INNOVATIVE CLOTHING DESIGN THROUGH THE USE OF

ADVANCED TEXTILES IN FORMATION OF FASHION SPORTSWEAR

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INNOVATIVE CLOTHING DESIGN THROUGH THE USE OF ADVANCED TEXTILES IN FORMATION OF FASHION SPORTSWEAR

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Approval of the Graduate School of Social Sciences

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ABSTRACT

INNOVATIVE CLOTHING DESIGN THROUGH THE USE OF

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MDes, Department of Design Studies

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Today's fashion and textile industry is going through rapid and fundamental changes and leap towards the future with innovation in textiles, fiber technology, innovation by various industries, in textile processing and garment assembly techniques. Our daily living conditions and clothing habits change according to our psychological state and social and cultural requirements. The end-user's constant change of his/her surrounding always finds a response from the technology and innovation in the clothing industry, sometimes taking inspiration from purely functional clothing categories. This continuous change redefine our clothing habits, even causes new markets to emerge, along with new design methods and processes to succeed in these markets. This study researches the historical and social background of product-led clothing design and examines the functional or aesthetical use of advanced textile enhanced casual wear which is shaped by social needs. Adapted clothing design process and marketing methods of fashion sportswear are investigated with this thesis. The focus of this study is to find the role and use of innovative clothing design through the use of advanced textiles in fashion sportswear and how its social adoption through branding works for various end-users.

Keywords: Advanced textiles, innovative clothing design, end-user, product-led clothing design, design process, social adoption, fashion sportswear, branding.

ÖZET

İLERİ TEKSTİLLERİN KULLANIMI İLE MODA SPOR GİYİM OLUŞUMUNDA

YENİLİKÇİ GİYSİ TASARIMI

Dikkaya Göknur, Özge

MDes, Tasarım Çalışmaları Bölümü

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Günümüz moda ve tekstil endüstrisi hızlı ve köklü değişiklikler geçirmektedir ve tekstil, lif teknolojisi, çeşitli endüstrilerde, tekstil işleme ve giysi birleştirme tekniklerindeki yenilikçi gelişmelerle geleceğe doğru bir atılım içindedir. Ayrıca günlük yaşam koşullarımız ve giyim alışkanlıklarımız psikolojik durumumuza ve sosyo-kültürel ihtiyaçlarımıza göre değişim göstermektedir. Son kullanıcının devamlı değişen çevresi bazen tamamen fonksiyonel giysi kategorilerinden ilham almak suretiyle giyim endüstrisinin teknoloji ve ilerlemesinden her zaman karşılık bulmuştur. Bu sürekli değişim, bizlerin giyim alışkanlıklarını yeniden tanımlamakta, hatta yeni pazarlar ve bu pazarlarda başarı sağlamaya yönelik yeni tasarım yöntemleri ve süreçlerinin ortaya çıkmasına sebep olmaktadır. Bu çalışma, ürün-odaklı giysi tasarımının tarihi altyapısını araştırmakta ve ileri tekstiller ile geliştirilmiş rahat giyimin sosyal ihtiyaçlar tarafından şekillendirilmiş fonksiyonel, estetik kullanım sebeplerini incelemektedir. Bu tez ile moda spor giyim için uyarlanmış bir giysi tasarım süreci ve pazarlama yöntemleri incelenmiştir. Bu çalışmanın odaklandığı nokta moda spor giyiminde ileri tekstiller aracılığıyla yenilikçi giysi tasarımı rolünün tespit edilmesi ve çeşitli son kullanıcılar için markalaşma aracılığıyla sosyal benimsenmesinin nasıl işlediğidir.

Keywords: ileri tekstiller, yenilikçi giysi tasarımı, son kullanıcı, ürün odaklı giysi tasarımı, tasarım süreci, sosyal benimsenme, moda spor giyim, markalaşma.

To My Children, Ege and Iris

ACKNOWLEDGMENTS

I express sincere appreciation to Asst. Prof. Dr. Şölen Kipöz for her guidance and insight throughout the research.

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CHAPTER 1

Introduction

Today's fashion and textile industry is experiencing rapid and fundamental changes and takes a leap towards the future with innovation in textiles, fiber technology, innovation by various industries, textile processing and garment assembly techniques. Concurrently end-users' constant change of his/her immediate surrounding creates new demands which finds design response from technology and innovation. This continuous feeding from innovation redefines our clothing habits. It causes new markets to emerge, along with new design, marketing methods and processes to succeed in these markets.

Advanced textiles are being innovated by textile and garment assembly industries with collaboration of different scientific developments in fields like nanotechnology, computer, chemical or biological engineering. Turning the advanced textiles into an efficient and creative design input for contemporary fashion and reach the end-users who will demand it has always been a difficult issue which requires different calibration of functions for different end-user demands. Advanced textiles allows the designers to create innovative clothing designs from professional product-led and sportswear clothing to wearable art forms. These designs eventually give inspiration to ready-to-wear designers to create clothing which will reach the end-users on the street by satisfying their functional needs.

Functional needs of the consumers in the physical and social environment should be mixed with expressive needs. People still want to look good, catch up with the spirit of the times.

This dilemma brings out the main issue that neither pure product-led nor fashion-led clothing designs satisfy contemporary urban living conditions and lifestyles. A more design conscious consumer group is emerging and end-user demands for urban clothing are exceeding what regular ready-to-wear clothing styles can offer. This new consumer group is expecting fully functional clothes performing according to the living conditions of the urban environment. These conditions include necessity of mobility, electronic communication, protection from surveillance or harassment in crowded areas, durable, comfortable and practical clothing for long travel times outside the comfort of homes. While satisfying these demands, the end-user also wants to express his/her style or fashion identity. This brings forth the need for a broader concept of contemporary clothing. Such a need is suggested by Gale and Kauri (2004) and they offer three reasons:

- the homologous relationship between the distribution of new technologies and clothing, i.e. personal mobile technology and clothing are both either worn or 'accompany' us wherever we go,
- the increasing trend of fabric-technology transfer between sectors,
- the blurring of clothing sectors, e.g. smart casual wear or fashion sportswear.

(Gale and Kaur, 2004, p.159)

The sector of fashion sportswear answers the end-user demands of the design conscious consumer group in the urban environment. This thesis is focused on the formation of fashion sportswear, in which advanced textiles plays the most important role. Fashion sportswear is the clothing sector in which the latest and most admired style in clothes

are combined with attires which are worn for sports or casual wear. It is the clothing sector in which good mix of aesthetics and performance is needed by the end-users which is achieved by advanced textiles. The term 'advanced textiles' connotes the integrative use of smart technologies in textiles or clothing, advanced ergonomic or anthropometric cuts, patterns, newly invented textile technologies and garment assembly techniques in its broad term, every time it's being used in this thesis.

As seen in figure 1.1, advanced textiles is the main input in the formation of fashion sportswear. Advanced textiles features must be used in a way in which both product-led and fashion-led clothing design purposes are served and be a product of contemporary fashion sportswear design as a result.

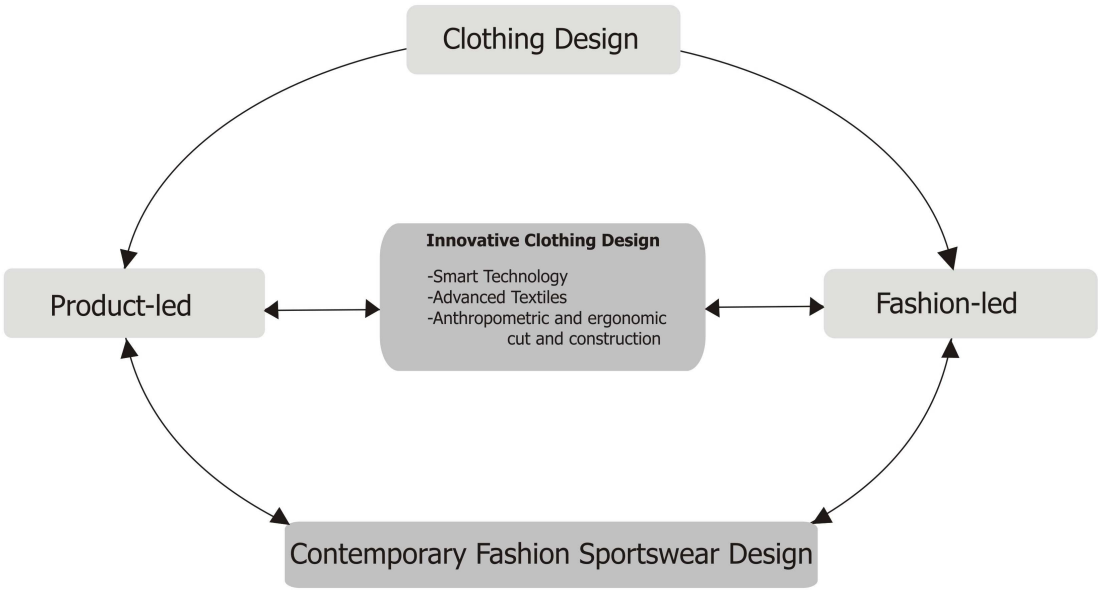


Figure 1.1 The cycle of fashion sportswear

Product-led clothing design is the design focuses on the purely functional value of the clothing as product. In its design process, smart technologies, advanced textiles, anthropometric, ergonomic cuts and construction is used to fulfill functional end-user

requirements. Fashion-led clothing design on the other hand is focusing on expressive and aesthetical needs of the end-users.

The role of the innovative clothing design through advanced textiles and its relation to end-user requirements shape its physical, social, technical and branding formation of fashion sportswear.

1.1. Purpose

The aim of this thesis is to make a thorough investigation of innovative clothing design's role through the use of advanced textiles in the formation of fashion sportswear. With this research it's expected to define how advanced textiles and innovative clothing design are affecting the formation of fashion sportswear.

The historical evolution of the product-led clothing design and innovation of advanced textiles and how it's incorporated to the daily use of casual wear is to be studied. The role of professionally used advanced textiles and innovative clothing design with their functional characteristics are researched. How these product-led performance requirements answer to the professional, recreational and fashion sportswear end-user demands are further analyzed.

Another aspect to be investigated is the social and psychological needs of the end-users. The different social, psychological issues which form inspirations for the designers are defined. The application of these inspirations as design methods is analyzed. The shaping of individual and social design priorities while examining the design methods through the use of advanced textiles is studied.

The study also investigates how a special design process is developed depending on the demands of the end-users. The product-led and fashion-led clothing design processes with their different focuses are analyzed and a new formation of fashion sportswear design process is discussed. The end-user requirements and focus of the innovation are the main indicators in shaping of the process.

Another important issue to be investigated is the branding strategies for sportswear companies to reach the end-users. How these designs find a place on the streets and through which channels they reach to the end-users will be analyzed.

1.2. Literature Search

When first started doing the literature search, finding sources related to inter disciplinary character of advanced textiles was a difficulty. The lack of information on innovation being used as a design tool in fashion, strategic design processes of such fashion products and branding strategies forming according to end-user requirements is one of the reasons in doing this research. Structured scientific research is made scientific contribution to textile engineering, fashion design and branding disciplines.

Readings are made on contemporary fashion, technical textiles, wearable technologies, functional clothing design, multi-disciplinary technical clothing design process and fashion theory through academic papers and books from electronic or printed sources and also news and articles. News about the latest technological advancements is always reported in magazines, newspapers, and journals as well as research papers. In addition to this it can be found in the journals about how this market is expanding with business strategies. Web-based textbooks and electronic journals that address all of the topics

varying from innovation management, fashion design and processes, advancements in textile engineering and the marketing of it have been searched comprehensively. Analyzing and interpreting international textile sales and brand reports constituted another source which was an essential tool for conducting this thesis. The relationship between advanced textiles from the engineering point of view and the focus on the design value of advanced textiles in the clothing industry, the relationship with the end user's demands and branding of it is emphasized. The findings about social and emotional impact, cultural differences and marketing strategies made a significant contribution to the thesis.

1.3. Methodology and hypothesis

Under the light of the purpose of this research, this thesis answers the question:
What role does advanced textiles play in the formation of fashion sportswear?

To be able to thoroughly investigate and answer this main question, four sub questions are needed to be asked.

The sub questions are:

1. What are the reasons for the need of advanced textiles innovated clothing design?
2. What kind of social and psychological needs make innovative clothing design and advanced textiles as a major design input?
3. How does the end-user requirements shape the design process?
4. How do innovative clothing design and advanced textiles reach the end-users through branding?

Forming different chapters in the thesis to answer these four different questions will answer the question thoroughly. The conclusion part of each section will contribute to the physical, social, technical and branding formation of fashion sportswear accordingly.

The topic requires merging information from different fields. Apart from the literature search related to the topic, searching through archives, finding interviews made with designers and specialists from the sector, observing and taking notes, collecting data and analyzing patterns helped to form references. Further investigation on the relationship of different topics intrinsic to the mass of data is focused.

