses in Fashion Design, dealing with the concrete action of flat patterning based on the implications of design theories, starting from a more all-embracing vision of creative methods, less focused on techniques, to explore possible hypotheses indicating new directions for projects designing fashion garments, to consider integrating two-dimensional and three-

dimensional patterning methods and their different technical ramifications as possible strategies in teaching flat patterning as a tool creative, can all assist in the process of social change for the future.

The Theme and the Problem

The theme of this dissertation is presented as a constructive critical analysis of the phenomenon of teaching the techniques of sketching garment patterns from bringing together original concepts to building a powerful composite connection in which Flat Patterning becomes a Creative Resource, opening new windows and exploring new paths.

As for the problem under investigation, this was a gap left up the researcher while he was learning flat patterning during his academic career. So, a research problem is what the researcher's work sets out to clarify. Its significance as a “problem”, related in a general way to the purpose of the investigation, is to offer a solution: what is investigated in this way is the problem to be solved. As Coutinho says:

“An investigation always involves a problem, whether or not the investigator is clear in making this explicit.” (Coutinho, 2011, p.45)

Coutinho (2015) also says: Content analysis “is a set of techniques enabling systematic analysis of a body of textual material so as to reveal and quantify the occurrence of words/phrases/themes regarded as ‘key’ for later comparison”

There are two types of content analysis:

1. Where categories are pre-defined before the analysis itself. This is associated with a theoretical framework which supports it and to which it refers.
2. Where categories are not defined before the analysis, so the analysis is of a purely exploratory nature; the results are due solely to the analysis methodology without reference to a pre-established theoretical framework. According to Bardin (2011), cited by Coutinho (2015), this type of content analysis takes place in three successive stages:
 1. Pre-analysis
 2. Exploration of material
 3. Treatment of results (inference and interpretation)

Taking this argument as a starting point, this dissertation can be understood as the concrete result of a thoughtful exploratory theoretical study based on reading books and studying theses,

dissertations and current scientific articles which make reference to alternative and complementary practices of garment patterning techniques as a creative resource in teaching fashion design.

The development of the research followed inferences from a review of the literature, which consisted of systematizing the information gleaned on specific questions from a substantial body of knowledge with the purpose of evaluation and summary.

The methodological scheme included: first, a bibliographic survey entailing a systematic exploratory research of documents available in electronic format online, in the database “Scientific Electronic Library Online (SciELO): Latin American and Caribbean Literature”.

Other sources of information, including books, manuals, theses and dissertations were used as well as accessing websites and online blogs. The key words used were, History, Fashion, Design and Patterning.

However, the principal focus of this research is to indicate and describe the methodological guidelines for the teaching of flat patterning in a creative way which can shed light on the questions that commonly arise concerning the transition from the two-dimensionality of fabric to the three-dimensionality of the human body.

It should be understood that it is not the intention of this dissertation is to find fault with or disagree with existing models of teaching flat patterning.

Rather, the intention is to put forward a discussion of teaching it in a composite, creative way, looking at possible integration of different two-dimensional and three-dimensional patterning methods, with their ramifications, as a strategy to rethink flat patterning as a creative tool in teaching fashion design.

Justification

Justification and context go hand in hand. Here, specifically, it is necessary to explain the underlying thinking that gave rise to the choice of a project that seeks to solve the problem(s) presented by context and to seize the potential opportunities offered. A justification that can be given for the choice of such a dissertation research theme is that its relevance to the researcher provides motivation.

In this case, the motivation is justified by itself and, especially, by the appropriate degree of difficulty and the opportunity given to the researcher with regard to the teaching of flat patterning at higher education level.

What led, therefore, to writing this work was the quest for knowledge, the means of gaining knowledge, and studying. And the way to plumb the nature of a problem is to study it in order to explain it.

So this paper will discuss the possibility of teaching flat patterning in a creative way as part of teaching Fashion Design. The study will be divided into five chapters which play an important role in unfolding thought.

Research Questions

The primary research question should be driven by the hypothesis rather than the data. That is, the research question and hypothesis should be developed before the start of the study.

To give strength and direction to the process of developing the present study, five different hypotheses are proposed, to be confirmed or refuted at the end of this investigation.

RQ1) What is a case study ?

According to Yin (1994), a case study is a comprehensive research strategy for investigating an empirical topic by following a set of pre-specified procedures. The case study method is different from other research methods such as experiments and surveys, where statistical generalization is used to extend the results to a larger population. In the case study method, analytical generalization is used to draw conclusions from the case studied to apply to theoretical propositions.

The cases for study can be drawn from innumerable traditional and practical experiences of creative pattern making, and can also be successfully documented and promoted through case study.

RQ2) What are the roles and importance of pattern making in fashion designing ?

This topic will aim and highlight pattern making as a highly skilled technique which calls for technical ability, and a sensitivity to interpret a design with a practical understanding of garment construction. For successful dress designing, patternmaking forms the fundamental step. This function connects design to production by producing paper templates for all components such as cloth, hemming, fusible etc. which have to be cut for completing a specific garment.

In today's world pattern making has become necessary for a fashion designer to make garments of different body sizes. Pattern making is quite interesting and important for a student and it

helps the people of any age groups to interpret the designs and understand the design with technical ability.

RQ3) What are the most common techniques in pattern making ?

There are three different common Pattern Making techniques to prepare a pattern i.e. Drafting, Draping and Flat paper pattern making. Drafting involves measurement derived from sizing systems or accurate measurements taken on a person, dress or body form.

Draping involves of two or three dimensional piece of muslin fabric around a form. It is a very creative method of making a pattern which also saves time and the design can be checked on the dummies itself.

Flat paper pattern includes a basic fitted pattern to fit a person's body form and gives comfort to it. This is a simplest method in which sloper is made and used for many design variations.

RQ4) Can pattern making be used as a creative source of learning ?

According to Tyrell (2010) Pattern cutting is about possibilities, experimentation and surprises, it has been said that '...behind every great designer there is a creative pattern cutter'

Objectives

While problem formulation serves to describe the aim of a thesis, the objectives provide an clear description of the specific actions to be taken in order to achieve the aim.

Apart from the researcher's proposed plans, the chance of gaining results through work achieved, the purpose of a research paper is to make clear what the researcher wishes to develop, from the theoretical sources to the accomplishment of the final results.

"Every research must have a clear objective so as to know what to look for and what it is aimed to achieve." (Marconi & Lakatos, 2002, p.24)

Objectives are usually divided into general and specific categories, so we have:

General Objective

According to Marconi & Lakatos (2003) the general objective "is linked to a global view and an all-embracing approach to the theme." Such a view enables the researcher to grasp the whole of the research (Marconi & Lakatos, 2003, p.219)

Andrade (2009) states that the general objective is linked to the research theme.

The final objective of the present investigation is to open a new window of thought on how the teaching of flat patterning might best be introduced as a “Creative Resource in the Teaching of Fashion Design” by making available a composite set of theoretical material including Flat Patterning, Draping or Moulage, Computer-aided Designing Cad 3D, in order to introduce the first steps in the process of creating a fashion garment.

Specific Objectives

The specific objectives integrate the topics in question with the purpose of making the general objective clearer. The specific objective is more defined. It is the path to follow in order to reach the goal of the general objective. It defines the stages or phases of a research.

This dissertation is therefore defined by:

1. Studying and systematizing the main facts concerning flat patterning and setting them in an historical context.
2. Building a bibliography that shows flat patterning as an important factor in fashion production.
3. Making clear, through studying scientific research, books and bibliographies, the importance of studying the theoretical and creative disciplines in teaching the flat patterning of fashion garments.
4. To present the ramifications and hybrids as a study, and a case study of flat patterning as a creative tool in the teaching of Fashion Design.

Methodological procedures

“These methods are intended to provide the researcher with the technical means to ensure objectivity and accuracy in the study of social facts.” (Gil, 2008, p.15)

More specifically, they are intended to provide the guidance necessary for conducting social research, particularly with regard to the collection, processing and validation of data relevant to the subject matter of the research carried out.

A method is not always followed precisely or exclusively in an investigation. Two or more methods are often combined. This is because one single method is not always adequate to guide all the procedures to be developed through the investigation.

“The object of research that follows a qualitative methodological procedure may in fact be a more generalized problem that is identified during the investigative process itself.” (Coutinho, 2011, p. 45)

For this reason, the dialectic method was chosen as the technique to be used in qualitative research. This is a dynamic interpretative method that works on the basis that facts cannot be detached from their social, political or economic context.

Lakatos & Marconi (2007) allude to the laws of dialectics.

Reciprocal action shows us that the world cannot be understood as a set of “things” but as a set of processes in which things are constantly changing, always in a process of transformation: “[...] the end of one process is always the beginning of another.” (Lakatos & Marconi, 2007, p.101). Things and events exist as a whole, linked together, dependent on each other.

In dialectic change, transformation is brought about via contradictions. At one point, change is qualitative, because changes to things cannot always be quantitative. On the other hand, as nothing stands still, everything has two facets - quantitative and qualitative, positive and negative, old and new - one turning into the other. The struggle between these contradictions is the content of the development process.

As to the purpose, this research can be classified as an explanatory case study that records, analyses and interprets facts, identifying their causes. According to Lakatos & Marconi (2011), this practice aims to fill out generalizations, to define rules more fully, to give structure and definition to theoretical models, to relate hypotheses to a more unitary view of the universe, or a generally more productive range, and to generate hypotheses and ideas by virtue of logical deduction.

As for the means, this involved a bibliographical survey of the history of fashion and patterning, with a theoretical analysis of anthropometry, ergonomics and geometry as well as an in-depth understanding of the concept of a fashion collection, followed by a case study.

The structure of this dissertation is presented below according to chapter content.

Dissertation Structure

A brief analysis of the theory of clothing history and its relationship to the history of the sewing pattern and fashion will be addressed *in annex* without attempting an exhaustive exploration. Only the theoretical and historical origin of the main concepts will be considered.

It is divided into two subchapters entitled: 1.1 - Brief History of Clothing and Fashion; 1.2 - Brief History of Sewing Pattern (in annex).

An initial approach to the pre-historic period will complete this, ending with a brief analysis of Cad (or Computer Aid Design) 3D technology within the history of flat patterning. At this point the dissertation will investigate:

1. Fashion through the ages (in annex)
2. History of flat patterning (in annex)

The wearing of clothing, an exclusively human characteristic, is a feature of most human societies.

It therefore follows that at least a rudimentary knowledge of the history of fashion and pattern making is of great importance in understanding the dissertation “Pattern making as a creative resource tool in the teaching of fashion design”.

A study of the history of clothing and textiles traces the availability and use of fabric and other materials to make garments, together with the use of sewing patterns, pattern making, and cutting throughout human history, leading to the development of technology.

From the draped linens of Ancient Greece to today’s casual jeans and T-shirts, exploring the history of clothing reveals an exciting part of our past. Who knew that the T-shirt was actually invented in the 19th century, or that high heels were once popular among men?

Fashion design reflects its time period. It is fascinating to see how the clothing of past eras mirrors the morals of the age. Clothing throughout time explains the importance of pattern making from the earliest days to recent times.

The first chapter of this dissertation is entitled “Birth of Fashion Design”. This is based on research and analysis of the theory and history of Design, Fashion and a brief analysis of Fashion Design.

The chapter is intended to illustrate briefly the history and importance of “Product Design” and “Fashion” for Fashion. Through the ages, these two terms have become merged as “Fashion Design”. Therefore the first chapter is divided into three subchapters: 1.1 - Design; 1.2 - Fashion; 1.3 - Brief analysis of Fashion Design.

The second chapter starts with a brief study of the body. “A body is not defined by its skin, organs and shape alone but by its measurements and movements. The body that can seduce and attract glances when covered with fabrics and shapes lends itself to the form of Fashion.”

The second chapter will also draw a parallel between Fashion concepts and the scientific studies of anatomy, anthropometry, ergonomics, geometry and volumetrics.

The second chapter is therefore entitled “The Body: Anatomical and Measured” and is divided into the following sub-chapters: 2.1 - Anthropometry; 2.2 - Anatomy in the development of clothing; 2.3 - Ergonomics and flat patterning; 2.4 - Geometry; 2.5 - Volumetrics.

The third chapter will make reference to the underlying thoughts of several authors including Rosa (2009), Braga (2007), Embacher (1999), Laver (1989), Lehnert (2001), Rocha (1998), Treptow (2005), Pires (2015), who are persuasive in their agreement about patterning and engineering in fashion, and further agree that, to achieve a fashion product of quality, respect must be paid to the needs of the consumer, going through various processes and research stages concerning textiles, Mood boards, colour and material, comfort and wearability. In view of the fact that the flat patterning of clothing is a much older technique, or creative process, than we imagine, the third chapter makes a non-exhaustive investigation of the methodological processes (planning clothing collections), fashion design, fabrics, the body and so on, followed by patterning and its orientation, divided into subchapters in order to exemplify patterning techniques through a case study, giving greater strength to the linear thoughts of this dissertation.

The fourth and last chapter will seek to synthesize the creative process of pattern making through a case study of the Japanese and Belgian cases and the inherent thoughts of Pierre Bourdieu, in order to give strength to the linear thoughts of this study.

This chapter is consequently entitled “Case Study: The Japanese and Belgian Cases, Kawakubo, Yohji Yamamoto, Shingo Sato, Nakamichi Tomoko, Martin Margiela” and is divided into the following sub-chapters: 4.1 - TR Patterning or Transformational Reconstruction ; 4.2 - Bourdieu and the creative process; 4.3 - Analysis of Flat Patterning by Bourdieu.

Chapter 1 - Birth of Fashion Design

1.1. Design

According to the Oxford English Dictionary, the term was first mentioned in 1588, defined as “a plan drawn up by a person, or a scheme of something to be accomplished, plus a first draft for a work of art (or) an object of applied art, necessary for the performance of a work” (Schneider 2010, p.195)

Cardoso, (2004) The word "design" comes from the English language and its etymology stems from the Latin designare, a verb referring to the act of drawing or illustrating. The idea of plan, design, intention, as well as configuration, arrangement and structure is contained in this noun. It can be seen that, from the etymological point of view, the term has its basis in two dimensions with its origins in the dynamic tensions between the abstract aspects of conception, projection, assignation and the concrete aspects in registration, configuration, form.

Studies indicate that there were several attempts to translate the term, but the various names tried were discarded.

Design is an area of knowledge related to the development of product design, the principles of which are centred on meeting the requirements and expectations of human beings (producers, consumers, users and spectators) in their concept of the product. Design is any creative and technical process related to the concept, configuration, maturation and specification of an artefact. This process is usually guided by an intention or goal, or the solution to a problem.

Manzini And Vezzoli (2005) For a better understanding, design, in its fullest, most current meaning, must relate not only to the physical product to which it directly applies, as defined by material, form and function, but must also extend to the system of production. This is the integrated set of product, service and communication that companies present to the market.

The International Consul of Societies of Industrial Design (ICSID) defines Design as:

[...] a creative activity whose purpose is to establish the multifaceted qualities of objects, processes, services and their systems, comprising their entire life cycle. Design is therefore the central factor in the innovative humanization of technologies and the crucial factor for economic and cultural exchange (Icsid, 2006)

According to Maynardes (2002) applying design to the product development process brings innovative characteristics to the project. What is looked for today is projects that meet the

real needs and desires of the consumer, including reliability and taking into account cost reduction, ecological concerns and other constraints as part of the same broader process.

Applying design to products also enhances the value of the items developed and produced. When buying a product instilled with design concepts, the consumer also gains the enhanced values that have been brought to it.

According to Emidio (2006) the design management supports the whole process of product development to its commercialization, through optimization of costs, packaging, promotional material, aesthetic standards, visual identity, suitability of material, manufacturing and ergonomics.

Design encompasses and enables the entire process because it adds value to the product in terms of aesthetics, ergonomics, comfort and functionality, as well as being a very important element in the rationalization of production. This aggregation of design value ensures the product's competitiveness, and consequently that of the company, since a product without such characteristics can become a risk factor to the user.

For this reason, when designing new products, it is of fundamental importance to take into account all necessary factors in the design, based on existing project methodologies, considering such issues as: problem-solving, task-study, design requirements and constraints, materials, processes, semiotics, and the market - and, in turn, which competitors have developed more competitive products than those who only think about some of these factors.

According to Montemezzo (2003) in order to develop a product, the designer must start with a design problem, or a problem with an existing design, in a particular product or service needed by the consumer public to improve their quality of life (Montemezzo, 2003, p.25)

In this case, the author of this research agrees with Montemezzo, (2003) and thinks it of extreme importance that a table specifying the contents be taken into account for the process of a design problem, or a problem with an existing design project methodology should be designed as Table 1, in order to facilitate logical thinking for the professional or fashion student. The importance of analysing the specific design problems which the product is intended to solve must therefore be underlined in order to develop a product. These are:

Table:01- Product developing with a design problem, or a problem with an existing design. Own Source:

1 - Analysis of the need
2 - Analysis of the social relationship (man to product)
3 - Analysis of environmental impact (product to environment)
4 - Historical development
5 - Market analysis
6 - Functional analysis (practical functions)
7 - Structural analysis

8 - Analysis of configuration (aesthetic functions)
9 - Analysis of materials and manufacturing processes
10 - Patents, legislation and standards
11 - Analysis of production system (product to product)
12 - Distribution, assembly, customer service, maintenance
13 - Description of the new product's characteristics
14 - Requirements for the new product

The data above will enable the designer to find the answers and justifications necessary for a full understanding of the product to be created, as well as the consumer's requirements for the specific product.

It is therefore clear that, by applying design definitions to fashion products, the fashion designer can achieve these same goals, since fashion design has been defined as an activity that attempts to transform ideas to satisfy the identified requirements of an individual or group into industrial products that can be manufactured.

1.2. Fashion

In its broadest meaning, the word fashion, from the Latin *modus*, means a choice, or rather, the mechanisms for making a choice, based on criteria of taste. It can be understood as a process of social regulation in which individual taste adjusts itself to the wider social taste, which dictates the rules and must be referred to. These determine, from time to time, what is fashionable in every period (Conti, 2008, 223)

According to Roland Barthes' book "The Fashion System", it is advisable to write the word "Fashion" with the first letter capitalized. In order to differentiate between Fashion (*moda*) and fashion in the sense of 'how to use', note the statement below:

It is advisable to write the word Fashion, with a capitalized initial, when used in the English sense of fashion, to refer to the social phenomenon with its broad, multiple characteristics that bring about effects and is influenced by aspirations and the events of the time, so as to retain the difference from fad, trend or style (Barthes, 1979, p.3)

Palomino (2003) and Lipovetsky, (1989) tells us that the word "mode" comes from the Latin *modus* meaning "manner", "way" or "behaviour". Similarly, in French *mode* means "use", "habit" or "style". The term came into use in Western Europe in the fourteenth and fifteenth centuries when clothes took on a role greater than just protection for the body, gaining new forms and being differentiated according to gender, male and female.

In the strict sense, fashion hardly appeared before the middle of the fourteenth century. "In the first place, this is principally due to the appearance of a radically new type of clothing, clearly differentiated

according to the sexes: cut short for men, long and fitted for women".
(Lipovetsky, 1989, p.29)

Perhaps another good definition to be considered for the concept of fashion is the combination of subjective and objective, abstract and concrete aspects. It can thus be said that the drawing of sketches, the choice colours and patterns and the co-ordination of pieces defines the abstract, aesthetic aspects of fashion. Turning these into material form, by defining the fabrics, the trimmings, making improvements, preparing of technical designs, patterns and trial studies, are the concrete aspects.

Debo (2004) defines the process as a catalyst between the two-dimensionality of fabric and the three-dimensionality of the body.

Fashion can be interpreted as a system of production and communication that introduces changes of behaviour and appearance, according to the culture and ideals of an era.
(Debo,2004, p.23)

Lipovetsky (2003), clarifies this by saying that "fashion is a phenomenon that encompasses language, manners, tastes and ideas, artists and cultural works". (Lipovetsky, 2003, p.24). Rech 2002), goes further, saying that "scientific advances also embrace the phenomenon of fashion and can be seen in the sociological, psychological and aesthetic changes that take place in society".(Rech,2002, p.29).

According to Castilho and Martins (2005):

Fashion must be seen as being structured by a whole visual system of meanings; it is therefore important that we support the understanding of it as a means of communication, like language, and, from this, understand it as an expression of meanings derived from the mutual presence of significant languages (Castilho and Martins, 2005, p.44)

Fashion is also a field that is privileged by aesthetic experience, and this statement is supported by the words of Rosa (2006): "It can be seen that in every era throughout history facts and events take on a certain rhythmic form in visual similarities. Fashion is full of concepts, contents and expressive contexts which characterize the different eras in which man has lived. It is about the repetition of these visual patterns in the manner of dress".

Lipovetsky (2003), has said that "fashion" does not spark enthusiasm in the intellectual sphere. It is celebrated in the museums, on the streets, in industry and the media, yet hardly troubles the theoretical questioning of the thinking heads (Lipovetsky 2003, p.9)

The word "fashion" came into use with the birth of the bourgeoisie in Europe, more precisely in the France of Marie Antoinette. In the seventeenth century Louis XIV, the Sun King, became

the first great icon of French fashion, due to his excessive vanity, and France became the centre that dictated fashion.

From its onset, this was instituted by the nobles; tailors merely obeyed their desires. The bourgeoisie, mostly tradesmen who were beginning to have money, copied the fabrics used by the nobles, their style of dress and their behaviour, and the nobles were not happy to see copies of their clothes worn by this newly emergent social class.

The nobility then started to create internal codes of dress that changed rapidly, before the bourgeoisie had time to copy them. Thus, was born fashion that rapidly changed.

Rules of etiquette were created at that same time, with the objective of distinguishing a person's origin since they were all very much the same in their clothing.

At first, the professionals working in the field of creating clothing for society were the dressmakers and tailors. In time, the branches became specialized, the creation process being separated from the execution of the project. Next came the so-called professional "stylists" who have more recently come to be known as "fashion designers".

According to Pires (2007), "For years, 'styling' responded to demand; however, the current reality requires a systemic approach, which enshrines the importance of design." (Pires 2007, p.67)

History shows that the first school of fashion appeared in France in the seventeenth century. From that time, it has been a constant to see prestigious designers of European fashion with an academic background.

1.3. Fashion Design

Regardless of the market to be targeted, it is the Fashion Designer who defines the character of a collection. They may work for a company or as a freelancer. [...] During the creative process, this professional must take into account not only artistic and social aspects but must also needs to keep abreast of market trends and technical advances in the industry, since changes in colour, improvements in fabric, the production line, capacities and prices are taking place at every turn (Feghali and Dwyer, 2001, p.103)

Put in very general terms, fashion designing is the art of creating clothing with contemporary appeal. As time has gone on, however, 'fashion designing' has broadened as a concept to include such accessory items as jewellery, bags and footwear. With the gradual evolving of fashion design in mind, it would be reasonable to say that it is 'the creation of fashion'.

Indeed, fashion designing has enlarged greatly from simply designing clothes. In today's world it has developed into a major global industry. It is a recognized choice of career throughout the world. And, over the decades, in addition to designing, a range of other career options have arisen within the industry.

Fashion designing originated in the middle of the 19th century with Charles Frederick Worth (1826-1895), who is recognized as the first fashion designer in the world. Originally a draper, Worth moved to Paris to establish a fashion house. He initiated the culture of fashion houses, advising his clients on the style of clothing that would suit them best.

It was at this time that several fashion houses started to engage artists to design patterns for garments. Different patterns would be shown to the clients, who would place orders for the garments they liked best. It was in this period that the custom of offering patterns to customers began, which would then be cut and stitched, replacing the former system in which clients were presented with completed garments. As the 20th century began, new developments in fashion occurred first in Paris, from where they would be disseminated across the rest of the world.

As the middle of the 20th century approached, mass-production was introduced into the fashion industry. This led to an increase in production quantity, giving customers a wider choice of available garments.

Christo (2008) brings to our knowledge that, the use of the word "design" in relation to "fashion" is recent, and the two words have become closer not just because of combining the terms (Design ± Fashion), but also because of the way the concept of academic and professional performance is understood.

It is necessary to emphasize that the concepts of Fashion and Design must be understood in context as the words can be used with different meanings when applied to a market situation.

The fashion designer is, in the first place, a product designer focused on the niche of clothing. By "designer" we are following the definition of the ICSID (International Council of Societies of Industrial Design):

"Design is a creative activity whose aim is to establish the multi-faceted qualities of objects, processes, services and their systems in whole life cycles. Therefore, design is the central factor of innovative humanization of technologies and the crucial factor of cultural and economic exchange."
(ICSID, 2006, no page)

When we think of fashion designers, therefore, we bring together the processes of creation and realization of projects that reflect the subjective outlook of the designer. It can be said then

that, when we think of fashion designers, we have in mind the processes of creation and the realization of projects that reflect the characteristics or the skill of the designer.

The goal of the designer is to make use of the technological innovations of his time to produce garments that reflect society, wholly or in part, in its cultural, social and economic sphere. This argument is complemented by Iida and Mühlenberg (2006) in the following statement:

"The fashion designer draws heavily on emotional factors in formulating new products." (Iida and Mühlenberg, 2006, p.5)

According to the studies, in the context described above (Fashion 2.2), fashion can be seen as a more or less coercive social and cultural phenomenon, consisting of periodic changes of style, the vitality of which stem from the need to win or maintain a certain social position (Joffily, 1999; Treptow, 2003)

Preciosa and Campos (2008) say the word fashion can be used as "vogue" or "craze", whatever becomes a trend. Or it can mean a setting of taste, the casting of shapes, colours and volumes that represent an era. It has already been said that the word "design" can be used when a design project consciously takes into account functional and aesthetic needs and the user.

But Rech (2002) sees the fashion product as any element or service that brings together "the properties of creation (design and fashion trends), quality (conceptual and physical), wearability, appearance and price, fulfilling the wishes and desires of the market segment for which the product is destined", to satisfy the needs and expectations of the consumer.

Rech (2002) further states that, as fashion is a social phenomenon, it "brings to apparel and décor the sociological, psychological and aesthetic changes that are intrinsic to architecture, the visual arts, music, religion, literature and philosophy." So, when thinking about Fashion from the sociological point of view, it can be concluded that fashion is much more than a set of clothes and accessories. It is a visual code that expresses identity, reveals lifestyle and social status, individualizes groups and personifies people.

In the light of Rech's thoughts (2002), we can move on to the fundamental ideas of Poci (2012):

Fashion arouses some of the values most dear to human beings. Differentiation, exclusivity, acceptance and self-esteem are among the elements that sew fashion into the social fabric, a fabric that permits individual expression yet, at the same time, makes the personal connection between the individual and the group with whom he or she identifies. (Poci, 2012; p.57)

But according to Pires' ideas (2004) fashion design can be defined as the individual bringing together creative properties, aspects of form, silhouettes, materials, textures, colours,

emotions, associated with aesthetic, functional and comfortable solutions; but again, Saltzman (2008) quotes it from a morphological point of view and says:

from a morphological point of view, it is necessary to research and to understand the body, with its kinetic potential, as well as the capacity of textiles to create forms with, and on, the body. "Clothing must be seen as a factor that conditions posture and movement, a source of tactile and visual sensations, comfort or discomfort, as well as a way of adapting to one's social milieu and the environment," (Saltzman, 2008; p.307)

For Saltzman, (2008), the body adopts various strategies when linking to context, for example mimesis or opposition, respect for norms or for transgressions, repetition or innovation. It is from this articulation that one must explore form which, in the field of clothing, is essentially textile. (Saltzman, 2008 p.306)

As Montemezzo (2003) puts it, the designer is the "messenger who sends out a message, in the form of a product, and the consumer is the receiver of this aesthetic message". Fashion has the special characteristic of expressing a singular identity and is linked to the pleasure of seeing and being seen, of displaying oneself to the gaze of others.

Taking account of the comments of Rech (2002), Poci (2012), Pires (2004), Saltzman (2008) and Montemezzo (2003), Fashion design is related directly to the body and the context of the body. This hypothesis comes from the relationship between dressing, covering, discovering and modifying the body and a specific context, where the functionality and usability of products are related to physical, social, psychological and ideological pleasures.

It should be mentioned that one of the points most closely touching the definition of design is the construction process using textile products, the realization of designs from drawings and sketches, the choice of colours and patterns, the coordination of pieces of the chosen fabrics, trimmings and embellishments, the design and production of technical plans, flat patterns and piloting studies seen here as abstract and concrete aspects.

All these activities are conceptualized as that stage in the development of a garment that deals with the interpretation of the technical drawing and configuration of form, and it can be said that the flat patterning is at the centre of the formal issue of clothing.

According to Cardoso (2004), all these activities, along with others, are directly or indirectly linked and are interdependent in designing, planning and producing of the items in a collection.

Gonçalves & Lopes (2007) As well as taking into account abstract and concrete aspects, such as the activities mentioned above, the creation and development of fashion design products requires a knowledge of such areas as human anatomy, physiology, anthropometry, psychology and sociology. This information enables the designer to create pieces more closely connected with the user.

Chapter 2 - The Body: Anatomical and Measured

According to Deleuze (2002, p.73), "What we have is a sense of what takes place within our body, a sense of what our body likes, and it is only by such senses that we immediately know our body and what matches it, our spirit and what matches it."

A new pattern can be detected in the body stemming from the immanent thought inseparably contained in a being's nature, in that there is a real breakdown of precedence, or dominance, between body and spirit, a collapse of the hierarchy of body and soul.

A body is not defined by its skin or form, but by the movement and enlargement it is able to develop.

Deleuze, finds in Spinoza an equable partner for his philosophical proposition: the affirmation of thought without representation and mediation. His declaration is: "Spinoza the materialist" (Deleuze, 2002, p.23)

This is because he proposed another beginning, another starting point, for the philosophy of thought, "a new model" (Deleuze, 2002), the body. As Deleuze points out, the more we set ourselves apart from the intimacy of the body's power, the more we waffle and end up not really knowing what it is capable of (Deleuze, 2002, p.24)

This separation of precedence would also mean the absence of causality between body and spirit, which would come about through a very specific but subtle procedure: the transgression of a basic moral principle of thought, which causes the soul to suffer with every action of the body and silences the body in every motion of the soul.

According to Deleuze, whatever happens to the body also happens, in equal measure, to the spirit. Every motion of passion in the soul finds its parallel motion in the body. "No pre-eminence, then, of one over the other." (Deleuze, 2002, p.24)

The body is the house of the soul and is a human property which can be seen and used in many different ways. It can be used as an object of seduction to discriminate and to threaten. It can be provocative. It can subdue or repudiate. The body speaks through its movements; we can comprehend the signals in gestures which have precise meaning in certain situations.

What we eat, how we dress, the daily processes by which we look after ourselves all represent our culture.

The perception of Foucault (1987) is that the body is synonymous with Art, Beauty and Power, or, to put it another way, the body should be seen as a harmonious dimension of the pure awareness of what one is and feels and the physiological “carcass” that nature has made.

The body is not only a document of culture, BODY-POWER; intentional body, phenomenological, semiotic, actor and prosthetic. It must be understood as taking into account the theme of power. It should be interpreted as body-power.

For Foucault, power:

intervenes materially, reaching the individual’s essential reality - his body - which is located at the level of the social body itself, not above it, entering into everyday life, and it can therefore be defined as micro-power or sub-power (Machado, 1979, p.12)

In Foucault’s words:

The body: “the surface on which events are written (while language records them and ideas diffuse them), the place of the dissolution of the Ego (which supposes the fantasy of a unit of substance), volume in perpetual pulverization. Genealogy (...) is therefore at the point where the body articulates with history. It should show the body entirely scarred by history and history breaking the body down”. (Machado, 1979, p.22)

In other words, the body is a field of multiple forces, convergent and contradictory, and the proper place for the settling of its conflicts, that is, the contentious forces that make up the body’s reality. There is no force without body.

To study the body, its forces, structure, divisions, motion, sensations and measurements, is therefore fundamental to an understanding of how fashion, clothing and flat patterning act in the transformation of fabric (a second skin) into items adaptable to the needs and comfort of the wearer.

Still concentrating on the thinking of Foucault (1987), the body is malleable, sculpted, and, like the “art of carving a work of sculpture” until a good result is achieved, faithful, disciplined, useful, effective, etc. The elements of which it is composed: space, body, gestures, activities, force and time, are all disciplined, all with the aim of maximizing speed, efficiency and utility. According to Foucault, it is gained through a composition and discipline of forces to achieve progress.

Foucault (1987) explains the formulation of his concept by saying:

“the body which no longer has power of its own has already been transformed, manipulated and formed for a particular activity: to be useful, effective in its movements, so that all the details of this body may be used to advantage. “The intention was to have mastery of the bodies of others,

not just to do as one wishes, but to operate as one needs” (Foucault, 1987, p.127)

According to Foucault (1992[1975]) and Giddens (1997[1991]), within societal life, the body is the stage on which life-force is displayed, but also on which that life-force is affirmed. Life-force can be exercised through objects, accommodating disciplined, docile or objectified bodies, or, on the other hand, objects can empower bodies.

Thus, in identifying the close link between knowledge and power as it touches the body, Foucault has launched a science, and all knowledge of body and soul in relation to the theoretical and epistemological support of knowledge. His analysis of scientific knowledge has consequently spread over a huge range of fields of knowledge including anthropometry, geometry, ergonomics, anatomy, and so on.

Merleau-Ponty (1994) and Nóbrega (2000) “Neither thing nor idea, the body is linked to kinetics, perception, sexuality, language, myth, to the lived experience, to poetry, to the sensitive and the invisible, presenting itself as a phenomenon that is not reduced to the perspective of object ...” Merleau-Ponty (1994) and (Nóbrega 2000, p.101)

2.1. Anthropometry

Anthropometry, or anthropometrics, is the study of measuring the human body. It is the science that gathers data of the various corporal dimensions existing in its totality, sizes, proportions, volumes (volumetrics), forms, movements and articulations.

“It establishes an indispensable base for the study of man in measuring matters of the body” (Petroski 2007, p.12)

According to Iida (2005), it complements in turn the affirmation that anthropometry deals with [...] the physical measurements of the human body, taking account of the differences found in the population. Obtaining these measurements implies the use of scientific criteria and procedures, with the aim of including a range of individuals differentiated by sex, age, biotype, etc., classified according to their profile (Iida, 2005, p.95)

States further that anthropometry “deals with the physical measurements of the body in terms of size and proportion”, which are bases for design and the application of ergonomic principles (Iida, 2005, p.97)

Concerning the measurements referred to above by Iida (2005), these can be obtained through three types of anthropometric dimensions depending on the degree of complexity of the work:

the static, related to the dimensions of the body when still; the dynamic, to do with the movements of each part of the body; the third being when the body is in a static functional position involving movement together with other parts of the body.