1.4. Structure

The thesis is divided into 6 chapters. It consists of one introductory, one conclusive and four main sections. (Figure 1.2)

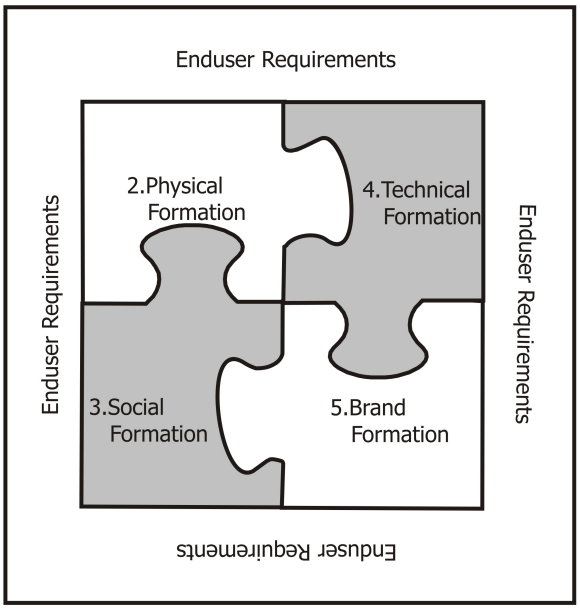


Figure 1.2 Formation of Fashion Sportswear

First chapter is introducing the research topic, the main and secondary research questions, information on the purpose, literature search and the methodology of the study.

The second chapter focuses on the reasons for the need of clothing design innovated with advanced textiles. The analysis of historical background along with categories of advanced textiles and innovative clothing are thoroughly investigated. This explained how these references answer the end-users' performance related needs and accumulate as the source of the physical formation of the fashion sportswear.

The third chapter gives an understanding of the social and psychological factors that affect the formation of fashion sportswear. The social and psychological state of the end-users draws an inspiration for the needs and preferences of clothing styles. This brings forth design concepts and application of innovative design methods through advanced textiles which shape the social formation of fashion sportswear.

In the fourth chapter, the study investigates how design process is developed regarding the demands of the end-users. The end-user demands shape the innovation level of advanced textiles in the design process. The fashion-led and function-led clothing design processes are analyzed to offer a new collaborative critical path in the formation of the fashion sportswear design process from the end-user's point-of-view.

The fifth chapter explains how the adoption of clothing innovated with advanced textiles open up different branding possibilities for end-users. These branding possibilities and marketing strategies fulfill different calibration of end-user demands in order to meet global consumers.

The sixth chapter is the conclusion part in the light of the previous four chapters. The synthesis is made in order to clarify the role of the role of advanced textiles in the formation of fashion sportswear Along with the problems occurred in incorporating innovative use of advanced textiles into every day global consumption.

CHAPTER 2

Physical Formation of Fashion Sportswear

Clothing physiology investigates the relationships between clothing, humans and the environment. Clothing is often regarded as 'microclimate systems surrounding humans'. (Gore-tex Glossary, 2010) Clothing physiology requires a basic understanding of the fields of thermal, work, exercise physiology; ergonomics and textiles. By applying research results from other areas, the functionality of clothing is developed responding various needs like protection and performance with help of innovations in different sectors.

The main ingredient of the product-led clothing design is advanced textiles. Advanced textiles can be defined as the unity or combination of smart textiles which sense stimuli from environment react or adapt by the integration of functions in textile structure. Advanced materials have characteristics like fire-resistance, ultra strength along with ergonomically and anthropometrically enhanced cut and variations.

Popular use of function-led clothing design benefits from the functions and characteristics of advanced textiles. Clothing which is designed to serve functional specific purposes or having certain protective finishes are using advanced textiles in order to obtain the required innovation level to raise the quality in product-led design. These textiles are creating the 'micro-climate clothing system'. 'Micro-climate' is 'the very thin layer of warm air that exists next to the body's skin. People are most

comfortable with a tropical microclimate of 90°F to 95° F and 40% to 60% humidity.' (Gore-tex Glossary, 2010) This term is used to describe the product-led quality of the functional clothing which aims to obtain a level of small climatic environment for the body. It also describes the unity of the design input for such clothing system.

There are certain functions of advanced textiles having active or passive characteristics attributed to each product-led clothing design. Passive clothing are designed with the performance of materials in the clothing whereas active clothing is when the functions are a result of activity of sensors, processors and actuators acting together, usually by consuming power. (Proetex Organization Website, 2009) Passive smart textiles can only sense the environment, they are sensors; active smart textiles can sense the stimuli from the environment and also react to them. (Langenhove, Hertleer, 2004)

The table below summarizes all of the functions of advanced textiles working actively or passively regarding the functional needs of the end-user. (Table 2.1)

FUNCTIONS OF ADVANCED TEXTILES

	Passive	Active
Heat and Temperature	Flame retardance	Change insulation properties of clothing depending on body temperature/ external temperature
	Fire Protection	Heat or cool inside of the clothing depending on body temperature/ outside temperature
	Heat storage and release	Measure external temperature/ radiant heat hazard to show alarm
	Heat Insulation	Alter garment to enhance protection against external temperature/ radiant heat
Mechanical	Impact resistance	Provide sensors capable of predicting incipient mechanical trauma, detecting ongoing mechanical trauma
	Ballistic Protection	Active protection against mechanical trauma (e.g. Clothing airbags, stiffening clothing etc.)
	Mechanical shear resistance	Active protection against ballistics (e.g. Reactive armour)
Moisture/ Water	Breathing fabrics Self cleaning-super hydrophobic	Detect external water threat Actively protect against water ingress (e.g. Change hydrophobicity, porosity)
	None	Actively protect against drowning (e.g. Deploy floats)
		Collect and recycle body fluids (e.g. Swear, urine)
Visibility	Decreased visibility (Camouflage, IR emission, super black)	Switch lights on and off on the clothing
	Increased visibility (retro reflectors)	Show information on external surface of clothing for protection and communication
	Color changing (light, temperature)	
Electrical	Electrically conducting textiles	Detect electrical activity on the body
	Anti-static	Stimulate the body with electrical activity
	EMF barriers	Conduct power or data around the clothing
Weathering	UV resistant Self cleaning-UV stain breakdown	
Vital signs	None	Measure such things as body temperature, heart rate, breathing rate, level of oxygenation, brain activity, reliably even when vigorously moving Measure compiles bioanalytical parameters in real time
		Provide ongoing real-time imaging of internal organs
Power	None	Store enough power for system performance
		Generate power from external resources such as solar power
		Generate power from wearer such as body heat, movements
Communications	None	Integrate high quality, low power, long range wireless communications with other devices
		Provide textile integrated antennae

Table 2.1 Active and passive functions of advanced textiles (Source: Proetex, 2009)

The promise of advanced textiles by using functions in innovated clothing design is to enhance human performance. There are three reasons for developing performance enhanced clothing design.

The first reason is the continuous quest of people for exploring the unknown and to overcome the difficulties of nature. Protection from damage, extremes of temperature or potential enemies are fundamental functions of clothing design in surviving hostile environments. This need of protection has been the oldest driving force for clothing development. The second reason for innovation is curing diseases or maintaining better health conditions. Designs which help to increase the medical conditions also increase the quality of life. The third reason is to compete in sporting activities thanks to the increasing human performance.

Professional product-led clothing designs are developed regards to above reasons are used in professional sectors like military, emergency prevention, space research or health and medicine. The professional sportswear industry is the largest industry that takes these features and adapts them to athletic performance enhancing sportswear for daily use. Professional sportswear utilizes these characteristics and after some time period and leveling down the complexity of usage and cost, they are offered to the recreational sportswear field. When fine distillation of features and commercialization and new features are combined with style, value and trend or comfort which bring out the essentials of future street wear. (Table 2.2)

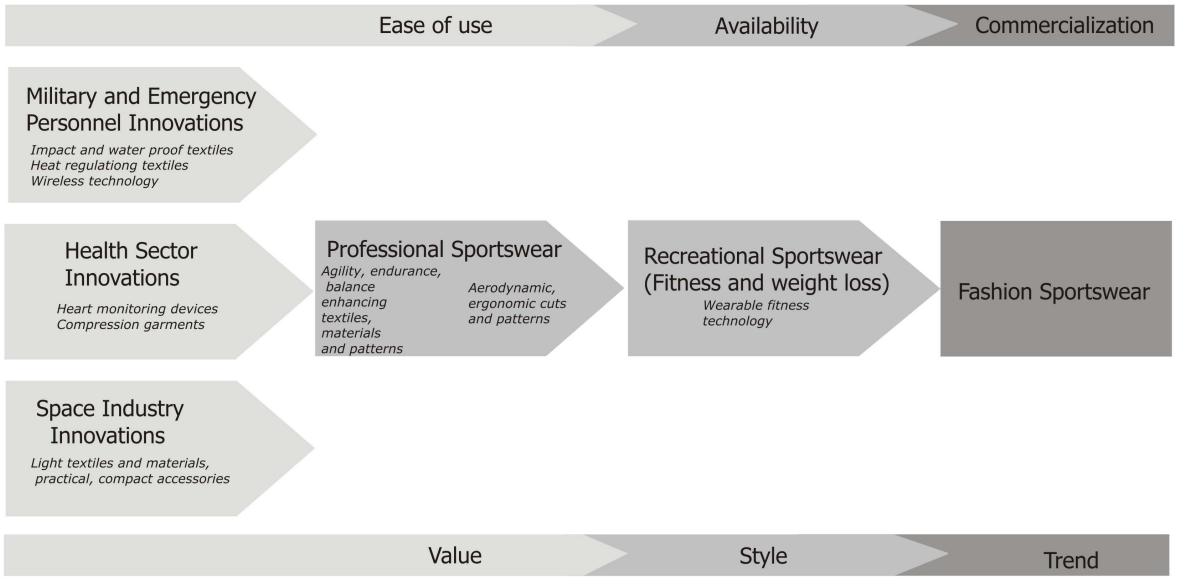


Table 2.2 Evolution of fashion sportswear

The following sections are of primary importance in explaining the historical role of innovative clothing design and adaptation of product-led innovations in the formation of fashion sportswear.

2.1 Enhancing quality of life

For healthcare industries textile firms are working in collaboration with design departments of universities or privately owned firms. Their goal is twofold. One is to find textile surfaces that heal; the other is to monitoring systems for steady health conditions.

Textile surfaces which heal and cure are using nanotechnology and microencapsulating methods. The best fit for microencapsulated fabrics is medical treatments, especially in the natural health sector. Already, European women are able to continue their war against ageing by wearing tights enriched with substances purported to reduce cellulite. There's vitamin E to heal scarring. There's some debate about how effective micro

encapsulation is as a treatment. Besides questions over the effectiveness of some substances, it's unclear how well the skin absorbs nutrients and what size the molecules need to be. But that hasn't stopped materials like bamboo and algae from being added to textiles to promote cell regeneration and stimulate blood circulation. Particularly against the background of an increasingly ageing society, bio-therapeutic medical textiles represent a growing market. Likewise the increasing number of people with diabetes or skin diseases ensures a continuing growth in market demand. The Institute for Hygiene and Biotechnology (IHB), part of the Hohenstein Institute, provides comprehensive information on this subject. (Avantex, 2007)

Projects to cover and heal our epidermis are progressing so that soon enough they even will be able to replace our skin with an artificial one. Advances by CSIRO (Australian Commonwealth Scientific and Research Organization) in material sciences are creating 'next to skin' technology that can protect the body against skin tear wounds and traumas. A major use of the technology is expected to be in patient care of the elderly, or bed-ridden. According to recent studies, nearly 15 per cent of people in high-care nursing homes have a 'skin tear' at any one time. The textile chosen by CSIRO is 95 per cent fine merino wool and 5 per cent Lycra®, a combination that can be worked into a soft, lightweight textile that is cool in summer, while still preventing the chills that can cause poor blood circulation. The fabric is about to undergo clinical trials after favorable patient trials. The researchers have developed a specialized knit structure with two crucial mechanical properties. The textile can stretch by 100 per cent without applying any significant extra pressure and this makes garments easy to put on over ankles and wrists then contracting to provide the necessary form-fitting to protect the skin against the friction that causes tears. (Commonwealth Scientific and Industrial Research Organization, 2007)

Developing micro technology for healthcare is a strong area where health giving textiles find their way of being used into the fashion area. So-called wellness fibers and fabrics are integrated to daily life everyday. New textiles that can look attractive, feel good and perform well can now even benefit the wearer's health. Microfibers are being engineered with substances suspended in minute bubbles that can be gradually released. These microcapsules are hollow and can contain a range of products, including medication, natural remedies, vitamins, UV-blockers, anti-bacterial/anti-microbial agents, mosquito and insect repellents, moisturizers, essential oils and perfumes. Microcapsules that are integrated to fibers are originally developed for use in space but now are being used in fashion and for the lingerie and hosiery markets. The Japanese are even developing youth-giving textiles which encapsulate anti-aging creams into fabrics worn next to the skin. (Braddock, O'Mahony, 2005) These characteristics which improve the skin and the bodily functions are already integrated into textiles for the end-users to improve the quality of life. Such examples can be found in fashion design collections as in figure 2.16. Prada Sport Menswear from Spring/Summer 2001 collection is designed with twisted cotton gabardine with Teflon(DuPont) Coating . The pant is shower proof and stain resistant offering a high level of performance, giving comfort to the wearer. The same property of thermoregulating ventilation can be found in adidas® Adipure style woven jacket. (Figure 2.1, 2.2)

Figure 2.1 Prada Sport Menswear from Spring/Summer 2001 collection.
(Source: O'Mahony, Braddock 2002, p.62)
Figure 2.2 Adidas Adipure style woven jacket (Source: Adidas, 2010)

The second main research area is monitoring the health conditions of patients. Integration of health monitoring tools into textiles brings comfort and safety to the users. These clothes can provide remote monitoring of vital signs, diagnostics to improve early illness detection and metabolic disorder and benefits to the reduction of the cost of hospitalization to the citizen.