It is the static dimension, however, that is used for the purposes of flat patterning a garment.

In fashion design, anthropometric body analyses should support the construction of industrial flat patterning. Application of these measurements must be present in the making of clothing even before its conception, or at least in the earliest phase of development of the product design, as it is the basis of knowledge of the wearer's body. As Capelassi (2010) states:

“[...] in developing fashion products, the industry, via the pattern maker, needs a table of measurements, a reference that the professional in that area has to follow so that the items are a suitable match for the physical profile of the users who acquire them”. (Capelassi, 2010, p.26)

Grave (2004), It can therefore be said that clothing creates an intimate relationship with its wearer. It must involve total communication with, and very often affection for, the body.

Consequently, it is important to take into account, and have consideration for, the anthropometric characteristics of each individual when planning a garment

It is clear that the two-dimensional template, usually expressed in drawing, plays an important role throughout the development of a design collection in order to inform and communicate, principally in the generation, evaluation and development phases.

In other words, clothing design, from its conception to the finished product, is based on two-dimensional templates: initial sketches, finished design, graphic charts, technical sheets and drawings, and patterns. It should be noted that, in the graphic stage of fashion design, the human body should be seen as a support to be enwrapped by the clothing.

So, Leite And Velloso (2007) the concepts of proportion, symmetry and volume (or volumetrics), as well as measurements of height and width, are fundamental at this stage to the accomplishment of the technical drawing and pattern and should be brought into the planning of the item as information during the graphic design.

It can be said, then, that many projects become flawed at this point, because anthropometric measurements are not taken into account, with only the abstract and aesthetic aspects of fashion being considered. The proof of this statement can be seen in the size variation for any one garment numbered according to the manufacturers' standard system, or, indeed, big differences in flat patterning for the same garment model.

It is important to emphasize that the present section of the dissertation does not seek to criticize graphic design in fashion or its aesthetic aspects, but to stress the importance of using the anthropometric measurements of its target public as the basis in the preparation of flat or industrial patterning.

Concentrating only on fashion's abstract aspects to the exclusion of the needs of the body when designing and making clothing can result in products that fail to meet the real needs of wearers, both in physical and aesthetic terms, causing discomfort, inconvenience and other problems.

This problem can be seen and analysed throughout the history of clothing, where the body has often had to adapt to garments and not the other way round, or garments have had to be remodelled. Good examples can be seen in figure 24, particularly when looking at the underwear of each age. This has always been used - and still is, though more subtly - to sculpt the female body according to each era's ideal of beauty.

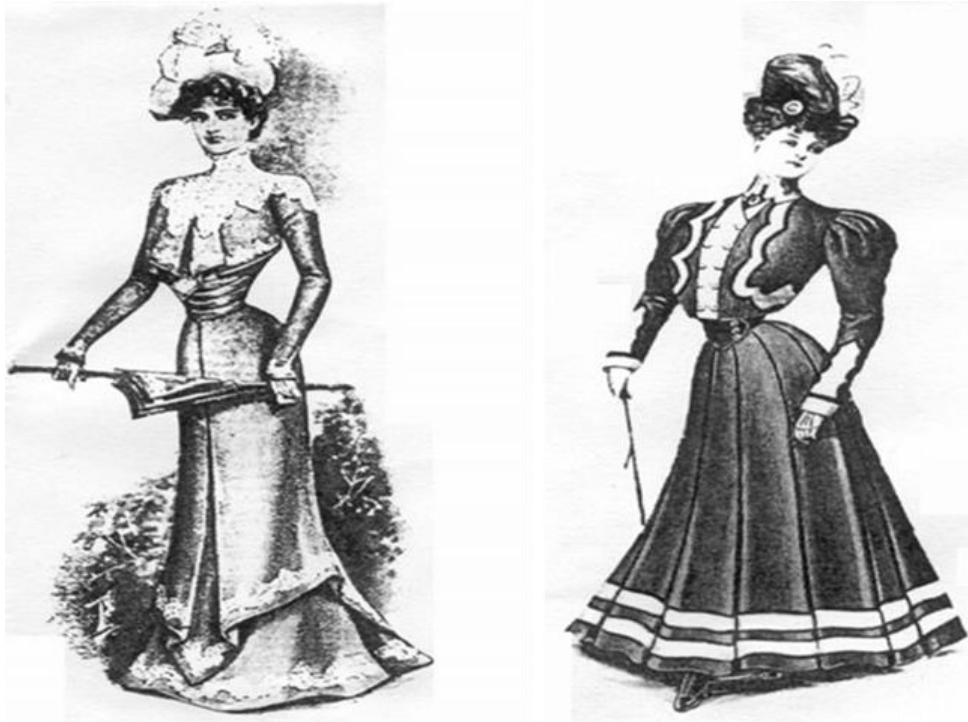


Figure: 24 - Costumes with the waist emphasized by a corset. Retrieved from: Brazilian Author, Laver James, 1989, p 221; - Original Book Title; - A Roupa e a Moda Uma História Concisa

“Figures 25 and 26, confirm the thoughts of Yarwood, Young and d'Ernest Leoty and Laver: “the first evidence of corsetlike garments can be found in the art of Minoan civilization, which depicts women wearing metal plates that slim the waist and accentuate the bust. [...] In the 16th century that type of bodice became a separate article of underclothing, laced together either in front or at the back and eventually supported throughout with strips of a firm material—such as wood, bone, or horn—between two layers of fabric. [...] The corset of 16th-

century Spain was supported in front by a wooden or bone rod placed vertically (or two, if the garment was laced in the front) known as a busk, which produced a flat shape, and was reinforced elsewhere with whalebone stays.[...] The corset was first associated with the aristocracy but was adopted by bourgeois women by the 18th century. Women of lower classes often made their own corsets from less-expensive cloth, using reeds for support and reinforcement”. (Yarwood, 1975 n.p) (Young, 2010 n.p) (Laver,1989, p.221) (d'Ernest Leoty,1893, p 53)

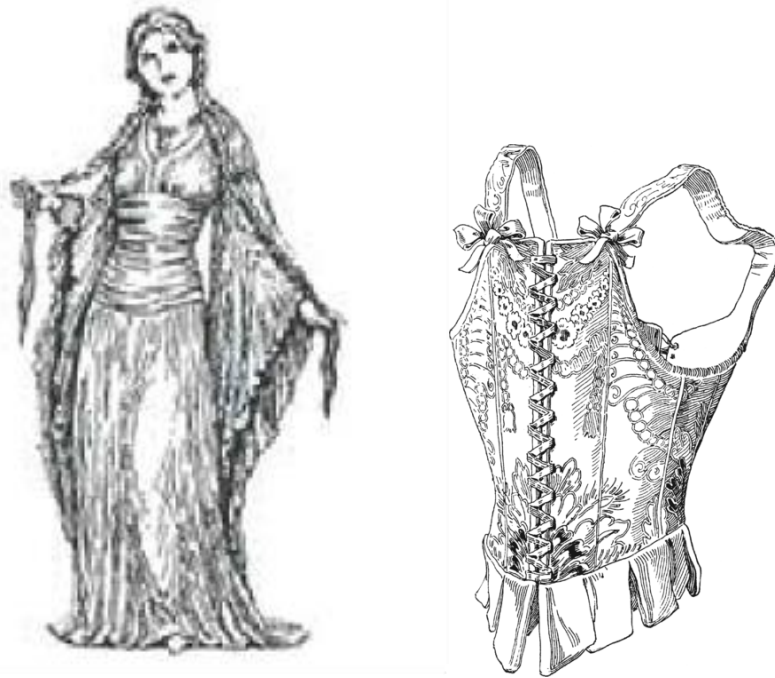


Figure: 25- Costumes of Woman in Bliau and Hipbelt. Retrieved from : Medieval Costume and Fashion (1999, p 41). Fig. 26 - Le Corset à travers les âges (1893, d'Ernest Leoty, p 53).

The form of the body was a long way from being taken into account as the flat patterning of lingerie evolved. Corsets are the great proof of this. They changed and adapted the female body physically until the early part of the twentieth century. Before them came the bliaut, a type of bodice tied behind or at the sides of the body, which secured the bosom like a breastplate and was sewn to a pleated skirt. Or, alternatively, the sorquerie, a very tight form of corset also known as a corselet or bodice.

It should be understood that these items were part of the culture and behaviour of the time. Women in society accepted the style; they assented to the ideals of beauty in the female body as they have in every era.

When clothing is designed without taking the human body's actual requirements into account, that is to say, without considering ergonomic aspects, it produces a range of tricks to alter the body.

lida (2005) says that ergonomic analysis shows that all products will satisfy some particular human needs and, directly or indirectly, they establish links. If this is to happen in the best way, products must have technical, aesthetic and ergonomic characteristics. Ergonomic quality is emphasized in lida's definition and it can be applied as a principle to items of clothing by relating it to anthropometry and flat patterning.

However, when one looks deeply at this concept, it can be seen that ergonomic quality and aesthetic quality in clothing are interrelated, so the former influences the results of the latter. When a garment is not suited to the wearer's body type, questions arise as to how the garment fits and hangs, whether it feels comfortable and whether the wearer looks well-dressed, compromising the product's aesthetic quality.

For this reason, the science of human measurement is of significance for the clothing industry as a whole since, apart from the ergonomic and aesthetic aspects, a single clothing size has to fit different body types, as demanded by the needs of mass production (Capelassi, 2010, p.26)

According to Silveira (2008) the best way of using anthropometric data is so that it ensures wearer satisfaction. When designing clothing products, it is necessary to adapt to the anthropometric differences of several bodies. Therefore, it is necessary for the clothing industry to study and understand consumers' bodies to avoid problems to do with comfort and wearability.

In lida's concept (2005) one must "define the anthropometric nature demanded by each situation; take measurements, using criteria that will ensure reliable data, and make use of the data in the right way."

Looking at the human body in this way as the starting point for competent product development, it is of fundamental importance to emphasize the relationship between the different dimensions of the body, some of which are necessary for making an item of clothing, such as body height, circumference at bust and waist, breadth of shoulder and back from the arm and neck to the upper body; for the lower limbs, circumference at the hip and the crotch, height to knee and ankle (lida, 2005, p.98).

As the flat patterning of a garment is developed, these measurements, along with some others, are fundamental to its construction, and the pattern cannot be made without them.

Anthropometry thus fulfils the function of helping the fashion designer to become aware of the significance of human dimensions in design and to make a connection between anthropometry and the garment he is designing.

Panero And Zelnik, (2002) Appropriate anthropometric data, used when the garment is at the flat patterning stage, reduces the risk to the industry of encountering problems to do with comfort, size and the wearability of the product.

In order to begin the technical procedure of flat patterning a garment, the body is represented flat with vertical and horizontal lines at angles which relate to the body's plane of balance, its symmetry, height, length, and the proportional ratio between the parts.

When tracing the flat pattern, it is important to study the proportional relation between the parts, such as: the position where the neck is situated, the anatomical position of the shoulder, the length of the arm, the positioning of the nipples, the length to the crotch for trousers, the breadth of the back, the position of the knee, and so on.

The standing body is three-dimensional and can be drawn in at least three basic modes: from front, back or side. As in figure 26, drafting and anthropometry shows us [...] It is by analysis of these three ways of visualizing the body that its lines of movement, articulation and malleable constitution can be traced - and the relationships derived from its connection with garments. (Castilho, 2004, p.63)

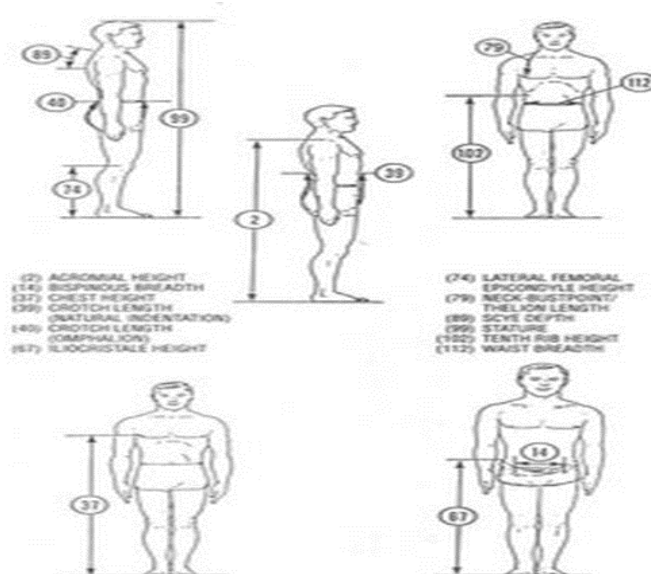


Figure: 27- Drafting and anthropometry. Retrieved from : Book; - Anthropometric Methods: Designing to Fit the Human Body by John A. Roebuck, Jr, p,4.

Accurate anthropometric measurements¹, mathematical calculations, use of the proportions between body parts and the positioning of balance lines ascertained during the building of the bases can make all the difference to the way garments hang.

¹ The last traditional anthropometric survey of the civilian population for apparel sizing purposes was conducted in 1941. According to the book, Women's Measurement for Garments and Patter Construction, Author O'Brien Ruth and Shelton C. William.

According to Silveira, (2003) Anthropometry stands as a foundation for the study of man as an object to establish the standards of proportionality required to define the measurements of garments.

Each individual body has its own measurements, so when it comes to industrial flat patterning, companies adopt standard measurements and adapt them to their target consumers. This is because anatomical changes occur depending on the age group, for example, there is a change in a man's profile created by differences introduced by age (HEINRICH, 2005)

Still following Heinrich (2005) by making use of this data, flat patterning can set the measurements for the market segment it seeks to reach, which is very important in the clothing industry because this makes the garment more valuable, satisfies the customers' wishes and gives both comfort and aesthetic standards.

Heinrich (2005) says further that the flat patterning department of the business needs to be vigilant in keeping up with the production of items, paying strict attention to product quality, so that customers are satisfied. Nowadays, this department is under pressure to produce at speed with no margin for error.

Heinrich also says that, these days, people seek comfort and functional service from their clothing to improve quality of life, along with ergonomic values and aesthetic concepts.

2.2. Anatomy in the Development of Clothing

The word anatomy is derived from the Greek anatomē meaning dissection. It is the science devoted to studying the structure of organized beings through a thorough examination of the body. This study is fundamental to the field of clothing, since the human body, with its three-dimensional and articulated structure, is the foundation of the fashion industry's product.

An understanding of human anatomy is essential when creating a flat pattern, since body and garment must be interrelated if the product is to satisfy in terms of performance, safety and comfort.

Santos underlines this by saying:

Since clothing plays a practical role, the fashion designer, when designing, must be aware of the perceptions caused to the main lines of the body. This is because it has to be borne in mind that the "development process of a garment stems from observation of the mapping of the body and ends with the approval of the body itself" (Santos, 2009, p.39)

Given an understanding of the principles of anatomy, it is possible to convey ideas through knowing how to assess the profile, so contours can be followed or changed. A knowledge of the measurements and proportions of the human body is required when studying the construction of flat patterning as it is directly related to the volume and curves of human anatomy.

The measurements needed to build an anatomical model must be put together according to the circumference (width) and height of the pattern to be made and the depth of the curves. From this, the point of balance can be located using the central, vertical and horizontal lines and symmetrical, asymmetrical or curved lines.

As shown in figure 27, Saltzman (2004) believes that clothing is designed depending on the function of body forms and movements, thus:

[...] the different angles of the joints lead to thoughts of structuring clothing according to the user's activities. The joints have restrictions to their form which must be taken into account in order to avoid tensions or impediments to the body's natural development Saltzman (2004, p.30)

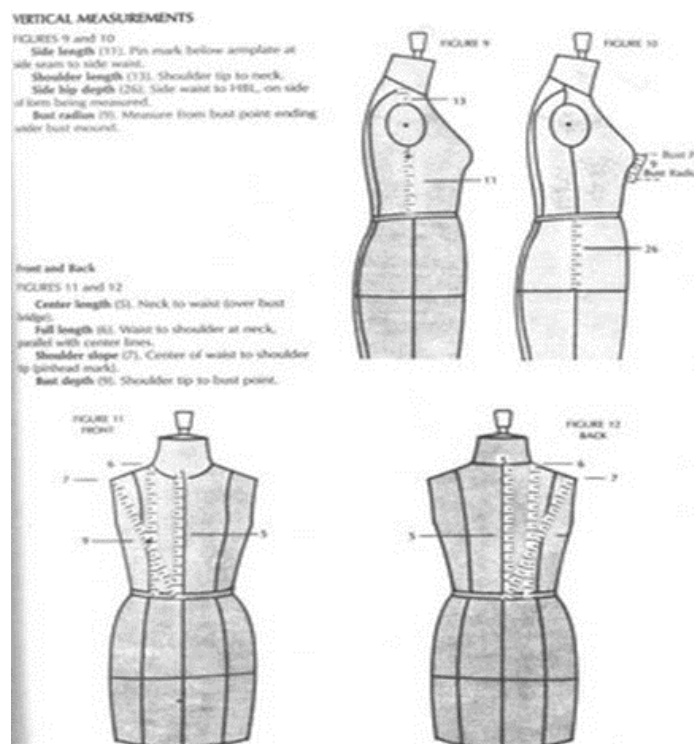


Figure: 28- Measure a dress form in order to plot those measures into a draft. Retrieved from: <https://www.fashion-incubator.com;>- Accessed in 15/02/2018.

It is important to emphasize that these lines and positions can be used to make female, male or children's patterns.

According to Heinrich (2005), the human body is made up of around 208 bones and more than 600 muscles which operate through the central nervous system. The body's locomotion and movements are controlled by the joints thereby giving the human being balance.

Clearly, the body is the pedestal on which to highlight the shape of different types of textile material and other products in order to boost comfort and fulfil the needs of the wearer. Flat patterning requires multidisciplinary knowledge if the items to clothe a body are to be made successfully.

According to Castilho (2004), the anatomical body is made up of the biological body, formed of proportions and components of vertical and horizontal variables to manifest a plastic anatomy. Height, volume and proportion are among the different characteristics of the topological body which is the base to be modelled, dressed and beautified.

2.3. Ergonomics and flat Patterning

Ergonomics as a concept of can be understood from the writings of Iida (2005), "The study of the relationship between man and his work, equipment and environment, and particularly the application of the knowledge of anatomy, physiology and psychology in solving problems arising from this relationship".

The practical objective of ergonomics is the safety, satisfaction and well-being of workers and consumers in their relationship with production systems and the products themselves. Ergonomics must be taken into account through the entire process of developing fashion products since it is the objective of the clothing industry to design products which will achieve the best interaction with the wearer.

Making use of ergonomic factors goes beyond seeking ways to improve the organization of work. It must bring together factors and procedures the better to fit products to the taste and the anatomical shape of consumers.

Ergonomics applies theories, principles, data and methods that, in the past, have been able to safeguard human life in matters to do with health and safety, comfort and satisfaction. When applied to design, they help to solve many social problems related to comfort, efficiency health and safety, (Dul & Weerdmeester, 2001, p.13)

With this in mind, Iida (2005) points out the essential qualities in the design of new products:

- Technical quality relating to efficiency in performing the main function;

- Ergonomic quality relating to factors of comfort, safety and ease of use in the product;
- Aesthetic quality which must communicate itself to the consumer and attract them.

From the qualities the author identifies, it is clear that ergonomics can be applied throughout the process of developing an item of clothing, particularly in flat patterning, bearing in mind that the process of developing new products focuses on use, efficiency, comfort and safety, with the intention of satisfying the needs and desires of consumers.

This relationship is built up in the same way in an item of clothing, because the aim is to make for greater competitiveness by improving the way the garment hangs, adding to comfort and enhancing aesthetic quality.

[...] specialists in the field of ergonomics have produced more and more research and information to do with the physical and psychological needs of people in their interaction with the material world. Research on anthropometry, thermal comfort, eco-design, visual and emotional ergonomics can be a starting point in applying ergonomic factors to design, even if it does not specifically deal with items of fashion (Montemezzo, 2003, p.49)

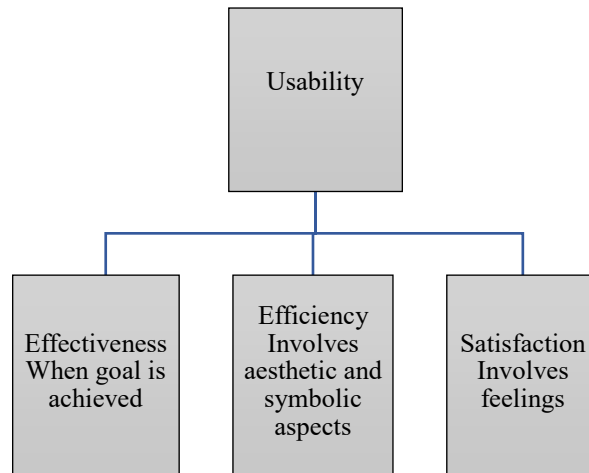
In relation to the fashion product or fashion itself, Montemezzo's words can be understood as a way of relating anthropometry, ergonomics and fashion to usability.

According to Moraes (2001) usability should be understood as the matching process between product and task, matching the user to the context in which the product will be used. He says further that usability can be understood as optimizing the fusion between product and user.

Martins (2009) develops this thought by saying that usability is the interface enabling products to be used efficiently, making them pleasant to handle and user-friendly, particularly items of clothing. Indicators of usability are directly related to ease of handling, which in turn decides how pleasant a garment is to wear and use, how convenient it is for putting on and taking off, and operating its fastenings (Martins 2009, p.13)

Moraes (2005), quoted in Silveira (2008), defines the diagram synthesis of the concept of usability usability as "the effectiveness, efficiency and satisfaction with which individual users achieve specific goals in particular environments". This is laid out in Table 2. Analysing this definition, Silveira synthesizes the concept in the diagram below (Silveira, 2008, p.99), Diagram synthesis of the concept of usability by Silveira.

Table 2: - Diagram synthesis of the concept of usability. Retrieved from: (Silveira, 2008, p.99)



Still according to Silveira, the efficiency of an item of clothing in development is achieved when the objective for which it was intended is attained, for example, a garment created for sports activities that allows its user greater freedom of movement.

Obviously, efficiency is connected to user-satisfaction in the product, such as a fastener that eases or improves the user's daily life. Satisfaction must be related to an acceptable comfort level the consumer experiences when using the product, which also involves his feelings in that situation.

Comfort can be defined as being “a state of mental and physical harmony with the environment stemming from the absence of any uncomfortable sensation.” The author further states that comfort in the context of fashion is associated with three factors: physical, physiological and psychological (Nicolini 1995, quoted in Martins, 2005, p.65)

Principles such as human anatomy, physiology, anthropometry, psychology and sociology are relevant factors to be taken into account when designing any product intended for human use. It is therefore vital that ergonomic principles such as usability and comfort are considered in the creation and development process of fashion products. Indeed, the importance of emphasizing ergonomics throughout the whole process of development and production of fashion products becomes clear.

Attention should be paid to ergonomics throughout all phases in the development of a garment so that the comfort and well-being of its consumer is significantly enhanced. In the case of flat patterning, concern with ergonomics is directly related to safety and freedom of movement (comfort), principally thermal and tactile comfort.

Hence, when making flat patterns in the industrial situation, the application of concepts of ergonomics, usability and comfort during the realization process help in the development of

consumer-oriented styles since ergonomic principles are being considered from the conception of the design.

Moraes & Mont'alvão (2003) It is important to mention that ergonomics as a science is linked to studying the capabilities, limits and other characteristics of human performance. It integrates knowledge from the human sciences to adapt tasks, systems, products and environments to people's abilities and limitations in dealing with them.

lida (2005) In the case of clothing production, ergonomics is applied directly to the consumer, particularly in the use of knowledge of anatomy, physiology and psychology, in solving problems arising from this relationship.

lida (2005) says further that clothing must be matched to ergonomic characteristics as well as being made of suitable materials and fabric according to the intended use. For example, garments might be resistant, durable, impermeable, flexible, anthropometrically suited to reflect differences in size aiming to cover individuals differentiated by gender, age and biotype, classified according to their respective percentile.

Montemezzo, (2003) Fashion design accommodates shape², profile, texture, colour, fabric and emotion through sketching, technical drawing, and flat patterning. The link to ergonomics brings the benefit of solutions to do with aesthetics, functionality and comfort marking out fashion products that correspond with sociological, psychological and aesthetic characteristics.

2.4. Geometry and Volumetrics

In order to come to a concept of geometry in fashion, it is necessary to know how the word geometry is formed etymologically, of what it comprises physically and how it came into being.

Canedo,(2009), tells us that the ancient Egyptians were the first to take the initial steps towards developing the discipline. In those days, the Nile annually overflowed its banks, flooding the delta. These floods deposited nutrient-rich alluvial sludge on the fields, making the Nile delta the most fertile irrigated land in the ancient world.

A consequence of this was that the river washed away the physical boundary marks indicating ownership of land. Without these boundary indications, farmers and other agricultural users,

² Induced by persuasive social settings, the dilemma of what is considered as an ideal size, shape and body image continue to impact decisions consumers make regarding clothing selection and fashion. Body image has been identified as crucial to clothing provision and fashion consumption (Sproles and Burns 1994 Sproles, G. B. and Burns, L. S.1994). Changing appearances: understanding dress in contemporary society, New York: Fairchild Publications. [Google Scholar].

temple administrators and palaces, were without clear references as to the limits of their land for cultivation and the payment of taxes to the rulers.

The ancient pharaohs decided to appoint surveyors whose task it was to assess the damage caused by the floods and re-establish the boundaries between the various land units. This brought about the birth of geometry.

These surveyors learned after a time to determine the areas of land lots by dividing them into rectangles and triangles. They became known as “stretchers of rope” and gained this name from the measuring instruments and intertwined ropes designed to mark right angles.

The general consensus of academic opinion is that Egypt is the land where Geometry began, which accords with the construction of the pyramids and this civilization’s other monuments which would require a knowledge of geometry. More recent studies disagree with this opinion and suggest the Egyptians gained much of their knowledge from the Babylonians.

The word geometry comes from the Greek *gē*, earth, and *metria*, measure. Geometry is the science dedicated to studying the measurement of flat or spatial shapes and figures, as well as the relative position of the figures in space and their properties.

The mathematical field of geometry deals with questions of shape, size and relative position between figures and the properties of space, divided into several sub-areas, depending on the methods used in their study. Geometry is defined as the branch of mathematics dealing with the laws of shape, size and relative position of figures and how the measurement of surfaces and geometric solids relate. Such measurements as the amplitude of angles, the volume of solids, line lengths and surface areas are used.

There are various types of geometry, such as descriptive geometry, which studies the representation of spatial objects on a plane, and flat geometry, which is two-dimensional in scope because it is defined on a flat surface. The geometry of planar figures is also known as planimetrics, while that of geometric solids is known as stereometry.

Having a better understanding of geometry and where and how it came about, knowing its etymological background and studying its forms, properties and measures, such as line, surface and volume, we can now define some of its most significant forms which fit into these three aspects bringing together features which have a significant connotation beyond the visual.

Definition of some elements of geometry according to Sodré (2008):

- A polygon is a geometric figure whose name is derived from the Greek *polús*, much, and *gōnia*, angle. A polygon is a closed polygonal line formed by consecutive, non-collinear segments.

- The triangle is a three-sided polygon. It is the polygon with the least number of sides and is re-garded as the most important of the polygons.

Every triangle has elements of which the main ones are: vertex, sides, angles, heights, medians and bisectors.

- The quadrilateral is a four-sided polygon. The main quadrilaterals are the square, rhombus (or diamond, or lozenge), trapezium and trapezoid.
- A rhombus is a parallelogram in which all four sides are of identical length. The diagonals of a rhombus form an angle of 90 degrees.
- A rectangle is a parallelogram with four right angles and two pairs of parallel sides.
- A *trapezium is a quadrilateral in which two opposite sides are parallel but of different length, known as major and minor bases.

The segment that connects the midpoints of the non-parallel sides of a trapezium is parallel to the bases and its length is the arithmetic mean of the sums of the measurements of the major and minor bases of the trapezium. (*In the US, a trapezium is called a trapezoid)

In order to understand better, it is necessary to know certain symbols and their significance so that we can accurately interpret their importance according to the best-known forms. In addition, symbols of some elements are of great use to the present-day fashion designer:

Hornung (1981) states that the circle is the simplest and most fundamental of all geometric forms. It is the basis of an infinite number of other shapes and patterns. It is defined as a continuous curve. Any and every point on the curve is equidistant from the inner central point. It enables the creation of a plethora of decorations, logos and so on through the processes of multiplication, subdivision and interlacing, and these can in turn serve as bases when combined with other forms. The circle can be subdivided usually by lines or arcs, or a combination of either.

Chevalier And Gheerbrant (1999) express the view that the sphere has the same symbolism as the circle; it is the circle in the order of volumes. It provides shape, a third dimension, to the meaning of the circle and corresponds to the best perceived experience: the celestial-terrestrial totality expresses itself wonderfully in the cube-sphere pair. And, as a symmetrical figure par excellence, the sphere is a symbol of ambivalence.

Hornung (1981) tells us that the triangle is a flat geometric figure with three sides and three angles. In an equilateral triangle the three sides are equal, and the three angles are also equal.

The isosceles triangle has two sides and two angles that are equal and, from the design point of view, can be regarded as an equilateral triangle extended in one direction.

Although the properties of the triangle have been studied with great precision from time immemorial, and many mathematical theorems elucidating these properties have been proved, it is not easy to define their significance or applications because they are likely to be quite complex. The image of the triangle has become so integrated as a powerful symbol of life that it has become, at the same time, both abstruse and inflexible.

Basically, it represents three things: there are two above, then two inferior combines to produce something superior, thereby symbolizing the union of positive and negative forces, the law of life.

According to Chevalier and Gheerbrant (1999), the symbolism of the triangle takes in the symbolism of the number three. It can only be fully understood in terms of its relationship with other geometric figures.

“The first superficies is the triangle, the second the square and the third the pentagon. Every figure can be divided into many triangles if lines are traced from its centre. The triangle is the basis of the formation of the pyramid. Linked as it is to the sun and corn, the triangle is twice a symbol of fecundity.

“The triangle with the point upwards symbolizes fire and the male sex; water and the female sex is symbolized when the point is downwards. The Seal of Solomon is composed of two inverted triangles and chiefly signifies human wisdom. The equilateral triangle symbolizes divinity, harmony, and proportion.

As every generation is made by a division, man corresponds to an equilateral triangle cut in two, that is, a right-angled triangle. “This transformation of the equilateral triangle into a right-angled triangle translates into the loss of equilibrium.” (Boethius, In Chevalier And Gheerbrant, 1999)

For Chevalier And Gheerbrant (1999), the pyramid stands for ascendant convergence, awareness of synthesis, and the pyramid is also a meeting point of two worlds, a world of magic connected with funerary rites, indefinite retention of life, or passage to a supratemporal life, and a rational world invoking geometry and modes of construction.

It was inevitable that lovers of mysteries should marvel at such a convergence and would find there on the one hand an explanation of geometry and on the other a justification of magic through mathematics.

The geometric relations of the Great Pyramid of Giza opened the path to other interpretations which led to the symbolism of the alchemists.

Hornung (1981) defines the square as a rectilinear figure of four sides and four equal angles. It can be divided in several ways: diagonally, it produces two, or four, triangles. But it can also be divided in several other ways using arcs and angles.

Studying the properties of the square becomes more straightforward if based on the study of its components, principally the triangle.

Chevalier And Gheerbrant (1999) point out that the square is one of the geometric figures most frequently found, and it is universally employed in the language of symbols. It is one of the four most basic symbols along with the centre, the circle and the cross. It is an earth symbol, as opposed to heaven, but, on another level, it is also the symbol of the created universe, earth and sky, as opposed to the uncreated and the creator. It is the antithesis of the transcendent.

Chevalier And Gheerbrant (1999) tell us further that the cube is the square of the square. In order of volumes, it has the same significance as the square in the order of surfaces. It symbolizes the material world and the four elements. Because of its balance, it came to be seen as a symbol of stability. It is often used as the base of a throne. In the symbolism of mysticism, the cube was seen as a symbol of wisdom, truth and moral perfection.

According to Hornung (1981), when two lines intersect at right angles in such a way that the four arms are of equal length, the resulting shape is called a “cross”. In its appearance, the cross is the simplest of geometrical figures, but the variations in its structure and detail are infinite so the examples given are merely an overview of the topic.

Chevalier And Gheerbrant (1999) state that the cross is the third of the four fundamental symbols. It creates a relationship between the other three. Through the intersection of its straight lines, which coincide at the centre, it opens the centre towards the outside. Inscribed in a circle, it divides the circle into four segments. It forms the square and the triangle when its arms are connected by straight lines. These simple observations gave rise to a most complex symbology leading to a richer, more universal language.

The cross symbolizes the earth, as does the square, but it expresses it from intermediate, dynamic and subtle aspects. The symbolism of the square is closely linked to that of the cross, particularly insofar as it links a set of relationships between the number four and the square. The cross is the most totalizing of symbols.

Hornung (1981) points out that, although it is not a pure geometric figure, the arrow has all the characteristics and properties of the triangular motif. It has been used from the earliest times

as a decorative motif both by savages and their civilized successors. It was at first linked to ideas of war or to indicate a direction, but it has lost this pictorial meaning over the ages.

These symbols are of great use to designers today when clear geometric forms, or parts of them, are applied to make patterns. Highlighting concepts about geometric forms and their origins and symbolism makes it possible to understand the meaning of these forms and how they have influenced creations in fashion from the fourteenth century, which is the aim of the current dissertation.

The use of geometry has been a constant theme in fashion since this time and is nowadays intensified by its recurrent appearance on the catwalks. In his book "Clothes and Fashion" or in its original title "*A Roupa e a Moda*" (Laver, 2005, p.62) states that:

"It was in the second half of the fifteenth century that clothes, both masculine and feminine, took on new forms and something we could start to call 'fashion'. A new garment appeared in this century which differentiated between the sexes as well as between the social classes, taking the place, for example, of the famous tunics, part of masculine costume" (Laver, 2005, p.62)

According to Thursfield (2001), It was a common garment for men and women to cover their legs. Women wore short separate hose which were held up by garters just below the knee. Men wore separate hose till the end of the fourteenth century and working men until the end of the fifteenth. It fitted closely up to the knee and its front rose to a point with a button on it to be connected with a doublet. Such a hose was worn with short braies. The hose was made of pure wool and had to be stretchable. Later, joined hose appeared as presented in Figure 28. It might be close-fitting, but this restricted movement, so hose that were baggy at the back and knees was more popular.

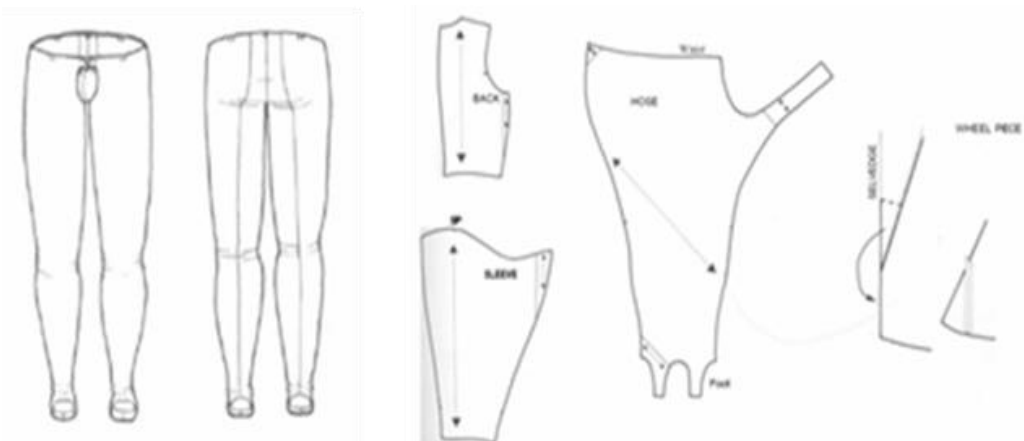


Figure: 29 - Joined-hose - garment details, front and back view and flat patterning of the garment. Retrieved from: Thursfield (2001, p.110-112),

Soares (2009) defines it as follows:

In the middle of the fifteenth century, with nations firmly established, there was an increase in luxury goods coming from mercantile prosperity, particularly in the Italian cities of Genoa, Venice, Milan and Florence. “This was the start of the Renaissance period, marked by a great cultural transformation in all areas of European society. And it was no different with the flat patterning of garments. The great advances made in this period represent the basis of all technological processes in flat patterning to the present time” (Soares, 2009, p.3)

Arising in part from this is the presupposition of a need for a geometric study of the body.

It was at the height of this period that Juan de Alcega created the first manual of tailoring techniques, incorporating geometry in his practical techniques and tracing the first patterns in the “Book of Geometry and Drawing” in 1580, as figure- 29 shows the Cover of the first book of tailoring, published in 1580, as Soares (2009) and Aldrick (2007) record. Learning these skills still takes place in master tailors’ workshops.

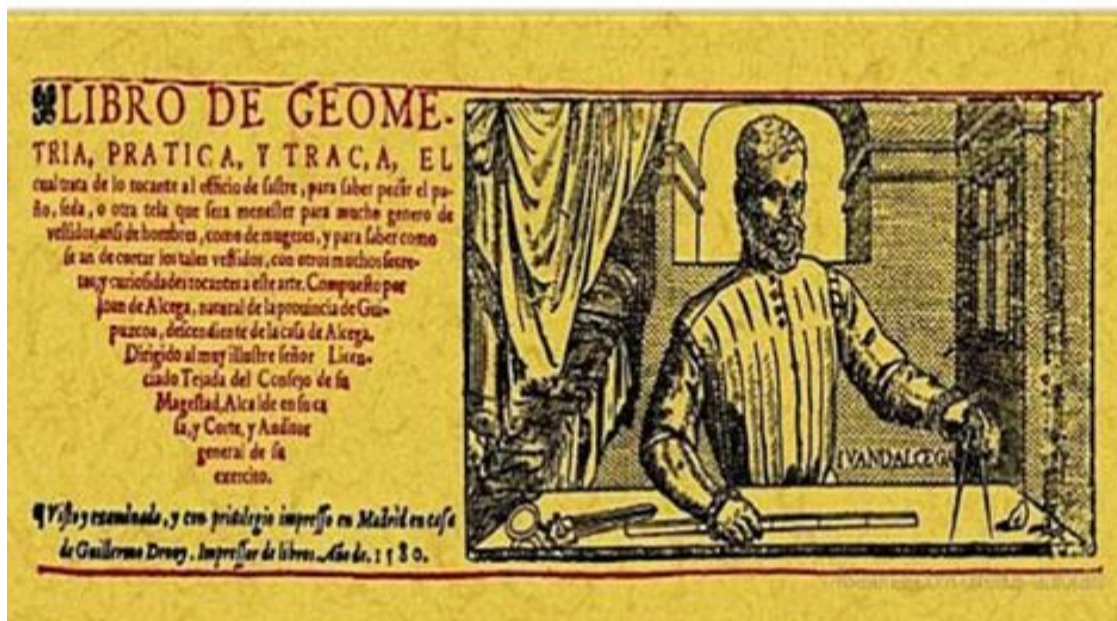


Figure: 30 - Cover of the first book of tailoring, published in 1580. Retrieved from: Alcega (1580).

It is worth bearing in mind that, in the “Book of Geometry and Drawing”, Alcega was making available to the public, that is to say to professionals and their apprentices, the proportions to be used in the creation of manufacturing diagrams and flat patterns of products. They were based on a standard measurement, usually the chest, an approach which still continues in various current methods.

Everything around us reminds us of geometric forms, we have but to look at the objects about us. The construction of flat patterning could hardly be different, so the study, building and

analysis of geometric figures are necessary to gain a good understanding of all production processes.

It is clear that these forms are present in all garments and the geometric point of these forms began to have great influence on fashion and in the patterning process as a new trend was established from the 60s.

To quote Laver, (1989) “In the 60s, clothes established a new trend. With the conquest of space, futuristic fashion, exploiting plastic, acrylic and multicoloured prints, gained strength. The fashions of the time followed hard, geometric lines and were erotic in the extent to which they more or less undressed the body.”

The same thoughts are expressed by Laver and Braga:

“Rebellion was the order of the day, and the prevailing similarity of clothing prevented the classification people into different social classes. Young people were rebelling against the lifestyles of their parents, challenging them and attacking them with an unconventional look”. (Braga, p.89, 2004)

Some trends from the 50s carried over to the next decade, such as the straight, tube-like H-line, the wide-shouldered, narrow-waisted Y-line, and A-line dresses which were fitted at the hips, widening to the hem. The fashions resembled the geometric shapes of capital letters.

During the 1960s, in 1965 to be precise, the French stylist Yves Saint Laurent created a collection inspired by the work of the Dutch painter Piet Mondrian. Made in Jersey, his primary colour print was inspired by Mondrian’s “Composition with Red, Blue and Yellow”. The modernist, geometrical dresses characterized the era, marking the union of art and fashion. It is still possible today to find models with different colours and shapes, but which refer to the De Stijl movement.

According to the fashion magazine Vogue; Yves Saint Laurent, in full Yves-Henri-Donat-Mathieu Saint Laurent, (born August 1, 1936, Oran, Algeria—died June 1, 2008, Paris, France), French fashion designer noted for his popularization of women’s trousers for all occasions. Yves Saint Laurent died after a long period of ill health at his home in Paris on June 1, 2008. He was 71.

Mondrian And The De Stijl Movement, featuring paintings, architectural drawings, mock-ups, furniture, documentaries, periodicals and photographs by artists of the Dutch modern avant-garde movement known as De Stijl (The Style), Piet Mondrian was presented in the prestigious cultural Center Bank of Brazil . (Source: *CCBB [Banco do Brasil Cultural Center]*)

Figure 30, Mondrian Dress by Yves Saint Laurent, influence of vertical and horizontal lines and Mondrian's primary colours spread through all the arts. It was very important in decor and also inspired all kinds of souvenir. It is important to remember that this dress heralded a new era in which the plastic arts and the best-known painters came to inspire fashion and fashion came to be seen as an art form.

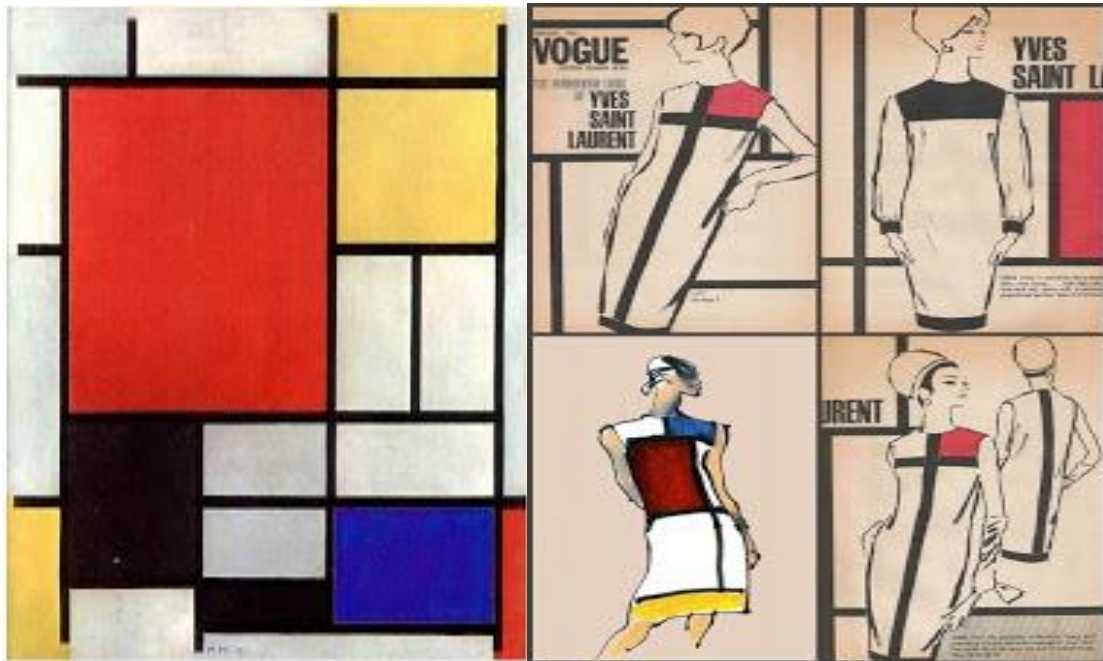


Figure: 31- Mondrian Dress by Yves Saint Laurent. Retrieved from: CCB, Painting by Mondrian, Banco do Brasil Cultural Center.

It was a tremendous success and has become one of the most famous collections in the history of world fashion.

As well as Yves Saint Laurent, mention should be made of the designer Emilio Pucci, who began his career as a fashion designer in the late 1940s and early 1950s creating clothes for skiing.

According to the British Vogue magazine, Don Emilio Pucci was born in 1914 to one of Florence's most illustrious families, *Marchese di Barsento*, (Italian pronunciation). The Pucci fashion house was founded in 1951 by Emilio Pucci, Marquis of Barsento. Four years before, in 1947, the designer created a ski ensemble that comprised a hooded parka and tapered ski-pants. As a colorist he was unparalleled and drew inspiration primarily from the natural landscapes of the Mediterranean, but also from the exotic locales to which he travelled.

Emilio Pucci took inspiration from the Mediterranean Sea and the tunics, turbans and palazzo-pyjamas of Eastern culture.

The prints, combining vibrant blue, pink, purple, green and yellow colours in geometric designs, became true icons, as can be seen in Figure 31. Cotton velveteen Prints appeared, particularly in the 1960s. It was not by chance that Pucci became known as the “Prince of Prints.”



Figure:32- Cotton velveteen Prints by Emilio Pucci from 60's and 70's. Retrieved from: <https://kristenlaird.com> Accessed in: 15/02/2018.

O According to Garcia (2008), the Italian stylist Emilio Pucci lives on in our imagination as the man who created the brilliantly coloured geometric prints that became a mania in the 1960s and continue to inspire many print designers of today.

2.4.1. Volumetrics

To the designer falls the task of giving integrated and comprehensive thought to the coherence of space, making links based on the real demands of the people against the context of their lives. This thinking is realized when expressed in such a way as to forge a link between the idealized concept and what is materialized (Souza, 2008, p.341)

It is not possible to talk about volumetrics in fashion without first clarifying the relationship between fashion and architecture, so as to have a better understanding what volumetrics is and how it is applied to fashion and its various elements.

The parallels between the constituents of architecture and fashion design are often either unknown or misinterpreted. However, these disciplines are in fact complementary with many constituent similarities.

The sub-theme of volumetrics will be approached with this premise as starting point.

From an architectural viewpoint, volumetrics can be defined as: “A set of dimensions defining the volume of a building or a series of buildings”. Professional architects and fashion designers both work with volumes, shapes, aesthetics, applications and calculations.

The concept of volumetrics is indispensable to the application of volume in both architecture and fashion design. With volumetrics, creative gestures and elements, such as communication and the interpretation of a sense of movement, take on a major role in both as regulator of the link between body and environment.

The volume of a body is the product of its three dimensions, width, height and depth. The designer acts as an intermediary charged with and committed to providing solutions through the possible ways of combining these elements with the design object. His work is related to research culminating in the creation of a design object that meets the fundamental needs of the individual and always has a purpose.

It is clear that fashion and architecture have aspects in common related to creation and questions concerning a project.

Noelle (2011) states that both fashion and architecture are always experimenting with new approaches and visions, and that they talk to each other more than we realize. Santos puts his point of view into a context of personal, social and cultural identity, saying: “Both fashion and architecture express ideas of personal, social and cultural identity.” (Santos, 2010, p.1). This statement can be applied to design in general.

According to Seivewright (2009), fashion and architecture start from the same point and principle, the human body. Both aim at the same objective: to give protection and shelter while providing a way of expressing identity, whether it be personal, political, religious or cultural. Both disciplines put forward ideas concerning space, volume and movement and have similar practices in the way they explore materials, transforming two-dimensional flat surfaces into complex three-dimensional shapes.

Thinking along these lines is fundamental, according to Rebouças (2011), Both fashion and architecture work with volume, structure, transparency, cutting plans and profiles to give protection and shelter to bodies. As well as interposing and directly influencing architecture, fashion can also inspire it.

Fashion is like architecture in that almost all the ideas which give rise to projects are conceived three-dimensionally from a two-dimensional drawing. It is easy to understand that professionals in these areas start from identical concepts and develop studies on the same issues (Rebouças, 2011, p.11)

Architecture and fashion work on questions of volume, shape, aesthetics, use and calculation. The difference is that in fashion the volume of a body and the movement required by the limbs must be predicted while architecture is static and has no articulated members. Fashion is unusual in that it envisages volumes and forms which enfold the human body, aiming at comfort and enabling the movement needed in day-to-day life, as well as aesthetic values.

Barthes (1967) says that is not difficult to make a connection between fashion, sewing and architecture if we think of sewing as architecture of the body and fashion as a system of definitions and constructions of meaning.

Fashion designers such as Yves Saint Laurent, Emilio Pucci, André Courrèges, Pierre Cardin, Paco Rabanne, Roberto Capucci, Gianfranco Ferré and Rei Kawakubo are among many examples of exalted names in the pantheon of fashion who had training in architecture to inspire or support their creations.

Similarly, Alexandre Vauthier, of the famous Valentino brand, created a look in his Autumn/Winter 2017 collection inspired by the architecture and architectural volumetrics of renowned architects as shown in figure-32.

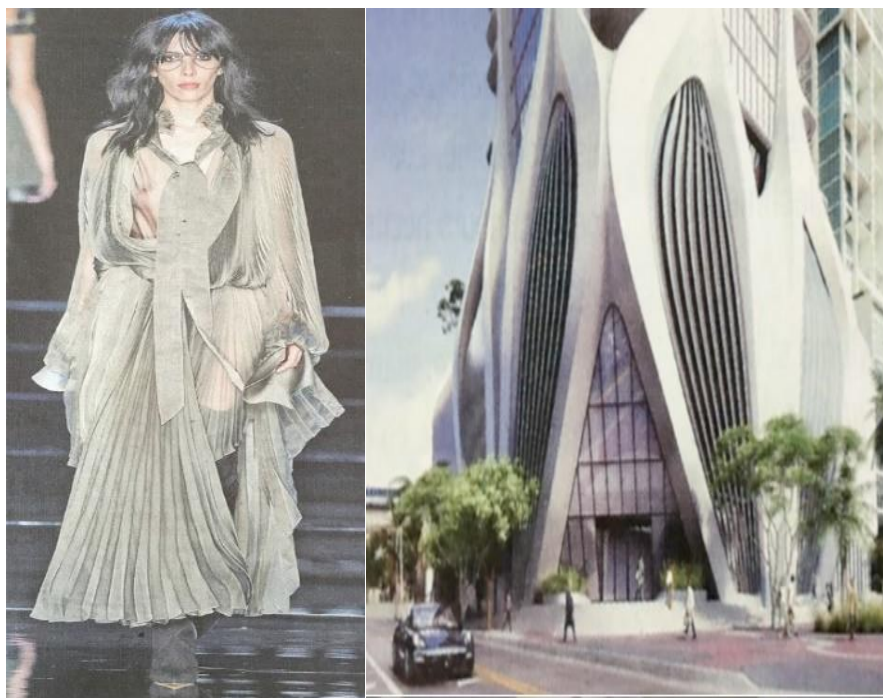


Figure:33- Fashion (Alexandre Vauthier) and Architecture (Zaha Hadid). Retrieved from: <http://www.vogue.com> Accessed in: 15/02/2018.

There is a direct link between fashion's quest for something striking and technology and flat patterning.

Volumetrics is clearly brought into almost all fashion shows and designer creations right across the planet. In “Pattern Magic” by the Japanese writer Tomoko Nakamichi, the degree of complexity and the limitless resource of the draping and flat patterning technique can be seen in one of her creations as shown in Figure 33: Origami by Tomoko Nakamichi



Figure:34- Origami by Tomoko Nakamichi. Source: Book “Pattern Magic”, - Author- Tomoko Nakamichi

To think of volumetrics is to think of the whole process of creating a fashion garment because it runs through the entire process, whether it be the selection of fabric, or the print that is the basis of a fashion sketch, because, at this stage, the design starts to take the body’s proportions and volume into consideration with regard to the techniques of flat patterning.

The fashion design can be subdivided into two elements, the artistic design and the technical drawing. The technical drawing is part of the product development process. The artistic design, also known as a sketch, is usually an expressive representation on a stylized body, which ignores real proportions.

The function of the technical design is to illustrate the garment as if it were stretched on a flat surface, the main aim being to communicate the designer’s ideas to those whose task is to produce the flat pattern and to pilot the piece.

The pattern maker is responsible for preparing of the patterns of garments and must take account of the volumetric rules of the body’s anatomical contours to carry out this task.

Flat patterning is the factor which determines the shape and volume of an item of clothing which must be suited to the body, whether it be still or in motion. The design of the modelling should, as far as possible, meet the demands of the body, thus flexing the actions of the joints of the limbs and trunk, offering comfort and practicality. The concept behind the flat pattern

should, so far as possible, meet the needs of the body and offer flexibility for the actions of the joints of the limbs and trunk, yielding comfort and practicality.

As we can see in Jones,(2005):

Clothing is three-dimensional, “though we can envisage the overall outline and shape of clothing as its profile changes when clothing is seen moving, curving through 360 degrees, revealing its volume”. (Jones, 2005, p.99)

According to blog (*de la Materia de Volumen de la Escuela de Arte de Cádiz*), QIU HAO, who is of Chinese origin and one of the great names in current fashion, makes use of volumetrics in his creations and has therefore gained great success in his career. He took an MA in Art in London focusing on women's clothing design before returning to Shanghai to found his own company, QIUHAO.

His work has been published in prestigious magazines such as Vogue, Elle, Harper's Bazaar, L'Officiel and V Magazine as can be seen in figure- 34. Qiu Hao has won prestigious awards in the industry and has been awarded a place in the “Woolmark Hall of Fame” alongside Karl Lagerfeld, Donna Karan and Giorgio Armani.



Figure: 35- Qiu Hao, fashion Work. Retrieved from: blog de la materia de volumen de la Escuela de Arte de Cádiz

Qiu Hao³ is one of today's most influential Chinese designers. Since specializing in interior design and space in 2001, he has launched his own ready-to-wear brand Neither Nor and has subsequently opened his first ONEBYONE boutique in Shanghai (blog de la materia de volumen de la Escuela de Arte de Cádiz, translated by the author)

His triumphs have not been limited to textiles and the catwalk. In 2010 Forbes⁴ named him as one of the 25 most influential people in the Chinese fashion industry and, more recently, he was nominated for the Breakthrough Designer Award in 2011. In the Global Fashion Awards given by the WGSN (blog de la materia de volumen de la Escuela de Arte de Cádiz, dated 01/2018).

The three-dimensional complexity between profile and volume can be clearly seen when the designer's care in taking account of the body's anatomical conformations is noted in the design of a fashion garment, seeking to meet the main needs of comfort and aesthetics.

³ QIUHAO Born in a city one hour away from Shanghai called Taicang, following the studies in interior and spatial design, he launched his first clothing line - Neither Nor - currently on sale in nine cities across China.

In 2004 he moved to London to continue his studies with a Master Degree at Central Saint Martins College of Art and Design and in 2006, upon his return to Shanghai, he established his fashion brand - Qiuhao which has already been showed in Singapore, Paris, Stockholm and Sydney.

In 2008 he was awarded the prestigious Woolmark Prize in Paris whereas this year he was nominated as one of the Breakthrough Designers by WGSN at the Global Fashion Awards. The designer is not keen to talk about his sources of inspiration and would rather let his sculptural knitwear garments do the talking. <https://www.vogue.it/en/talents/contests-and-more/2011/11/qiu-hao>

⁴ **Forbes**, American business magazine owned by Forbes, Inc. Published biweekly, it features original articles on finance, industry, investing, and marketing topics. Forbes also reports on related subjects such as technology, communications, science, and law. Headquarters are in New York City.

Founded in 1917 by Bertie Charles ("B.C.") Forbes, a business columnist for William Randolph Hearst's newspaper chain, Forbes magazine was the only major business magazine in the United States throughout the 1920s. By 1930, however, two business magazines had joined the market: Business Week and Fortune. During the 1930s and into the 1940s, Forbes magazine's circulation numbers fell behind those of its two competitors.

<https://www.britannica.com/topic/Forbes-magazine>

Chapter 3 - Pattern Making as a Creative Resource

Creativity is a systemic capacity that manifests itself in new and value-added solutions (ideas, products, concepts, questions, processes, etc.) influenced by various contextual factors from the social and cultural environment. This capability is in part the creative thinking of the individual, with their cognitive functions and stored knowledge which establish new connections between ideas.

However, working on an assumption that the individual is part of a network, their thoughts will also be stimulated and influenced by social contexts and group work in which ideas are come from the expressions and thoughts that others communicate.

And this happens through a creative and projective process by which methods, techniques and even procedural knowledge itself can enable the development of new concepts to deal with different factors influencing creativity, stimulating creative thinking and facilitating communication and interaction between individuals.

The creative process is the personal development of innovation and differentiation. However, when thinking about Fashion, it is important to understand creative work as a means of overcoming alienation, with the intention of making it possible to analyse the Fashion Designer's work.

Creativity has been regarded as a divine gift and this idea of an innate talent has only recently been replaced by a view that points to the possibility that each and every one of us can develop creatively,

Kehrwald (2002) [...] whether through day-to-day living or personal effort, or through formal or informal education. That is, one learns to be creative and it is an ongoing process that takes place throughout life (Kehrwald, 2002, p.4).

In Fashion, the process "refers to the set of influences and interactions, changes and adaptations, the systematization of people, organizations and institutions that give life to the cycle from beginning to end." (Conti, 2008, p.225)

In this context, every creator needs to think about his creative process in fashion and how to stimulate his own creativity. There are some tools that can be used to promote creativity and these should be incorporated into the daily routine so the designer can develop differentiated and innovative work. The fashion designer must establish a methodological approach to developing a collection.

In all elements of the Fashion market, every stage has its individual importance and needs and the flat patterning is one of the fundamental factors in the training of a professional fashion designer, because it is through drawing patterns that ideas begin to materialize, to gain form.

Across the years various methodologies have been developed and adapted in quest for the best way to model items of clothing. In order to carry out this activity, knowledge is needed about different techniques running from flat geometric representation to a “spatial” view of the garment. Some knowledge of geometry, a certain skill with drawing materials, and some competence in the area of computer science are the tools and equipment needed to carry out flat patterning.

When talking about flat patterning, or when reference is made to it, technique soon comes to mind because the patterning of clothing entails rules and parameters that are well defined for developing a product. In particular, when talking about the flat, or two-dimensional, patterning technique used by dressmakers, ateliers and the garment industry, this consists of drawing the pattern on to paper with all the measurements taken from the person, darts, straight lines and curves, cutting the pattern and sewing it on to the fabric.

In this case, geometry and mathematics are used for the purpose. After the sewing and finishing, the sketches will shape the curves of the body and create a garment that can be displayed in three dimensions. There are several methods of flat patterning from which to choose and patterns which follow a standard method can also be purchased readymade in magazines.

Turning to Moulage or Draping, this is the inverse of the process of flat patterning. A draping or moulage mannequin is used and the garment is built on it, making it possible for the garment to be seen in three dimensions at once. It could be said that this patterning technique gives greater creative freedom to the fashion professional because of the immediate contact which gives immediate three-dimensional visualization of the product, which gives greater control over creation in an unusual way and makes final adjustments easier. This is one of the factors that distinguishes moulage from traditional patterning.

Nowadays many fashion students and professionals question which the best patterning technique is; flat bi-dimensional patterning or three-dimensional draping. From an academic and scientific point of view, it is not matter of a better or worse technique but, rather, which technique that is best suited to the individual professional.

We must also bear in mind that the techniques are mutually dependent so there is no better or worse. To achieve a draping of excellent quality, the professional must also have a basis of knowledge about flat or bi-dimensional patterning, so the two techniques do not compete but are complemented by the bias of fashion.

We can go yet further on the basis of the case studies to be researched later as this dissertation develops: “Flat patterning as a creative resource in the teaching of fashion design.”

According to Rosa (2009), “... patterning is the technique responsible for the construction of garments; it is the structure of clothing. When carried out well, it gives shape, perfect volume and trim to garments. It is the fundamental step in achieving the creation of a fashion design; wide knowledge of this art enables the solution of pattern interpretation.” (Rosa, 2009 p.22)

It is clear from Rosa’s thinking that flat patterning technique must be mastered by fashion designers because knowledge of this technique will reinforce the process of creation and execution of the product.

Ruth Guimarães’ book “Human Conquests - Clothing” has an interesting reflection on the function of dress and fashion in the preface. The book makes very interesting comments on the function of clothing via-à-vis the cold, the heat, modesty and tradition, etc.

Braga (2007), Dressing up, then, seems to be the most convincing argument for the use of dress because primitive man went without clothes but not without decoration. “Whatever the intention, covering the body was a necessity.” (Braga, 2007 p.18)

Studies by many historians, such as Embacher (1999), conclude that the use of clothing as protection against the cold makes sense when living in regions near glaciers but, when considering ancient civilizations, the argument does not hold water because the regions of the fertile Euphrates, Nile and Indus valleys are in tropical climates and clothing was also worn there.

It is evident from the chapter in this dissertation entitled “Timeline: Fashion and Sewing Pattern History” that clothing has been influenced by historical, economic and cultural events such as wars, religion, architecture, music, the arts, and so on. All these elements were and are experienced by mankind and have influenced the way people dressed in the past, and still today.

It can be said that, at that time, although it was unintentional, the extremely creative act of wrapping fabric around the body to shape it like a sculpture, following the natural form and giving the item the desired shape, can be seen as a form of what we now call draping, or three-dimensional patterning. It is also true to say that, at that time, the easiest way to transform fabric into a garment was to cut a small rectangle of cloth and wrap it around the waist, creating a draped shape with volume, and this act was done, of course, to embellish the body, to be seen and show off.

This way of making garments was used by the Egyptians, Assyrians, Greeks and Romans because it was the easiest way to turn fabric into a garment. Wrapping a small rectangle of fabric round

the waist made a primitive form of the skirt, or sarong. Later, another square of cloth was cut and hung over the shoulders, held by brooches.

According to Laver (1989), unlike garments that clung to the body's form, regarded as "barbarian", draped clothes were a mark of civilization. It is a historical fact that at one time the Romans even condemned to death people who wore clothes that defined the shape of the body, or clothes that were thought of as "barbarous"

In the 7th century BC there was no real distinction between clothing for men and women. They both wore only one type of clothing, the chiton. The men's fell to the knee, the women's to the ankle. This garment was held by pins or brooches attached to the shoulders, without the armpit being clearly defined, a cord being tied round the waist. The sleeves and waist soon became defined. It is this period that is regarded as seeing the start of the basic principles of patterning.

Note also that, later in history, in the mid-nineteenth century to be precise, clothing production was a form of a manual work. Tailors were masters of the art of tailoring and made men's clothes, seamstresses and dressmakers made gowns for female clients. Any piece of clothing was made in the same way: individual measurements were taken and the ideas of each client were followed.

Parisian Haute Couture began in the middle of the 19th century with the designer Charles Frederick Worth. It is recognized that he brought about a change in the concept of fashion. Worth did not make dresses according to his clients' wishes; he created collections which he then presented to his clientele, the ladies of society.

A great transformation took place in fashion initiated by the French couturier Paul Poiret in the period prior to the First World War. He modernized fashion from an aesthetic point of view following the impulses of reform movements at the beginning of the 20th century. Lehnert, says that "Poiret advocated the notion that the natural beauty of the female body should be emphasized." He was a champion of the liberation of the female body. His fashion continued until the start of the First World War, only declining in the post-war period because of the difficult situation and the shortage of raw material. (Lehnert 2001, p.14)

Men's clothing changed little during this period while women's clothes became even more austere and functional. There was a predominance of small voluminous profiles: fashion took a decisive step towards modernity with pure lines and a sense of function.

Centuries and epochs. Much has been said of a change in body and form. We are also led to believe that such changes have influenced a new way of patterning, working on the basis that patterning is the engineering of the body and the product of fashion clothing. There would also

have to be a change in patterning to change body shape because it is impossible to think of a glorification of the body's form, as was done in the past and how it is done today, without also thinking of an adjustment in patterning.

Rocha (1998) believes there is evidence that there was a need for patterning much earlier than was once thought. He suggests that man's curiosity about measuring his body is a very ancient thing. History shows that he employed parts of it as units of measurement. There is documentary evidence from the Ancient Egyptians to show the existence of proportion between the parts and the whole of the body (the upper limb amounted to eight middle fingers).

To pattern is to interpret the transformation of the bi-dimensionality of fabric to the tri-dimensionality of the body, with its forms and contours and environment.

Analysis of the argument behind Rocha's assertions (1996) leads to the conclusion that the development of clothing simply shows man in his quest for socio-cultural evolution and responding to the urge to see and be seen, seeking and gaining social status. This alone brought about the beautification of the body and led man to construct paradigms and attractions to position him in front of others. This more than shows he wanted to be noticed.

Still referring to the analytical discourse quoted above in which Rocha (1998) suggests measurement the body is an ancient human curiosity, this may lead to the conclusion that finding a way to transform or pattern the flat surface of fabric according to the curves and contours of the body is also an ancient human curiosity. Such a process would only be possible through techniques conceived by patterning, flat or three-dimensional. The second option seems more likely in the light of the historical context of the text.

This chapter explains man's wish, from ancient times to the present, to be a stylist, architect or designer, a hunger that has continued across the centuries. It clarifies his adoration of the body, his need for transformation, his concern with seeing and being seen, with health, aesthetic beauty and the worship of bodily forms and curves. There is then reference to flat patterning in contemporary terms following the lines of the thoughts of Silveira (2006) who says:

Silveira (2006) "Patterning consists of the act of interpreting the model on the basis of the fashion designer's ideas, and the concretization of those ideas, and the information recorded in the product datasheet."

The view of Jones (2006), is that flat patterning is a matter of putting together a set of templates which reproduce the shapes and measurements of the human body adapted to a style proposed by the designer. These are implemented from an analysis of the technical design and other design specifications.

Silveira (2006) And Jones (2006) agree that patterning makes the ideas of the fashion designer possible, whether these have been conceived from a drawing by hand (a fashion sketch) or by technological means (a computerized drawing). Moving the process on in accordance with the patterns may extend the idea that patterning is a process that involves different areas of knowledge.

The professional fashion designer needs an understanding of the body and its forms - and this has to be felt. At least a basic knowledge of mathematics is necessary as this develops the creative sensitivity to be aware of what is around them. The professional in any area of fashion who does not gain this creative feeling can never find true satisfaction in the profession.

In order to draw patterns it is necessary to understand the anatomy of the human body, to be able to imagine body and garment which must relate to each other like complementary extensions of the same thing. It must always be borne in mind as a principle that a successful fashion product can only be achieved by taking functional, safety and comfort aspects into consideration.

As Heinrich (2005) points out, the human body is made up of [...] bones and [...] muscles, operating through the central nervous system. The movements and motion of the body are controlled by the joints which give balance.

“The study of how to construct a pattern of the body is based on the volume and indentations the anatomical form presents. Its plan can be divided into sections - locating the point of balance with the aid of lines: central, vertical, horizontal, symmetrical, asymmetrical or curved.” (Heinrich 2005, p.28)

The studies above show that the fashion professional must take into account requirements of comfort, durability and functionality in order to obtain a quality fashion product. This must start by developing a pattern that involves the study of ergonomic factors, anthropometry and knowledge of the user's body.

Therefore, to carry out industrial flat patterning, the main factors to be considered are the shapes, measurements and movements of the human body. So, when thinking about a specific flat pattern based on design theories and implications, it is important to start with a more comprehensive vision less focused on pre-established techniques set out in cutting and sewing manuals. This can open the possibility of finding new directions in which to take fashion design projects embracing integrated amalgams of two- and three-dimensional patterning methods and their different techniques as possible strategies for teaching patterning as a creative tool.

3.1. Methodological Processes: Planning Collections

Fashion designers generally use a methodological process to plan clothing collections⁵. They look at textiles, mood boards, colour cards and so on for extra ideas to develop better harmonized collections from the aesthetic point of view, collections that present theme, form, station, and pattern defined and in line. Following these procedures, the professional is expected to arrive at an ideal collection which will receive public adulation.

In the fashion designer's academic Treptow (2013), training and in the marketing practice of clothing and accessory brands, a collection is thought of as a group of pieces designed for a season, following a theme and harmonious in style, colour and shape. This should follow the line of reasoning along which the products have been developed through the creation methodology of the collection, which should include surveys of target audience, market, colour trends, shape and textures, product mix and mix of styles.

Many professionals and researchers advocate planning a Fashion Product Collection along the lines suggested by several authors who define it as "Product that can be offered for sale to the market that satisfies a desire or need." (Kotler In Rech, 2002, p.37)

In the ideas Rech outlines and sees the fashion product as any element or service capable of accumulate creation, quality, dress, appearance and price that suits the demand of the market segment for which it is intended (Rech, 2002, p.37)

As well as the authors mentioned, consideration must also be given to Jones (2011) who believes the language of the product design shows itself through the project in elements of the collection's style giving it unity and harmony.