As presented by Luprano in Helsinki in 2006 in Workshop on Wearable Technology and Intelligent Textiles, cluster of EC co-financed projects on smart fabrics, Biotex was one of these projects. Biotex aims at developing dedicated bio-chemical sensing techniques compatible with integration into textile. (Figure 2.3) Some of the project goals are to allow comfort and monitoring, non-invasive measurements, continuous monitoring during daily activity of the person. The technical objectives use mainly three methods: Sweat monitoring, infection detection through blood for burnt persons and oxygen saturation of blood for medical, sport and security applications. (Biotex, 2009)

While ‘Biotex’ is using sensors to monitor health conditions with sensors integrated to textiles, project ‘Ofseth’ deals with monitoring through optical devices. The aim is increase the mobility in monitoring by integrating optical fiber based sensors into functional textiles for extending the capabilities of wearable solutions for health monitoring. Wearable monitoring systems measure vital physiological parameters such as respiration movements, cardiac activity, pulse oxymetry, temperature of the body. Being compatible with a textile manufacturing process is the challenge for this project. (Ofseth Project, 2009)

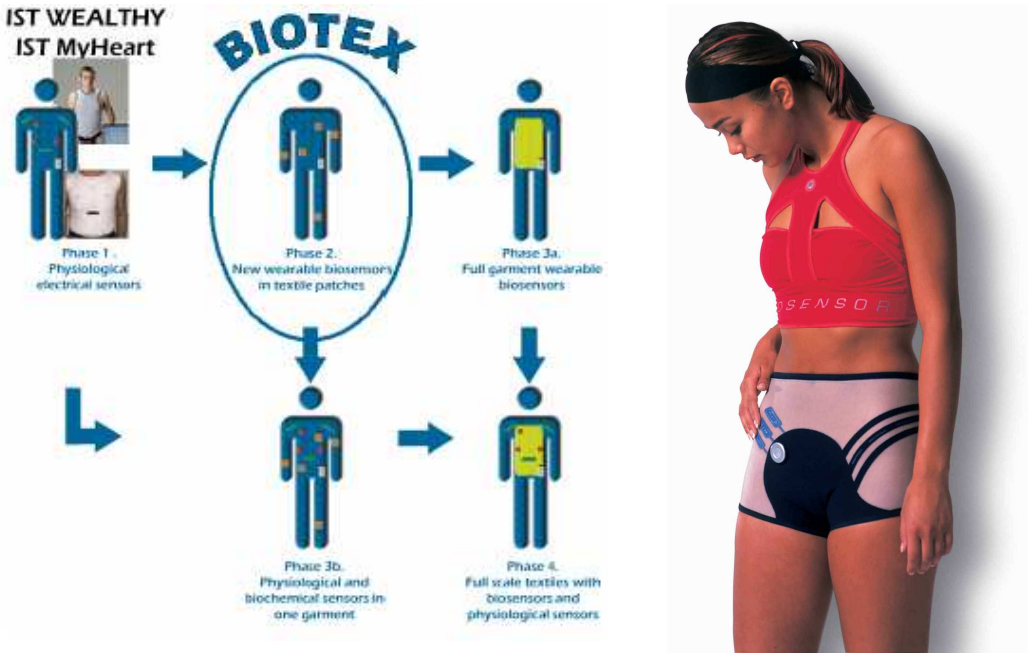


Figure 2.3 My Heart Project by Biotex (Source: Biotex, 2009)
Figure 2.4 Philips Design Perfect Performance (Source: O’Mahony, Braddock 2002, p.80)

All of these projects are mainly to increase the quality of life of a patient, but projects like second skin and cardiac monitoring find their way into the professional sportswear area, where these equipment and textiles are designed more practically and compact for the professional athlete’s use. The monitoring equipment and garments find their way into professional and recreational sportswear. The example of Philips Design Perfect Performance is an outfit of top and shorts which are made of a high stretch textile and

have biomimetic sensors to monitor pulse, blood pressure, and body temperature to let wearers know how they are performing. Conductive embroidery and printing connect to an integrated audio device for monitoring. (O'Mahony, Braddock 2002, p.62) (Figure 2.4)

2.2 Managing hostile environments

Beginning of 20th century was an era when industrialization, technological advancements and explorations accelerated. This was opening new fields and areas for the people to explore. New areas of the world were reachable with new transportation devices and these environments could be inhospitable in terms of living conditions.

In the name of scientific discoveries professionals and scientists explored the deepest ends of the oceans, the coldest places in the North and South Pole and climbed the highest mountains. Some explorers went to the rain forests to discover old or existing civilizations. They needed clothing that will protect them from the extreme weather conditions. These driving forces pushed the development in the field of textiles and innovation in designs for protective suits. Materials used in construction of the garments offers protection from weather conditions like hot or cold climates, rain, snow wind and sun. Both insulation and thermo regulation have been primary functions that helped the wearer maintain and adjust his/her regular environment. (Lee, 2005)

The deep sea explorations for centuries put forward the development of the deep-diving suit by August Siebe in 1837 which is the first preceding example of contemporary deep diving suits.(Figure 2.5) (Seagrant Institute, 2010) These suits have developed in time maintained by covering the human body with innovated textiles and self-contained breathing apparatus. The patterns are innovated through time to reducing the bulk and

introduce ergonomic cuts to come up with the most comfortable suit which gives the wearer freedom of movement, as can be seen in Figure 2.6. With the invention of Neoprene it's used for diving and surfing suits. Neoprene is a synthetic rubber-like perforated polymer. It is waterproof, lightweight, breathable, soft, warm, and fast drying. (O'Mahony, Braddock, 2002) The invention of diving suit and innovation of Neoprene as diving suit material, gave the recreational sportswear market to use Neoprene for fashionable sportswear designs. (Figure 2.7)

Figure 2.5 Siebe's first enclosed diving dress, 1837 (Source: American Dive Center, 2010)
Figure 2.6 Contemporary diving suit by Hyperflex (Source: Hyperflex, 2010)
Figure 2.7 Fashionable sportswear garment by Hyperflex (Source: Surfshot, 2010)

Search for protecting the humans from extremes of weather conditions has been pursued by designers and scientists to help the explorers. The characteristic which is most likely to be adopted by fashion sportswear is thermoregularity. This property is widely needed and searched by scientists and designers to respond the polar explorers. Roald Amundsen, who is the first arctic explorer who went both to South Pole and North Pole in the late 19th and first decade of 20th century, adopted the native fur coats of the Inuits for thermal protection. (Figure 2.8) (Princeton University Library, 2010) Scientists have tried to find other design solutions to help the explorers protect from

extreme weather conditions using the technological innovations of its time like electrically heated cloth. (Figure 2.9) The heatable cloth which is operated by a battery or portable generator in figure 2.9 is designed and demonstrated by medical research council prior to arctic expedition in 1957. (Lee,2005)

Figure 2.8 Amundsen in arctic expedition, 1913 (Source: Columbia, 2010)
Figure 2.9 Electrically heated cloth, 1957 (Source: Lee, 2005, p.149)
Figure 2.10 Battery heated coat, 1968 (Source: Lee, 2005, p.149)

These designs for professional product-led clothing have eventually found their place for street use with further innovation like this battery heated casual wear coat which was designed in 1968 as an early experimentation. (Figure 2.10)

The advanced fabric choices today differ from wicking fabrics, to bi-component layers, phase change materials and super absorbent polymers of which effectiveness as cooling systems are customized by the designers for professional wear. The clothing designers constantly develop more practical and functional clothing design solutions for today's explorers. Aerogel is a contemporary insulating material used for space experimentations. It is being adopted by professional sportswear. Aerogel is a nanoporous solid material possessing no less than 50% porosity by volume, composed of 99.8 % air. It is used in padding against extreme weather conditions with high-level of protection. The light protective garment which is insulated with aerogel material in

figure 2.11 is developed by Grado Zero Espace which is a design innovation and solution firm and used in arctic expeditions of the 21st century. (Figure 2.11)

Figure 2.11 Snow jacket insulated with Aerogel (Source. Grado Zero Espace, 2010)
Figure 2.12 Fashionable snowboarder jacket with thermal insulation for recreational use (Source: Burton, 2010)

The developed clothing designs are worn by professional sports enthusiasts, as well as people who have to work in extreme weather conditions, thus reaching a wider range of usage for recreational sports purposes like snowboarding and surfing. These sports are bringing people together to socialize and wear such garments for performance and also for expressive reasons like this thermal insulated jacket by a professional snowboard apparel company. (Figure 2.12) The smart use of innovation in clothing design and materials gradually enter recreational sportswear market and eventually will be adopted by fashion sportswear.

The military was one of the main reasons for the innovation of the clothing to enhance the human performance against enemies and against weather conditions. Military organizations of leading countries spend large amounts of financing to the research and development of protective clothing.

Thermal insulation was one of the first concerns of the pilotsthat came into the light during the First World War. They had to endure extreme cold weather only by layering wool, silk and leather. This caused rigidness and restriction of movement. Sidney Cotton, pilot of the Royal Air Force collaborated with his own tailor and came up with a suit designed for pilots' needs. (Figure 2.13) It had a thin fur lining, a layer of air resistant silk with an outer layer of checked Burberry fabric. It also had a draught-proof fur trim around the necks and the cuffs. (Braddock, O'Mahony, 2002)

Figure 2.13 Sidcot pilot suit (Source: Lafayette Foundation, 2010)

The army today needs up-to-date features which have multi offensive/defensive features for survival. Military suits are well designed and should perform under heavy weather or stressful conditions. The U.S. Military has a program called 'Programme Executive Office Soldier' by which soldier clothing and equipments are designed by working with various industries for innovation. The soldier is given below features, which put the soldier under a lot of stress and turn into highly active performers:

Helmet-mounted vision enhancements for improved situational awareness in all visibility conditions

Weapon sights for enhanced target acquisition
Weapon-mounted and Soldier-carried sensors and lasers for accurate location of targets by pointing, illuminating, locating, and/or designating
Ballistic and fragmentation protection
Technologically advanced tactical equipment for the individual Soldier
Environmental protective clothing
Individual chemical protective gear
Personnel airdrop equipment
Flame-resistant clothing
Clothing Bag items

(U.S.Army Military Website, 2009)

'Product Manager Clothing and Individual Equipment' provide comfortable uniforms that enhance mission effectiveness. These products protect against manmade threats, such as fire and biological/chemical agents, as well as environmental threats, such as extreme weather conditions. (U.S.Army Military Website, 2009)

The other hostile environment is the space. Pursuing the innovations in advanced textiles to use them in space suit design to survive such an atmosphere is a passionate designer's dream. A very good definition that describes a spacesuit is by Amanda Young, simply stating that:

> … a spacesuit is, for all intents and purposes, a miniature spacecraft designed to keep the astronaut alive and well in the most hostile environments.
>
> (Young in McQuaid, 2005, p.163)

In designing the spacesuit, the main aim is to protect the body from high pressure. The first protective suit of the high altitude and space era was first developed in England. In 1934, company B.F. Goodrich developed a suit for Wiley Post with quilted cotton exterior and rubber inlayers. The materials used wool ad cotton and aluminum. They got the inspiration from deep-sea diving suits. (Lee, 2005) (Figure 2.14) The first space suit protoype to walk on the lunar surface was designed by NASA produced in 1964 by ILC Industries, which are official spacesuit producers for NASA ever since. (Nasa, 2010) (Figure 2.15)

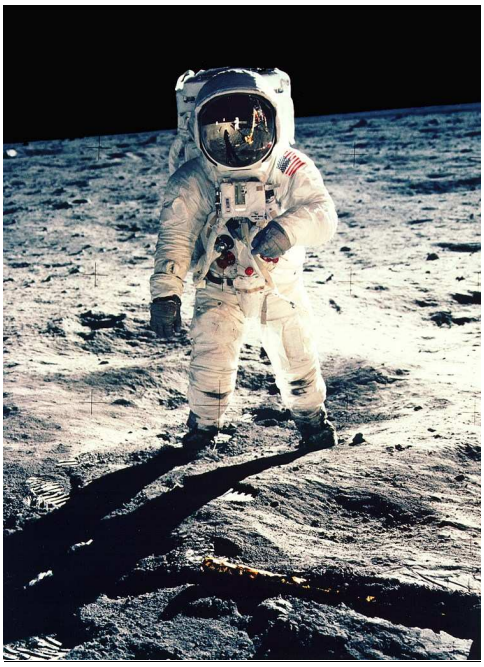


Figure 2.14 Full pressure suit by B.F.Goodrich, USA 1934 (Lee 2005, p.162)
Figure 2.15 'Buzz' Aldrin on the lunar surface in 1969 (Source: Nasa, 2010)

Space suit requirements include UV, cosmic and X-ray radiation, temperature, micrometeorite, control pressure (vacuum) protection, body conditioning, monitor physiology and activity (vital signs, oxygenation, biochemistry), provide communications, life support and enable mobility. (Proetex Organization Website, 2009) Engineers establish design limits according to temperature and pressure conditions in space and calculate the withstanding points of the different materials to these conditions. The last calculation is done to find out the longevity of the garment and deciding on assembly techniques of the design considering ergonomic issues. Figure 2.16 is the inner layer of spacesuit with liquid cooling equipment, figure 2.17 is the outer shell of the suit made of laminated fabric and both made of nylon, polyester, aluminum and plastic. (Nasa, 2010)

Figure 2.16 Apollo Liquid Cooling Garment, 1968
Figure 2.17 EXI-A laminated fabric suit, 1968
(Source: McQuaid 2005, p.172, 175)

Searches and innovations are being made to designthe spacesuit lighter and easily movable and technology offers new design solutions and advanced materials for that purpose. Figure 2.18 shows an innovated spacesuit design called 'Biosuit' which is developed by MIT researchers and Professor Dava Newman and it uses human pressure instead of inflation to protect against the vacuum of space. This suit system provides more mobility for the astronauts for extravehicular activities. The design uses innovated space technologies using 'biomedical skin replacement materials', wearable technologies and information technologies. The systems and most materials are recyclable and it is one of the ultimate interdisciplinary works among engineering, design and medicine. (Massachusetts Institute of Technology-MIT Biosuit, 2009) The interdisciplinary work of

the contemporary innovations in wearable and information technologies enabled such progress.