And, last but not least, to complement Jones' and Kotler's line of thinking in Rech, (2002), at risk of befuddling our thoughts, Escorel (2000,) must be added. He says:

" ... To ensure control over the different aspects involved in the product development process so as to enable mass production using appropriate industrial technologies." (Escorel, 2000, p.66)

According to Rech, "products which come from design projects do better than products developed by methods based on practice." (Rech 2002: p.58)

⁵ Book basics fashion design: 04. Developing a collection a group of accumulated items of a particular kind Elinor Renfrew Colin Renfrew FASHION DESIGN v grow or cause to grow and become more mature advanced or elaborate. Published by AVA Publishing SA Rue des Fontenailles 16 Case Postale 1000 Lausanne 6 Switzerland

It is easier to understand this comment on the development of a fashion design product when Slack's thoughts in Rech are considered.

He throws light on the matter by putting into context the five determinant phases he regards as important in the development of fashion products, then adds thoughts that filter through the whole, as shown in Table 3: Five stages of fashion product development :

“It is possible to identify five steps in the development of fashion products, highlighting the importance of aspects of design and suitability that permeate all stages of the project. They can be seen in the table.” (Slack, 1997, 2002, p. 69).

Table 3: Five stages of fashion product development. Source: Own source

1- Generation of concept; generation of ideas
2- Selection: definition of fashion themes
3- Design: sketches of models, choice of fabrics, haberdashery, colours, shapes, accessories
4- Evaluation and improvement: development of technical drawing, patterning, technical template
5- Final design and prototype: development of the pilot garment and approval analysis; development of packaging and production of publication material

According to Souza, many authors discuss design issues but Montemezzo (2003), who assesses Rech's views, makes it clear that he is one of the few authors who approaches the subject from the point of view of fashion.

In summary, in the course of surveying authors' thoughts on collections and putting them in context, it became clear that the majority always stressed that the ideas in collections must have unity and harmony.

It is therefore becomes important to explain that there are two variants of research in fashion design, these being:

1. To assemble tangible objects (fabrics, attachments, and other objects).

2. The second is a more abstract, visual and investigative method using books, magazines, periodicals and the internet.

Renfrew and Renfrew (2010) say it is possible to take a theme for a collection from research. While developing the collection along with their team, the fashion designers explain the theme using images, designs, story-boards, garments, colour charts, fabric and haberdashery⁶ found during the research.

Once the theme has been chosen and defined, along with the colour chart, fabric and haberdashery, the designer responsible for the collection initiates proposals. It is at this stage that handmade or computer-assisted fashion designs can be produced. The latter makes the process both more flexible and more precise and can be carried out using vector drawing programs such as Corel Draw or Illustrator.

The proposals to make up a collection having thus been agreed, the first stage is to generate concepts. Secondly, the theme is defined. The final, but not the least important stage is "Design". Sketches are made of models and fabrics, haberdashery, colours, shapes and accessories are chosen.

It is important, and entirely feasible, to introduce the teaching of flat patterning as part of the creative process at the stage under consideration here. At this creative stage of the "Project", most students, the future fashion professionals, are hugely keen to sketch their fashion designs. They are already thinking in their fabrics, etc.

This is confirmed in Grave's (2004) comments. He says:

The student must be introduced to the intricacies of flat patterning from the moment the creation of a fashion design is conceived. This is the stage at which the student must gain the perception and understanding in which "patterning [...] has a participatory function in the articular movements of the human body." (Grave, 2004, p.49)

These thoughts can be taken a little further if the comments of Araújo (1996) are taken into consideration. He defines patterns and fabrics as two-dimensional, consisting only of length and width.

An item of clothing is the result of assembling various component parts. There is also a third dimension, depth, which is incorporated into the model through darts.

⁶ Haberdashery is a fashion term that has a strong relation in a fashion industry. It is a Retail Shop for things like button, laces, ribbons, threads or needles etc. Haberdashery Shop is a very ordinary shop usually you can find in small towns or small markets. It's a very important place for everyday purchases for tailors, fashion designers, small boutique owner's especially students of fashion design who needs to go to this place very often to find new and unique things for their accessories or to depict latest fashion trends or theme elements from their collections. Available in: <http://www.worldsultimate.net>

So, if a fashion product is to be successful, it must be successful in the patterning. And, according to Araújo, for that to happen, the patterning must follow a logical sequence of development which takes into account the steps presented. Table 4 therefore exemplifies a Chronological sequence of pattern making development as a sampling assignment of (Araújo, 1996).

Table 4: Chronological sequence of Pattern making development. Source: (Araújo, 1996, p.97)

<ol style="list-style-type: none">1. Acceptance of the design of the item in sketch form.2. Verification of the dimensions with the styling department.3. Production of sample patterns based on size.4. Sewing of sample.5. Trying out of sample on the mannequin.6. Assessment of fit and appearance (styling department).7. Modification of the sample and alteration of the patterns.8. Repetition of the test on the mannequin and modification in the light of criticisms until approved.9. Experimentation with the sample on live mannequin and modification of the sample and patterns to improve the approved version.10. Critical appraisal by the creative department.11. Modification of sample and patterns according to the criticism.12. Repetition of the test on the live mannequin and modification of the sample and patterns to improve the approved version.13. Preparation of experimental design for costing.14. Examination the design with a view to introducing modifications to the patterns to make better use of the fabric.15. Develop a complete set of patterns for production in all sizes (graduation).
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It should be noted that what Araujo (1996) means is that a patterning system appropriate for fashion products and in line with the table should be considered from the product's design or creation phase and that it should then be made available in sketch form to the appropriate departments. It might also be considered that the Fashion Design industry should note and consider important factors such as the movements and articulations of the human body.

“Patterning is the process responsible for the visualization and feasibility of the creation/design of a fashion product”. This can be clearly understood from the words of (Novaes, 2011) who says:

“[...] This is a stage in the process of designing and making clothes that requires the creation of shape, body volume and patterning. This can be represented photographically and/or by drawing, or it can be a mental image conceived by the designer and/or creator, and should involve the behaviour of the fabric and the construction techniques (construction processes, machines, sewing, finishes, etc.)” (Novaes, 2011, p.116)

It “is it fashion design what engineering is to architecture”. “Patterning is the grammar of fashion design. If patterning is not mastered, sketching becomes pointless, the fashion design is a doodle.” (Treptow, 2003, p.154).

Jum Nakao, defines patterning as the structure of a building (...) it is the intelligence behind the drawing, the wisdom behind the making. (Jum Nakao, 2009, no page)

Studies show that the need to illustrate fashion arose when spoken description became insufficient. According to (Blackman, 2007, p.6), “The history of fashion illustration began in the sixteenth century when voyages of exploration and discovery sparked fascination with dress in every part of the world.” Caldas, (2004) says in his book that, until the eighteenth century, the spread of this phenomena, started by the social elite, was mainly through painted portraits and dolls, sent principally from France to the other European countries. “[...] Propagating things in this way was very expensive for customers and it was gradually replaced by the Journal de la Mode, the forerunner of the magazines, which appeared in France in the late eighteenth century and proliferated after the French Revolution” (Caldas, 2004, p.52)

We live today in a technological age but drawing by hand is still one of mankind’s first forms of expression. Design in its various forms has the function of passing information to whoever will develop and produce it. It is the drawing that gives the first idea of how a certain product will be, whether it be a fashion design or some other type of design. The same can be said of a map or guide or Design. The inception of a product is also its reminder, to be consulted in step-by-step improvements.

In the field of fashion, the term most often used for a fashion design is “sketch”, the drawing used to interpret a garment as well as making it possible to bring together thinking about the fashion product in design terms and in manufacturing it. The fashion sketch can also be regarded as the designer’s signature because everyone has their own style which differentiates them from each other. For the professional who is going to develop the garment, the sketch has the purpose of demonstrating the hang and the combination of colours, materials and prints, enabling the generation of alternatives to be visualized for the collection as can be seen in Figure 35.

However, this is not always used in a garment’s production stages because it does not carry all the information needed to produce the garment.

It is through this communication tool, the fashion sketch, that the various stages of creation and production are made clear, through which the item is illustrated and transmitted to different sections of the clothing industry, where it takes shape and gains three-dimensionality

“It should be noted that there are two different types of design language within the fashion product development process⁷. There are firstly the drawings by hand, called sketches or fashion designs, and these will later be represented as technical drawings and technical charts”. (Gagnato, 2008, p.39)

Then there are the computer illustrated designs. These are appropriate for art and technology. The biggest advantage offered by computer-based design is the speed with which changes can be made and the ease of making several simulations, with colour options, haberdashery and prints, even before a test piece is made. This will also later be represented by technical drawings and technical sheets.



Figure 36: Stylized Fashion Design. Retrieved from : Jones (2000)

⁷ Every fashion designer draws fashion sketches. They don't necessarily make fashion illustrations as well. The fashion sketch is all about technical details; it is not art. Even though it can look beautiful, with colors, shading & amazing models wearing the clothes, this is not its purpose. Its purpose is to show the darts and seams of the garment correctly. It is also to show the colour combination and suggest styling (hair, accessories, shoes). Often designers use fashion templates to save time and they draw directly over them. They can make simple pencil drawings or detailed sketches rendered over them. Don't confuse the fashion sketch with the flat technical drawing. Fashion sketches serve as a base or guideline for the flat. The classical flat is digitally drawn (usually in Adobe Illustrator). In general a flat is what says you are a designer familiar with the business. They might incorporate fabric swatches, colour swatches, close-ups of the logos. The purpose here is to communicate the design idea precisely. How do they look? Usually just clean black outlines with minimal shading. There is no figure. Nothing interesting going on. Technical drawings show the clothes as if they were laid flat on a table. Now, fashion illustration is where fun comes in, the artistic sister of the former two. The fashion illustration doesn't worry about technical details. All it wants is to make you desire the clothes! It talks in emotional language. It creates mood, a fantasy! That's why it is often used in promotional ads and magazines. Available in: <http://www.idrawfashion.com>

Figure- 36, shows the second fashion design option, or “illustration” as it is technically in the fashion profession, was introduced to help designers who have limited skill in drawing by hand so the computer-generated design puts into context the thoughts of Jones, who says:

“For those of little talent, the fashion illustration will be their metier. Most fashion designers, however, will use it to make drafts or develop ideas. More elaborate illustrations, such as sketches, will be made only to show the sequence of a fashion show or to give journalists an advance view of the next collection”. (Jones, 2005, p.95)

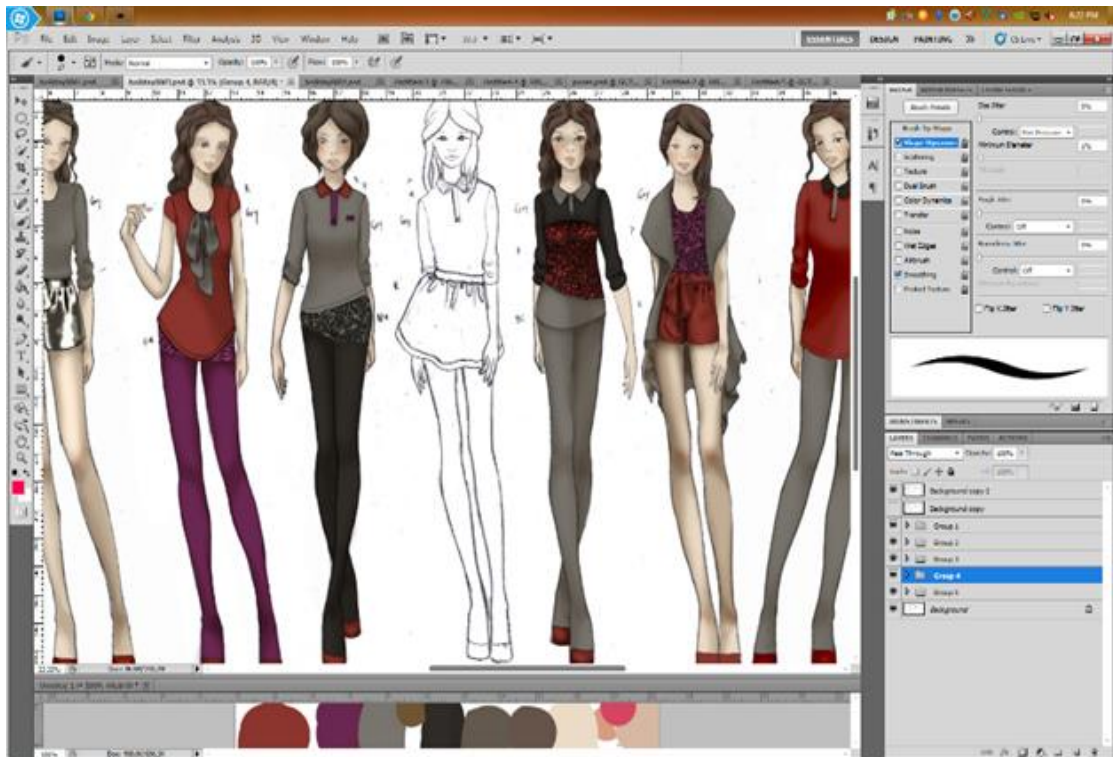


Figure: 37 - Fashion Drawing developed in a 3D cad program, Cad Audaces. Retrieved from: <http://www.industiasc.com.br/audaces/produto/audaces-idea>. Accessed: 04/04/2018.

Drawing as a discipline forms part of the curriculum of every fashion design course because mastering visual language is incontestably important in the training of a designer. It is recognized that fashion design is a representational resource that includes a diverse range of information important for communicating of ideas and projects within the industry. The aim of fashion design is also to illustrate the ideas of the designer who, by use of colour and texture, projects ideas of the raw materials to be used, types of fabric and the hang of the garment.

It can be said that fashion drawing is the art of representing clothing, how the fabric falls, in drawing, painting or sculpture. Other than the nude in art, every human figure is shown dressed, and this is very significant because it reflects a time, a style, a status, a culture and society, or a trend in fashion.

3.1.2. Fabrics

The choice of fabric best suited to the design planned must be considered when making a garment or collection, along with the stylist's intentions as recorded on the technical file. Attention must also be paid to the market sector for which it is intended, be it casual, sports, social or party.

When the graphic representation is made it is important to know the type of fabric to be drawn so its shape is not altered - after all, every fabric has its own characteristics of texture, hang, movement and shape. Clearly, fabric is the raw material most often used to make designed fashion garments, although many other materials can be used, such as fur, leather, non-woven fabrics and haberdashery items.

Regarded as a landmark in human evolution, weaving has made a contribution in numerous fields: the arts, science, technology and social customs. Fabrics are made by the interlacing of two threads known as the warp and the weft. The warp consists of the threads running vertically, parallel to the length of the fabric. These threads remain fixed and in constant tension. The weft is formed by the yarns woven horizontally into the warp in successive passages from one side to the other, forming the width of the fabric. (Pezzolo, 2007, p.144)

The fibres used to make the fabrics are classified as natural, artificial or synthetic. The natural fibres can have animal, vegetable or mineral origins, examples being, respectively, wool, cotton or amianthus. Artificial fibres derive from modified natural fibres; such as viscose, for example. Similarly, synthetic fibres come from petroleum and include polyamide, polyester and polyurethane. (Saltzman, 2004, P.37 And Chataignier, 2006, p.29).

The various fabric each have their own characteristics inseparably linked to their structure and the materials from which they are produced, and fashion designers need to observe these qualities, as Saltzman notes:

“[...] It is fundamental to assess the quality of the malleability of a fabric. That is to say, the suitability of the material must be appraised according to its weight, fall, elasticity, movement, adhesion and texture to shape round the volume of a body. And surface-related qualities such as colour, design, weft, structure, brightness, opacity or transparency, must not be forgotten.” (Saltzman, 2004, p.44)

With respect to the flat patterning of clothes, the fall is one of the peculiarities of fabric that has greatest influence in making garments. Chataignier points out that, as the name suggests, the fall, or hang, comes from the consistency of the fabric and its degree of malleability. (Chataignier, 2006, p.64). To quote Chataignier further:

“The cut has mysteries unknown to lay people. The weft and warp dictate positions in which parts of the pattern must be placed to ensure the fall is perfect. The neckband, sleeves, waistband, legs, and so on, if not properly cut, will not fall properly. They will become crooked and the clothes will appear defective in their individual parts and overall. The pattern maker marks with an arrow the direction in which the pattern is to be placed, taking account of the bias.” (Chataignier, 2006, p.67)

The fall results from the way the patterns are cut in the fabric. As mentioned above, the patterns cannot be positioned at random but must follow an alignment criterion, that is to say, they must be placed “with the bias”. This is done by drawing a straight line in the centre of each individual pattern that makes up the complete pattern, and positioning it parallel to the warp of the fabric. This line is still found during the drawing and is related to the body’s verticality, the main reference being the sagittal plane.

Vionnet in Kirke (1998) says that fabric has three directions: length, width and bias. However, the yarns that make up the fabric run in only two directions while the bias runs diagonally, stemming from the spaces between the interweaving of weft yarns. When hung by bias, fabric is unsupported and distorts through the force of gravity, taking on a rippling effect. (Vionnet in Kirke, 1998, p.54) This effect can be achieved by tilting the warp and weft of the fabric to exactly forty-five degrees.

In fashion history, some creators are celebrated for their special skill at identifying and using the full potential of fabrics with great sensitivity in developing their garments. Madeleine Vionnet and Cristóbal Balenciaga, both well-known stylists, are particularly recognized for this talent. As shown in Figures 37 and 38 , Vionnet and Balenciaga showed their skill working with delicate, flowing fabrics like satin, gazar and crepe. Vionnet used the 3D modelling technique, or draping, and initiated the cut of the age making use of the bias. Balenciaga used tailoring as his patterning technique and preferred robust fabrics like wool and synthetics, more appropriate to the design of formal wear. Vionnet and Balenciaga were both able to take advantage of the fall of the fabrics they used, whether they were flowing or robust.



Figure 38: Gazar dress by Cristóbal Balenciaga./ Retrieved from: Jouve, 1997, p.47. Figure 39: Fluid Fabric Dress by Madeleine Vionnet. Retrieved from : <http://gille-k.blogspot.com/2009/09/puriste-de-la-mode.html/> Accessed 04/04/2018

According to Ostrower, “Every material possesses certain potentialities for the ways in which it can be used, and also many impossibilities. While they may be seen as limitations to creativity, they must also be recognized as guides, because, as a result of the limits, there are hints for continuing a piece and even taking it in new directions.” (Ostrower 1987, p.32)

Ostrower is saying that the material nature of the fabric dictates the methods chosen to handle it. The qualities and the limitations of the fabric have a significant impact on driving the creative process.

The same view is clear in Saltzman (2008) who states that clothing is, essentially, a textile object. Once changed into clothing, the fabric is like a second skin, because, as mentioned in the previous chapter, fabric delineates the profile due to the natural affinity of approach, expansion of volume or levelling of dimensions. (Saltzman,2008, p.306)

Finally, Castilho, observes: “If, in the first instance, bodily decoration was a procedure applied directly to one’s own skin, in the second, fabric is like second skin covering and recovering the first. However, this skin is characterized by transformations continuously defined by the rhythm of change. And it is this second skin, with its nature predominantly textile, which, until today, enables the fluctuations and mutations of the bodily decoration.” (Castilho, 2004, p.59)

Given the ins and outs of knowledge required about body, fabric and context, it becomes clear and explicit that the configuration of a fashion product is arranged through idealization of a silhouette. The concept of the silhouette refers to the two-dimensional representation of a shape on a surface.

But Saltzman, suggests that, in clothing, the silhouette should be understood in three-dimensional terms, since this is the nature of the body. (Saltzman, 2004, p.69)

The way to achieve the particular silhouette normally stipulated in a costume design causes a very common query among students of fashion and professionals in the clothing industry.

When a well-designed fashion project causes questions, these questions must be asked about the fashion/clothing project itself. It has gone through the patterning stage, the stage which follows the project design and can be seen as the process by which the clothes are configured, as already mentioned.

According to Castilho, “the type of cut the fabric should receive is defined in patterning, taking account of the qualities and possibilities offered by the textile material from the perspective of construction.” (Castilho, 2004, p.143)

These thoughts are echoed by Saltzman (2004):

“A series of steps is involved in putting the design of a garment together. Usually, the drawing is transformed into a pattern, a process known as flat patterning. This is then transferred to the fabric ready for cutting so the

parts can be sewn to make up the volume. Patterning is a process of extraction which involves translating body shapes to the terms of a textile surface. This in turn involves relating something two-dimensional, the fabric, to a three-dimensional composition, the body.” (Saltzman, 2004, p.85)

Starting from the premise that the flat pattern is the definitive element denoting the type of cut the fabric is to receive, it is easy to see that it is advisable to analyse the concepts, method and technique of the process in order to understand the rationale of patterning. This, according to Coelho, is directly linked to action and development. The word presupposes movement, path, method and technique, terms often related to patterning and related to the development of each stage of the process.

Still quoting (Coelho,2008 p.265):

“The process is the great matrix of the whole *modus faciendi* and so represents actions in movement that are difficult to grasp. [...] The method can be the rules of organization and control through which the process unfolds and also a creative side of the process development. As to the technique, this constitutes the methodological strategy which is already fixed with pre-established procedures and anticipated results. By contrast with the technique, a method is not known a priori.” (Coelho, 2008 p.265)

Coelho (2008) makes it clear that flat patterning should not be understood only as a technique because, when flat patterning is understood only as a technique, it loses the broad dynamic sense enshrined in the concept of a method which is part of a larger process, which is all the research done by the designer. Logical reasoning is essential to carry out flat patterning. But mastery of technique is also essential. Creating through patterning is not enough.

Gaining a broad knowledge through experience and perception - tacit or implicit knowledge - is necessary because this “is a source of great potentiality” (Heskett, 2005, p.71).

It is assumed that the techniques of patterning garments can be mentioned; two-dimensional patterning, also called flat patterning, and three-dimensional patterning, known as *moulage* in French, or *draping* in English.

3.1.3. Pattern making techniques

Before embarking on the different methods and techniques of pattern making, it is important to point out that flat patterning is classified as tailor-made (or bespoke) and industrial.

As the first mentioned of these, “Patterning from measurements”, bespoke, is designed to serve just one individual using the measurements of their body as the basis to construct the pattern, it is widely used by private dressmakers who work from home or have their own atelier.

Industrial patterning, which is more the concern of this dissertation, develops large-scale patterns which vary only in size. A standard table of body measurements of the body is used for this. The patterning makes use of design elements and tools in the development in all situations.

Carrying out the technical procedures of flat patterning a garment starts from the principle of representing the human body on a flat surface. Vertical and horizontal lines are set at angles related to the body's plane of balance to detail the symmetry, height, length and relation of proportions between the parts.

The two-dimensional pattern uses geometric principles and the pattern is drawn by hand on paper or directly on the CAD system using a table of body measurements. These detail circumference - the main areas are bust, waist and hip - and length.

According to Borbas and Bruscajim, "the patterning of clothing on an industrial basis can be carried out through two geometric methods: the two-dimensional technique [...] and the three-dimensional technique." (Borbas and Bruscajim, 2007, p.157)

Industrial flat pattern making can be subdivided as follows:

1. Flat patterning manually
2. Graphic flat patterning using CAD/CAM computerized tools

Flat pattern making, which is two-dimensional, is a precision exercise requiring accurate measurements and calculation, the use of proportion and an ability to imagine the effect in three dimensions. The flat patterns are made from a set of measurements. Constructing patterns in two dimensions is quick, economically viable and indispensable for the fashion industry. It can also be designed using a software system programmed to print on the plotter according to the specified measurements.

Knowledge of basic and secondary measurements and materials, and how to use them, are required in order to make patterns using the flat patterning technique which is based on the use of planes and lines related to the balance and dynamics of the completed item.

The initial design, called a diagram, can be drawn manually on paper using appropriate tools: pencils, rulers, curved rulers for hips and armpits, squares, tape measure, carbon paper for sewing, pliers for darts, among other instruments.

The pattern drawn on paper is two-dimensional in form. Diagrams are made using patterning tools and materials by forming 90° angles. Straight lines and curves taking various forms ensure the balance of the piece by adhering to a table of standardized measurements for different sections of the clothing design.

Apart from the manual process described above, flat patterning can also entail the following steps:

1. Interpretation of template and analysis of table of measurements
2. Drawing of the basic diagram of the body
3. Interpretation and preparation of sketches created by the designer
4. Preparation of the pattern ready for cutting of pilot garment
5. Analysis and approval of the garment
6. Correction of pattern and making of new pieces if required
7. Preparation of final flat pattern
8. Graduation of patterns

Having gone through all the steps and procedures mentioned and having been accepted by the departments and professionals responsible for patterning, the finished pattern is sent to the graduation department so that the range of designated sizes can be determined according to the fixed table of measurements.

Flat pattern making can be done manually or using computer CAD/CAM software. CAD systems have great advantages for pattern makers in that they make it possible to plan, scale and design quickly.

3.1.4. Computer pattern making (Computer Aided Design)

CAD is an English acronym that stands for “Computer Aided Drawing”. CAD is the generic name applied to software designed to produce technical drawings in architecture, engineering, geology and design.

CAD developed alongside computing. Everything started in the 1950s as interactive computer graphics were developed and the first graphics terminals and printers appeared. Large companies developed their own CAD-based software on large central computers known as Mainframes. CAD started to be used in the same decade in the automobile and aerospace industries and in government agencies.

The use of CAD to pattern clothing started in the 1960s when the world’s first automatic machine for cutting fabric was invented, a machine that revolutionized the clothing industry worldwide. The companies that led the way in developing CAD software for pattern making were Gerber Camsco, Lectra Systems, Microdynamics, Assyst and Investronica.

Over the years, various methodologies have been developed and adapted in search of the best way to make patterns for garments. Knowledge of a number of techniques, ranging from flat

geometric representation to a “spatial” view of the garment, is needed for pattern making to be carried out. Ability in the field of computer science, a knowledge of geometry and some skill with drawing materials are the tools and equipment needed for flat patterning.

The digital system is not a substitute for the fashion designer. What changes are the tools you work with. This professional uses his knowledge of pattern making and knowledge of the digital system gained on through training, developing a design started manually transferred to the computer. The system also makes it possible to organize files of patterns which can be used later to develop similar patterns. This gives the pattern making industry the advantage of saving time, space and organization.

Casagrande, points out that CAD is more than just a tool to assist with pattern making⁸, it also helps with cutting and saves money because “the system is adapted for least waste and, as different cutting schemes are fitted to the computer, the cutting table is left free for the fabric to be spread out and cut”. (Casagrande 2008, p.11)

Nowadays the software market has CAD systems equipped with graphics tools that can interpret digital patterns, enabling the operator/pattern maker to perfect intricate drawings precisely, as well as making it possible to adapt patterns in files already created.

As Silveira, notes, patterns developed on CAD can interact directly with CAM - Computer Aided Manufacturing technology. These automation systems use computers and numerical control equipment for production processes. (Silveira, 2006, p.3)

Silveira, therefore confirms that everything needed to make flat and three-dimensional patterns can be carried out through specific software, and this software can be seen as a resource that can assist in the realization of a pattern and it speeds up its development. The program has all the characteristics of both flat patterning and moulage but these are carried out directly in the chosen tool.

⁸ Computer-aided design (CAD) involves creating computer models defined by geometrical parameters. These models typically appear on a computer monitor as a three-dimensional representation of a part or a system of parts, which can be readily altered by changing relevant parameters. CAD systems enable designers to view objects under a wide variety of representations and to test these objects by simulating real-world conditions. Computer-aided manufacturing (CAM) uses geometrical design data to control automated machinery. CAM systems are associated with computer numerical control (CNC) or direct numerical control (DNC) systems. These systems differ from older forms of numerical control (NC) in that geometrical data are encoded mechanically. Since both CAD and CAM use computer-based methods for encoding geometrical data, it is possible for the processes of design and manufacture to be highly integrated. Computer-aided design and manufacturing systems are commonly referred to as CAD/CAM.

Figures,39 and 40 below shows a pattern developed using flat-patterning software and an example of three-dimensional modeling whilst Dinis, Vasconcelos and Casagrande, account two-dimensional CAD CAM .

As Dinis and Vasconcelos also point out the work of developing new patterns takes less time because foundation patterns already recorded and approved can be reused after making some modest amendments to create new models. Pilot pieces are thus virtually certain to be approved while, at the same time, the patterning standard is maintained.(Dinis and Vasconcelos, 2014, pp.101-2)

Although Casagrande, says that two-dimensional CAD has increased patterning process productivity in the clothing sector in that it has not only speeded up the stages of grading and fitting but has also made it possible to archive patterns (as an HD instead of using physical pattern files), so “problems like lack of space and deterioration of paper patterns are solved.” (Casagrande, 2008, p.11)

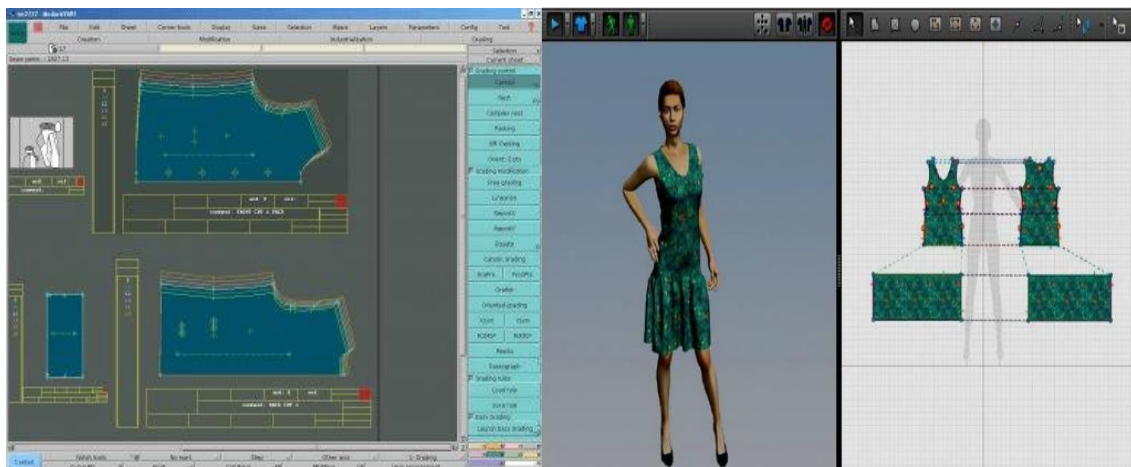


Figure 40: Work Area. Retrieved from : lectra Modaris./Figure 41: 3D lectra Modaris. Retrieved from: (Pires, 2015, p.36.)

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However, one of the major problems in the use of technology in patterning is that most of the industry's professionals lack even the most basic knowledge of informatics. Consequently, it is common to find designers who are well experienced in patterning by hand but who have no computer skills or, the flip side, there are excellent systems operators who have no patterning skills.

As far back as the mid-1990s, Araújo discussed the problem of resistance to CAD systems from some pattern makers. Most designers prefer to draw in the traditional way, using paper, ruler and pencil, etc., scanning them on to the computer via such devices as the tablet or scanner, rather than drawing directly on to the computer [...]. (Araújo, 1996, p.139)

As this was an extremely subjective matter, communication was open to misinterpretation. Two-dimensional design made it very difficult, and expensive, to perfect garments with highly complex or contoured surfaces. Understanding the method mentioned above, it can be seen that the industry did not yet have the capacity to produce a reliable, easy-to-understand pattern such as we have today in patterns constructed with 3D technology.

3D software technology was developed to solve this impasse to give a fully comprehensive representation to fashion products in 3D terms. This in turn led to the development of rapid prototyping and today's 3D printing.

Explains that the designer's personal working environment is reproduced. This feature enables "The designer to operate directly on a tablet using personal tools and materials but the lines are drawn electronically" so that patterns created manually in this way can be reproduced by means of a specific program. (Aldrich, 2014, p.203)

It is very necessary for operators of the CAD/CAM system to have specific knowledge of pattern making if they are to use the software to its fullest effect, because lack of a full understanding of pattern making renders it impossible for the operator to identify problems with the design created.

Given the tools available in CAD 3D, the fall of the fabric used in the pattern can be simulated, prints can be visualized, the drape can be envisaged. The size can be increased or decreased quickly and in a practical way. Colours can be changed, buttons put on, seams stitched and the entire collection can be brought together in a parade. All this can be done in a totally virtual way using various other tools that enable visualization of completed patterns without the need to construct a pilot garment.

But it is vital to understand that 3D CAD cannot facilitate pattern making of garments. Patterns must be designed or scanned two-dimensionally in 2D software to be transported, "cut", "sewn" and made up in the three-dimensional environment.

Three-dimensional garment patterning using 3D CAD has made it possible to see how a design will result when made up, just like three-dimensional modelling (also known as draping or moulage) without the need to make several pilot pieces.

3.1.5. Three-dimensional pattern making “Moulage or Draping”

An important characteristic of three-dimensional patterning is that it superimposes material and body support because it actually needs both to realize the pattern that will be recorded on the material. Geometric patterning only uses the material as a carrier. This could be textile material or paper, for example. (Novaes, 2011, p.93)

Three-dimensional patterning, moulage or draping, is a special technique used from conception when developing the design of articles of clothing, working the fabric in three-dimensional form.

Duburg in Tol (2012) and Mesquita (2004), notes that the term “moulage” derives from the French mouler, “to mould”, and originally meant “to shape something with the aid of a mould”, or, more generally, to shape something. Moulage, therefore, means, modelling. (Duburg in Tol, 2012, p. 31)

“Moulage: from the French verb mouler, to mould; to form; to model; to sculpt. The technique of the modelling process that inverts, or subverts, the order of the process of the plane drawing. The garment and the raw material are modelled on the body and are only later drawn on paper. This can be done on wooden mannequins or on living models.” (Mesquita, 2004, p.10).

It is synonymous with the English word draping which means giving shape to draping fabric so that it hangs well, which is to say “the artistic arrangement of clothes in a sculpture; or the artistic arrangement of crimps in dresses,” which brings us closer to the idea of manipulating fabric in the form of pleats.

It can be confirmed in Kawamura and Mesquita (2004):

“Draping is to make three-dimensional designs, or sketches for a design. Some designers start to create on a mannequin bust stuffed with cotton and covered in beige cotton fabric. They usually work from the neck to the hip. The designer, using cotton cloth and pins, begins to create an actual profile of the garment he has in mind. Sometimes this task is relegated to an assistant stylist. When the garment has been created and made up on the dummy, the specific parts and the sewing lines are marked so that, when the fabric has been removed from the bust, the markings and observations required to make up the first sample prototypes are saved and can be transferred to paper.” (Kawamura, 2004, p.75)

Both, explain a contextualized method of handling the fabric on the dummy to create the form of a product of fashion clothing. However, moulage implies controlling and previewing the results of several interconnected steps to substantiate form in producing a garment through the patterning system. (Mesquita, 2004, p.10) and (Kawamura, 2004, p.75)

Moulage, or draping, is a three-dimensional modelling technique where the pattern of a garment is constructed on a mannequin, or sewing bust, allowing its visualization in terms of space, height, width and depth, as well as volume and how it hangs, before the garment made, facilitating an understanding of the respective functions of the parts of the garment and how they should be put together.

Nevertheless, according to Souza (2006), it is necessary to prepare the fabric on the bust before developing the three-dimensional model. The warp and weft must be perfectly squared and the fabric must correspond to the characteristics of the fabric intended for eventual use in the piece in question to guarantee the quality of the final product.

The fabric used in draping is called toile (or muslin in the United States). During the process of creating a design, the first trials are carried out using toile. Toile is usually made of raw cotton fabric in its natural colour, which is easier to use when the pattern is being marked up. Toile can be used as a substitute for most materials, however, when using fabrics with high elasticity, the toile must also contain elastane, such as jersey.

“When the fabric intended for the final garment is very different from toile - for example, if it is knitted - the moulage is usually made in the intended fabric or something very similar.” (Duburg And Tol, 2012, p.31)

Schacknat (2012) describes draping, or moulage, as a technique in which “design and pattern making are carried out simultaneously. (...) Where later adjustments may be needed soon becomes clear, and also the requirements of the fabric itself. At times, this is something unexpected, which may generate new ideas that would never appear on paper.” (Schacknat, 2012, p.02)

The draping technique allows projected garments to fall perfectly, favouring an understanding of the form of the body’s structure while garments are being put together. Its practice frees creativity as a form of three-dimensional sculpture, making it possible to see the pattern in three dimensions from front, back and sides.

Three-dimensional modelling was customarily used in Ancient Greece and Rome, making use of draping techniques to fashion their clothes with fabrics on the body. They manipulated the fabric directly on their bodies, using fastenings that served to define their profile.

According to Laver, (2003), throughout the long period of Greek civilization, their clothing had no form of its own. It was composed of rectangular pieces of fabric in various sizes, neither cut nor sewn, draped over the body. While there were undoubtedly numerous variations in the manner of adjusting them to the body, the lines remained essentially the same. (Laver, 2003, p.25)

It is worth noting that the fluidity of Ancient Greek garments was taken up in the 1880s as an influential aesthetic to be copied. The loose, flowing robe was worn sometimes with a corset, sometimes without. Draping, or moulage, thus gained recognition through the creations of one of the leading fashion designers of all time, Madeleine Vionnet.

Following research studies, mention of Madeleine Vionnet is important in order to highlight some of the characteristics of three-dimensional modelling that appeared in that period: developing a garment on the body, aspects of appraising the fabric and other factors concerning the way it hangs. Vionnet was concerned to liberate the female body through diaphanous, flowing garments as can be seen in Figure 41. She is regarded as one of the greatest French designers of all time and was the first to cut on the bias to create clothing. According to Selling, she worked exclusively with silk, museline, satin and velvet, later developing, with her supplier, silk crepe with acetate thread, one of the first synthetic fibres. (Selling, 2000, p.71-p75)

Vionnet had unusual methods of producing clothing, possibly through not being able to draw. To avoid drawing, Vionnet worked out her ideas directly on a small scale articulated wooden mannequin and to determine the details and shape of the dress. Her creative process stemmed



Figure 42: Dress by Vionnet. Retrieved from : Kirke, 1991

from basic geometric forms such as triangles and squares, the same base as an artist or architect, all calculated mathematically and thought through without improvisation.

Kirke, tells us that Vionnet was more interested in structure than style and as a result it is possible to see the beginning of a completely new technology of patterning. This can be affirmed by her having completely changed the silhouette of the dress. (Kirke, 1991, p.42)

Comparing the work of the Spanish creator Cristóbal Balenciaga and Vionnet, it is possible to see similarities in the methodology but Vionnet worked with the lightest, most fluid of fabrics while Balenciaga utilized more structured materials.

Balenciaga is another couturier who made use of mathematical precision and moulage played a vital role in his creative process. Balenciaga created volumes and profiles in his work that were very unconventional but extremely refined, which assured the absolutely timeless character of his work.

As Duburg (2012) says and Jouve, (1988) shows us in, figure 42:

Duburg (2012), “The use of draping or complex moulages can be seen in Cristóbal Balenciaga’s architectural constructions. His creations often stood out from the body creating a special space between the skin and the fabric.” (Duburg 2012, p.15)



Figure 43: Coat by Balenciaga. Retrieved from : Jouve, 1988.

In his day, Balenciaga⁹ was the designer who investigated the construction and fall of sleeves, demystifying the traditional drawing of armpits as shown in figure 43 . He innovated new patterning for the cutting of dresses and coats, essential for improving the fit and the dress, always hanging elegantly. His results were gained by altering almost imperceptibly, by a matter of millimetres, the traditional tracing of the pattern, investing the garment with beauty and comfort. He brought new forms to the body in his designs and took advantage of all the features and techniques of pattern making to create the “perfect sleeve”. The perfect precision and finish of his cutting earned him the title of “architect of the dress”, and his name is eternally synonymous with fashion.



Figure 44: Templates by Balenciaga. Retrieved from: Jouve, 1988.

The intention is to clarify the art of pattern making in the concept of draping/moulage. Draping (English), or moulage (French), is the technique of modelling three-dimensionally using specific manikins, or even models, as the basis for modelling a garment. Madeleine Vionnet was one of the early leaders in the use of this technique. Legend has it that she used mannequins because

⁹ **Cristóbal Balenciaga**, (born Jan. 21, 1895, Guetaria, Spain—died March 23, 1972, Valencia), Spanish dress designer who created elegant ball gowns and other classic designs. Balenciaga began seriously studying dressmaking at the age of 10, when the death of his father, a sea captain, made it necessary for his mother to support the family by sewing. His first trip to Paris at 15 inspired him to become a couturier, and by age 20 he had his own dressmaking establishment at the fashionable summer resort of San Sebastián in Spain. <https://www.britannica.com/biography/Cristobal-Balenciaga>

she had poor spatial vision. The objective of the technique is to facilitate spatial vision, removing the need for tests concerning weight, elasticity and the hang of the fabric.

Figure 44 shows draping instructions for drafting the basis of the front of the body. Jones (2005) explains the art of draping as sculpting with fabric and says that “it works best with soft, flexible fabrics used in very generous quantities”. The fabric can be moulded perfectly to the body and held with an invisible seam or it can fall in a loose, undulating way. The fabric can be worked using models of flesh and bone, but it is better to use a mannequin for most of the work since it can take a great deal of time to arrive at the desired effect with a live model. (Jones, 2005, p.149)

Figure 44. Draping instructions for drafting the basis of the front of the body:

17. Fold under the 1-inch extension at center front.
18. Crease the lengthwise grain line at the apex (Figure 2.4).

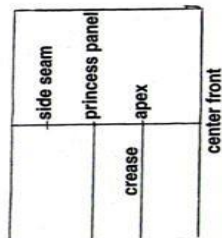


Figure 2.4 / Steps A16–18

B. DRAPING STEPS

1. Pin the muslin to the dress form at the apex. Two pins inserted in opposite directions will prevent the muslin from shifting.
2. Smooth the muslin up from the apex so that the center front grain line of the muslin lies directly over the center front seam of the dress form.

3. Pin at the center front and neckline.
4. Pin at the center front halfway between the neckline and bust level.
5. Drape the muslin so that the bustline level is straight across the dress form, leaving the lower half of the muslin hanging like a box jacket; pin on the bustline level between apex and side seam to prevent the muslin from sagging (Figure 2.5).

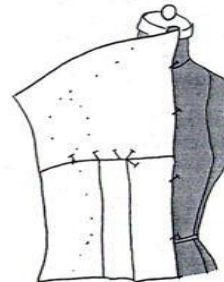


Figure 2.5 / Steps B1–5

Figure 45: Front base drafting and draping of the body. Retrieved from: Jaffe, Hilde; Relis, Nurie, (2005, p.14 and 15)

As well as being a step-by-step method, theoretical elements such as the importance of knowing about fabric, thread, the positioning of patterns on the fabric in the direction of the warp of the yarn (yarn patterning) and some of the stages of pattern making. As to materials, many are similar to those used in flat patterning methods. These include tape measure, pencil, ruler, and curves and squares for the correction of curves and lines obtained from modelling on the mannequin. As well as these standard items, there are specific tools for this technique: pins, fabric scissors, toile fabric, marking ribbons and mannequins.

Draping can be seen as the perfect way of developing ideas and creating new profiles, sometimes even combining the method with flat patterning. This combined approach is particularly useful when profile variations can be made apparent through the flat patterning of garments - draping or moulage.

According to Souza, many designers in the clothing industry still resist three-dimensional modelling. They are so used to drawing and flat patterning that they have difficulty creating using moulage.

However, Fischer (2010) believes that, for the designer who is looking for a more exciting cut and is ready for something surprising, draping offers an excellent way to approach the development of a design and the modelling. Take inspiration from the texture, colour and hang of the fabric and watch the modelling evolve before your eyes.

Draping should be regarded as an integral part of a fashion designer's creative process. Just the simple fact of using draping while creating sets up a new configuration; the designer creates while he models and can try out various possibilities as a result of what he sees in the form of the garment and the fall of the fabric.

This being so, the contemporary fashion designer, with his "can do" attitude, is able to establish his particular mode of expression through draping, from the values that make up his universe, modernizing both forms and aesthetic result.

The focus of this creative process is the interactivity that exists between creator and creation which combine in the three-dimensional modelling. In this scenario, the fashion designer has more control of his project; new horizons are open to him and his limits are expanded because he has full liberty to shape his own ideas.

In his book "The Art of Manipulating Fabric", Wolf makes a very exciting point in reference to draping: just using a different fabric, or attaching it in an unusual position, can produce some astonishing results, quite different from what was anticipated.

A technique that suits the weight and suppleness of the muslin used in this book may not be right for the fabric you are using. However, the fabric might transform the technique into something special. Or you might pull off a striking meld of fabric and technique for an unexpected and unique result. (Wolf, 1996, p.8)

Nakamichi, reinforces the ideas of Wolf, above: "With modelling, there is always more than meets the eye, and giving shape to a garment after deciphering the mechanisms at play is a deeply rewarding experience." (Nakamichi, 2011, p.104)

The use of draping in the creative process can impel the student, and fashion professional, to discover innovative ways of building the profile of a garment, and even develop an authorial style of manipulating fabric, by gradually improving their technique.

"The development of a design involves a high degree of creativity [...]. Although creativity is important, design as an activity serves creative and economic aims. The design process helps to satisfy both these points. It seeks to initiate a range of possible solutions involving a variety

of techniques and devices to encourage participants to be audacious in exploring imaginative and innovative solutions”. (Ambrose and Harris, 2011, p.11)

3.1.6. Preparing the dress form

The ability to use a dress form is a valuable skill in itself. It can be a great asset in the creation of patterns, whether this is being done on a professional level, as part of student training or as a domestic hobby.

This research will outline how to use a dress form to make a pattern, different draping techniques using a dress form and the tools you will need to help sew and drape, and the overall use a dress form to its full potential.

The blogger Jane Elizabeth explains that draping is a three-dimensional way of creating a dress pattern using a dress form. When draping, fabric is arranged over the dress form in 3 dimensions. This enables the dressmaker to experiment with original, even asymmetric, patterns in the fabric, such as ruffles or other shapes, which he can actually see. A dress pattern drawn on flat fabric does not allow this.

The method of draping includes stitching the garment by using of loose-hanging material to create a flowing effect. It can be used to create a very impressive effect when finished appropriately. Draping needs ability and practice to produce exact fitting, fall and fullness.

Karolyn Kiisel makes the following observations in her book “Draping”: “As with any artisan skill, draping has its tools of the trade”. She is careful to give the following advice: “Acquiring good quality tools that fit your physical size is a worthwhile investment”. The right tools increase efficiency and assist in making skills become second nature, allowing you to focus on being creative without being distracted by technicalities. (Karolyn Kiisel, 2013, p.09)

The first piece of equipment required to start draping is a covered mannequin. Many versions are available and selecting the right one will depend on circumstances and needs. The best are solidly mounted on heavy metal stands.

Kiisel goes on to say: Standard dress forms usually follow commercial sizing measurement specifications. A small to medium size is usually used in a professional design studio. The finished garment can easily be graded up or down to fit larger or smaller sizes.

The bust, waist, and hips must be defined before using the mannequin. The best method is to use a cotton twill tape, ¼-½” (0.5-1.5 cm) in width. It should be pinned round the mannequin as follows:

- **Bust tape:** Start at a side seam and wrap the tape round the fullest part of the bust (the “bust point”), pinning every few inches (7.5-10 cm) all the way round the form. The tape should follow the mannequin at front of centre. The tape should be kept high at the back and parallel to the floor.
- **Waist tape:** There will usually be a seam in the fabric at the waistline, making it easy to identify. If this is not the case, the narrowest part should be found and the tape wrapped tightly round the waistline and pinned.
- **Hip tape:** Hip measurements are usually taken 7" (18 cm) below the waist. The tape should be pinned horizontally from a side seam and kept parallel to the floor at 7" (18 cm) below the waist.



Figure 46: Preparing the dress form. Retrieved from : Karolyn Kiisel, “Draping” 2013.

3.1.7. Understanding your form’s measurements

Still following the suggestions Karolyn Kiisel endorses in her book, the author and researcher agree that the mannequin’s measurements should be taken and noted. This makes it possible to decide how the mannequin may need to be adjusted when working on a garment of a specific size or customized for a specific individual. (Karolyn Kiisel,2013, p 10)

The mannequin can be padded when draping for a larger size. Strips of cotton felt approximately 5" (12.5 cm) wide should be cut and wrapped round the mannequin to shape it until the required measurements are reached. When draping for a size smaller than the

mannequin, this must be allowed for by draping more tightly or making adjustments later at the confirmation stage.

Draping is a form of making a dress pattern using a dress form. Unlike drawing a dress pattern on flat, evenly spread fabric, draping positions the fabric over the dress form in 3 dimensions, allowing the dressmaker to visualize unusual or uneven patterns in fabric, such as ruffles or other shapes that are not symmetrical.

Karolyn Kiisel (2013) observes that the term draping refers to the use of fabric to create a design directly on a mannequin. It is an essential skill for a fashion designer.

Draping is a “work in progress” which continues to evolve until taken off the mannequin, when it is turned into a garment pattern. For many designers, draping a new design rather than drawing a flat pattern is an easier way to develop the important skill of visualizing how a two-dimensional sketch transforms into a three-dimensional form.

Some of the guesswork involved in pattern drafting is eliminated as the contours of a garment can be seen to take shape during the draping process. With sketching and pattern making, it is not until the pattern is finished and the garment cut and sewn that the three-dimensional result can be seen. It takes a lot of experience to become proficient at pattern making. Anyone who has mastered a few basic skills can drape, as our ancestors did with their simple robes and tunics.

The ultimate goal of training in the skills of draping is to strengthen original expression while creating new profiles.

Most designers like to experiment with the manner in which a fabric hangs, but there are ways in which this can be established. The technique of draping is most often used in making dresses but it can also be used to fashion skirts, blouses or trousers. Designers have to think about many factors when draping fabrics.

Most designers like to experiment with fabrics, trying out how they hang. There are particular methods of checking how a fabric will drape. This can be done by establishing the fabric's thickness and stiffness using an implement called as drape meter.

The drape meter is used to determine a drape coefficient which is numbered on a scale from 0 to 100. Light textiles such as sateen and muslin drape more easily than heavy twill.

Chapter 4 - Case Study (The Japanese case, Kawakubo, Yohji Yamamoto, Shingo Sato, Nakamichi Tomoko)

Baudot, (2002) and Seeling, (1999) In the 1980s, Japanese designers burst into the world of fashion totally breaking with the aesthetic then in vogue, the “femme fatale” look: low cut and tight, bold colours, high heels and heavy make-up. “In contrast, these designers caused amazement when they produced an off-the-body shape, hiding instead of exposing the body, with forms and trimmings left unfinished, garments asymmetrical and always in black and white”. (Baudot, 2002, P.313 And Seeling, 1999, P.495).

In his book, Crane, emphasizes that “Kawakubo made sweaters full of holes and garments left incomplete and irregular stripes. The machines for making the clothes were deliberately altered to produce defective parts.” (Crane, 2006, p.310)

It was necessary to give an impression, or imitation, of poverty in the creations, which was the very antithesis of the values of perfect craftsmanship generated by Haute Couture. Although these pieces seemed to be produced sloppily, their form nevertheless challenged the understanding of western designers with the architectural complexity of their shape.

Among the big name Japanese designers, Yohji Yamamoto’s important work should be noted. He managed to bring together avant-garde propositions and Parisian-style Haute Couture with elegance and firmness as well as making accessible great opposites, fantasy and function, eroticism and modesty.

In the words of Baudot (2002) “The Japanese is a master of the art of cutting and a great architect of the wardrobe. Each of his collections throws into question the structure and hang of garments.” As opposed to Western clothing that is supposed to act as a new skin for the body, Yohji seeks to give space for the body to move. His clothes have sculptural profiles; others are loose and unstructured (Baudot 2002, p.322)

The vital element is the quality of the material; full-bodied fabrics serve to inspire angular creations while fluid fabrics unquestionably lead to light, rounded shapes. Yohji Yamamoto has immersed himself in the field of patterning methods and sewing techniques to create his range of references.

Debo,(2000) reports that many of the patterns created by contemporary Japanese designers reveal striking features of Oriental weaving and production, very different from the Western approach.

The traditional Japanese robe, the kimono, is constructed from of a number of lengthy rectangles shaped by folds that do not correspond to the body's anatomical form. The influence of this technique is quite clear in Yamamoto's shows. He is a keen observer of the methods of producing Haute Couture and makes use of this when combining elements from his own culture.

So it can be said that flat patterning is a fundamental component of Yamamoto's creative work, because its use permeates the blend of eastern and western techniques, not only as a technique needed to realize a collection but as an intrinsic methodology in the process of creation.

4.1. TR Patterning or Transformational Reconstruction

TR pattern cutting is about Transformational Reconstruction. This is a form of pattern cutting which translates into immediate and instinctive 3D creations as opposed to the more conventional way of drafting. The designer behind this idea was Shingo Sato.

The designer Shingo Sato has worked with Azzedine Alaia in Paris and Trussardi in Milan. Sato has taught at the Bunka Fashion College in Japan and, leading the TR Pattern Design Studio, is dedicated to research and the teaching of patterning.

The hypothesis behind Sato's transformation and reconstruction technique is to design patterns with innovative cuts and volumes. Starting with raw cotton pieces and built on bases, including draping, that offer the designer contact with body's volumetry from the very start, it is possible to evaluate the aesthetics and proportions of new designs.

The "Transformational Reconstruction" patterning method developed by Shingo Sato could be just one more patterning method were it not that this method is of such help in reflecting on the importance of putting patterning at the very early stages of the conception of a project. It is a technique that reconstructs and transforms fabric patterns.

The technique involves an approach that uses experimentation and creativity to construct new volumes and cuts on the mannequin. Sato starts from two-dimensional patterns (flat patterning) which he manipulates through rotations and transforms from an individualized perspective to "sculpt" something three-dimensional. This technique makes it possible to explore new paths and dimensions to innovate on the level of the shape and construction of pieces. It is possible

not only to create concepts and products but schemes of thought to solve questions relating to form.

TR patterning is a methodological technique that follows Fashion principles and as such is a technique developed primarily for fashion professionals. The technique incorporates skills of pattern manipulation, such as draping, in a more intuitive, artistic and innovative way but based on the foundation flat patterning.

Sato (2013) says that both amateurs and professionals have the chance to experiment creatively, to learn from errors and find new paths by chance when exploring new techniques and methods. "Patterns [...] transform and revolve around different perspectives, like parts of a puzzle." He says that, sometimes, a mistake can produce an unexpectedly good result as shown in figures 46 & 47 .

Novaes also affirms the benefits of using three-dimensionality when designing of fashion garments:

Three-dimensional patterning of clothes works to support body and material at the same time, establishing a direct dialogue between the imagination, the behaviour of the material and the support of the body, giving the maker of the garment greater mastery of form and proportion, as well as visualization of the finish and the seams. (Novaes, 2011, p.87)

Illustrative examples from the patterning method Transformational Reconstruction:



Figures 47 & 48: Shingo Sato working on the Transformational Reconstruction method. Retrieved from: Available in <https://thesewingdivas.wordpress.com/2011/12/02/shingo-sato-designer>. Accessed: 02/05/2018

The Transformational Reconstruction technique, Figure 48, eliminates the need for darts and sewing lines in putting garments together and replaces them with asymmetrical, geometric circular cuts that create an innovative handling of volume.

Fig.48 also illustrates the Transformational Reconstruction modelling method. It can be seen that Sato¹⁰ creates the model of a sleeved blouse through cuts. He does not change its volume but completely eliminates basic building features such as darts, armholes and side seams.



Figure 49 - Shingo Sato blouse using the Transformational Reconstruction method. Retrieved from: Available in: <https://thesewingdivas.wordpress.com/2011/12/02/shingo-sato-designer/> Accessed: 02/05/18

Without doubt, among today's fashion designers, Sato is one who makes use of patterning in a creative way, respecting the intricacies of traditional patterning, or, to put that better, he merges the two- and three-dimensional methods in a creative way to create an amalgam in the patterning process.

Shingo Sato philosophizes and says: "I consider myself a patternmaker designer. To design, you must be able to project as you do in patterning, and not just respond to a drawing. Conception occurs in many places, but it does not occur in the sketching of a garment, but in the development of pattern."(Shingo Sato,2011 no page)

¹⁰ His approach to design is not new, since we patternmakers know how to transfer darts, add style lines etc but it has limits because drawing a pattern design on paper has less creative possibilities. Shingo Sato's design process "**Transformational Reconstruction**" which is done in **3D** gives so much more possibilities to be creative. Available in in: <https://thesewingdivas.wordpress.com/2011/12/02/shingo-sato-designer/>

The special effect of the sleeve seen in figure 49, is first made on 3D paper and then a pattern is drawn for transfer to the fabric. One of the features is to eliminate the joining seams as far as possible to give a better visual effect.

According to the website, the Sewing Divas, Shingo Sato¹¹ shares his designing process by giving workshops in various parts of the world like in the USA, UK, Colombia, Japan, Italy. But he also shares his work on YouTube via numerous videos (at this moment he has added 34 videos).

It all starts with a good basic pattern which you can accomplish by moulage/draping or drafting by hand on the flat (paper pattern). The basic pattern, which is sewn from unbleached cotton, will become a new pattern after the design lines are added on a dress form.

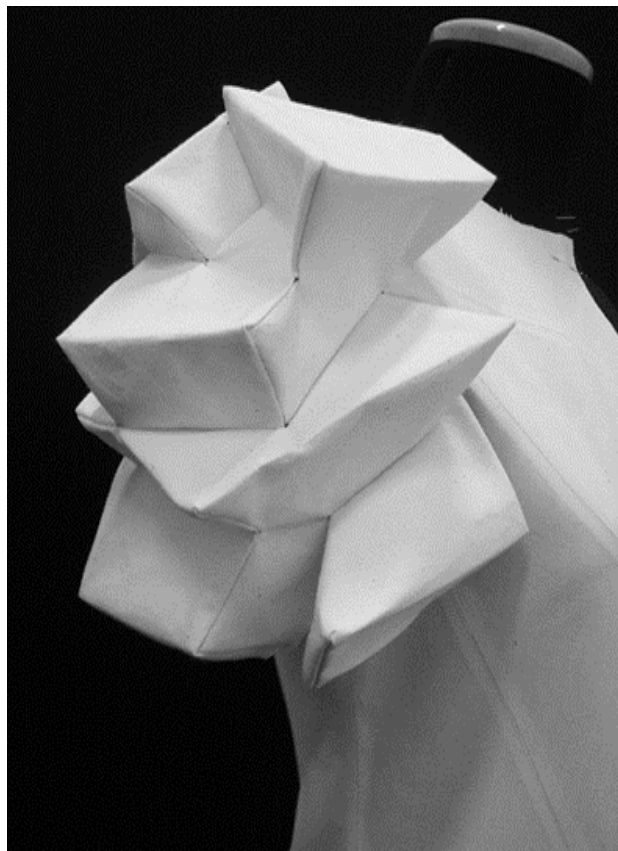


Figure 50 - Sculptural sleeve created by the Transformational Reconstruction method. Retrieved from: <https://www.pinterest.pt/pin/53198839320294662/?lp=true>. Accessed 03/05/2018.

¹¹ Shingo Sato, Patternmaker, designer and educator gives away many of his techniques and make his “tools of the trade” readily available on youtube. While his approach, which he calls “Transformation, Reconstruction” has been critiqued as simply dart manipulation and elimination, something which is neither new or innovative, he demystifies the process, merging design with patternmaking to “draw” line and form on the dress form, often with a magic marker. An exploration of his techniques reveals an ease with breaking tradition and the adoption of new form, the old rules need not apply. Available in: <http://ecosalon.com/the-marriage-of-patternmaking-and-fashion-design/>

Nakamichi Tomoko is undoubtedly another outstanding designer who makes use of patterning in a creative way as can be seen in figure 50.

Many students and designers see Patternmaking as an arid, academic, mathematical practice, difficult to grasp and not an element of design. But a spell of enchantment can be woven if Patternmaking and Design are brought together on an equal footing. Laurence King Publishing's outstanding and unique book series called *Pattern Magic*, offers a savour of the kind of wizardry that can be achieved. The books were written by Tomoko Nakamichi of the famous Bunka Fashion College in Japan (the original designer Yohji Yamamoto is an alumnus of the college) and encourage the reader to design garments in an overtly imaginative 3D manner.

Nakamichi shows garments features merging from collar to body, form leaping off the body, while soft geometry and the body tussle with each other and mercifully, standardized forms became passé.



Figure 51 : Nakamichi Tomoko. Retrieved from : <https://daphnesensei.wordpress.com>. Accessed 06/05/2018

Nakamichi Tomoko has devoted a great deal of her professional career to teaching at the Bunka Fashion College in Tokyo. She currently runs patterning courses and conferences in her native Japan and in other countries. She is also the author of *Pattern Magic*, *Pattern Magic 2* and *Pattern Magic: Elastic Fabrics*, books, published by Gustavo Gili, that bring together the results of her research into patterns developed to contribute to the education of her students.

Nakamichi Tomoko's work differs in the way she relates geometric shapes to the anatomical ones found in basic patterns. The new volumes merge with the contours of the body to create a new profile in a kind of collaboration. She uses the flat patterning method to create volume that jump from the clothes giving a sense of depth. Three-dimensional elements are added to the basic shapes.

Nakamichi Tomoko's work is illustrated in the example below. The blouse features three cubes above the bust. It is made by applying the cubic forms on the mannequin. The elements are set into the relief while the garment is being structured. However, in the planning, the patterns completely lose their link with the figure from which they started.

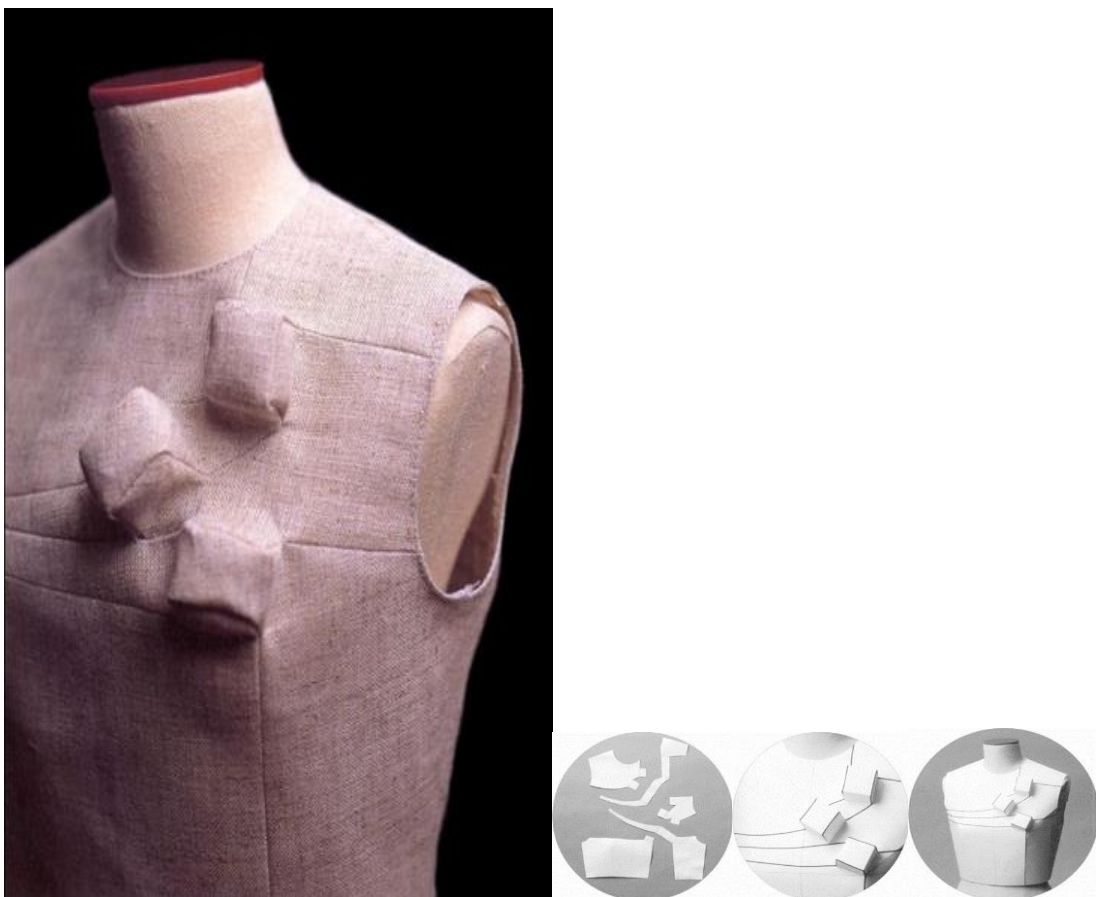


Figure 52: Blouse “cubes” and the planning steps. Retrieved from : Ilustração a partir de Tomoko, 2005, pp.46/47

In Figure 52, the next example, a Flared skirt + cone (*godê*) is seen in which a hole was opened the basic pattern and a cone was added. The new composition was redesigned so that the element of depth represented by the cone was perfectly integrated into the structure of the skirt, creating a sense of continuity between the two shapes. The procedure undertaken to join the two elements together can be seen in the figure below.

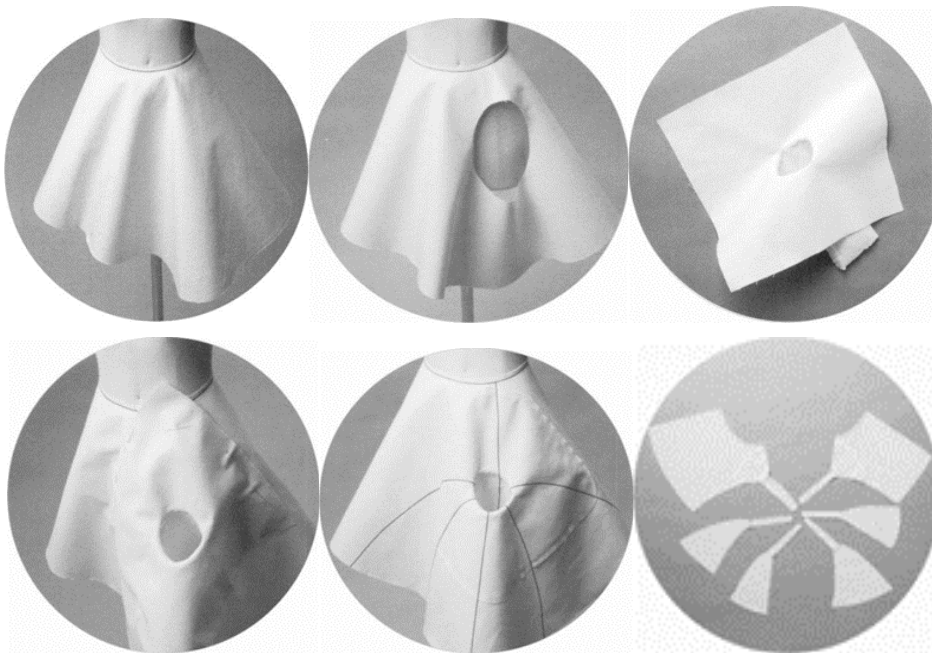


Figura 53: Flared skirt + cone. Retrieved from : Illustration from Tomoko, 2005, pp.38 & 39

Result: using the three-dimensional modelling method in conjunction with the two-dimensional patterning method can be seen as a great argument to back the importance of embedding patterning as a creative form while a project is still in the design stages.

As Tomoko states “Draping is a play on light & shadow. Make it flat, then fix it in 3D. Patternmaking is a synthesis of flat and 3D techniques”. (Tomoko, 2005, no page)

The work of these two designers show the possibility of exploring the flat patterning method to increase the range imaginatively when creating fashion products.

Notes that grading, magnification and reduction of patterns for different measurement sizes is seen as the stage following the approval of a prototype. “Grading techniques have been improving due to the organization of the garments, standardization of sizes and classification and labelling procedures. Differences in measurements between various sizes are spread across the patterns that make up the garment according to criteria to ensure there are no distortions or proportion problems in the larger sizes”. (Jones, 2005, p.140)

Although the first part of the development of is achieved through the draping method, the grading is carried out through techniques related to flat patterning. Differences in measurements between one size and another are divided and sorted on measurement reference lines, for example, the waist, bust and hip. The Cartesian coordinate system is used to grade extremes which involve measurements of width and length at the same time.

Unlike flat patterning, this enables a direct relation between the material and the volume of the body, enabling indirect contact with the body’s measurements. The difference can be seen in this way: in flat patterning the measurements to determine volume are decoded, in the draping system, it is the volume that leads to the measurements.

Recalling what Salles says: [...] “It is through creative resources that a project is brought to fruition and can be exhibited. When I say resource, I am emphasizing how a particular artist makes how he manipulates material come as close as possible to the poetry of his scheme in the finished garment” (Salles,2009, p.107)

What Salles wants us to understand here is that creative resources are mediators between form and content, linked to the way in which the artist works. The creative resources should be understood as the methods of patterning the garment and the techniques attached to them, which must be linked to the nature of the material being used. (Salles, 2009, p.107) acknowledges that this presents its own rules.