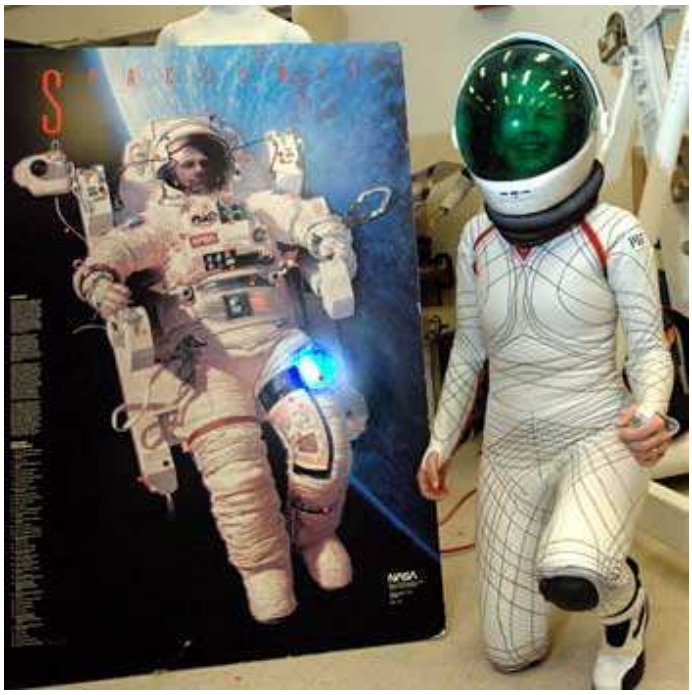


Figure 2.18 Biosuit compared with gas pressurized space suit
(Source: MIT Biosuit Webpage, 2009)

These suits were innovated by research teams from different fields exploring different materials from plastics to metals in different methods. Inventing these suits helped the textile and garment design industry to develop and than somehow integrate into daily life use. Another impact of professional product-led innovations was on fashion. Such innovations and designs have not only influenced the society with their performing products which increase our daily life quality but also with their look and attitude of the time.

2.3 Making of a 'superhero': faster performing humans

Towards end of the 19th century, people started to bring the social, leisure activities to a competitive level that modern sporting games have started to emerge around the globe.

In these sporting events the athletes competed with each other at a level that their clothing was the main item in their hand to make a difference to their competitor. A new style of sneakers, a garment layer that will protect them from snow but also light at the same time, was meant a 'split second' difference. The athletes are competing since the history of the Olympics with garments and shoes designed for performance of their time. (Figure 2.19)

Figure 2.19 Paris 1924, Games of the VIII Olympiad. Athletics, 3000m steeplechase (Source: Olympics Official Website, 2009)

The demand for textiles which are the raw materials for sports clothing design is explained by Shishoo as:

> The rising interest is due to a number of social factors that include increased leisure time, increased considerations of well-being and good health, growth of indoor and outdoor sports facilities as well as the ever increasing pursuit of the adult population of activities outside the home or workplace.
>
> (Shishoo, 2005, p.1)

Faster and better performance for humans can not be separated from sports activities. Sport performance depends on physical condition of the performer, his/her mental situation, environmental changes and pre-performance training. A functional garment that has an aerodynamic cut and enhanced smart training feature helps these variables

to work for the good of the performer. In the new millennium even a split second difference defines the champion in the contests. People who perform on an athletic level are divided into two categories. The first group is the professional athletes, who are considered to be of an 'elite' level because competition is involved. The second category is the simple participants who pursue athletic performance for fitness or for weight control. The sportswear market researches the active and passive functions of smart textiles as mentioned earlier, different ergonomic cuts and new fiber contents to offer designs for different categories of sportswear consumers.

There are factors affecting sport performance where new and updated versions of sportswear are constantly needed in professional athletic performances for better performances. The physical factors, also known as neuromuscular factors are affecting performance. The body type of the performer is suitable to specific sports branches; the muscular strength, endurance, flexibility, agility, balance with coordination and speed are factors which are affecting the athletic performer. With the right combination of functional cut and textiles, the performer will be affected positively by these factors. Second category is psychological factors. The mental condition of the athlete is also important in defining the performance. The self motivation during competition and training, discipline, the level of alertness and acuity are determining factors. If the athlete believes a certain type of clothing will help him in developing his/her speed performance then this will enhance the motivation, too. The factor of environmental conditions has uncontrollable effect. Adapting to unexpected environmental factors and be stimulated can be achieved by the athlete's clothing. The last factor is coaching and external support. The training before performance, the tactics, and nutrition along with the sport techniques learned are factors that can affect the athletic performance. (Faqs Reference, 2009)

For the professional, 'elite' level athletes the training phase requires wearable technology and equipment for the athlete and his staff to monitor and make the important changes during his/her training activities. Functions that monitor human performance have the same characteristics as functions required for personal health. The physiological data of the performing person needs to be recorded, stored and transmitted in order to interpret the improvements in health or endurance of the performer. This information is analyzed through ECG, breathing rate, body temperature and biochemistry. These functions are used to improve athlete's performances and they are integrated in the form of smart shirts, chest bands and watches, accelerometers for activity monitoring and shoe pressure and activity measurement. (Faqs Reference, 2009)

The innovations of health monitoring devices are becoming user-friendlier, smaller and compact which could be attached with the clothing. This professional area is commercializing easily with the collaboration of electronics and new wearable technologies industry's research and developments. A number of commercial companies are currently providing health monitoring shirts for sports training. Wearable fitness technology is created which is compact and user friendly helps the elite and recreational athletes train on their own independent from place and other variables. (Proetex Org., 2009) A very well-known and popular example of medical monitoring used for professional purposes and developed to use for recreational and fashion sportswear is Nike's collaboration with I-pod. This is an exercise program which helps the wearer to self-monitor the activity. It's co-created with Nike and Apple. It requires I-Pod nano, Nike+ shoes, Nike I-Pod Sport Kit and Nike+ Sensor. The sensor is put in the especially built-in pocket under the insole of the Nike+ shoe. The receiver is connected to the I-Pod nano. The sensor tracks the run and sends the data to the I-Pod. The runner can listen to

his/her time, distance, pace and calories. With the Heartrate Strap, even the heart activity is monitored and recorded. (Apple, 2010) (Figure 2.20)

Figure 2.20 Nike+ Exercise Program (Source: Nike, 2010)

Other than wearable technology, comfort giving and muscle stimulating advanced materials make the performance to increase . The below materials and their contents not only help to improve physical performance but also help to diminish the environmental negative affects to the body which is a popular demand by the general end-user. Lightweight materials are required by athletes for protection and they were first developed for space programs or the military. Aerogel is an example of technology first developed by NASA in and because of its ultra light weight nature being only three times denser than air is now being used for athletic clothing and offers insulation in conditions of extreme cold and maintaining a light structure without keeping down the wearer. (O'Mahony & Braddock, 2002) Microfiber materials are used for many other sporting branches allowing lightness and durability, windproof but breathable or water resistant structures. (Clarke & O'Mahony 2005) During the activity of warming up and cooling down, one shouldn't feel the need of an extra piece of clothing. Thermo regulating fabrics are mostly used for mountaineering, tennis and also for beach and travel wear. The best examples for thermo regulating fabrics are the successfully mass-produced and marketed brands. Nike's Drifit and adidas®' ClimaLite are examples of this type (O'Mahony & Braddock, 2002)

Some of these materials have the primary end-user requirement from medical basis. There are garments innovated with advanced materials which help the athlete increase his/her neuromuscular performance. These innovations find their way to professional and recreational and sportswear. Compression garments are one of these innovations. They are pieces of garment like pantyhose, tights, bandages which are used as post-operative recovery products of which degree of compression is adjusted by a doctor. As research by Bringard, Perrey and Belluye (2006) show that wearing compression tights during running exercise may enhance overall circulation and decrease muscle oscillation to promote lower energy expenditure at a given prolonged sub maximal speed. (Bringard, Perrey and Belluye, 2006) An example is the Nike Pro-Core Long Compression Men's shorts which are designed for professional and recreational sportswear. The inspiration is from the post-surgical compression garments. The shorts are well-ventilated with thermo regulating properties of Dri-Fit fabric. (Figure 2.21, 2.22) (Nike, 2010)

Figure 2.21 (left) Postsurgical compression garment (Source: Marenagroup, 2010)
Figure 2.22 (right) Nike Pro - Core Long Compression Men's Shorts (Source: Nike, 2010)

Currently new sporting disciplines have emerged and the need for the perfect performing clothing continues. From surfing and snowboarding to climbing and mountain biking, performance sportswear is a huge industry that is driven by creative and scientific exploration. Experimentation and creativity are the driving forces behind performance sportswear design. People are never satisfied with their athletic performances since the first professionally held modern sporting events. The trainers and the sports apparel companies work harder than the athletes to come up with the perfect clothing or accessory design that will boost their performance. According to Kluger, 'the human race is becoming a faster race and the performance arc is rising'. (Kluger, 2000) Designers bring together all knowledge through materials, cuts to reach the speed and performance of once mythological 'superhuman' with the help of technology. Technology and knowledge have become the integrated tool for success.

Figure 2.23 (left) Adidas Optigon recreational sports training shoe
Figure 2.24 (right) Adidas Def Jam Eldorado
(Source: Adidas, 2010)

The best example of this athletic performance enhancing sportswear turning into use in fashion and people on the street has always been the sneakers. There are different innovations to create the perfect performing shoe. Bill Bowerman the co-founder of Nike has poured liquid rubber into waffle iron to create the outsole for a better performing result in the 1960's. Adidas was the first sporting shoe to invent the screw-in-

studs for soccer. These innovations have continued to develop sports-specific products and also reach the aesthetic and expressive demands of the end-users. Today there are different performing athletic shoes serving different general end-user needs. For example Adidas has performance training shoes (Figure 2.23) which have certain qualities like this shoe adapts to the ground for improved handling and stability during high-speed maneuvering, element of design in forefoot for maximum stability without limiting movement and special midsole, made of a visco-elastic rebound foam, contours to your foot like a custom mould. And it can also be worn on the street. The Adidas Def Jam model is created for more styling and fashion purposes than performance. The special design serves more expression than performance needs. (Figure 2.24)The Adidas Sumner model is has the characteristic of a comfortable in-, mid and outsole of a performance athletic shoe but the appearance resembles a shoe which can be worn in the city with work attire. (Adidas, 2010) The Diesel 2010 footwear collection also has this model (Figure 2.26) which utilizes innovated athletic shoe outsole but offering a more urban appearance to wear fort occasions other than sport performance but give comfort in walking in the city. (Diesel, 2010)

Figure 2.25 (left) Adidas Sumner (Source: Adidas, 2010)
Figure 2.26 (right) Diesel Footwear (Source: Diesel, 2010)

Today, research and development into sportswear textiles is an area where a lot of investment is done. (Braddock, O'Mahony, 2005) These efforts to develop human performance enhancing apparel for sports find the use in mass market over time. They all transform into profitable solutions into recreational and finally to fashion sportswear market.

2.4. Expansion of performance clothing to fashion

The influence of these inventions of synthetic materials and advanced cuts which are used in explorations and sports have influenced the daily life of people at an extent that pioneer fashion designers adopted these design inputs as inspiration.