Along with the creative processes, “it should be noted that the creative resource options can be modified and targeted along the way. It therefore becomes clear that these procedures are not necessarily pre-selected and determined by the artist but, most of the time, are encountered as work progresses”. (Salles, 2009, p.109)

Amalgamating flat patterning with the technique of draping can enable the methods to check and balance each other so as to adapt the two-dimensional form of the patterns to the three-

dimensional reality of the body. This hybrid patterning technique can be appraised by the extent to which the content of the basic techniques of flat patterning and three-dimensional modelling converge where the two techniques are mixed and alternated in the development of the pattern as Novaes says:

“Other possible paths [in the processing of a garment] are the result of cross-overs between patterning methods and production systems. But so far these paths have not been exhausted as the configuration of geometric patterning with three-dimensional modelling in the development of a prototype is another possible method for patterning garments”. (Novaes, 2011, p.93)

As already mentioned in this chapter, the technique developed by Tomoko Nakamichi intertwines flat patterning and three-dimensional modelling. Novaes, says: “Nakamichi’s work is an example of how it is possible to bypass body shape through geometric patterning by creating unusual volumes when designing and making garments”. (Novaes, 2011, p.88)

This construction, however, makes the patterning process even more elaborate. Creating abstract forms in patterning clothing suits well the potential of three-dimensional modelling.

Tomoko Nakamichi. *Pattern Magic*, Vol. 2. Japan: Bunka, 2007, the method introduced by the teaching material of the Bunka School, Japan, the author of which is Tomoko Nakamichi, offers a break with traditional patterning and is effectively a hybrid technique which merges flat patterning and three-dimensional modelling features.

This method is recommended for those who already have some knowledge of basic flat patterning because the bases stemming from this are the starting point for most models in the three volumes of the material.

The *Pattern Magic* book¹² teaches the reader how to use the method, the meanings of acronyms, lines, points, and so on. The step by step instructions are always accompanied by illustrations and photos to give a better indication of how the product should develop. These diagrams abound with dotted lines and arrows, combinations of these, all with clear indications.

To explain the projects, the author has used bases derived from a particular flat patterning technique built on a screen surface to be placed on the mannequin. Only then are the transformations started, as can be seen in the figures 53 below.

¹² *Pattern Magic* is the cult pattern-making book from Japan. Taking inspiration from nature, from geometric shapes, and from the street, this book harnesses the sheer joy of making and sculpting clothes. The book takes a creative approach to pattern making, with step-by-step projects for fashion designers and dressmakers to enjoy. Each project is beautifully illustrated with clear diagrams and photographs showing the stages of construction, the muslins, and the finished garments. Available in: <https://www.goodreads.com/book/show/9047345-pattern-magic>

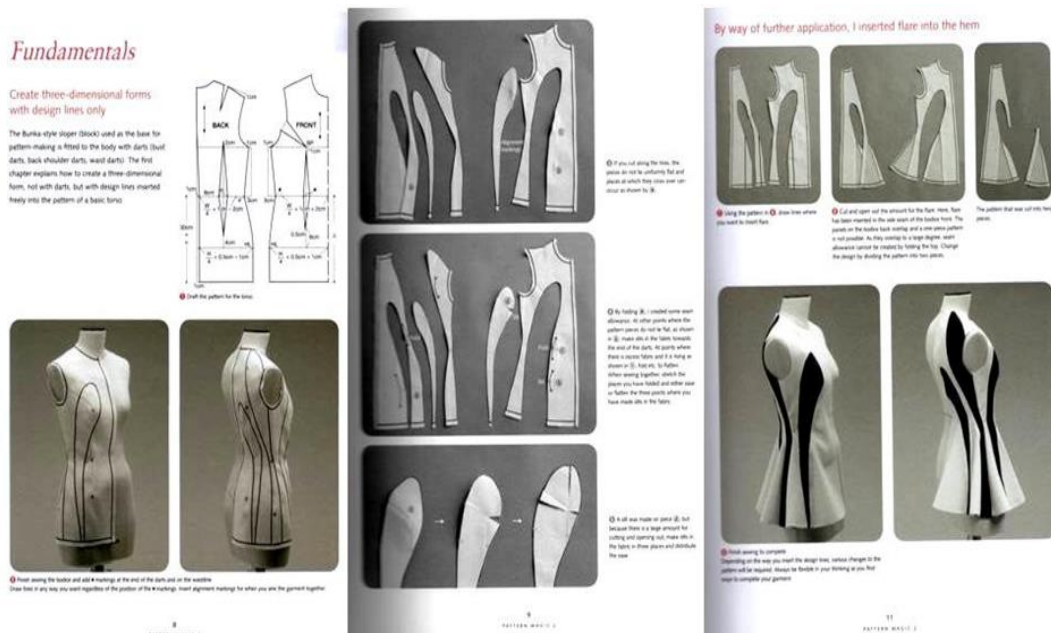


Figure 54. Example of the Transformational Reconstruction method (pattern making), starting with flat pattern. Retrieved from: Nakamichi, 2007, pp. 8, 9 & 11

Novaes, tells us that three-dimensionality “works to support body and material at the same time, setting up a direct dialogue between the imagination, the behaviour of the material and the support of the body, giving the maker of the garment greater control of form and proportion.” (Novaes, 2011, p.87)

As can be seen in figure, 54 below Tomoko Nakamichi turns the practice upside-down, initiating development of the garment with three-dimensional modelling and external experiments on the mannequin, planning it later. as the figure.

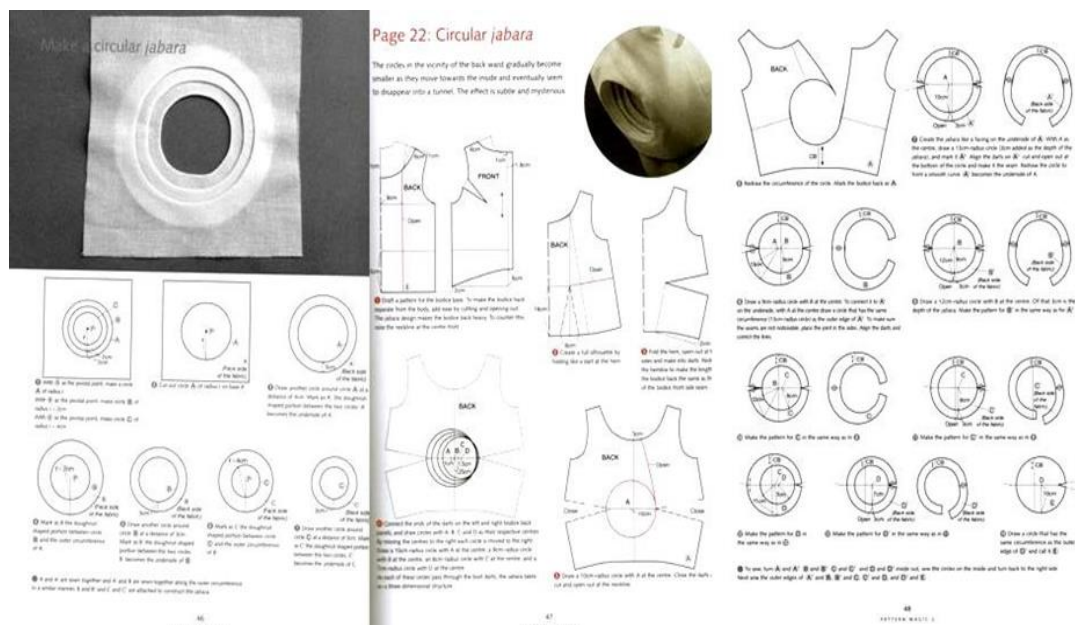


Figure 55. Development and merging of three-dimensional and flat pattern technique. Retrieved from: Pattern Magic vol 2 - pp. 46, 47 & 48.

The materials used include ruler, tailor's curve, French curve, scissors, pliers, bobbin, carbon paper for sewing, craft paper and brown paper, tape measure, pins, needles and thread, and fabric for draping. This is the same for both techniques.

The use of flat patterning as a creative resource in the fashion designer's teaching, or when a fashion product is being designed, becomes clear in the work of some designers of Haute Couture and designers of contemporary ready-to-wear clothing. It is evident in previous chapters of this dissertation where mention is made of our ancestors who used the draping technique to cover their bodies, but the process is even more apparent in the work of Worth, Vionnet and Balenciaga, etc.

Nor should we forget contemporary designers who, like their predecessors, incorporate features of flat patterning as an essential step in the concept of fashion garments, using the methods and techniques of flat patterning as a creative reference and fundamental tool in creating their collections. Patterning is therefore one of the main factors in the creative process linking creativity to the processes of conception and configuration of fashion clothing.

As mentioned earlier, the 1980s became known as "the Japanese phenomenon". It had a great impact on what young designers of different nationalities produced but the 1980s also saw the emergence of another revolutionary movement that impressed the world of fashion: the Belgian Revolution.

Both movements dismantled the internal structures of fashion in an attempt to restate it in an intellectually subversive way. Fashion had always rummaged through the past in search of inspiration; these movements looked to the future.

"A group of six Belgian designers followed in the footsteps of the Japanese designers, creating an avant-garde concept and fashion image". (Grumbach, 2009, pp. 360 & 361). Known as the Antwerp Six, Walter van Beirendonck, Dirk Bikkembergs, Marina Yee, Dirk van Saene, Ann Demeulemeester and Dries van Noten, introduced a wholly new attitude. And, despite receiving the same training at the Royal Academy of Fine Arts, Antwerp, their styles were individual, distinct and varied.

Jones says: "The Belgian designers were reminiscent of the Japanese in their affinity with a postmodern conceptual approach to clothing and a predilection for black." (Jones, 2005, p.47)

According to Braga (2007), the movement gained greater strength in the '90s with the deconstructivism advanced by Martin Margiela.

"It was deconstruction to construct anew; a kind of paradox that ended up becoming fashionable. It was a kind of recycling, so fashionable in the late '80s and early '90s, and, from the popular and commercial point of view,

the concept turned into frayed hems and visible overlock”. (Braga, 2007, p.102)

“The Belgian designer Martin Margiela is one of this group’s great exponents of contemporary world fashion. Trained at the Royal Academy of Fine Arts, Antwerp, he worked, like his colleagues, for three years with Jean Paul Gautier, set up the Maison Martin Margiela in 1988 and, between 1997 and 2003, simultaneously worked as artistic director¹³ of the female sector of the traditional Hermès, one of the best known and most luxurious French houses of Haute Couture, renowned for the superior quality of its cut and finish”. (Debo In Momu, 2008, p.7)

Seeling,(1999) Influenced by the same creative conceptual leanings as the Japanese designers, Margiela soon came to be regarded as “deconstructivist” because of the unfinished appearance of his garments. Linings, shoulder pads and seams were left exposed as well as basic elements of the clothing, such as sleeves, waist and shoulders, being out of place.

His clothes were wrongly judged to be anti-fashion. As Debo says in Momu, (2008), “it is not Margiela’s intention to make a “tabula rasa” of the history of fashion; the house philosophy is simply based on a rejection of the notion that fashion has to reinvent itself completely at every stage”. (Debo in Momu, 2008, p.3)

Margiela radically questions the parameters laid down for around a hundred years of Haute Couture without, however, threatening its central position in the field of contemporary fashion. Ideas drawn from previous collections and elements taken from the collective memory of fashion are constantly put into their new collections

The Haute Couture secrets that tailors have used for centuries, the traditional manufacturing techniques such as modelling and internal finishes, seams, darts, shoulder pads, lining, paper patterns are revealed, demonstrating that Margiela knows the production secrets in depth.

As artistic director at Hermès, he developed his characteristic investigation of tailoring, although within the parameters of the Haute Couture tradition.

Maison Martin Margiela has brought in numerous variations on garments that make up the canon of Western fashion over the past two decades. Obvious examples include the trench coat, the tuxedo, the white shirt and jeans. As well as being celebrations of the collective memory of modern fashion, these items demonstrate that Margiela is a specialist tailor.

¹³ The fashion designer who leads the creation of a great brand, such as Karl Lagerfeld at Chanel, John Galliano at Christian Dior and Nicolas Ghesquière at Balenciaga, is known as the artistic director In France. (Garcia in Queiroz, Botelho, 2007 p.34).

Even so, the house is primarily known for its conceptualism and radical reinterpretation of fashion. The fashion world is very prone to forget that true innovation is only possible when based on total mastery of the trade and rigorous historical knowledge. (Debo In Momu, 2008, pp.11 and 12)

Margiela brought striking examples of this deconstructivist perspective to his 1997 Spring-Summer collection and the autumn-winter collection of 1997-1998¹⁴. Deconstructivism, which can be seen in the shape of a bust-dummy with markings showing, is the starting point for the development of the entire collection, as a comment on the attempt to reshape the body to make it fit the standard size of a tailor's dummy.

On the contrary, the the dummy's standard size is put on the body like a suit of armour to which the additional elements are fixed, illustrating the various phases in the process of the making of a garment. "Clothing ceases to be an arbiter between the body and an inanimate doll." (Debo In Momu, 2008, p.12)



Figure 56: Fitting Mannequins. Retrieved from: <http://www.maisommartinmargiela.com/> Accessed 09/05/2018

¹⁴ "That year Maison Martin Margiela debuted its first period pieces. In 1998, Maison Martin Margiela debuted a menswear collection, known as line 10. Maison Martin Margiela oversaw creative direction of womenswear for the French design house Hermès from 1997 until 2003, with the design team working under Hermès chairman Jean-Louis Dumas. Available in: <http://www.wikipedia.com>

Reports: “It’s as if the garments had been wiped out on one side. In some cases, the material is still attached to the roll of fabric, which is carried by the model.” (Debo in Momu, 2008, p.12)

Icon garments such as trench coats, blazers, trousers and dresses have been finished on one side only while the other remains incomplete as an unfinished work. This defines the 2006 Spring-Summer collection.



Figure 57: Unfinished parts- Spring-Summer 2006. Retrieved from: <http://www.style.com/> Accessed 09/05/2018

This brief analytical history of fashion developments in Japan and Belgium makes clear that flat patterning is a fundamental element in the work of these designers. Its use runs through all their collections, not only as a technique necessary to the manufacture of each collection but also as a methodology intrinsic to the creation process. In this way, the rigidity of the traditional application is turned into a concept of the clothing.

So, in order to change the role of flat patterning to being part of the creative process of fashion design, a research perspective must be taken into account in which teaching is seen as a creative process. It should be borne in mind that the creation of projects, elaboration of ideas, problem solving, configuring of creative work as a resource of a change of the activity of design, is one of the principal facets of the reality of fashion design.

Significance is given to the process of creation in this way; the triangular approach comes into play. A contextualized understanding and production becomes possible. Such questions are fundamental to an education in the arts because they encompass everything about teaching and learning. They assume equal importance in the planning of a fashion class.

It is also important to see the practice of teaching as a creative process that integrates the individual with the objective world without snuffing out imagination. Creativity should be seen as a stimulus that instigates and develops creative capacities, not as part of the teaching process.

Before concluding this essay, it is intriguing, therefore, and of some significance to look at the thoughts of the sociologist Pierre Bourdieu on the creative process of fashion. According to Setton (2008), “Bourdieu, one of the greatest sociologists of recent decades, stands out in the academic world for his extensive intellectual production, which encompasses several research themes including education, culture, fashion and the arts”. (Setton 2008, p.120)

Bourdieu seeks to interpret culture in mass society through the study of consumerism. He argues that the most dominant influence is not economic capital but symbolism that is invisible, exclusive and profound.

According to Bourdieu, a symbolic dispute enters the sphere of culture due to the introduction of mechanisms of glorification and symbolic capital. He likens the sphere to a field: “I call the sphere a playing field, a field of objective relations between individuals or institutions competing for the same object.” (Bourdieu, 1983, p.02)

Since inclination and capacity for the appropriation of cultural goods, such as fashion and art, are not evenly distributed, the appropriation of luxury cultural goods can serve as a social distinction. For this reason, that the more exclusive a cultural good is, the greater is its potential to distinguish its possessor, and, therefore, the greater is the symbolic gain its possession will ensure.

Bourdieu gives an analysis of French Haute Couture in “The Couturier and His Label: Contributions to a Theory of Magic”, published in 1975. He suggests that dominance of the market happens in the light of high value objects being interpreted in terms of their “label” and concludes:

“If there is a situation in which things are done with words, as in magic - inclusive, rather than magic, this is true in the fashion world. The label, a simple “word glued on the product”, is the unquestioned signature of the consecrated painter. From an economic and symbolic viewpoint, it is one of the most powerful words”. (Bourdieu And Delsaut, 2002, P.159)

The magic emanates from the power of the label. “It is at the heart of the production of goods and is focused not only on material production but also on symbolic production, an “operation of symbolic transubstantiation takes place. This is self-depicting magic.” (Bourdieu And Delsaut 2002 P.156).

The language of fashion has an important role in the transubstantiation because it is through this means that it demonstrates its legitimacy. “The source of the efficacy of this ritual operation should not be sought in magical formalism, that is, in ritual itself, but in the social conditions that produce faith in ritual.” (Bourdieu And Delsaut, 2002, p.161)

The social conditions that endorse the field, which are responsible for producing symbolic capital and generating collective belief and ignorance, are termed “social alchemy by Bourdieu”. (Bourdieu And Delsaut, 2002)

Bourdieu (1983), among others, contributed greatly to the creation of a new area of research in Sociology: the study of taste.

The role of taste is vital in the thinking of the author, for it is through the taste that symbolic domination occurs. Even when one is aware of the power of influence of those proficient in the language of fashion, taste depends essentially on initiation. This can come from the individual’s social environment or study, but without that mastery of the field, taste will not have autonomy. Without freedom, taste is dominated by the position built by symbolic capital, devised by the creator through the brand and confirmed by the specialized media.

The individual who lacks knowledge of the field thinks he is free, but his taste is manipulated by the stratagems of the field itself. Another important aspect of taste is that it is inseparable from aesthetic aversion, and these aversions stem from the lifestyle that springs from differences between classes.

So, to achieve autonomous taste, to enter and stay in a field, there are two routes: by acquiring the specific habitus associated with birth and education, or through cultural goodwill. The habitus of taste is like the fashion label. It is not enough for the producer simply to create models; if that were all, everything that was made would be a brand. And for the consumer, there is no point in own an item from a hallowed label without knowing how to carry off the look.

4.2. Bourdieu and the Creative Process

With regard to fashion, Bourdieu (1975) says that the symbolic capital expressed through the brand label is conveyed by the stylist through creative processes, against the background of knowing the rules of the game and how others entered the field and gained a permanent place there.

“Society always pays itself with the false currency of its dream” (Mauss). Which means that, in this game, you have to play the game: those who deceive, are themselves deceived, and deceive the better the more deluded

they are; they are much more mystifying when they are themselves mystified. To play this game, you must believe in the ideology of creation (Bourdieu, 1975, p.9)

Mobilizing symbolic energy rests in the capacity and power of the creator. The energy is emitted by the group of professional agents dedicated to operating the field, among whom fashion journalists, editors and critics stand out. These agents endorse and propagate through their comments and the association of their images with those of the labels. The author himself recommends aspiring creators to make use of every possible means of consecration or invent new ones. The creator must pay attention to the maintaining the symbolic order, the habitus that legitimized his attachment to the field and which generates social alchemy, if he is to perpetuate his position in the field.

“The creator’s habitus and the position he occupies in the field, that is to say, the function objectively attributed to him, even though he has objectively produced it, (...) is related to his intention not to break with the field. The avant-garde creator wants to preserve Haute Couture but to distance himself from tradition, as well as the new bourgeoisie”. (Bourdieu And Delsaut, 2002, pp.174 and 177)

Habitus is important to Bourdieu. It is a concept that encapsulates perceived social and cultural trends. In this concept, consumption constitutes what a person is. It is his lifestyle, the factor that determines whether or not they enter the field. It is worth noting that it was Bourdieu (1983) who was responsible for popularizing the term "lifestyle".

This viewpoint denies the idea of evolution in fashion design, because what drives change is dialogue, interaction, symbolic struggle within the field, so that economic capital comes out of symbolic capital. Bourdieu's (1983) contribution to the creative process is enlightening because, informed of the mechanisms of the field, the creator can devise his or her entry strategy with more calculation. To do this, it is necessary to look at the history of fashion and think about the particular breaks and strategies the stylist used to place himself in the middle of the field: his rationale, his habitus, not just his time and his product.

“The label, the brand name, is the hallmark that changes, not the material nature, but the social nature of the object. But the brand name is a proper name. This raises the problem of succession, because only common names or common functions are inherited, not proper names”. (Bourdieu, 1983, p.8). That said, how is this power produced by a proper name? It might be asked, for example, how does a painter have this power to create value? The easiest, most obvious argument is the singularity of the work. But what is in fact the issue is not the singularity of the product, but the singularity of the producer. But how is this singularity produced? (Bourdieu, 1983, n.p)

According to this researcher, a creator’s singularity is due not only to their work, but is also the result of positioning within the field, acceptance from peers, and, therefore, from the consumer. This springs not only from technical dexterity, mastery of design and patterning - if

that were the case every tailor would be an “Giorgio Armani” - but also from the aggregate of consciously manipulated subjective knowledge.

The ancients had conservation strategies that aimed to profit from progressively accumulated capital. “Newcomers have subversion strategies that are geared towards specific capital accumulation, which presupposes a more or less radical inversion of the scale of values, a more or less revolutionary definition of the principles of production and product appreciation and, at the same time, a devaluation of the capital held by the rulers”. (Bourdieu, 1983, p.2)

Against this context, the author points out the path of change, the driving force behind new creators entering the field; the struggle for power, symbolic, orthodox and heterodox. The newcomers convince the ancients by underpinning their work with established values, a condition that is necessary even for subversion. Breaks take place only within the field, because they come from knowing the rules of the game. The field itself is the limit of the dispute. It is possible to ignore the field, but this results in isolation, or it is possible to create another field.

Bourdieu (1975) shows how the field works by describing clashes between the avant-garde and the retrograde, the right and the left, the orthodox and the heterodox, the hallowed and the heretical, emphasizing that the content changes substantially, taking in various aspects of form, raw materials and so on, but that the structure of the field is not affected. This fact contributes once more to “shuffling” understanding of how it works, how it is portrayed and access to it.

“The newcomers can only depose the ancients because this is the implicit law of the field. In every sense, fashion is the latest fashion, the ultimate difference. An emblem of class (in every sense of the term) is deposed when it loses its distinctive power. That is when it is revealed”. (Bourdieu 1975, p.5)

Charles Worth’s star began to rise when he attracted the attention of the wife Pauline von Metternich, wife of Prince Richard von Metternich, the Austrian ambassador. Pauline had status at court and commissioned to Worth’s wife, Marie, who can be regarded as the first model, to show her sketchbook to the Empress Eugénie, wife of Napoleon III.

Worth’s discovery was not a matter of production but in the possibility of reproduction, which came from observing of the incipient German garment industry alongside French patterning and tailoring techniques. The fashion industry became globalized, taking on production impelled by the seasons and the monetary economy, going right up to the precepts of tradition, which maintain the isolation.

“My work,” Worth said, “is not simply manufacturing; it is primarily creating. Creation is the secret of my success. I do not want people to order their clothes. If they ordered, I would lose half of my trade.” Or again, “The revolution of 1870 is nothing compared to my revolution, I who destroyed the crinoline.” (Grumbach, 2009, p.18)

So the concept of symbolic energy, as creator's currency which makes up its symbolic capital, consists of the aura of the brand, which first appears with the emergence of fashion and its first creator. This symbolic energy has to be harmonized with the habitus of the stylist as it represents the personification of his creative potential through the coherence of his posture, image, communication, home, lifestyle and, finally, facets that confirm his creative uniqueness.

The lesson to be learnt from these matters, in their various manifestations, is a way of understanding the creative processes in fashion design, whether in Haute Couture, ready-to-wear or in production. Even in different spheres, it can be seen that all these sectors belong to the same field: fashion.

What changes is the degree of creative autonomy and investment in showing this. But understanding the different manifestations of the fashion field is important for performance, particularly nowadays with dissemination of information, fashion colleges and alternative markets being explored, autonomous designers, and production being mostly ready-to-wear.

The idea that the creative autonomy of Haute Couture and ready-to-wear designers means they can "create according to their daydreams" does not hold good and it is important to emphasize this. As the author says: "Haute Couture furnishes the ruling class with the symbolic marks of class (...) for all the rites that celebrate its distinction." (Bourdieu And Delsaut, 2002. p.172)

Creation comes from analysing a series of factors and its success depends on being effective in each. As noted in the Bourdieu's words, social alchemy is so efficient that it convinces even those who belong to the field that the creation in fashion is supernatural.

4.3. Analysis of Flat Patterning by Bourdieu

According to Bueno, there is a relationship between language structure and the creative process of fashion. It can be compared with syntax which is defined as: "The part of the grammar dealing with the arrangement of words in a sentence, the relation of sentences to each other and the grammatical construction" (Bueno 1996, p.609)

It consists of the logical elaboration and satisfactory handling of a multiplicity of combined possibilities of discourse. In this context, syntax in the world of fashion is the concept of the creation of a product, collection or campaign. "The concept is established from the understood extension of an object, taking in its attributes, qualities and constitutive elements" (Coelho, 2008, p.165)

This is because it guides the decisions and arranges the elements, establishing coherence within the proposed theme, style or desired objectives. As in a syntactical analysis that examines the relationship of words in a sentence, the concept takes care of assembling and evaluating a proper configuration between styles, colours, shapes, materials, lighting, execution and everything involving fashion activity as in a text or speech.

If language corresponds to the concept in fashion, the grammar that standardizes language is flat patterning in fashion. Grammar as defined in the dictionary corresponds to:

The methodical and detailed exposition of the constituent elements of a language; - standardized or descriptive: the system that gives the practical rules for speaking and writing; - historical: the study of the formation and evolution of a language in time and space; - comparative: the comparative study of two or more languages from the same group (Bueno, 1996, p.329)

As grammar exhibits and details the elements of the language for writing and speaking, so flat patterning works like grammar as a set of rules that composes fashion's expression, acting in both the design and the manufacture.

Flat patterning and draping together comprise a process that makes possible the "(...) best manner to start the initial translation of the ideas collected in your research." (Seivewright 2009, p.106)

Like grammar, the patterning process also has a historical aspect. It pays studious analytical attention to the forms of the past and makes allusions to old garments.

Folding, crimping, pleating and draping a fabric in a three-dimensional representation of the human body enables the designer to work on more complex shapes and techniques that are often very difficult to develop in the more conventional mode of flat modelling. "(...) Adopting abstract forms from what inspired you and exploiting your potential on a mannequin is a far more expressive way of developing clothing ideas than just drawing. This sort of practice can be seen as rather like sculpting the fabric on a body". (Seivewright, 2009, p.106)

To create models and shapes for clothing through the grammar of manipulating fabric on the dummy - draping - or to master the technique of flat geometry, requires expression and speech in the language of fashion which materializes the concepts into forms. Thus, morphology, which includes the "harmony of the forms material can assume; part of the grammar that studies the structure, processes of formation, reflection and classification of words" (Bueno, 1996, p.441)

In fashion, this would be the techniques of flat patterning, because they attend to the form of clothing, as morphology attends to the form of words. So the morphology of fashion is flat patterning and draping.

Taking the long view, the rules of the field of fashion are determined by explicit and implicit constraints. A different type of light effect, a twist in the timeline, and everything returns to the style of another decade, or there is even a hint of “east meets west”.

“For newcomers, the game is almost always a matter of breaking with some of the conventions of the day (...) but within the limits of decorum, without calling into question the rules of the game or the game itself.” (Bourdieu And Delsaut, 2002, p.121)

Daring to walk down different avenues, paths of new forms, as well as producing unusual combinations of colours and materials, are innovative ways of subverting the rules through a challenging stance. On the other hand, the conservatives defend and maintain “sobriety, elegance, balance and harmony. The vanguard always opposes audacity, freedom, joviality and fantasy.” (Bourdieu And Delsaut, 2002, p.122)

But for Crane, the term avant-garde in fashion implies changing the connotation of garments with specific characteristics for purposes other than those to which they are related. An example of this approach was the way in which some foreign stylists in the 1980s, among them the Japanese designer Rei Kawakubo, created clothes that affronted Haute Couture’s traditional values. (Crane, 2006, p.308)

“Perfection of craftsmanship is the hallmark of Haute Couture clothing. The stitching must be perfect, the cut flawless. Kawakubo created sweaters full of holes and unfinished garments with irregular stripes. The machines for making his clothes were deliberately altered to produce defective parts. (...) Another basic feature of Western clothing conspicuous in Haute Couture is symmetry. Kawakubo created dresses with three sleeves and coats with one side longer than the other.” (Crane 2006, p.309)

“He created something totally new, unlike anything that had gone before; others recreated forms already established in previous times. An example of this approach is the creation of Christian Dior’s New Look, which adapted a style from the beginning of the twentieth century to the post-war reality”. (Crane, 2006, p.312)

Kawakubo dared to break with the pre-established forms like Dior’s innovation on the back of the shade of previous decades. These are examples of how the manipulation of forms, which can only take place by means of the proper use of patterning, are relevant in the struggle for legitimacy in the field. These changes do not happen without the creator having an in-depth knowledge of past and present forms, because it is only through knowledge of these ranges that the new ones can be put forward.

If the fashion designers of the past set certain rules, when we come to the contemporary world we find an openness to the new and different ever more accentuated and at an ever more frenetic pace. The fashion designer’s objective is still to recreate a set of features in clothes that give an aesthetic character, that have the capacity to attract receptive attention to the way

they are shaped, to the materials used, and to their presentation. Further than that, “he should think about issues that define the question of use, adaptation to the body (ergonomics), situations presented by contemporary life, as well as matters related to cost, comfort and well-being”. (Castilho; Martins, 2005, pp.34 and 35)

Famous fashion designers from the past such as Worth, Vionnet, Balenciaga, Pucci, Yves Saint Laurent and others more recent such as, Qiu Hao, Alexandre Vauthier, Kawakubo, Yohji Yamamoto, Shingo Sato, Nokamichi Tomoko and Martin Margiela are just some of the famous names who have played with form and have used patterning as the creative process by which they have illuminated and brightened the catwalks across the globe.

Using of flat patterning as a creative resource can be seen to a greater or lesser extent in fashion designers’ work. The good professional’s success depends on his ability to understand and create new methods in order to enrich not only his or her own knowledge but also that of others.

Without doubt, flat patterning is the architecture of fashion, as it is also for the professions of architects and plastic surgeons. Flat and three-dimensional patterning complement each other, and provide an innovative theoretical base to give new significance to the role of flat patterning in fashion design courses.

Flat patterning is a fundamental element and tool in carrying out fashion design, and should be seen as a merging of two processes or techniques introduced at the beginning when the student is studying the body, shapes and the design of a collection. It can demystify the process giving the student a fuller understanding that the Fashion Designer is not only the art director (stylist) and that the profession offers other opportunities, a good example of which is the profession of pattern maker.

Conclusions

The main objective of this research is to interpret how the concepts and implications of traditional studies of flat and three-dimensional patterning complement each other, and to provide an innovative theoretical base to give new significance to the role of flat patterning in fashion design courses and Fashion itself. This is carried out by means of an analysis of ancient and modern historical facts as well as the study of scientific works on the subject.

The analysis of topics supporting the research is intended to give a broad vision while at the same time keeping the main focus in sight by providing perceptive information concerning the subject.

For this research *in appendix* (pag.125 to pag. 151) a brief analysis of the history of fashion and patterning presents a broad view understanding that our ancestors, perhaps unintentionally, made a creative use of patterning to protect themselves from the cold or simply to make themselves comfortable.

First under the spotlight is a brief analysis of fashion, then design and, at the end, Fashion Design. Chapter 1, defined the birth of fashion in an intrinsic and original way through the thoughts of various authors and scientific works. It is noted in this chapter that there would not be fashion garments or products shaped and fitting perfectly if they did not go through the pattern making stage. It is possible to go yet further and stress that both fashion and design benefit from pattern making to achieve creative and volumetric features.

Chapter 2 deals with the harmony of the body and its form, as well as traditional patterning and its mathematical, geometric, ergonomic and volumetric aspects, with reference to fashion, design, body and patterning.

Understanding the traditional patterning process is vital because, as a result of studying the methods and techniques, it becomes possible to talk about different forms of patterning as creative resource methods to form part of Fashion Design courses.

Chapter 3 seeks to bring together the creative processes of a collection, with textiles, in order to construct a case study. The relationship between patterning and design is built on an analysis of how successfully it works in developing fashion products and also applying the range of techniques, methods and processes.

The Japanese and Belgian case studies challenged the approved and opulent patterning of haute couture and gave a new way of thinking about fashion and patterning with a creative vision.

Finally, chapter 4 underlines the theory discussed in the previous chapters with an analysis of models created by renowned authors, such as Bourdieu, and designers who have innovated and challenged with original and creative patterning processes.

This objective dissertation is a reflection concerning the relevance of a deeper, more all-embracing, more interesting scheme of teaching flat patterning, integrated with the theoretical and creative contents of Fashion Design. It offers a more effective way of learning in which the student is encouraged to reflect on what he learns, thereby finding the best way to develop the products.

As Beduschi says:

“It is important to study the way in which flat patterning is dealt with in Fashion graduation courses and how aspects that encroach on Fashion Design are approached because, when flat and three-dimensional techniques are integrated and allied to concepts from other disciplines, the approach reaches the fundamental view of design and its multidisciplinary character, since the patterning is the very core of the product and the design itself”.
(Beduschi, 2015.p.10 own translation)

In the course of developing an in-depth analytical study of the various modelling techniques in use, taking aspects mentioned in this treatise as the starting point, those characteristics which can favour or hamper a student’s progress in the course of his training have become clear, whether this be in the academic field or at career level.

Many aspects related to teaching and learning have been described, studied and analysed. It has been illustrated that the two-dimensional and three-dimensional modelling techniques complement each other. Putting their positive facets together can result in more effective teaching, minimizing the individual shortcomings of the two methods and enabling the student to appreciate the origins of what he is studying. The student or fashion professional is able to gain a broader view of the need to study the principles of anthropometry, geometry, ergonomics and volumetrics.

The calculations and diagrams involved in the flat modelling technique can be integrated with the visualization afforded by the three-dimensional method. It has also been shown that the theoretical elements specified throughout this dissertation can optimize learning to bring about imaginative thinking.

This being the case, this treatise proposes a broader modelling strategy amalgamating three-dimensional draping and flat pattern making in order to optimize the modelling of clothing.

This will break down the continuing division between the modelling disciplines. The dichotomy, creation or technique, is reduced by providing a link, to the advantage of both and bringing about a closer connection between fashion’s professional areas.

While this has been an extensive research, it is by no means complete. With this in mind, it is suggested that future research be undertaken including a wider bibliographical survey as well as field work. The bibliography should be systematized in order to verify in greater depth the arguments used to explain the need for modelling and to understand how its techniques came about in the face of other cultural practices. A questionnaire should be developed concerning the theoretical areas of flat patterning and three-dimensional modelling in order to come to a fuller understanding of the real purposes contributing to the need to develop new modelling techniques and techniques in the area of autonomous and creative knowledge.

The suggestions put forward in this dissertation provide a fusion of practical knowledge allied to theoretical content related to the body in an amalgamated modelling technique. The aim is to make possible more effective learning which will encourage the student to reflect on what he learns in order to discover the best way of developing his modelling.

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Appendix I

Fashion and Sewing Pattern History “Time Lineⁱ”

ⁱⁱ Some knowledge of the history of fashion and pattern making, in summary form, is of great importance to support the thesis “pattern making as a creative tool in the teaching of fashion design” based on an understanding that the wearing of clothing is an exclusively human characteristic and is a feature of most human societies.

The author suggests a study of the history of clothing and textiles traces, over human history, the availability and use of textiles and other materials for the development of technology and the making of clothing and patterns such as sewing patterns, patternmaking and cutting.

From the draped linens of Ancient Greece to the casual T-shirt and jeans of today, the history of clothing is an exciting part of our past to explore.

ⁱⁱⁱAccording to Sara Pendergast And Tom Pendergast (2004), we have essentially only indirect evidence of the very first clothing. Archaeologists have found splintered scrapers made of rock as seen in Figure 1 which they believe were used to tear meat from the skins of animals. These date from around 100,000 B.C.E. It is believed early man then cut these hides into shapes they liked, made holes for the head and perhaps the arms, and wrapped the furs over their bodies. Their techniques probably advanced quite quickly. They may have used thin strips of hide to tie the furs around themselves, much as belts are used today.



Figure: 1- Slaughter of an animal. Retrieved from: Book Fashion, Costume, and Culture, Sara Pendergast and Tom Pendergast, Project Editor Sarah Hermsen, Imaging and Multimedia Dean Dauphinais, Dave Oblender.

Cro-Magnon man, considered the next stage in human development, emerged around forty thousand years ago and made advances in the clothing of the Neanderthals. The smarter Cro-Magnon people learned how to make fire and cook food, and they developed finer, more efficient tools. Sharp awls, or pointed tools, were used to punch small holes in animal skins, which were laced together with hide string. In this way they probably developed the earliest coverings for the body, legs, head, and feet.

One of the most important Cro-Magnon inventions was the needle. Needles were made out of slivers of animal bone; they were sharpened to a point at one end and had an eye at the other. With a needle, Cro-Magnon man could sew carefully cut pieces of fur into better fitting garments.

ⁱ The cave painting figure 1: depicts the slaughter of an animal whose skin would be used for clothing and whose meat would be used for food. For More Information Corbishley, Mike. What Do We Know about Prehistoric People? New York: Peter Bedrick Books, 1994. Fowler, Brenda. Iceman: Uncovering the Life and Times of a Prehistoric Man Found in an Alpine Glacier. New York: Random House, 2000. Goode, Ruth. People of the Ice Age. New York: Crowell-Collier Press, 1973. Hawkes, Jacquetta. The Atlas of Early Man. New York: St. Martin's Press, 1976.

Evidence suggests that Cro-Magnon people developed close-fitting pants and shirts that would protect them from the cold, as well as shawls, hoods, and long boots. Because they had not learned how to tan hides to soften them, the animal skin would have been stiff at first, but with repeated wearings it would become very soft and comfortable. Jacquetta Hawkes, author of *The Atlas of Early Man*, believes that Cro-Magnon clothes approached those of modern Eskimos in their excellence of construction (Sara Pendergast And Tom Pendergast, 2004, p.5)

When humans began to wear clothes is not known exactly but anthropologists believe animal skins and vegetation were used to make coverings to protect against cold, heat and rain, especially as humans migrated to new climates.

The first humans known to make clothing were the Neanderthals who lived from around 200,000 B.C.E. to around 30,000 B.C.E. The earth's temperature rose and fell dramatically during this period, creating a series of ice ages across northern Europe and Asia, where Neanderthal man lived. The Neanderthals had powerful, athletic bodies that conserved heat and were well adapted to the cold climate of their day.

But their greatest asset was their large brain. Neanderthals learned to make simple but competent stone tools. Their spears and axes made them effective hunters and their prey was the deer, reindeer, ibex and wild boar among whom they lived, along with other mammals such as the occasional mammoth. At some point, Neanderthals learned how to use the thick, furry hides of these animals to keep themselves warm and dry. With this discovery, clothing was born.

According to Sara Pendergast And Tom Pendergast, Figure 2 shows the remains of a man who died 5,300 years ago in the mountains of Austria were discovered near the border with Italy, helping to confirm much of what these archaeologists had discovered. The body of this male hunter had been preserved in ice for more than five thousand years and many fragments of his clothing had survived. (Sara Pendergast And Tom Pendergast, 2004, p.6-7)



Figure 2: The ice man clothing. Source: Ancient-origins - Inglaterra, Retrieved from <https://http://www.ancient-origins.net> Accessed in: 05/01/2018

Archaeologists pieced his garments together and found that the iceman, as he became known, wore a complex outfit. Carefully sewn leggings covered his lower legs, and a thin leather loincloth was wrapped around his genitals and buttocks. Over his body, the man wore a long-sleeved fur coat that extended nearly to his knees.

The coat was sewn from many pieces of fur, with the fur on the outside. It was probably held close by some form of belt. On his feet the man wore animal hide short boots, stitched together with hide and stuffed with grass, probably to keep his feet warm in the snow.

On his head the man wore a simple cap of thick fur. Though the iceman discovered in Austria appeared much later than the earliest Cro-Magnon man, the way his clothing was made confirmed the basic techniques and materials of early clothing. The ravages of time have destroyed most direct evidence of the clothing of early man, however (Sara Pendergast and Tom Pendergast, 2004, P.6-7)

It is thought that the first assembled piece of clothing was the tunic. A tunic is made from two pieces of rectangular animal hide bound together on one short side with a hole left for the head. This rough garment was placed over the head and the stitched length lay on the shoulders with the remainder hanging down.

“The arms stuck through the open sides and the garment was either closed with a belt or additional ties were placed at the sides to hold the garment on the body. This tunic was the ancestor of the shirt” (Sara Pendergast And Tom Pendergast 2004, p.6-7)

Ancient Egypt 3000 BC

ⁱⁱⁱⁱThe history of fashion has a vital place at the heart of the development of humanity and, therefore, in the evolution and modification of its customs. It can be seen from studies carried out in the field of clothing that the textile industry may date from prehistory, more precisely from the Neolithic period [...] (FEGHALI; DWYER 2006, p.37)

“Ancient Egyptians were the first human society to have an identifiable sense of style in clothing. From Egypt’s earliest beginnings around 3100 B.C.E. to its eventual decline around 332 B.C. E., Egypt’s kings and queens, called pharaohs, and its many noble men and women, placed great emphasis on the appearances of their clothes, jewelry, the wigs they wore in place of natural hair, and their skin. The Egyptians idolized the human body, and the clothes they wore complimented the lines of the slender bodies that were most appreciated in Egyptian society”. (Pendergast Sara And Pendergast Tom, 2004, p.21).

Egypt’s climate was very warm, as it is today, and Egyptian dress provided the perfect complement to this warm weather. Both men and women tended to dress very lightly. For nearly 1,500 years it was very rare for men to wear anything on their torso, or upper body.

For the upper class and the pharaohs, the main form of dress was the schenti, a simple kilt that tied around the waist and hung about to the knees. Working men wore first a loincloth, a very small garment that covered just the private parts, and later the loin skirt, which was somewhat more modest and covered from the waist to the mid-thigh.

In about 1500 B.C.E. Egyptian men began to wear simple tunics on their upper bodies. They adopted the custom from the neighbouring region of Syria, which Egypt had recently conquered (Sara Pendergast And Tom Pendergast, 2004, p.21).

Men wore a wrap-around kilt, also made of linen. These simple garments might be decorated with borders or fringes though the fabric was left in its natural colour; dyes were rarely used. Highly decorated jewellery - collars and bracelets, rings and earrings - and superbly worked headdresses were worn by the wealthier classes to embellish their clothing. Even at this early stage in man’s history, it can easily be seen that vanity played a large part with the people of ancient civilizations, particularly with the better off.

^vAccording to Nery “in the course of its development, the Egyptian civilization not only influenced its neighbours - the Chaldeans, Assyrians, Babylonians, Persians and Cretans - but was also influenced by them.” He notes further that, because of the hot, dry climate, the Egyptians dressed with the minimum of apparel (Nery, 2003, p.22)

^{vi}Köhler, points out that, in common with all ancient costume, the most significant feature of the clothing worn by the Egyptians was draping. Each of the peoples had its own particular way of wearing raiment which were essentially similar in cut and style (Köhler, 2001, p.68)

^{vii}Carvalho and Silveira (2012), attributed the following characteristics to Egyptian attire: “a predominance of geometric lines in rectangular forms with intense colours within precise areas” (Carvalho and Silveira, 2012, p.15)

Köhler (2001) adds that: “the Egyptians of the Old Empire (3000 BCE) wore a thong made of cloth wound several times round the body and fastened with a belt known as a chanti.” (Köhler, 2001, p.59)

ⁱⁱ B.C. stands for Before Christ, and it means the number of years before the birth of Jesus Christ. That was about 2000 years ago, so the date 552 B.C. means 2552 years ago. Some people use B.C.E. ... That stands for Before the Common Era, and is used in order to avoid Christian references. Available in: <https://quatr.us/history/bc-stand-for.htm>. Accessed in: 05/01/2018

^{viii}Ancient Egyptians also wore a sort of mantle or cape that hung over their shoulders. Figure 3 shows the passage of time, a further item was added to the Egyptian wardrobe, the kalasiris. This long tunic, sometimes sleeved, sometimes sleeveless, which varied in length, width and fastening, was worn by both sexes. So, like almost all ancient costume, the striking feature of Egyptian clothing was the draping (Dinis and Vasconcelos, 2009, p.61)

^{ix}Nery (2003) further states that the women's main garment was based on a rectangle molded to the body, a type of sarong reaching the breasts, attached with one or two loops which sometimes formed short sleeves. It seems that women did not feel the need to cover their breasts. An item worn only by the upper class was the kalasiris, a rectangular mantle made of very light, transparent fabric that could become a tunic when seams were added to the sides. (Nery, 2003, p.24)

This was worn by both men and women. When draped, the fullness was concentrated to front of the body. These drapes, furthermore, as well as the slightly starched pleats, were a sign of wealth. A colorful contrast was provided by wigs, belts, and great collars.

Draped clothing became the mark of civilization, and similar loose robes were also worn by Assyrians, Greeks and Romans.

^x "Those who followed the natural form of the body were looked on as 'barbarous' and, at one time, the Romans went so far as to condemn to death anyone who did so." Laver finishes by saying: "Draped clothing required a considerable advance in the art of weaving making it possible to produce rectangular cloth in sizes suited to the purpose" (Laver, 1996, p.14)



Figure 3 : A noble woman wearing Kalasiris: <http://www.pinterest.pt/pin/383439355755192250> , Retrieved from <http://www.costume.com.ar/images/Ind%20Egipto/mujer%20con%20peplo.jpg> Kalasiris, Accessed in: 05/01/2018

Fashion trends can first be seen in the costumesⁱ of the Ancient Egyptians. The principal fabric used for their clothing was linen which is ideally suited for use in the subtropical climate of the desert. Women wore long, simple dresses in sheath style held in place by shoulder straps. Often the sheath exposed the breasts as the people of the ancient world did not view this as immodest or indecent. Servants would wear just a loincloth or even work naked.

Linen was most important fabric in Egypt, made from the fibers of a plant called flax. Egypt had well-developed weaving techniques and many Egyptian workers were involved in producing linen fabrics. It was a light fabric which made it comfortable in hot weather. It was also easy to starch, or stiffen, into the pleats and folds which decorated the clothing of both men and women, especially beginning in the Middle Kingdom (c.2000-c.1500 B.C.E.)

ⁱⁱⁱ Greek clothing usually consisted of long, flowing garments, head wreaths, and sandals.

Egyptians used a variety of colours in their clothing, and these colours had symbolic meanings. Blue, for example, stood for Amon, god of air; green represented life and youth; and yellow was the symbol of gold. Red, which symbolized violence, was seldom used, and black was reserved for the wigs worn by both men and women. By far the most revered colour was white. White was a sacred color among the Egyptians, symbolizing purity. Luckily, white was the natural colour of flax (Sara Pendergast and Tom Pendergast, 2004, p.22-23).

Egyptians were not modest and enjoyed showing off their bodies. Women and men are frequently depicted in hieroglyphs, or picture stories, wearing see-through garments. (Sara Pendergast and Tom Pendergast, 2004, p.23)

Knowledge of Egyptian clothing has come almost entirely from studying the many hieroglyphs left in the tombs of kings and nobles. This has led some historians to question whether our knowledge of Egyptian clothing is based on reality or on idealized images. It seems likely that hieroglyphs would offer the best possible picture of clothing, making the colours brighter and the fit more pleasing, as photos in a fashion magazine do today.

The few physical remnants of clothes that have been found are in fact heavier and clumsier in their construction than those depicted in the hieroglyphs.

Yet, according to Sara Pendergast And Tom Pendergast, one of the facts about Egyptian clothing that has most intrigued historians is the lack of change seen in the clothing over many centuries. Basic garments such as the schenti and the kalasiris were virtually unchanged for more than twenty centuries. This lack of change has led historians Michael and Ariane Batterberry to conclude, in their book *Fashion: The Mirror of History*, that the Egyptians' costume habits shouldn't be considered fashion, which refers to styles of clothing that frequently change, but rather a symbol of this culture's consistently simple, beautiful, and enduring sense of style. (Sara Pendergast and Tom Pendergast, 2004, p.23)

3000 BC Ancient Greece

^{xi}The history of clothing in Ancient Greece traces its roots to three significant civilizations: the Minoans, the Mycenaeans, and the *Ancient Greeks*. Each of these civilizations created sophisticated clothing customs. Clothing for these civilizations served not only to cover and protect the body but also to decorate and enhance the beauty of the wearer.

The Minoan culture developed on the Greek island of Crete in about 3000 B.C.E. Minoans created a thriving society around royal palaces and survived for several hundred years. Archaeologists, scientists who study the remains of ancient cultures, have excavated sites in Crete to find pottery, frescoes (paintings applied directly to wet plaster on walls) on the walls of palace remains, and statues. These artefacts provide a vivid picture of Minoan culture, especially that of wealthy citizens.

Minoan remains indicate that Minoan clothing fitted the contours of the body and required knowledge of sewing techniques. Men wore a variety of loin coverings and rarely covered their upper bodies. Women wore tiered, bell-shaped skirts and fitted short-sleeved tops that exposed the breasts.

Minoans seemed to idealize tiny waists, and both men and women wore tightly fitted belts, or girdles, that cinched their waists down to a fashionably small size (Sara Pendergast And Tom Pendergast, 2004, P.119)

When the Minoan culture disappeared in about 1600 B.C.E., for reasons archaeologists have yet to discover, the Mycenaean culture began to flourish on mainland Greece. They invaded Crete where they encountered the Minoans. The remains of Minoan culture influenced the Mycenaeans who adopted many of their clothing styles.

Women's clothing is especially difficult to distinguish from Minoan clothing. Women wore the same long skirts and short-sleeved tops; however, paintings indicate that Mycenaean women did occasionally cover their breasts with a bib or blouse. Mycenaean men appear to have worn loin coverings similar to the Minoans, but more frequently they seem to have worn short-sleeved tunics with a belted waist.

The truly distinguishing costumes of the Mycenaeans were their armour. Evidence indicates that Mycenaeans were warlike peoples. For battle, Mycenaean soldiers wore protective clothing that wrapped the body from neck to thigh in bronze plates, bronze leg guards, and helmets constructed of boar's tusks (Sara Pendergast and Tom Pendergast, 2004, p.120).

In addition to dyeing, decorative designs were also painted, embroidered, or woven onto garments in many colours. Garments were also adorned with patterns of geometric shapes or trimmed with colourful border designs.

In Ancient Greece, clothing consisted of rectangular lengths of fabric made of linen or wool. As the climate was hot for most of the year, the Greeks wore light clothes as seen in figure 4. Their clothing usually comprised two main parts: a tunic (a *peplos* or *chiton*) and a cloak (*himation*).

Garments were secured at the shoulder with decorative clasps or pins with a belt, sash or girdle round the waist. Men's and women's clothing differed in length: men wore their robe to the knee while women wore their clothing to the ankle.

GREEK CLOTHING



Figure 4: Ancient Greek clothing tunic and a cloak. Source: [tripline.net/trip/Greece - England](https://www.tripline.net/trip/Greece-England), Retrieved from <https://www.tripline.net/trip/Greece%3A-Krissy-Parsons-33246711033010068676D90E90A6DDB4>, Accessed in: 05/01/2018

Women wore an inner tunic called a *peplos* which was made of wool and clasped at the shoulder. The upper part of the *peplos* was folded to the waist to form the *apoptygma*. Men and women of all ages wore the *chiton*, a lighter tunic made of linen and frequently pleated. A man's *chiton* was knee-length whereas a woman's fell to the ankles.

Greek clothing was essentially made up of three items: the *chiton*, a type of linen tunic, the *peplos*, a woollen over-garment worn by women, and the *chlamys*, a woollen cloak. Fabrics were coloured, patterned and decorated (Kölher, 2001, p.109)

Women wore an undergarment, called the *strophion*, round the mid-portion of the body and the shawl they wore over the tunic was called the *epiblema*.

When in public, some women also wore a loose veil. Women also wore necklaces made of gold and silver and had earrings and bracelets. Men wore a rectangular, blanket-sized robe made of wool which was called the *chlamys*. This was typical Greek military attire and, when not being used as a robe, it was wrapped round the arm to form a light shield in combat.

In the colder winter months, Ancient Greeks wore the *himation*, a larger cloak worn over the *peplos* or *chlamys*. With the passage of time, the *himation* came to be made from lighter materials and was worn throughout the year.

The Greek style of dress differed from their neighbours to the east. Men and women both wore long gowns, often in thicker wool.

^xThrough most of its history, clothing has followed two distinct lines of development, which have resulted in two contrasting styles of dress. The author means by this that manner of dress is divided between male and female styles, but this distinction has not always been followed as Greeks and Romans wore robes while the women of the Far East and Near East wore trousers (Laver, 1996, p.7)

Because much of our knowledge of Greek fashions comes from the marble sculptures they left behind, many people once thought that most Greeks wore only white clothes.

However, experts now know that even the pale marble of the statues was once covered with bright paint that wore off over the centuries.

Greeks, in fact, loved colour and many dyed their clothes. Wealthy aristocrats wore purple clothes dyed from a species of shellfish or pure white linen robes. Yellow clothes were worn mostly by women. Black clothes were worn by those mourning the death of a loved one. Peasants dyed their clothing a variety of greens, browns, and greys. Soldiers wore dark red garments to minimize the appearance of blood on the battlefield (Sara Pendergast and Tom Pendergast ,2004, p 121)

ADSⁱ The Romans

^{xii}The ancient Romans took the clothing traditions of the past and adapted them into one of the most distinctive costume traditions in all history. The greatest influences on Roman fashion came from the Etruscans, who developed an advanced society in Italy hundreds of years before the Romans became powerful, and from the Greeks. It was from these two cultures that the Romans inherited their love of draped garments.

But the Romans were also greatly influenced by the surrounding peoples they conquered over their years of expansion. From the Gauls, who lived in present-day France, they inherited a garment something like modern pants, and their trade in the Far East enabled them to use silk and precious stones.

There were two different sides to Roman clothing, however. On the one hand, the Roman clothing tradition was very stable, with the dominant garments staying the same from the time of the founding of the Roman Republic in 509 B.C.E. to the collapse of the Roman Empire in 476 C.E. But the materials used to make the garments and the way they were decorated changed a great deal.

“Garments made from rough wool in the early years were later made from rich, imported silk in the years of the empire (27 B.C.E.-476 C.E.). Strict rules about the kinds of stripes, or clavi, that could be worn on men’s tunicas, or shirts, and togas, long cloaks, in the early years gradually disappeared, and men later wore intricately patterned garments”. (Sara Pendergast And Tom Pendergast, 2004, p.165)

Wool spun by the women of the family was used to make Roman clothes. In later times, wealthier people had slaves to do this work for them. The wealthy could also buy linen, cotton and silk brought to Rome from distant parts of the Empire.

Romans began to set rules about clothing and became known as the epitome of style and fashion. Their togas had always to be arranged in a particular manner which told others their social rank or status.

The history of the rise and fall of the Roman Empire, including Roman costume during this engrossing era, has fascinated historians for two thousand years.

^{iv} A.D. 1570s, from Latin *Anno Domini* "Year of the Lord." First put forth by Dionysius Exiguus in 527 or 533 C.E., but at first used only for Church business. Introduced in Italy in 7c., France (partially) in 8c. In England, first found in a charter of 680 C.E. Ordained for all ecclesiastical documents in England by the Council of Chelsea, July 27, 816. The resistance to it in part might have come because Dionysius chose 754 A.U.C. as the birth year of Jesus, while many early Christians would have thought it was 750 A.U.C. [See John J. Bond, "Handy-Book of Rules and Tables for Verifying Dates with the Christian Era," 4th ed., London: George Bell & Sons, 1889] A.C., for *Anno Christi*, also was common 17c. Available in: www.dictionary.com/browse/a-d

^{xiii} According to Dinis and Vasconcelos, “the origin of Roman costume lay with the Etruscans who wore draped and sewn costumes and influenced the Romans in their clothing”. (Dinis and Vasconcelos, 2009, p.62)

The Etruscans developed an advanced society in Italy, inspired by the Greeks, several centuries before the Romans came to power and it was they who exerted the greatest influence on Roman fashion.

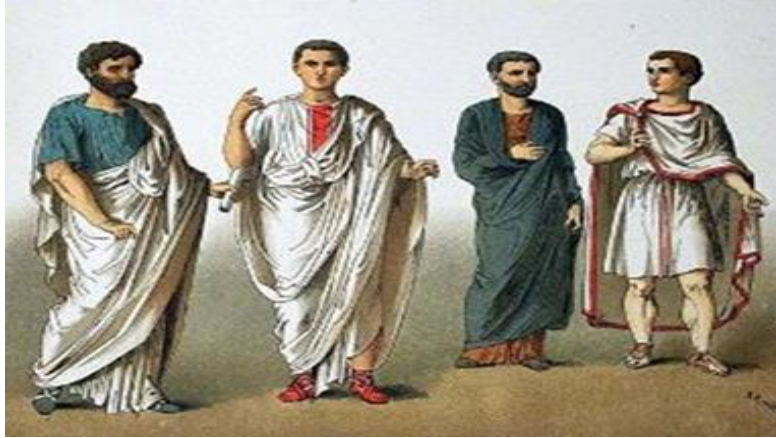


Figure 5: Roman toga and clothes copied from the Etruscans. Source: alamy. Retrieved from <https://www.alamy.es/imagenes/roman-toga.html> Accessed in: 06/01/2018

Romans were meticulous about the way they dressed, so much so, in fact, that they developed rules about who could wear what and how certain items should be worn.

Etruscan costume had a great influence on the Romans who subsequently came to dominate Italy, and the rest of the region. Wealthier Etruscans were particularly well dressed. Their clothes were made of fine wool, cotton, and linen and were often brightly coloured, following the Greek models on which they were based as seen in figure 6 where Aristotle and Alexander the Great wearing tunic and toga copied from the Etruscans.

Women, for example, typically wore a gown called a *chiton* under a shawl called a *himation*. Both garments would have been dyed in bright colours, and there is evidence to show that Etruscan women loved to wear extravagantly patterned garments. These included *tebennas*, or long cloaks, with *clavi*, or stripes. Men wore a loin skirt that covered their genitals and often wore a Greek-style tunic. The *lacerna*, a short woollen cloak, was also very common.

Braccae: Early Romans did not wear trousers. Both men and women wore beautiful, draped garments such as the *toga* or the *stola*, a long gown that hung almost to the feet.

Casula: The *casula* was a versatile outer garment which the Romans wore from around 200 B.C.E. and, in modified forms, it is still in use throughout the world today. The word *casula* means “little house”. Usually made of wool, it was a large oval or rectangular piece of fabric with a hole cut into the centre for the head to pass through.

Dalmatica: The *dalmatica* was a Roman variant of one of the most common of all garments, the tunic or shirt. To begin with, it had long sleeves and a bell-shaped hem that reached to the knees or even to the feet. In the fullness of time the *dalmatica* developed more elaborate styles. Both sides of the garment were often adorned with *clavi*, or stripes, and the way in which the sleeves were cut could be narrow at the wrist and broad at the shoulder, or the other way round.

Feminalia: *Feminalia* were close fitting knee-length breeches stretching the length of the thighbone. Despite the implication of their name, they were in fact worn most often by men.

Palla: The *palla* and *stola* were the most frequently worn items of clothing in female use in ancient Rome. A *palla*, a large, rectangular piece of woollen cloth, was wound round the body, either over a tunic, or shirt, or a toga if the wearer was unmarried, or over a *stola*, a long gown, if the wearer was married.



Figure 6: Aristotle and Alexanderⁱ the Great wearing tunica and toga. Retrieved from, Book Fashion, Costume, and Culture, Sara Pendergast and Tom Pendergast, Project Editor Sarah Hermsen, Imaging and Multimedia Dean Dauphinais, Dave Oblender.

Stola: The *stola*, a long gown usually without sleeves, was the married woman's standard garment in ancient Rome. It hung almost to the feet and was typically worn with two belts, an upper one fastened below the breasts created folds resembling a blouse while a wider belt fastened around the waist. The *stola* was often decorated in various ways.

Tunica: Throughout the course of Roman history, from the foundation of the city state in 753 B.C.E. until the fall of the Roman Empire in 476 C.E., two garments were essential to the male wardrobe: the *tunica* and the *toga*. The *tunica*, a type of shirt, was the simplest of garments adapted from the Greek *chiton*.

It was made from two rectangular pieces of fabric, set on top of each other. In the early Republic *tunicas* could have short sleeves which grew to full length in the days of the later Empire.

Styles and patterns of *tunica* changed a lot during the thousand years of Roman history. Long sleeves were not thought to be manly in early Rome and tunics were also cut above the knee. By the later Empire, however, after the second century C.E., long sleeves were common and *tunicas* extended almost to the feet.

Tunicas are generally regarded as a male garment but poorer women and children of all classes also wore them. The *tunicas* worn by children mirrored the styles of their parents. The *tunica* was a truly all-purpose garment and still survives in its basic form in many modern clothes, particularly the T-shirt.

Toga, more than any other single garment, the toga has come to be seen as the typical garb of Ancient Rome. It is seen ubiquitously on statues and in paintings of Roman men from the foundation of the city state in 753 B.C.E. until the fall of the Roman Empire in 476 C.E. During the years of the Republic (509-27 B.C.E.), the Romans were frequently known as the gens togata, or people of the toga.

The *toga* could be worn in many ways. Most frequently, it was held behind the back and draped forward across the left shoulder so that the end hung between the legs. It was then wound under, sometimes around, the right arm, over the chest and back over the left shoulder. Part of the toga could be lifted over the back of the head as a type of hood.

The clothing traditions of Ancient Rome have many other interesting aspects. The spread of the Empire to so great an extent to the warmer East and the colder West meant that Romans came to live in very different climates, consequently they became the first major civilization to wear different clothes for different seasons.

They made warm boots for the winter and history's first known raincoat.

^v The picture above shows the great philosopher Aristotle, right, teaching his pupil Alexander the Great. Both men wear traditional Roman clothing: Aristotle wears a toga and Alexander wears a tunica.

Because their empire spread to so many other countries, particularly across Europe as far as the British Isles, many Roman traditions spread and variations on Roman costume can clearly be seen to this day in the vestments worn by priests of the Roman Catholic and Anglican Churches.

^{xii} Weather was one of the determining factors in the variation of types of clothing. In regions where the temperature was low, warm clothing was necessary. On the other hand, tropical climates with high temperatures allowed greater variety in means of covering and ornamenting the body. "In temperate zones, the climate as well as religious and social customs influenced the way of dressing". (Dinis And Vasconcelos, 2009, p.57)

There is much more of interest about Roman clothing traditions. Because their empire grew so great and took them into very different climates, the Romans became the first major society to wear seasonal clothing – that is, clothes for both warm and cold climates. They made warm winter boots and the first known raincoat. The spread of their empire also meant that Roman traditions spread into other countries, particularly throughout Europe and into the British Isles. Variations on ancient Roman costume can still be seen in the vestments, or priestly clothing, worn by members of the Roman Catholic Church (Sara Pendergast And Tom Pendergast, 2004, p.167)

The Middle Ages (1000-1300 AD)

^{xviii}Kings and queens wielded dominant influence on the development of fashion during the medieval period. Only the wealthy could dress in fashionable clothes as shows figure 7. Ordinary people, the peasantry, were restricted in what they could spend by the Sumptuary Laws, and this included money spent on clothes. King Edward III in England passed Sumptuary Laws which permitted only royalty to wear cloth of gold and purple silk. Women of lower classes were banned from wearing expensive veils.

Only the wives or daughters of nobles were allowed to wear velvet, satin, sable or ermine. Fashions changed with each king and queen. During the Middle Agesⁱ, a person's headdress was a clear marker as to their social rank.



Figure 7: ladies of High Middle Ages. Source: History of Western Civilization through Fashion. Retrieved from <https://www.alamy.es/imagenes/roman-toga.html> Accessed in: 07/01/2018

People wore loose tunics of linen or wool tunics during the medieval period. As the era progressed, clothing became more distinctive and men and women of different professions wore clothing individual to their trade. Men wore woollen trousers under the tunics. Kings and noblemen wore long tunics that came down to the ground.

Women wore 'kirtles'. These were tunics that came down to the ankles. Shirts were worn over these and, when in public, women often wore a shorter kirtle on top of the tunic. Noble women dressed luxuriously. Married women wore tight-fitting caps and nets over their hair.

A 'bun' was a standard form of hairstyle though some women wore veils and their hair would be tightly braided or left to hang loose.

^{xiv}Dinis and Vasconcelos, "Tell us that, during this period, the evolution of pattern making made it possible for garments to be better cut with gussets and pleats". (Dinis and Vasconcelos, 2009, p.64)

From 900 A.D to 1000 A.D

Clothing in the early Middle Ages was worn very tight to show off better the beauty of the female form. Long tunics were fastened at the waist and, if there were sleeves, closed at the wrist, though many women wore sleeveless tunics.

Their clothing comprised two tunics plus a veil thrown over the head which could fall down front and back to cover the entire neck. In addition, queens, princesses and noblewomen wore a long, ermine-lined cloak.

From 1000 A.D to 1100 A.D

^{xv}During this period, clothing consisted of two tunics, one longer than the other, the longer worn beneath the shorter. Tunics had previously hung loose without definition. Both men's tunics and women's dresses were now fitted more closely to the body, which increased both warmth and style. Gowns closely followed the contours of the body from the shoulder to below the waist and a separate, fuller skirt was sewn to the bodice.

Tight sleeves, pleated in many folds, reached down to the wrist. The longer sleeve of the over tunic was exaggeratedly elongated to such an extent that the hem of the lower part of the sleeve sometimes reached the ground. The lower part of the dress, the neckline and the borders of the sleeves were embellished with decorative bands. The waist was encircled, just above the hips, by a girdle.

A veil, finely worked, completely covered the hair and was fastened over the head to cover the shoulders and hang down to the feet. It was not fashionable to show long visible plaits. Different colours were used for the underdress, but the gowns and outer tunics were usually white.

From 1100 A.D to 1200 A.D

^{xvi}During this period, clothing consisted of a linen cap with lappets hanging over the shoulders.

The robe was fastened with long bands which were attached to the sleeves near the wrists and went around the waist. Near the collar, a round buckle fastened the tight gown and two cloth bands went around the neck to look like a necklace.

^{vi} In the history of Europe, the Middle Ages (or Medieval Period) lasted from the 5th to the 15th century. It began with the fall of the Western Roman Empire and merged into the Renaissance and the Age of Discovery. The Middle Ages is the middle period of the three traditional divisions of Western history: classical antiquity, the medieval period, and the modern period. The medieval period is itself subdivided into the Early, High, and Late Middle Ages. available in: https://en.wikipedia.org/wiki/Middle_Ages

The women wore long cloaks and closed shoes, now pointed in style. Coloured bands were attached to the shoes and tied round the ankles allowing the shape of the foot to be seen.

Medieval women wore a broad band attached to the headdress. This was tied below the chin helping to frame the shape of the face. Women also wore surcoat, a large wrapper with sleeves. This was worn over the upper part of the robe. With the passage of time, women began to wear sleeveless surcoats.

From 1200 A.D to 1300 A.D

^{xvii}The thirteenth century was a period of luxury and medieval clothing was embellished with jewellery made of gold and silver with pearls and precious stones. Women wore large belts made of solid gold and men wore pointed shoes, as seen in Figure 8.

Gowns with tight bodices were worn below close-fitting, fur-trimmed jackets which reached just below the hip. The gown had long, tight sleeves with a small slit at the wrists and was fastened in front with a row of buttons.

Hairstyles were plaited and fell close to the side of the face, down to the neck, and were decorated with gold and silver ornaments or pearls. Pointed caps were worn with turned up borders, the hair gathered in thick curls to the side. Long, pointed shoes were worn with richly embroidered clothing.



Figure 8: Late Middle Ages - Medieval Clothing. Source: Dolores Monet. Retrieved from <http://www.bellatory.com/fashionhistoryofthemiddleagesclothing> Accessed in: 07/01/2018

From 1300 A.D to 1400 A.D

^{xviii}Coats and surcoats worn during this period trailed on the ground and were accompanied by wire-framed hats covered in lace or embroidery. The hair was kept in place with a net of silk.

The surcoat became a wide, trailing coat kept in place on the shoulders and draped at the lower part of the body.

A corset encased in rich silken lacework in summer and fur in winter was worn externally to front and back without concealing the outline of the bust. A steel busk kept the corset in place.

Women adorned themselves with false hair and wore nets to allow the mass of false hair to be partly visible, hidden behind padded puffs.

The Renaissance 1450 A.D to 1600 A.D

^{xix} Renaissance means “rebirth”. According to Steele Philip, “Historians use the term to describe the revival of learning that took place in Europe toward the end of the Middle Ages. The scholars of the day looked back to the literature of Ancient Rome and Greece for their inspiration, but this was also a time of looking forward: the start of the modern world. The Renaissance was at its most exuberant in the small city-states of Italy and across southern Europe, but it influenced the north as well.” (Steele Philip, 2005, p.26)

Renaissance (1450-1600): Renaissance fashion is one of the most readily identifiable styles in history. European women favoured flowing skirts, lengthened corsets and decorated hair. Men wore hose and low-necked tunics. The most popular choices of fabric for both men and women were rich velvets, brocades, and linen. A typical Renaissance man wore a doublet, a snug-fitting jacket with or without sleeves, along with skirt, hose and shoes.