An early example of adoption of performance oriented clothing into fashion was by Burberry. Burberry developed and introduced 1880 the fabric Gabardine, which is a breathable, tearproof and waterproof fabric. Thomas Burberry was a commited tailor, stressing on quality and innovation. In 1895 Burberry developed the Tielocken, which is the predesessor of the trenchcoat. It was adopted by British officers during the Boer War. In 1914, commissioned by the War Office to adapt its earlier officer's coat for new combat requirements, Burberry added epaulettes and 'D' rings, and the 'trench coat' was born. (Figure 2.27)Today, the performance clothing which was once created for military use, is an essential fashion product of today's luxurious fashion world like this Burberry 2010 model classical trench coat made of gabardine material and with unchanged rain –preventing shoulder cut and military style belt with buckle. (Figure 2.28)

Figure 2.27 Burberry military trench coat ad, around First World War (Source: Evilmonito, 2010)
Figure 2.28 Long double breasted cotton trench coat, 2010 collection(Source: Burberry, 2010)

In 1920s, Chanel was the one of the first designers who used rough and cheap materials which were used only for functional purposes to design pants, knee length skirts. She made clothing from jersey, which was previously used as underwear material for men. She transformed them into couture material. These items became popular as her lifestyle. Her designs were seen as 'elegant sport' or 'sport chic' as described by Baudot. At that time women were using their right to pursue leisure activities but they are expected to do it in a feminine way. (Figure 2.29 and Figure 2.30) (Baudot, 1999)

The 1920s were the time when society demanded functional apparel that could be used for active sports. A boost for this market has also initiated by the rebirth of modern Olympics, tennis tournaments and other sporting events.

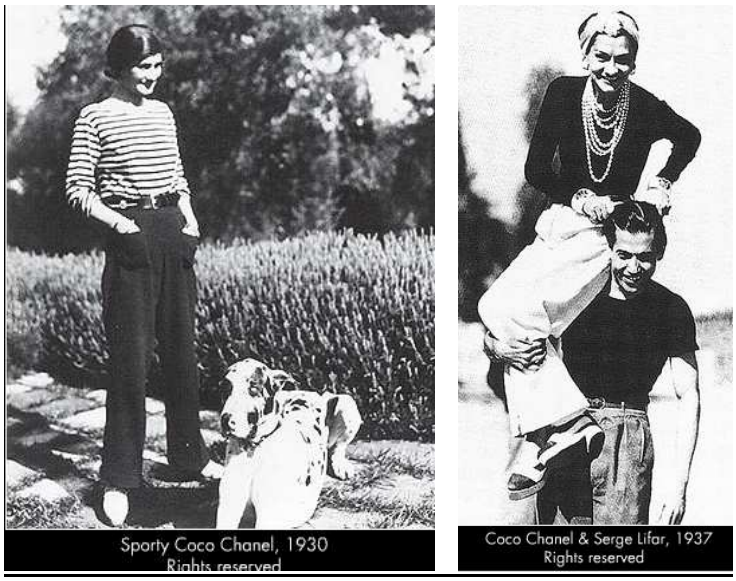


Figure 2.29 and **2.30** Coco Chanel in 1930s
(Source: Chanel, 2006)

As Chanel was a pioneer in democratizing fashion for women by using performance enhancing materials which were solely used for men at that time, the reflection of the daily agenda of the society has always been an influence. In 1960's fashion has turned these inventions of synthetic fibers, ergonomic plain cuts, material science and pattern developments into solid collections. In this decade also the effect of the space technology on fashion was undeniable.

Figure 2.31 Audrey Hepburn in Courregés designed hat from mid 60s
Figure 2.32 Emilio Pucci for Braniff Airlines from mid 60s
Figure 2.33 Pierre Cardin's 'biker' look from mid 60s
(Source: Designkultur, 2010)

André Courregés is an important fashion designer whose design identity was a pioneer in designing clothing for the future without any historical reference. He used technical textiles of his time and modern cuts that were highly inspired by the space travel. André Courregés collections featured proportionate, well-cut pants, rigidly constructed clothes with smooth 'trapeze', or trapezoidal lines, and short skirts, with white midcalf boots and large, dark glasses as accessories. (Encyclopedia Britannica, 2010) He had a contemporary and futurist style for his time. (Boucher, 2004) (Figure 2.31) Other designers like Pierre Cardin, Emilio Pucci's influenced by futuristic simple cuts, created a 'space age look' with newly invented synthetic materials that are used in space suit designs as a physical and visual design input in their time. (V&A Museum, 2010) (Figure 2.32 and 2.33)

Another field of product-led clothing affecting fashion design is when recreational sporting activities were increased and personal exercising became popular in the 1980's. The invention of Lycra® by DuPont was made in 1959 but it got popular in the late 70s and eighties being used and 'improved' the looks in sportswear and fashion clothing. (Laver, 2002) Olivia Newton John showing the trend of indoor sports in 1980 opened an era for sports clothing to enter the fashion market. Jane Fonda introduced Aerobics into the urban living making leg warmers popular. Elastic wrist and headbands' purpose were to use it against perspiration caused by active sports but they were being worn on the street for no function reason. (Park, 2006) The pioneer fashion designer of early 1980 introducing sportswear clothing into fashion is Norma Kamali. She designed a 'Sweats Collection' for Spring/Summer 1981, using the sportswear fabric jersey which was used for sportswear clothing. (Figure 2.34) She was influenced by the popular sport activities and high level of sports clothing merchandise bringing sportswear into fashion. She even

used advanced materials used for sports shoes for high heeled shoes. (Figure 2.35) (Laver, 2002)

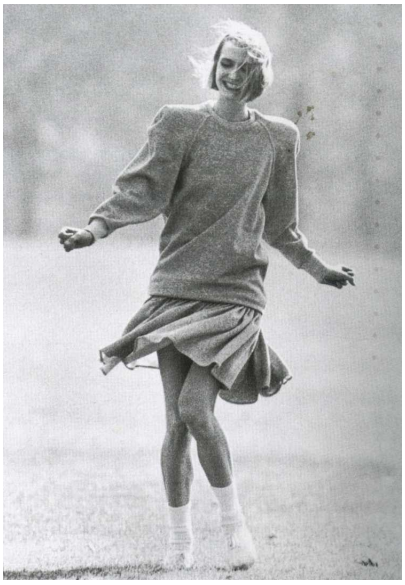


Figure 2.34 Norma Kamali Jersey sweat shirt and skirt, 1981
(Source: Laver 2002, p. 283)
Figure 2.35 Norma Kamali high heeled sneakers from 1983 (Source: Rubylane, 2010)

The biggest influence of product-led clothing into fashion was in the mid nineties when non-fashion functional clothing classics like army surplus, parkas, multi pocketed cargo pants and jackets are introduced to more design-conscious luxury fashion clothing buying consumers. The pioneer of this influence is Helmut Lang who created the design identity of 'urban sportswear' using functional clothing features and luxurious fabrics with little 'fashion connotations'. (Figure 2.36) Laver suggests that 'the prevalence of urban sportswear in male dress can also be directly correlated to the increasingly informal approach to workplace clothing.' (Laver 2002)

Figure 2.36 Helmut Lang, Fall 2004 Collection
(Source: Style, 2010)

The last pioneering influence of product-led clothing has been current electronic and computer technology features integrated advanced textiles. Hüseyin Çağlayan is one of the conceptual fashion designers who is innovative, experimental and has a unique conceptual design language of the late 20th and early 21st century and uses these influences in his field. His inspiration to be able to tell his design story and concept takes methods as design language from very different disciplines. He's using concepts and methods from architecture and philosophy. To support his concept and story he is using unconventional materials and unorthodox techniques. The creative process and the design language support the advanced materials he is using and the innovations he explores influence his creative design process. In his collection for spring 2007 he used battery operated self-activating smart technologies integrated to his designs which are becoming preferred design tools for contemporary product-led clothing. He took these

technologies out of their functional performance context and used them in his conceptual and critical designs. (Figure 2.37)

Figure 2.37 Hüseyin Çağlayan, Spring Collection 2007
(Source: Style, 2010)

Hüseyin Çağlayan's designs prove the major influence of contemporary performance clothing and advanced textiles into fashion world. Hüseyin Çağlayan is a fashion designer who is a contemporary pioneer in fusing product-led clothing technology and science with fashion.

Advanced textiles and innovative clothing design are responding the professional performance needs and appropriate designs are created. These designs play a great role in performance clothing for the end-users on the street. They also played and continue playing a great role in inspiring fashion of their relevant time.

CHAPTER 3

Social Formation of Fashion Sportswear

The need and driving force of innovation for clothing design originates from the needs of the modern living conditions. The changing social life cause new needs to emerge and new clothing designs get innovated with advanced textiles. Fashion designers are looking for tools and methods to keep people safe and performing in the modern society. End-users have to be able to perform well on individual level as well as in the society.

The 'social formation' that is stressed in this chapter does not explain the developing of certain type of society with its superstructure and economic infrastructure (Habib, 1997) but it attributes to the contemporary social agenda of the modern society which forms the inspiration input for the fashion sportswear sector.

Emotional and physical needs individually and socially are caused by social factors and personal experiences. This creates the design dimensions on social and individual level. The issues in the contemporary social agenda are perceived as inspirations of design concepts which form in the individual or formal design dimensions. Design concepts use the necessary functions related to its design dimension and turn them into design methods to solve urban clothing problems.

3.1 Design dimensions on individual and social levels

With the cultural differences in design and consumption of clothing developed with advanced textiles in the urban society, different types of design identities are created. Products and people both differ in their appeal on the design dimensions.

The design dimensions include practical uses, serving clothing performance on social level and as well as individual level. Unlike work wear and uniforms which tend to strengthen the functions of human performance and give a 'glimpse' of a comic strip inspired 'superhero', these functions have to fulfil our psychological needs in the city as well as physical needs of basic protection and performance of an 'urban hero'. The physical functions that increase urban performance matter the most at individual level. These functions help us to feel safe in the threatening environments. The clothing as microclimatic system, its protection functions from weather extremes, and its performance based design increasing the functionality in the city are what we need physically when we are outside of our safe homes.

The design methods for the design concepts take inspiration from advanced cuts and materials which satisfy a functional need combining performance and comfort in the urban space. When functional clothing operates on social level, the socio psychological functions become important when interacting in the society as an individual. Our clothing is our immediate personal environment in which we feel safe and secure while we communicate with the social world. (Table 3.1)

DESIGN DIMENSIONS ON INDIVIDUAL AND SOCIAL LEVELS	
Social Level **Social design dimension**	**Individual Level** **Personal design dimension**
Person/Socety Interaction	**Person/Human body**
Clothing as personal environment (Habitat to socialize, serving basic social communication needs)	Clothing as microclimatic system (Habitat to survive, serving basic communication needs)
Urban armour (against surveillance and outside disturbance e.g. noise/ i-pod, cameras, people/ flexible cuts)	Protection armour (against external physical conditions like impact, weather)
Aesthetic appearance based design (fashion and style)	Performance based design (function)

Table 3.1 Design dimensions on individual and social levels

Another function in the human/society interaction is that functional clothing serves as 'urban armour'. This term is used by respectable philosopher Virilio (1996) and other academicians. As Kipöz called 'urban armour' as a social protection (2007) in the context of functional clothing for disastrous times:

> Like buildings that are protected and fortified, the human body compensates for its fragileness with protective garments. Designers of urban clothing have developed different strategies, such as surface protection, body-machine complex, structural underwear, and military and police army influences to create the metaphor of armored dress in the metropolitan environment.
>
> (Kipöz 2007, pp. 22-23)

This new utility area where sportswear, fashion and modern daily life mix is called 'supermodern wardrobe' by Bolton. (2004) The term 'supermodern' is borrowed from anthropologist Marc Augé. The supermodern condition is overabundance of space information and individualisation according to Marc Augé. (Augé, 1997)

It opens up a new dimension of market niche where the rules of functional aesthetics play a great role in using the marketing opportunities in contemporary fashion. Bramel comments on these new market opportunities as:

> Consumers understand now that synthetics and traditional fibers can be effectively combined to respond to new, versatile or nomadic lifestyle needs: going from work to weekend or traveling and hiking with the same suitcase or backpack. Consumer trends emphasize multiple uses, and sports garments must also address these needs. Tomorrow's consumers will be more discerning; function alone will not guarantee durable market growth. The external influence of fashion should therefore be considered a major source of new market opportunities.
>
> (Bramel 2005, p.40)

The performance clothing responding to changing social needs and lifestyles must be mobile, hybrid, multifunctional, modular; provide urban shelter and also offer continuous communication update with the social world, thus provide the wearer functional efficiency, ease of use, comfort and a certain level of safety.

Combination of functional clothing design deriving from anthropometric and ergonomic function with individualized social and psychological needs of the social environment create hybrids and blends of clothing design deriving from fashion, performance, conceptual designs inspired by critical thinking or social awareness. All of these concepts gets filtered and create a perfect combination of fashion sportswear.

3.2 Contemporary Fashion Design Concepts in Social Adoption

The contemporary social environment introduces new design concepts for fashion designers as inspirations other than styles and trends related to aesthetical and historical references. These inspirations make the fashion designers look for a solution

to the urban issues which the society is facing like political, socio-economic situations and daily metropolitan living conditions. Clothing and fashion designers, academicians and philosophers offer suggestions that raise the practicality of clothing in the urban world. (Bolton, 2004)

3.2.1 Social awareness as design concept

Raising the standards of living conditions and bringing comfort to our lives is a social issue to be focused on by clothing designers. One of the important social and political problems of our day is homelessness, which can be considered as a natural result of poverty, migration, or natural disasters. (U.S. Department of Housing and Urban Protection, 2010) Different projects of functional clothing or art are proposed by non-profit organizations, artists or designers about homelessness and need of 'urban protection'.