Isabella of Portugal is shown in figure 9, wife of the Holy Roman Emperor Charles V, wears pearls, jewels, velvet, and lace in this painting of 1548 (Steele Philip, 2005, p.28).

The Renaissance was a time of many great artists [...] Patrons who paid for the paintings loved to see themselves displayed in the very latest fashions, [...] artists delighted in capturing the quality of silks, velvets, and pearls on canvas. Some, such as Antonio Pisanello (c.1395-1455) and Jacopo Bellini (c.1400-1470) went further and designed textiles themselves. They could be seen as the first fashion designers (Steele Philip, 2005, p.27)



Figure 9: Queen Isabella of Portugal in a Burgundian Style Costume. Retrieved from http://www.wikimedia.com/public_domain Accessed in: 07/01/2018

Steele Philip (2005) Traditional long costumes and mantles were still worn at the coronations of European kings and queens in the fifteenth and early sixteenth centuries, and the various regalia appear on coins of the day. The courtiers at the enthronement of the elected doge (chief magistrate) of the republic of Venice shimmered with silk, damask, and cloth of gold, the most costly fabric of the day.

The doge himself wore an embroidered horn-shaped cap rather than a crown. Venice derived its wealth from maritime trade, and each year the doge would throw his official ring into the waves as a symbol of the “marriage” between Venice and the sea.

During the fifteenth and sixteenth centuries, short costumes became increasingly fashionable among young men, although their fathers preferred to wear long gowns. Knee-length or calf-length garments, often with very long, fancy sleeves, also went in and out of fashion.

“In the 1400s the doublet was generally very short, revealing the full length of the leg, clad in hose. Virility was often emphasized and exaggerated with a codpiece”. (Steele Philip, 2005 p.29)

“In the 1500s noblemen wore puffed sleeves, slashed to show the rich, silk lining. “Trunks”, or short breeches, now appeared, and by the 1530s these often reached the knee. Short cloaks also became popular at this time”. (Steele Philip, 2005 p.29)

^{xx}A longer, flowing jacket was worn over the doublet. Men’s shoes were long and pointed. Leather clogs were used out of doors. According to their social class and status, women wore a chemise and stockings made of wool, linen, cloth or silk. “Gowns were known for their full skirts and wide sleeves. Headdresses, including coiffed hair and padded hoods, were very elaborate. Dresses, trimmed in a most costly manner, became shorter and necklines rather lower to display necklaces”. (Steele Philip, 2005 p.29-30)

Women’s gowns became high-waisted. Further developments included a low-cut V neck which was folded back to reveal an attractive lining in a contrasting fabric beneath. Cuffs were added to the long-fitted sleeves in what was known as the Burgundian fashion.

Elizabethan (1558-1603)

^{xxi}Originality of style reached a new summit during Queen Elizabeth I’s reign. The Renaissance was at its height during the Elizabethan Age with art, music, literature and theatre all reaching pinnacles of achievement.

Men and women’s apparel became even more elaborate as seen in figures 10 and 11. Men wore very square, severe styles while women favoured huge, voluminous skirts framed by wire hoops secured with tape and ribbon. Iconic portraits of William Shakespeare and the Queen are symbolic of this period; the ruffled collars and wide, stylized headdresses represented the very cutting edge of fashion. For the first time in the recent history of apparel history, women wanted their clothing to be similar to that of the men, with slim waists, broad shoulders, and puffy sleeves.



Figure: 10- Queen Elizabeth I, c.1585-90. Figure: 11- Man, In A Spanish Cloak & Doublet Retrieved from.: <http://a1reproductions.com/queen-elizabeth-i-c-1585-90-by-mary-ellen-best-oil-painting.html> Accessed in: 07/01/201

Baroque (1604-1682)

^{xxii}The Baroque period in the history of clothing began in Italy in the first half of the seventeenth century and soon spread to the rest of Europe, reaching its zenith in France in the reign of the Sun King, Louis XIV. Ruffled collars gave way to softer, wide collars made of lace or linen.

The sleeves of the outer garment were often split, revealing the fabric of the chemise, or undershirt, beneath, and they ended at the elbow to show the forearm. Higher waists were popular with both sexes and hats with wide, floppy brims became the vogue. Women's gowns were looser fitting than formerly and were lightly decorated with embroidery and ribbons.

Men wore doublets and utilitarian leather jackets called "jerkins", while hose were replaced by full, knee-length garments called "petticoat breeches" which were decorated with ribbon and bows.

Rococo (1714-1830)

^{xxiii}Figure 12 shows the Rococo fashion in the pre-French Revolution era is most easily recognized by the expensive, exquisitely tailored garments that were the hallmarks of the courts of Louis XV, and then Louis XVI and Marie Antoinette, between 1715 and 1780. In England, the comparable period is known as Georgian because it took place during the reigns of George I to George IV (1714-1830)



Figure:12- Man and Woman, Baroque and Rococo periods. Retrieved from <http://www.wordpress.com/category/baroquerococo-1650-1800/>; - Accessed in: 08/01/2018

Lace, silk brocades and high heels were popular with both men and women as were very tall powdered wigs. Panniers, or structured side hoops, were worn beneath women's dresses to widen the silhouette. Men wore plain coats with curving tails and long, tight breeches. Women's fashion became influenced by ancient Greece following the French Revolution and dresses were worn draped round the body and without corsets.

Regency (1811-1837)

^{xxiv}The fashion of the English Regency era was much simpler than in the past, but it is still an important part of the history of apparel. The elaborate gowns of the former century were replaced by lightweight dresses tied at the waist with a sash and accentuated by a bodice made of gauze. Ladies wore pelisses,

long-sleeved three-quarter length jackets, and wide brimmed hats secured with ribbon under the chin. Men's clothing was essentially practical, with pantaloons and tall boots suited to riding.



Figure:13- The Regency era in the United Kingdom. Retrieved from [https://www. Susan Macdonald's Blog/wordpress.com](https://www.Susan_Macdonald's_Blog/wordpress.com) Accessed in: 08/01/2018

Victorian (1837-1901)

^{xxx}Women's dresses at the beginning of the Victorian era, as seen in figure 14, were pale and simple, with wide "leg of mutton" sleeves. The petticoat, chemise, and corset were the standard undergarments. It is interesting to note that the Victorian era plays an important part in the history of the T-shirt as an early version of this undershirt was invented at this time. Popular accessories were bonnets, gloves, and cameo brooches. By the mid-19th century, wide sleeves had been replaced by long, fitted sleeves and later "bell" sleeves. Necklines rose in line with the modesty of the era.

During the day men wore informal, loose fitting "sack coats", turning to a waistcoat or frockcoat with top hat for formal dress.



Figure: 14-Victorian Clothing Styles. Retrieved from <https://victorianchildren.org/victorian-dress-and-victorian-style-clothing/> Accessed in: 10/01/2018

Art Deco (1911-1946)

^{xxvi}Early 20th century fashion blossomed before and after the Great Depression. This was a time of experiment when knee and calf-length skirts became popular for the first time in fashion history and dresses were being made with interesting fabrics, beading and draping. Knitted and rayon fabric evolved and novel ideas such as the sweater were being introduced into menswear. Another important part of the T-shirt developed in importance after the Second World War when men began wearing them for casual dress.



Figure:15- Early Art Deco (1911-1929). Figure:16- Late Art Deco (1930-1946). Retrieved from <http://char.txa.cornell.edu/art/dress/historic/earlyart/earlyart>. Accessed in: 10/01/20.

Mid-Century (1950-1970)

^{xxvii}The defining points of the mid-20th century fashion time line, shown in Figure 17 included hourglass figures, tailored bustlines and full, A-line skirts. Poodle skirts, often worn with cardigan sweaters and saddle shoes, were a common trend for young girls, and were worn over petticoats. Suits, ties and shirts with button-down collars were standard formal wear for men while the popularity of the T-shirt and jeans grew among the younger generation. By the 1960s, fashion had changed dramatically with short dresses and tight jeans a popular option for women.

Until this time clothes had been made on a per person basis, but ready-to-wear clothing now began to appear. Abba Gould Woolson began the movement to create ready-to-wear fashions which enabled clothes to be made in bulk and sold to a mass market.

Many historians, including Laver (1989), believe that men's and women's clothing gained a new diversity of form, particularly from the fourteenth century when the first indications of fashion began to be seen.



Figure: 17 - Fashion time line. Retrieved from <https://sewinwonderland.wordpress.com>. Accessed in: 12/01/2018

French style had led western dress from the thirteenth century due to its shapes and decoration. This influence was most keenly felt in England because, according to Köller(2000), Germany, Italy and Spain were more independent and had styles of their own.

1980s /1990s, Modern clothing (present day)

^{xxviii}“The eighties saw the end of labour union influence in politics, and the rise of a riskier, more individualistic, free market culture. Fashion changed to reflect the “greed is good”, ambitious attitude. Some clothes expressed this desire to seem successful, while others were a deliberate rejection of those values”.(Hibbert Clare, Hibbert Adam, 2005, p.44).

As in the twenties and thirties, men’s suits stiffened to create a triangular frame with wide shoulders and a fitted, narrow waist. This powerful look was emphasized with very dark grey flannel materials and expensive details, such as silk linings. Names like Armani, Gucci, Ralph Lauren and Calvin Klein became global fashion brands.

“Women’s suits also widened at the shoulders, which were built up with shoulder pads, while skirts shortened. Hair was worn fluffed out as “big hair. “Make-up became bolder and used a wider palette of colours. The result was more powerful and predatory.” (Hibbert Clare, Hibbert Adam 2005, p.44).

1980s style was mainly about one thing: more is more. Regardless of the style you preferred, the more-is-more approach was present. If you went for an office look, your shoulders would be heavily oversized, and your outfit was in strong, contrasting colours.

If you favoured a funky look, voluminous hair, neon colours and denim on denim was the order of the day. Edgier fashion, as in rock, went full on with black, leather, animal prints and T-shirts with motives. Without doubt, the decade was voluminous, over the top and went big even when outfits were quite simple. The silhouette to strive for was the inverted triangle; bodysuits, leg warmers and blazers were clothing pieces for workouts, often with matching (or not matching) leggings in neon shades or any other popping colour. Loose shirts in silky materials combined with high-waisted pants and a belt to mark the waist was common.

As design and detail became increasingly important to the discerning consumer, Japanese expertise with texture and fabric became a must-have. First recognized in the seventies, designers Issey Miyake, Kenzo,

and Yohji Yamamoto won the loyalty of many American and European consumers (Hibbert Clare, Hibbert Adam, 2005, p.44).

Transition to the 1990s:

^{xxix}In 1983 none other than the one and only Karl Lagerfeld took over the legendary fashion brand Chanel, which is still highly successful and influential.

“At the beginning of the nineties the Cold War finally ended with the breakup of the Soviet Union. In 1991, American president George Bush announced a “new world order”, where nations would work together to end war and poverty. But the nineties were a decade of instability, with countries and federations breaking up, sometimes violently”. (Hibbert Clare, Hibbert Adam, 2005, p 48).

The fashion Trends of the 1990s are in many ways are similar to the 1980s, as shown in figure18. The oversized silhouette remains, if less dominant, also the pastel shades and use of denim and strong colours. The decade often feels like a less glamorous version of the ‘80s, with functional clothes as well as street style being more to the fore.

Clothes of the late 1980s and early 1990s are quite similar and not too easy to separate, something that underlines late 20th century fashion history. As the ‘80s progressed, the emphasis on the inverted triangle silhouette decreased and a slim, defined fashion emerged. 1980s supermodels continued to dominate the fashion world during the 90s but new stars such as Kate Moss, Naomi Campbell, Linda Evangelista and Claudia Schiffer emerged.

The 1990s saw the genesis of two sweeping shifts in Western fashion: the beginning of the rejection of fashion which continued into the 2000s among a large section of the population, and the beginning of the adoption of tattoos, body piercing (other than ear piercing) and, to a lesser extent, other forms of body modification such as branding. This started the indifferent, anti-conformist approach to fashion which was popular throughout the 1990s, leading to the popularisation of the casual.

The ‘80s and ‘90s introduced big fashions for both men and women. With the passage of time from the twentieth century to the twenty-first, fashions continued to change with each year, as it continues changing to the present day.



Figure: 18- Fashion Trends 80s and 90s. Retrieved from <https://sewinwonderland.wordpress.com>

Dinis and Vasconcelos (2009) point out that “(...) the passage of time and historical events, along with technological innovations, have contributed to the development of dress as an adaptation of progress.” Monteiro (2002) tells us that historical events are reflected in the way people dress: war; periods of wealth or poverty; religious influence. Every phase lived by man influences dress. Dinis and Vasconcelos (2009, p.59-60) note that, according to Boucher (1987), the evolution of costume in Europe can be divided into three phases:

1st phase: from antiquity to the fourteenth century. With nations yet to be formed, costume varied greatly from region to region but underwent little evolution during this period, maintaining a uniformity within each social class and lacking personal characteristics. Clothes were usually long without a defined silhouette and were draped. They reflected religious functions or social customs.

2nd phase: from the fourteenth to the nineteenth century. Dress became tighter and shorter. It also gained national characteristics as trade and politics evolved in each country, and a personal stamp which allowed for the creation of individual styles out of particular customs and tastes.

3rd phase: from the mid-nineteenth to the twenty-first century. As new means of production evolved, influenced by mass production, clothing moved from the individual to become increasingly international. Companies within the clothing industry increased their enterprise to gain ever more customers. At the same time, haute couture, which emerged in the mid-nineteenth century, combined to maintain personal style with the imperative change of fashion, the privilege of wealthier classes.

Dinis and Vasconcelos (2009) conclude that a fourth phase can now be added from the end of the twentieth century to the present. This phase capitalizes on the customization of made-to-measure garments marketed by the Internet.

1.2 The History of Sewing Patterns

xxxSewing itself dates back thousands of years, to the Palaeolithic period, but constructing patterns for making clothing is a much more modern development.

Studies of antiquity tell us that the earliest known fashion patterns date back to ancient Egypt and were fairly simple guide templates cut from slate. (Similar slate guides, presumed to be the products of trade, have also been found in ancient Roman catacombs.) However, for most of the early period of human history, clothing was mainly constructed from rectangular shaped pieces of uncut woven fabric.

Producing fabric was very labour intensive and it was therefore costly to purchase so, for the most part, it was left intact to minimize waste. The wearer almost always made his own clothes at this time. The cloth itself rather than the shape or design of the garment was the distinguishing feature.

According to Laver (1996), the first geometrical shape to appear in pattern making was the rectangle. The simplest means of making a garment was to wind pieces of cloth around the waist, which improvised a sarong and created the form of a skirt. And it was this method of creating garments that gave rise to three-dimensional pattern making, draping.

The first use of the word “tailor” appears in Europe in the year 1297. This suggests that pattern making must have begun at some earlier point as tailoring involves the act, or art, of cutting and sewing cloth, the two basic aspects of constructing clothing from a pattern. Also, in the 13th century, a French tailor tried to make patterns from thin pieces of wood. However, this tailor’s invention was thwarted by the powerful Tailors Guild whose members worried that such an invention would put them out of business.

According to Nora MacDonaldⁱ, Professor of Fashion, Dress & Merchandising; the real art of pattern making did not begin until the 15th century, as a result of two pivotal historical moments: the Renaissance, which took in the desire to dress in a way that accentuated the human form, and Gutenberg’s printing press. The former led to carefully engineered pieces of fabric being cut to make clothing that contoured the body. The latter meant that images of clothing designs could be circulated more widely.

^{vii} The success of sewing patterns could not be ignored, and the competition would really begin; by 1869, James McCall started his pattern business. Nora MacDonald is a Professor and Curriculum Coordinator for the Fashion, Dress and Merchandising program in the School of Design and Community Development. She also serves as Curriculum Coordinator for the Davis College and College of Creative Arts *Disegno Italia* study abroad program. Her teaching assignment includes: apparel design and illustration, visual merchandising, apparel production and fit, flat pattern design, fashion study tour, and teaching practicum.

Now, when the wealthy wore new form-fitting gowns, poorer people were able to see images of the designs even if they had never visited the big cities, let alone the court. As the European states grew in power, so they influenced each other, and what the leading people were wearing was a large part of that influence. Fashion was truly born.

At that time, fashions continued to be made by tailors. The process was elaborate, with tailors working individually with their clients to take measurements, to customize and even create patterns. Such highly esteemed skills were very costly, which meant the services of tailors could only be afforded by the very rich. This continued to be the case until the Industrial Revolution.

To remain in fashion was a very laborious process for those who could not afford a personal tailor. The publications of the day, such as Godey's Lady's Book, The Young Ladies' Journal, and Peterson's Ladies' National Magazine (later simply called Peterson's Magazine), showed the latest fashion designs but the accompanying text was more an ornate description than a set of step-by-step instructions.

In the average household the lady of the house and her daughters made the clothing and they struggled to use the fashion lithographs provided. Diagrams were not often provided, and measurements were not given. Even when a woman had the talent to make the necessary calculations, all the sewing had to be done by hand – and sewing could only be undertaken after more vital and immediate work had been done. By the time a dress was finished, it could already be out of fashion.

The Industrial Revolution brought with it a wide range of advances which greatly improved the living standard of ordinary people, introducing less expensive textiles and promoting an even greater desire for fashions, naturally spurring further advances in the fashion industry. From the beginning of nineteenth century, when the first sewing machines were invented, the history of clothing patterns begins to parallel closely the development of the domestic sewing machine. Paper patterns were first seen early in the century.

These early nineteenth century patterns had all the pieces of a garment superimposed on one large paper sheet, each piece coded with specific lines, in different patterns (straight lines, dotted lines, scalloped lines, broken-dash lines or even combinations of these). Each pattern piece can be seen in Figure 19.

These patterns were sold in a one-size-fits-all mode; it was up to the seamstress or housewife to measure and grade (enlarge or reduce) each piece to fit the individual who would be wearing the garment.



Figure: 19 - Photo of uncut paper patterns above from Journal des Demoiselles, with illustrations, via Whitaker Auction Co. Retrieved from <http://www.inherited-values.com> Accessed in: 20/01/2018.

Sewing machines came into mass production for domestic use by the 1850s and became popular for use in the home between 1854 and 1867.

^{xxxi}Yaffa Draznin, Author of the book, "Victorian London's Middle-Class Housewife": What She Did All Day Contributions in Women's Studies by Nov-2000; says:

“The housewife with free time in the afternoon was far more likely to spend it at the family sewing machine than in making social calls. For the first time, it was possible to make a man’s shirt in just over an hour whereas before it would have taken 14½ hours by hand; or, to make herself a chemise in less than an hour instead of the hand-sewing task of 10½ hours. No wonder the middle-class married woman welcomed the domestic sewing machine with such enthusiasm!”. (Yaffa Draznin, 2000, no page)

Singer’s first consumer, or domestic, sewing machine, the Turtle Back, which took its name from the large container it came in, appeared in 1856 and, naturally, it could hardly go unnoticed by the ladies’ magazines and household manuals. Dressmaking began to be covered, embracing everything from taking measurements to advice on fitting garments and, of course, the patterns themselves.

Magazines began to print dress patterns inside their pages. However, in the mid-1800s sewing patterns for fashionable garments were rather complicated, creating an opening for people like Ellen Louise Demorest and her husband William Jennings Demorest, who began to help those who were interested in sewing at home. By 1860, Madame Demorest’s Emporium of Fashion began advertising her hand work patterns in magazines, with the patterns cut to shape in two options for the consumer: purchased “flat”, where the cut patterns were folded and mailed, or, for an additional charge, “made up” where the pattern pieces were tacked into position and mailed. (Yaffa Draznin, 2000, no page)

Madame Demorest’s patterns from the Emporium of Fashion were promoted through fashion shows held in homes.

However, in figure 20, patterns were still only available in one size at this time. As most of us know them, patterns had their roots in the winter of 1863. The studies tell us that Ellen Butterick and her complaint “were the mother of invention”. In fact, it was her husband, Ebenezer Butterick, an inventor who had formerly been a tailor, who revolutionized sewing patterns and fashion history in the winter of 1863.

xxxii“Snowflakes drifted silently past the windowpane covering the hamlet of Sterling, Massachusetts in a blanket of white. Ellen Butterick brought out her sewing basket and spread the content on the big, round dining-room table. She was fashioning a dress for her baby son Howard from a piece of sky blue gingham. She carefully laid out her fabric and, using wax chalk, began drawing her design”. (Ebenezer Butterick 1863)

The idea of producing patterns in sizes was revolutionary and by spring the following year, Butterick had produced and graded sufficient patterns to be able to package them in boxes of 100, selling them to tailors and dressmakers. The patterns were created from carbon board.



Figure: 20 - 1899 Butterick Pattern - Ladies Double Breasted Coat. Figure 21- Early sewing patterns by Butterick, McCall’s, *The Delineator*. Retrieved from <http://www.inherited-values.com> Accessed in: 20/01/2018.

Butterick's patterns were for men's and boys' clothing during the first three years. Dress patterns came in 1866 which is when the sewing pattern business really began to take off. The success of sewing patterns was so great that it could not be ignored and by 1869 James McCall had started his pattern business.

The early sewing patterns by Butterick, McCall and Demorest were not printed. Instead they were outlined on tissue paper by a series of perforated holes and instructions included suitable suggestions about fabric, size information, and a description of how to cut the pieces from the tissue and piece them together to form the garment (assisted by a code of shapes, such as v-shaped notches, circles, and squares cut into the paper). As with the earlier publications, The Delineator was originally intended simply to market Butterick patterns. However, it quickly expanded into a general interest magazine for women in the home.

In 1875, in addition to marketing paper patterns through the magazines, Butterick produced the first in-store sewing pattern catalogues.

Madame Demorest was still in business and, in 1877, business was at its peak. The Demorests' Monthly began circulation in London and, along with the quarterly, the company began to publish Madame Demorest's What to Wear and How to Make It. The Demorests sold their pattern business in 1887 and it lived on essentially in name only.

By the 1900s, home sewing and clothing patterns were big business. According to Zuelia Ann Hurt in Craft Tools – Then and Now (Decorating & Craft Ideas, October 1980 issue), one of the last people to enter the fray at the turn of the century became one of the big names in sewing pattern collecting. The leading fashion magazine Vogue, shown in Figure 22, began to publish a coupon for a pattern soon after 1900. For fifty cents, the reader received on her dining-room table a pattern hand-cut by the designer Mrs Payne.



Figure: 21- Vintage Vogue Paris Originals Pattern, Nina Ricci. Retrieved from http://www.vintagepatterns.wikia.com/wiki/Vogue_1125_A. - Accessed in: 20/01/2018.

While Vogue used its publishing power to spawn a fashion pattern business, other sewing pattern companies did not slow down. In 1902, James McCall's magazine The Queen of Fashion changed its name and became McCall's Magazine.

^{viii}Vogue Patterns fully transitions from perforated to printed tissue patterns. In 1961, Butterick licensed the Vogue name and began to produce patterns under the Vogue name.

The Butterick sewing pattern industry introduced the “deltor” in 1910. This was the first-time instructions printed on a sheet were included in the envelope with the pattern.

In 1914, B Altman’s department store in New York City became the first store to stock the patterns of the Vogue pattern department, and the department officially separated from the magazine to become the Vogue Pattern Company. Vogue Patterns went on to launch the Vogue Pattern Book in May 1920.

A further development came in 1920 when McCall’s took the initiative to change from producing perforated tissue patterns to printed ones, and they also began to work with designers such as Lanvin, Mainbocher, Patou, and Schiaparelli.

The Simplicity Pattern Company was founded in 1927 by Joseph M Shapiro with his eldest son James J Shapiro. In 1931¹, Vogue started its Couturier Line and introduced new large format envelopes while Simplicity began producing DuBarry patterns exclusively for F W Woolworth Company, which continued until 1940.

Condé Nast started the Hollywood Pattern Company in 1932. Hollywood Patterns in Figure 21 were very popular because they featured designs straight from film and often had photos of Hollywood stars on the packaging. They continued production until shortly after the end of World War II. Illustrations in full-colour appeared on the covers of McCall’s pattern envelopes from 1932.



Figure: 22 - Betty Grable Hollywood Pattern. Retrieved from <http://www.betsyvintage.com> Accessed in: 20/01/2018

In 1933 Advance began manufacturing patterns for the J C Penney Company which were sold exclusively at their stores. Over a period of time, this connection brought a number of designers, including Edith Head and Anne Fogarty, as well as rights from Mattel for authentic Barbie fashion patterns.

Simplicity eventually changed completely to printed sewing patterns in 1946 and in 1949 Vogue added the Paris Original Models patterns from French Couturiers. It was the only company authorized to duplicate these designs. Such deals with international designers were to expand, including millinery designs in 1953 and International Designer Patterns in 1956.

McCall’s patterns began to produce a further designer line in the 1950s. This included the work of the French couturier Hubert de Givenchy and the Italian, Emilio Pucci. Vogue Patterns completed the transition from perforated to printed tissue patterns in 1958.

In the 1960s, McCall's "New York Designers' Collection Plus" featured designs from Pauline Trigere and Geoffrey Beene, among others. In 1961, Butterick licensed the Vogue name and began to produce patterns under it. The "Young Designer" series, featuring designs by Betsey Johnson, John Kloss, and Mary Quant, was produced by Butterick starting in 1960s and continuing through the 1970s. Vogue Patterns fully transitions from perforated to printed tissue patterns. In 1961, Butterick licensed the Vogue name and began to produce patterns under the Vogue name.

By the late nineteenth century industrial innovations appeared in the manufacturing process of pattern making. The pattern maker made the first pattern by culling information from the construction meetings. The paper pattern was then drafted on to muslin (a plain fabric) and a sample garment was draped up. The drape was pinned and basted (hand stitched) to keep it in place. The drape was thoroughly reviewed by both the pattern maker and designer, adjustments being made as required.

^{xxxiii}Pattern making is the logical ordering of a project, the basic exposition of what it is planned to make. The term "pattern making" is a translation of the expression "project design". [...] when you intend to create or recreate a product, or when you want to put shape to an idea, you design or model the project. (Thiry-Cherques, 2006, p.19)

Once the drape is approved, the pattern draft is turned over to computer-aided design (CAD/CAM). The technician digitizes the basic pattern pieces. All the separate pattern pieces are then blocked, that is to say, they are created with all the information and additions (seam allowances, fold lines, dart lines, etc.) required to make them usable pattern pieces. It should be noted that, at this stage, everything is made up in Standard Clothing Pattern size 10. After blocking, the pieces are mapped using a laser plotter.

The completed size 10 pattern is sent to the dressmaking department where it is tested using several different fabrics. The home sewer's techniques using a domestic sewing machine are simulated to ensure the design will be suitable for use with various fabrics and that it is not too complicated to construct.

Once the home-sewing test has been passed, the pattern is graded to different sizes using a computer program. The complicated task of grading patterns, which formerly had to be carried out manually by the patternmakers, is now computerized.

The measuring department determines the fabric yardage and notions needed. Computer software helps technicians to create the very best fabric layout to suggest so the fabric can be used efficiently. Once all information for step-by-step instructions is to hand, they are written up for the consumer in easy-to-understand language.

A computer template (or plot) is used to plot out the pattern. Pattern pieces are laid out in such a way that little tissue will be wasted in the printing process. The computerized plot and the instruction sheets are sent physically to the printer. The pattern envelope, however, is sent to the pattern printer electronically.

The plot is unrolled on a pre-sensitized plate of aluminium that varies in size according to the size of the tissue sheet to be printed. Plates can be as small as 30 in x 90 in (76.2 cm x 229 cm) or as large as 50 in x 90 in (127 cm x 229 cm). A vacuum frame sticks the plot to the aluminium plate, lights expose the plate, and the plate is etched where the lines on the plot are printed. In essence, the plate is burned with the image of the pattern pieces. The plate is next printed using off-set lithography. The image is inked, transferred to a felt blanket, and then transferred to paper. This saves wear and tear on the metal plate.

Pattern tissues are printed in units of 1,300 sheets. These units are kept together using clamps and are transported together. Some units may be cut down with a sharp saw into smaller tissue pieces. All tissue pieces must be folded to fit into the envelopes and may be folded either manually or by machine. Instruction sheets are also printed using off-set lithography.

Envelopes, however, are sent electronically from the design offices. A film of the envelope design is created off the computer information and is used to expose the aluminium plate. Once the pattern is tested and approved, a computerized grading program creates the various size patterns and the amount of fabric required is measured. It is then printed with off-set lithography. Once printed, the envelopes are folded, glued, and ready to receive the folded tissue patterns.

One single clothing pattern printing facility can print 100,000 complete patterns (meaning all the tissue pieces) in a single day; it produces 23 million patterns a year.

Pattern making in today's world

xxxiv Pattern making has been assisted by CAD/CAM programs (Computer aided design/Computer aided manufacturing).

Pattern making has become an easy job in the contemporary world with the use of computers. Different software packages are now available on the market to meet manufacturers' needs. The packages most regularly used are Gerber, Electra, Tukatech, OptiTex etc. This range of software has made the task of the sewing pattern master much easier. They have made the process of pattern making more economical and less time-consuming.

Computer-aided design as shown in figure 23, (CAD) involves creating computer models defined by geometrical parameters. These models typically appear on a computer monitor as a three-dimensional representation of a part, or a system of parts, which can be easily altered by changing relevant parameters. CAD systems enable designers to view objects from a wide variety of representations and to test these objects by simulating real-world conditions.

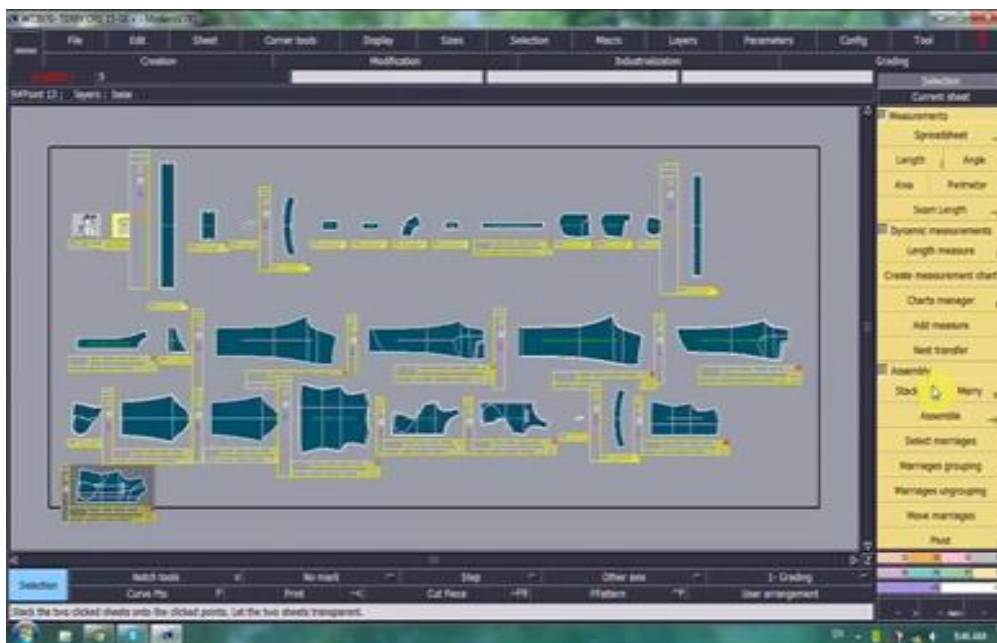


Figure:23- How to use Lectra¹ Modaris pattern cutting software. Retrieved from Book; Pattern cutting for clothing using CAD; - Author: M. Stott; - Published by Woodhead Publishing Limited in association with The Textile Institute Woodhead Publishing Limited, 80 High Street, Sawston, Cambridge CB22 3HJ, UK.

CAD had its origins in three separate sources, which also serve to highlight the basic operations that CAD systems provide. The first source of CAD resulted from attempts to automate the drafting process. These developments were pioneered by the General Motors Research Laboratories in the early 1960s. One of the important time-saving advantages of computer modelling over traditional drafting methods is that computer modelling can be quickly corrected or manipulated by changing the model's parameters. The second source of CAD was in the testing of designs by simulation.

The third source of CAD development resulted from efforts to facilitate the flow from the design process to the manufacturing process using numerical control (NC) technologies, which enjoyed widespread use in many applications by the mid-1960s. It was this source that resulted in the linkage between CAD and CAM.

^{ix} Lectra is the copyright owner of all Modaris software images reproduced herein with its permission (<http://www.lectra.com>); text © Woodhead Publishing Limited, 2012

Appendix II

Original text in a foreign language translated by the author.

^{xxxv}La volumetría de la indumentaria es un concepto indispensable en la aplicación del volumen en el diseño de moda. Con la volumetría se aportan en el diseño elementos creativos y la gestualidad, la comunicación e interpretación de las sensaciones del movimiento. Así, el vestido regula la vinculación entre el cuerpo y el entorno. Volumen de los cuerpos es el resultado de sus tres dimensiones, ancho, alto y profundidad, por tanto, el diseñador es un sujeto comprometido a dar respuestas a través de los posibles modos de combinación de los elementos y del objeto de diseño. Su actividad, se relaciona con la investigación, para una posterior creación de un objeto de diseño que satisfaga las necesidades fundamentales del individuo y siempre con un propósito. (escueladeartedegranada.es)

^{xxxvi}QIU HAO, es uno de los diseñadores chinos más influyentes de la actualidad. Tras especializarse en diseño interior y de espacios en 2001, lanzó su primer marca de ready to wear 'Niehter nor' y posteriormente abrió su primera su primera boutique ONEBYONE en Shanghai.

En Londres estudia una maestría en Arte enfocada en diseño de ropa para mujer para volver a Shangai y fundar su propia firma QIUHAO.

Su trabajo se ha publicado en revistas tan prestigiosas como Vogue, Elle, Harper's Bazaar, L'Officiel o V Magazine. Qiu Hao ha recibido importantes premios otorgados en el sector, e incluso compartido lugar en el "Woolmark Hall of Fame" con Karl Lagerfeld, Donna Karan y Giorgio Armani.

Sus triunfos no se limitan a las pasarelas y el textil, pues en 2010 fue nombrado por Forbes como uno de los top 25 de personas mas influyentes den la industria de la moda China, y mas recientemente, en 2011 fue nominado al "Breakthrough Designer Award" en los Global Fashion Awards que otorga la WGSN. (Escuela de Arte de Cádiz, Publicado el noviembre 13, 2014 por volumeneacadiz)