One of the primary functions of clothing is the provision of shelter against the elements. Flügel in 'The Psychology of Clothes' (1930) say that 'clothes are like a house, they are protective; but being nearer the body and actually supported on it, they are portable. With their help we enjoy the advantages of shelter without the disadvantages of becoming sessile.' (Flügel in Bolton 2002, p.58)

This situation is best characterized in Lucy Orta's work 'Refuge Wear - Habitent'. (Figure 3.1 and 3.2) Lucy Orta is an artist who creates 'wearable shelters' who brings individuals humane practical solutions. (Quinn 2002, p.20) Her work varies from 'portable architecture', 'survival suits' to 'refuge wear'. This clothing is a part of the refugee wear collection which is a hybrid of a tent and raincoat, made of aluminum coated polyamide,

polar fleece, telescopic aluminum poles, including a whistle, lantern and compass. (Studio Orta, 2009)This garment serves a personal space to homeless people who feel the need of protection and escaping the surveillance risk. Virilio comments on Lucy Orta's work as:

> Lucy's clothes emancipate themselves, expand to try to become a house, a pneumatic raft… The garment becomes more than a mere clothing; it is a vehicle, a survival vehicle certainly, but also a vehicle which protects against anonymity.
>
> (Virilio in Orta, 1996)

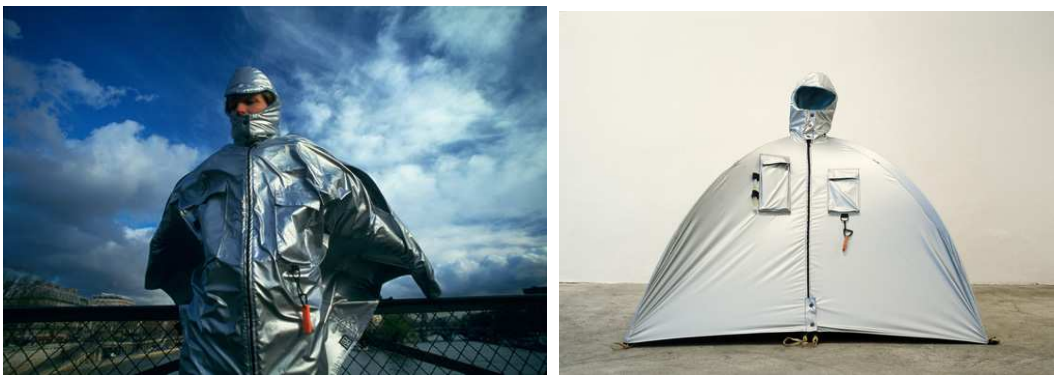


Figure 3.1 and 3.2 Refugee wear by Lucy Orta, 1992-93 (Source: Studio Orta Website)

In these kinds of garments advanced finishing or fibers together with advanced patternmaking skill and cuts are used in order to convey the meaning effectively.

Nonetheless, for those who are mobile, the sense of home cannot be fixed in geographical place however it is for sure that there is a need of a 'pure and safe space' as Morley puts it. (2000, p.141) Our clothing must offer us a kind of mobile home and give the sense of home and security.

Such example of transformation of conceptual design and wearable art into a commercial product is designed by C.P. Company and it is a hooded cloak with advanced

cut and pattern. It turns into a hammock, which would give the wearer a temporary resting place for unexpected time spent outside the comfort of home. (Figure 3.3)

Figure 3.3 'Amaca' Hooded Cloak converts into an hammock by C.P. Company (Source: Bolton, 2002)

Designed to function as portable environments, the fashion sportswear clothing provides shelter against the natural conditions. However for mobile people, some sense of home is needed even when travelling. These artistic inspirations become design inputs for urban fashion sportswear design.

3.2.2 Social disasters of the new century

There are various risks and disasters in the world that we face every day in our modern world. There are natural disasters like earthquake, volcano eruption, flooding or global warming or risks and problems created within the social modern world like homelessness, sexual assault, or technological surveillance. The society needs protective functions of modern clothing other than sheltering individuals against climatic and environmental conditions. It often extends to protecting them against actual physical harm either in the form of unintentional injuries or deliberate attacks from other

individuals. In urban spaces people need safety against attacks and assaults, against unexpected indoor or outdoor weather conditions. When being alone outside, people are exposed to various psychological dangers or subject to the gaze of passers-by. Consequently, the metropolitan experience is characterized by insecurity and paranoia, which creates a personal fear against the possible risks in the contemporary urban world.

The society is aware of these uncertain conditions and risks and feels the need of managing these risks that the modern world brings. Giddens calls this as manufacturing and managing uncertainty in a 'risk society'. (Giddens, 1990) The term 'risk society was first used by Ulrich Beck in 1990s and it's describing how the modern society responds to risks. (Beck, 1992) The term 'risk society' gives inspiration to the designers to find solutions that respond and address to the emotions of wearers who get affected by social and natural disasters.

The 'risk society' which was first defined by Giddens, also finds a new meaning in Kipöz's definition. (2007) The hybrid character of the garment serve as different types of wearing in broader sense. As defined by Kipöz:

> The ontological problems of radical modernity such as homelessness, exclusion, confinement, alienation, social decay, oppression, disruption, complexity, fragmentation and trauma also change the glamorous face of fashion and influence the mode of clothing into a de-constructive complex structure, which can be defined between body, space and the object to be re-semantified within the context of risk society.
>
> (Kipöz 2007, p.347)

The 'risk society' term is used as a reference to the 'Design against Disaster' research project which was presented by Kipöz in 2007 at the European Academy of Design conference, Dancing with Disorder: Design, discourse, disaster. (Dress against disaster,

2007) In this project, the students were expected to design garments which will address solutions to various social and physical risks they might encounter in the modern society.

One example is called 'Global Warning' and aimed preventing the risks of global warming. The design used white and grey metallic color to diminish the effects of sunlight. The body was made of lightweight, perspiration resistant material. A removable nylon panel with inserted piping equipment was designed to filter dirty water into drinking water. The system was supposed to function with the help of the solar panels on the shoulders. (Figure 3.4) The other example is called 'Strong Enough'. (Figure 3.5) The outfit is designed to prevent a possible sexual assault. It's made of elastic, strong fabric. It allows ease of mobility to the wearer but also creates confusion to the harasser with its complex pattern and cut. The outfit also uses the idea of chastity belt in the construction of undergarment and broken mirrors attached on the upper body to give the attacker a look of himself.

Figure 3.4 Student project from DAD 2007 called 'Global Warning' (DAD 2007, p.55)
Figure 3.5 Student project from DAD 2007 called 'Strong Enough' (DAD 2007, p.73)

The disasters and social risks lead people to the level of the uncertainty and lack of confidence in their daily lives which brings them to the level of paranoia. This paranoia leads the society and with the feedback of the end users' experiences to 'paranoid products' as used by Gamman and Thorpe to be categorized as 'over-determined fortification', 'moral panic' design, delusional design and 'normalizing of emergency conditions' products/services. (2007, p.895) This paranoia leads to design of the clothing products against perceived dangers which Bolton describes that is fantasized as potential dangerous characters as potential criminals. (2002, p.81) The garments which are designed as conceptual and wearable art or actual performing items against social risks have the potential of 'empowering the individual against the deal with the real or perceived risks and disasters of the urban environment.' (Kipöz, 2007, p.341)

One of the examples of designs which are sold as products against crime is 'Karrysafe' garment, bag and accessories which are 'socially responsive street accessories' as called in the explanatory website of Design Against Crime Research Center which is a practice led research center located at the Central Saint Martins College of Art and Design. (Design against Crime Research Center, 2009) (Figure. 3.6 and 3.7) This accessory is carefully thought and designed, using durable fabric for outdoor use to respond to the modern metropole.

Figure 3.6 and **3.7** Karrysafe Bag and accessories (Source: Design Against Crime, 2002)

These designs find a place in the product lines of travel wear or sportswear brands and are sold as a result of the end-user need of the urban society.

People are afraid of that something dangerous or risky might happen to them and feel the need of covering themselves with functional aspects like light and protective elements against possible risks stated above. This new dimension or utility area nevertheless creates conceptual design solutions which can be interpreted into powerful salable merchandise taking profit from this social paranoia. The innovative design solutions which answer to society risks and dangers are not only developing our bodily but also spiritual performance. (Göknur, 2007)

3.2.3 Nomadic urban life

The people have to live in a mobile world. The clothing needs and social obligations of people in the city reflect sense of mobility too. Everyone has to be in a flux of situations, concepts, places and time. As people move in the city to go to work, or walk through the streets to run daily errands they carry cell phones, mp3 players on them with the need of more space on them to carry these equipments. Waiting on the bus or train, resting on a bank or stair steps in a corner to check our messages creates a need of clothing designed with highly ergonomic concerns. The people face a 'nomadic' living in this modern world. As Bolton (2002) states:

> The clothing today is designed to respond to the physical and psychological demands of transitional spaces such as roads, railways, airports and the street.
>
> (Bolton 2002, P.7)

Since the invention of fashion, 'clothing is defined by the context in which it is worn' as Bolton puts it (2002, p.7). After Second World War, with newly restructured cities, the modern city life has become the place of anonymity. Structured highways, motorways, buildings, big department stores, airports led the way opening new understanding of space. The circulation of urban population has accelerated since the last two decades. The abundance of these types of places along with the freedom of movement, new kind of needs emerged in terms of travel wear that derives from contemporary fashion and professional sportswear. (Bolton, 2002)

This need of clothing involving portable design solution for the end-users for their memories, traces from actual self or basic functional goods while traveling is used as inspiration by fashion designers with the invention of durable materials. Vera Maxwell designed a 'travel ensemble' in 1948, which has a big pocket. It resembled a big bag with nylon compartments attached to the jacket. This is an early example of a modern sportswear garment focused on urban performance. (Figure 3.8 and 3.9)

Figure 3.8 The jacket from the Vera Maxwell's 1948 travel ensemble (Source: Met, 2010)
Figure 3.9 Pocket **d**etail from the jacket (Source: Martin ed., 1998, p.56)

The need of 'mobile living' and portable designs that would hold belongings is stressed by Berger and Mohr (1975). Berger and Mohr (1975) mention the migrant workers in Europe in 70's in their book called 'The Seventh Man'. When the 'gastarbeiter' were not permitted to keep their suitcases in their dormitories, they disobeyed, because their suitcases were not only the 'case' of what they wear, but they were all of what they have brought from home, their memories and attached self from the time they left their country. Berger continues:

> … each suitcase, locked or tied round with a card, is like a man's memory. They defend the right to keep their suitcases.
>
> (Berger and Mohr in Morley 2000, p. 44)

Traveling and living in a place are redefined in the contemporary urban city. These needs are defined in Issey Miyake Travel Jacket of the collection AW 2000-2001. The necessary items like wallets, keys, a pen, notepad, electronically communication devices like cell phones, mp3 players are all needed to be carried around on the people. (Figure 3.10)

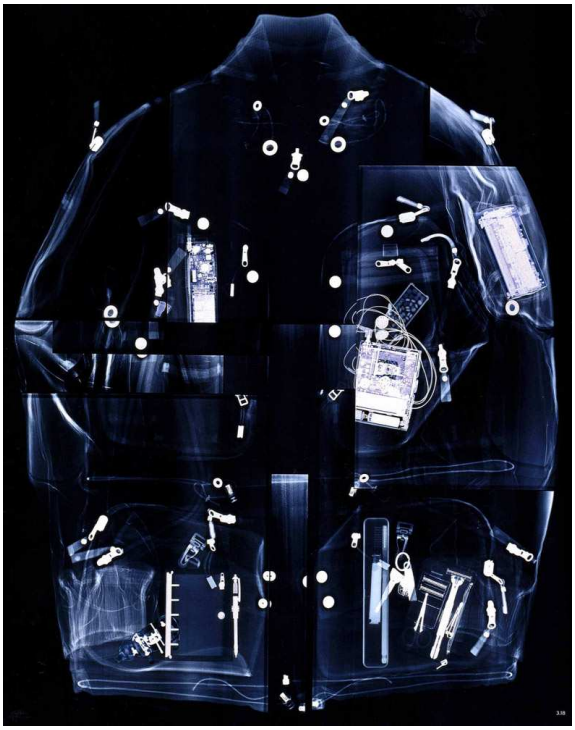


Figure 3.10 Issey Miyake 'Travel Jacket' AW 2000-2001 (Source: Bolton, 2002, p.46)

People don't want to carry equipment or belongings in a bag when they run errands or exercise. Garments incorporated hidden pockets and attachments are created for the reasons above.

The nomadic living condition combines all previous design concepts in one. The urban nomadic clothing has to offer shelter, mobility, communication and extra carriage place altogether. This kind of design solutions can be found in sportswear or casual wear brands. Casual wear brands which specifically focus on answering the travelling problems of the people are also a good example. Samsonite's pant made of stretch textile with detachable bag is designed to respond travelling needs. (Figure 3.11)

Figure 3.11 Samsonite pant detail (O'Mahony Braddock 2002, p.155)

There are outdoor clothing design companies which focus on mobile design solutions answering mobility required situations. Pants with multi cargo pockets and detachable legs are designed for a long time spent outdoors in nature, but they are used also in the cities like this design from the brand Columbia. (Figure 3.12) More fashion driven styles are also designed by casual wear companies which satisfy the performance and fashion

needs of an ‘urban nomad.’ The design by G-Star Raw with combination of aesthetically pleasing and functional cut answer more expressive needs and also performance at the same time with ergonomic pattern and extra pocketing in breathable fabric. (Figure 3.13)

Figure 3.12 (left) Pant with detachable legs with cargo pockets (Columbia, 2010)
Figure 3.13 (right) G-STAR Raw belted tapered jeans (Stylecompare, 2010)

The concept of mobility points out the function of holding possessions, keeping necessary items while being mobile. This function is achieved by specific cuts and materials that satisfy the individual level of design needs. In outdoor clothing the designs focus on fulfilling the needs with aesthetically pleasing cuts. These features are combined with favorite sportswear materials that are preferred by casual sportswear customers like denim and gabardine. This turns these designs into commercial fashion sportswear products.

3.3 Contemporary fashion design methods of functional clothing using advanced textiles responding to design concepts

Functional clothing has certain characteristics like enhancing urban performance with cut or advanced materials and appeals to the modern person living in the urban world. These characteristics also shape the design methods which answer to the design concepts stated earlier. A thorough analysis of these design methods need to be made in order to understand the social formation of fashion sportswear. Some of these design methods were offered by Bolton as characteristics of 'supermodern' wardrobe. (Bolton, 2002) The most important clothing design characteristics turn into design methods for urban performance are multifunction, transformation, modularity and smart function.

3.3.1 Multifunction

People need to accomplish their daily routine practically and as fast as possible. That's why they need their clothing or accessories to serve more than they are designed for or acquire them to have roles next to their main functions.

Multifunctional clothing finds a definition in its advanced cuts or its advanced textiles. A multifunctional cut or design refers to the garment which should offer different layering, folding, interconnecting of the materials that it should serve for multiple purposes of the wearer. That means it should protect the body and as well as serve as a technology-station with its multi pocketing cuts or reconfiguration of its parts offer a new way of use of the garment. Along with the use of advanced textiles which have the quality of

water-resistance or tear-resistance offer more durable ways of using of one garment under different conditions that the daily life offers to us.

Figure 3.14 Parka and multipocket waistcoat w/ folded aluminium scooter (Source: C.P. Company, 2006)

For example the parka in Figure 3.14 designed by C.P. Company with multi functions provides a protective environment against bad weather, while it serves as a bag to contain equipment with multi-pockets. It is anti-rip, anti-abrasion, oil and waterproof with protective fabric; holds mittens and an aluminum foldable scooter.

This method of multifunction is achieved with the help of the textile innovations and advanced pattern making. The existence of such functional fabrics and potential design solutions are researched and applied in different combinations by the designers and answer to the right result of such need. The designers search for the ultimate design, method, cut and textile offerings to answer these urban problems.

3.3.2 Transformation

Transformation is an important method of designing for fashion sportswear clothing which offers hybrid structures and body types as design solutions. The term 'hybrid' is generally used today to refer several kinds of things, all of which are abstractly heterogeneous in origin or composition according to Stross. (1999, p.254) Stross proposes that hybrids, particularly in the cultural domain, are often created to fulfill environmentally sanctioned functions, to fill contextual needs, or to take advantage of opportunities created by new situations.

The hybrid forms are usually designed on the basis of their exhibited characteristics. The hybrid form which is achieved after transformation has superior features than their 'parents'. (Stross, 1999) This new type of clothing is transformable from one function to the other offering different types of uses for different situations that might be needed in the urban space.

Transformation is a design concept interpreted by designers in the form of advanced cuts or using hybrid textile surfaces or smart textiles as the co-work of scientists from different fields of textiles, computer sectors using innovative fabric assembly techniques. This example of clothing is an inflatable parka which turns into air mattress from C.P.Company's SS2001 'Transformables' collection. (Bolton, 2002) It is neither a jacket nor an armchair but has the function of both and is superior to its original state. The superiority is defined by the selection and combination of fabric and garment assembly techniques. The hybrid characteristic of the fabric which has a man-made structure and advanced pattern ends up with a hybrid design solution. (Figure 3.15 and 3.16)

Figure 3.15 (left) Inflatable parka turns into air mattress (Source: Bolton,2002, p. 65)
Figure 3.16 (right) Air mattress and chair (Source: C.P. Company)

These hybrid and transformational bodies developed by the use of the design methods which today's contemporary fashion sportswear designer benefits from. Protecting the body and serving the individual to satisfy another need is a method requires good knowledge of anthropometry and ergonomics with material knowledge.

A transforming design called 'Wearable Chair' by Issey Miyake has the advanced cuts and materials combined which exhibits a certain level of protection of the body as a vest that transforms into a chair. (Figure 3.17) Breward's observation on Issey Miyake is that he creates transformational designs which are produced beyond seasonal trends. He's knowledge of innovative cuts and different uses of proportions create these advanced designs. (Breward 2003)

Figure 3.17 Wearable chair by Issey Miyake
(Source:Businessweek, 2006)

The hybrid structure of the vest is the solution to the design problem defined by the designer. The designer is eager to find an answer to the practical need, so he carried on searching innovative cuts and textiles, creates a new hybrid structure which fulfills such requirement.

A clothing design that is transformed from one piece of garment into another is welcomed by the end-users and can even be found rather commercially on the market. The example of North Face convertible dress is a performance dress designed for work and travel. It's a dress, converted into a skirt. The straps are folded and rolled down to morph into a causal skirt. The material is recycled, soft and stretch; it features moisture management technology that wicks away moisture from skin; moving it to the outer layer of the fabric where it evaporates. (Figure 3.18)

Figure 3.18 North Face convertible dress (Source: North Face, 2010)

3.3.3 Modularity

Our daily responsibilities and living conditions are discontinuous. We live in one place, work in another and exercise or shop in another facility or place. Each context may call for a different set of functions. Modularity as a design concept in urban life helps to design clothing to break this discontinuity. Many designers of functional and casual wear clothing have adopted a modular system of dressing in an attempt to simplify the complexities and unify the discontinuities of modern urban life. (Bolton, 2004)

According to Merriam-Webster dictionary, modularity means construction with standardized units or dimensions for flexibility and variety in use. In design, modularity refers to development of a complex product or process from smaller subsystems that can be designed independently. (Merriam-Webster, 2007)

Modular clothing offers practicality to the wearer by shaping and suggesting combinations of pieces from the start. This practicality is achieved either by a continuous garment assembly system or by different pieces of clothing combined and worn differently. The design system as a project of Issey Miyake is under the name of A-POC, acronym for 'A piece of cloth'. The project has been exemplary to the modular clothing as design method combining garment assembly techniques with design and a solution to innovative clothing production. (Issey Miyake, 2010) Issey Miyake developed a philosophy of creating clothes from a single piece of material which is customized with a pair of shears. The production process is patent-holding and kept as a secret. The examples in Figure 3.19 and 3.20 show the A-POC Galaxy 2007 design. It's a denim jacquard cloth which has a surface that imitates the garment wash effect of denim fabric in a 150x150 cm. dimension. After cutting the design the end-user is ready to wear the piece of cloth, in this case it's a pair of jeans.

Figure 3.19 (left) Issey Miyake A-POC Galaxy (Source: Flickr, 2010)
Figure 3.20 (right) Issey Miyake A-POC Galaxy customized denim pant (Source: 1cco Blog, 2010)

All of these characteristics above are end-user needs for a person who lives in the modern world and he/she travels during the day. The physical and social needs during the day change according to the weather conditions, communicative responsibilities, and daily physical performance. A social interacting person expects all of these requirements to be fulfilled from the most intimate service provider of his/her own: The system surrounding his/her 'microclimatic' and practical environment.

3.3.4 Smart functions

Weather the mobile urban life or the physical or social dangers of the city motivates the innovative clothing designs, the clothing must offer other functions than advanced cut and pattern solutions to our spontaneous needs. Technology fills the gap of abundant need of information and gives the sense of 'connectedness'. (Bolton, 2004) Most important feature is accessing to information, which is a necessity to every traveler to keep in touch with the people they associate with. Bolton calls this type of clothing as 'quasi-uniforms that articulate our powerlessness in transitional space.' (Bolton 2004, p.15)

The smart function method works when the clothing that is used for daily wear are attached with electronic components or wired with computer technology in order to enable a continuous communication with other people. To connect the textiles to the clothing design and to the cellular phone or other internet access, the design is supported by connecting and integrating technology to the woven or non-woven clothing material with various assembling techniques including sewing.

An example of a solution of smart functions in textiles is solved as an embroidered keypad of which production was made with ordinary embroidering techniques and conductive threads. It's a flexible, durable and responsive keypad which can be used and manipulated for different clothing designs integrated in order to communicate with when people are on the move. (Post E.R. Orth M., 1997) (Figure 3.21) These innovations bring merging of the clothing and connection to the smart systems closer. This design method is getting more popularized as the innovations in washable computing devices and systems continue.

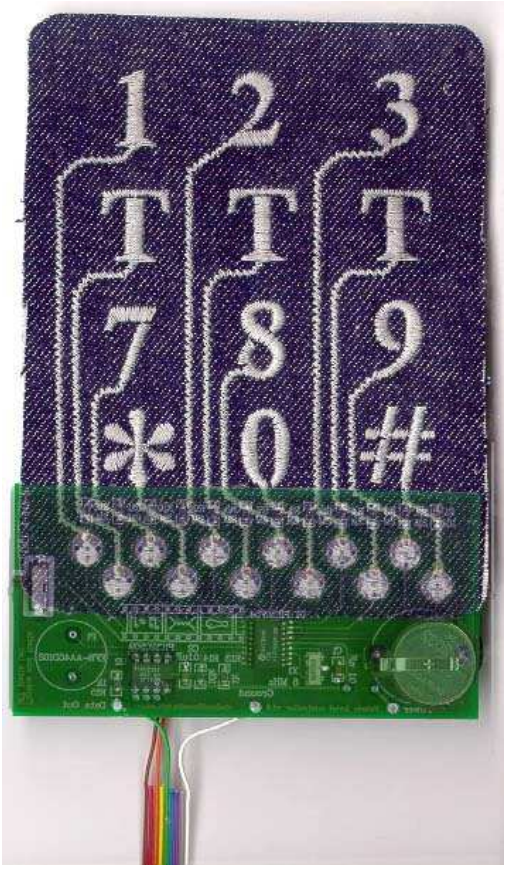


Figure 3.21 Embroidered denim keypad
(Source: Post E.R. Orth M., 1997)

The early examples of the need for communication bringing out smart functioning as a design method are observed in product-led clothing. NASA used this innovation for the

astronauts to make the communication easier. (Byko, 2005) The communication need is used for other product-led clothing styles varying from the military to emergency staff. (Figure 3.22) What was a necessity for the survival of the professional users in the space is becoming a necessity for urban end-users' social connectedness and survival in the city.

Figure 3.22 Space suit glove with an embroidered electronic keypad (Source: TMS, 2010)

This innovation finds a use in the service oriented industries like airport management to answer the communication problems of mobile airport personnel. Designing a telecommunication scarf was expected to solve that problem. (Electronic Shadow, 2007) Such garment was innovated by Mestaoui and Kaci in collaboration with France Telecom's research and development department in 2000. (Figure 3.23) This prototype was a multimedia communications scarf. There is a touch screen, a mini Web cam integrated. It is designed to receive and send visual and written visual information. There are concealed earphones positioned at ear level of the collar when raised, and wrapping it around the neck places a microphone in front of the mouth. It is then easy to have a telephone conversation or a videophone conversation. It's designed as a complete portable office. (All business, 2001)

Figure 3.23 Communication Scarf by Mestaoui N., Kaci Y.A., 2000
(Source: Electronic Shadow, 2007)

An example of such method can be seen in the Levi's and iPod collaboration for leisure activities. Levi's designed the first iPod compatible jeans and the pants are allowing the end-user to attach the iPod and give freedom of movement. (Figure 3.24)

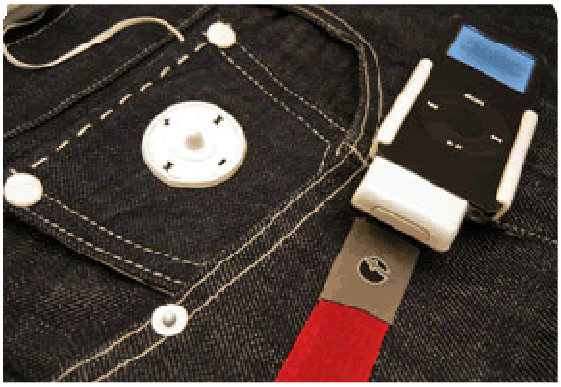


Figure 3.24 Levi's iPod compatible jeans (Source: Fibretronic, 2010)

Another smart functioning method involves blue tooth technology and enables wireless communication with the electronic media. The garments are innovated or designed so that a Bluetooth control panel is inserted for wireless electronic media attachment. It is developed for sportswear for recreational but also for urban use. Motorola and Burton snowboards designed Audex jacket series. (Figure 3.25) The design enables the wearer to listen to music through the iPod or make phone calls through wireless connection, which enabled through a control panel on the sleeve. (Mobilewhack, 2010)

Figure 3.25 Burton snow jacket designed with Motorola (Source: Mobilewhack, 2010)

In our social surrounding the society has to cope up with time and information. Design methods like smart functioning used in constructing fashion sportswear serve as a convenience to the people who are out there mobile and transporting from one place to the other. Connecting information to the body closer, with wearable electronics and portable environments is needed by the contemporary urban end-user.

The design concepts located in design dimensions bring forth the methods by the use of technology. With modern society which brings changes, new social needs get produced like feeling self active, durable and mobile. The designer reacts and searches for suitable

advanced materials and design methods to accurately express the right combination of solutions responding the end-user's social needs. These contemporary methods mentioned above are results of curious minds of fashion designers who eagerly and repeatedly work to find answers to different needs of the urban society. Modernity and development in societal level forces the clothing designers to be practical and find effective solutions. The social issues and used methods in designing clothing for urban use cause commercial markets to emerge like fashion sportswear.

CHAPTER 4

Technical Formation of Fashion Sportswear

Clothing design development process starts when the consumers demand specific goods in a specific time period. Both in contemporary fashion and performance clothing design, the process starts with analyzing the needs of the end-user. The Merriam-Webster dictionary defines the end-user as the ultimate consumer of a finished product. (Merriam-Webster, 2008) This term attributes a commercial value to the product that is put together at the end of the design process. Contemporary fashion design focuses on creative part of the design process while performance-clothing design focuses on extensive prototyping in research and innovation stages to find the optimum solution to answer the physical problem that was defined in the beginning of the process.

One factor in the design process is the role of end-user needs when innovating new products designed with advanced textiles in functional clothing and sportswear design. The end-user needs cause different innovation focus areas in product-led clothing, performance sportswear and contemporary fashion. The other factor is the contribution of innovative production techniques and the collaboration of the design and science related disciplines during the product development process.

Advanced textiles are being innovated in collaboration with textile, chemical, biological and nanotechnology industries and turning them into an efficient and creative design input for fashion sportswear requires multi-disciplinary and inter-disciplinary work.

Collaboration of different industries with scientific branches, produce know-how and production process for this newly evolving clothing design sector and form the technical basis of its design process.

4.1 Shaping innovation according to FEA design framework

Driving force of innovation as start-up phase in creative design process is primarily physical needs of the consumer. In contemporary fashion design, the driving force shifts to aesthetical and expressive needs. In the product development stages, customer demands are defined; suitable designs are created according to contemporary trends. The product development stages of a fashion product should be processed to meet retail delivery dates. On the other hand, in product-led clothing design, the end-user expects to have the primary requirements to be fulfilled, which are not necessarily bound with the 'zeitgeist'. Only the technological advances and innovations are variables, which change the design methods accordingly.

The end-user needs of clothing products are analyzed by Lamb and Kallal. They developed a design criteria model (1992) (Figure 4.1). This framework in the figure below focuses on the functional, expressive and aesthetic design criteria of the target consumer. These criteria shown are interrelated and shape each other. The creative formation of clothing design according to this framework differs from product-led clothing to fashion clothing. The three types of criteria in the framework -being the functional, expressive and aesthetic- define different end-user needs and open up fields of innovation depending on the target consumer's culture. This framework is suggested by Le Pechoux, Little and Istook (2007) as the design criteria bringing effective design solution. The FEA design framework shapes the creation of the designs and determines

the innovation focus for the demanded product in the process. It has functional criteria like fit, mobility, comfort, protection, donning and doffing which could change the design focus according to the target customer needs from which culture she/he originates. The aesthetic criteria to develop innovation are art elements, design principles, body and garment relationship. The expressive criteria are the values, roles, status of the end-user in the society and self-esteem issues that the end-user is facing play a role in deciding on the focus of the clothing design.

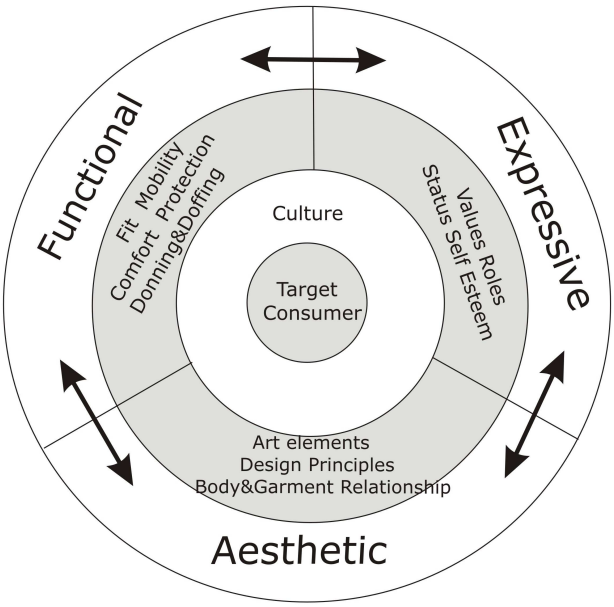


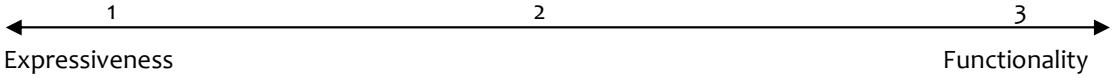
Figure 4.1 FEA Design Framework of Lamb and Kallal (1992)
(Source: Hines and Bruce 2007, p. 208)

This functional/expressive/aesthetical design framework is also observed by Seymour. (2009) She puts the expressiveness and functionality levels on the table 4.1 for a 'fashionable wearable', which is a term used by her to describe the 'designed garments, accessories, or jewelry that combine aesthetics and style with functional technology.' (Seymour 2009, p.12)

It is seen that the highly expressive styles are the garments of which functionality is less important. The garment is actually conceptual art, which uses technology and innovation

as a means to express its designer's feelings. The highly functional garments are the work wear in this table. Personal expression is not required and is restricted. (Seymour, 2009)

This design framework can be also applied for fashionable wearables as stated in table 4.1. Fashionable wearables are clothing which utilizes smart technology and answering users' needs in the social area. (Seymour, 2009) The design framework for a fashionable wearable shifts between functionality and expressiveness. These garments have defined as functional and stylish utilizing technology.



1 The fashionable wearables in the high fashion realm are expressive and the functionality is less important.

2 The fashionable wearables have a defined function and some need to be stylish. Sportswear and health-monitoring garments require this duality.

3 The functionality is the focal point. In work wear, the necessity for personal expression is limited by strict pre-defined functionalities and restrictions.

Table 4.1 Levels of expressiveness vs. functionality according to Seymour (Source: Seymour 2009, p.14)

These criteria of design framework define the innovation level in each step of the design process to be focused. The innovation focus according to this FEA framework shifts from basic survival needs to performance, aesthetics and expression as seen in table 4.2. The end user's primary concern in health, space, military and emergency sectors is simply survival. Survival should be maintained by innovation in advanced cuts, textiles and smart applications and computer attachments for functional clothing design. As the

category shifts from basic product-led clothing sectors to professional sportswear performance market shown in the table, performance becomes the most important requirement that shapes the innovation of the design in the process. In recreational sportswear, the ranking shifts from performance to comfort and fashion, because the end-uses do not only pay attention to performance properties but also aesthetical features. In contemporary fashion design, aesthetics become the primary concern. The end-user needs in the beginning of the creative design process for each field shapes the ratio of innovation from textile, cut and pattern to style and trend needs creating a unique mixture for each sector. (Table 4.2)

	INNOVATION FOCUS ACCORDING TO END-USER NEEDS		
		Primary Concern	**Secondary Concern**
Product-led	**Health**	Survival	Performance
	Space	Survival	Performance
	Military	Survival	Performance
	Emergency	Survival	Performance
Fashion –led	**Professional Sportswear**	Performance	Aesthetics
	Recreational Sportswear	Performance/Aesthetics	Expression
	Fashion Sportswear	Performance/Aesthetics/Expression	

Table 4.2 Innovation focus according to end-user needs

The end-user needs defined according to each sector specify the innovation focus based on that need as a design requirement. These specifications lead to advanced textiles and necessary innovations to be integrated and worked during the design process to fulfill these needs.

4.2 Innovation in creative design process

Product development process for fashion design is formed by many different functions which are 'built on one another and they must be monitored and controlled.' (Rosenau, Wilson 2001, p.168) Fashion uses these functions by creating different versions of cut, pattern, look and silhouette in order achieve the product of which the end-user will be satisfied. As a result, the 'end-user' is the stimulator to start the design process and affect the whole process of product-led clothing design and it is the 'consumer' affecting it in contemporary fashion design.

Product development process is also affected by the timeline. Contemporary fashion design's product development process differs from product-led design's product development process. Contemporary fashion design product must meet timely requirements in order to meet buyers and trends for its new season. Product-led designs are handled as a project during the development process where every project has a time plan that it has to meet in the end of its process but not necessarily to meet current trend requirements in a given time period.

Carr and Pomeroy (1992) offer a 13-step product development process. (Figure 4.2) This gives the idea how a critical path of design process should form for fashion-led clothing design. The critical path in the design process plays the greatest role in terms of defining the action plan that gives accurate information to which direction the process flows. The product development stages are analyzed in terms of innovation focus in each step of the process. The Carr and Pomeroy's product development process starts with market research, design concept, followed by market screening. These stages form the 'origin of styles' mainly forming the creative design process. The making of the

prototype, sampling, range meeting are the 'development of samples'. Pattern adaptation, testing are the 'refinement of business objectives and making the production pattern, grading, preparing markers, templates and specifications for production forms the stage of 'the attainment of commercial products'.

PRODUCT DEVELOPMENT PROCESS (according to Carr and Pomeroy 1992)		INNOVATION FOCUS ACC. TO END-USER NEEDS
The origin of styles	Market Research	Aesthetics/Expression
	Design Concept	Aesthetics/Expression
	Market Screening	Aesthetics/Expression
Development of samples	Prototype pattern	Function/Aesthetics
	Sample	Function/Aesthetics
	Range Meeting	Aesthetics/Expression
Refinement of business objectives	Pattern Adaptation	Function/Aesthetics
	Testing	Function/Aesthetics
The attainment of commercial products	Production Pattern	Function/Aesthetics
	Grading	Function/Aesthetics
	Markers	-
	Production Templates	-
	Specifications	-

Figure 4.2 The process of apparel design and product development of Carr and Pomeroy (1992) in Hines and Bruce (2008, p.190) matched with innovation focus according to end-user needs.

The stages of a contemporary fashion product development process cover all functions and actions that are necessary for the product development in fashion apparel design firms. The creative design process involves critical functions where different innovation foci play different important roles in each of them. The stages of planning, creating the design concept and developing the design shape the 'creative process of design'. (Le Pechoux et al., 2007)

4.3 Innovation in product development processes

In the first stages of innovative clothing product development, the fibres and fabrics are added with advanced capabilities, for instance they are embedded with technology or are constructed with conductive fibers and coated with advanced properties. The simple method of weaving of the yarns and fibers, which constitutes textiles, is becoming complex with collaboration along with other industries like nanotechnology, electronics integration, chemical treatments, microfiber technology and other fields. There are fibers and threads that are easily commercialized and some need more experimentation before they are introduced to the end-user on the street market. The synthetic fibers are the most commonly known, well-fit and commercialized fiber technology that serves our everyday needs at work, leisure and sport activities.

As seen in the table 4.3, the evolution of fiber engineering below by Bramel (2007) shows that from 1960s to 1980s, the function of the man-made fibers was to innovate and see how far the scientists can go by imitating the skin. They focused on elasticity, softness, later moisture management and thermal insulation and being waterproof. After 1990s, the textile industry, with the collaboration of the other industries focused on well-being of the body. They developed textiles that controls odor, protects from the sunrays and even muscle compression that is used in health sector and then adapted by professional/recreational and fashion sportswear. Designs have these properties in fashion sportswear merchandise as mentioned in chapter 2.

Period		
1960s	*1st generation synthetics*	*Function: Imitating the skin*
	Elasthane	Elasticity
to	Microfibers	Softness
	Modified cross-sections	Moisture management
1980s	Fleece	Thermal Insulation
	Membranes	Waterproofness+breathability
1990s	*2nd generation synthetics*	*Function: Improving on the skin*
	Bacteriostatisticity	Odor control
	UV-blocking	Sun protection
	Power stretch	Muscle compression/ Muscle precision

Table 4.3 Evolution of fibre engineering (Source: Bramel 2007, p.28)

The next step of the process is sampling and prototyping. The sampling process is in search for innovative prototyping techniques using simulation and modeling. This issue is brought forward by Watkins (1996) that the design problems occur and are difficult to predict when designing for apparel is that the apparel industry still struggles in creating a virtual prototype of the proposed garment. There are also other human factors that a functional apparel designer should consider when designing for smart functional clothing. Some of them counted as:

> Relationship of the body parts (to one another and to the garment)
> The changes in relationships between body parts as it moves
> Heat and moisture transport away from the body
> Sizing and fit
> Ease of donning and doffing
> Perceptions of comfort, fit and function
>
> (Ashdown and Watkins, 1996 p.472)

All of these factors are considered in garment development stage. One of the garment samples for running that was developed in Nike Research laboratories is the 'Swift Suit'. (Figure 4.4)The Swift Suit is a full bodysuit that even covers the hair and hands to prevent aerodynamic drag and a low-friction coated fabric is used. Each part of the body is evaluated separately according to velocity and size. Appropriate fabric assigned to each part of the body according to its additional needs such as insulation. The seams are

moved to the back of the torso to reduce drags; the front ones are positioned according to the airflow. All seams are cut to be horizontal when at maximum velocity.

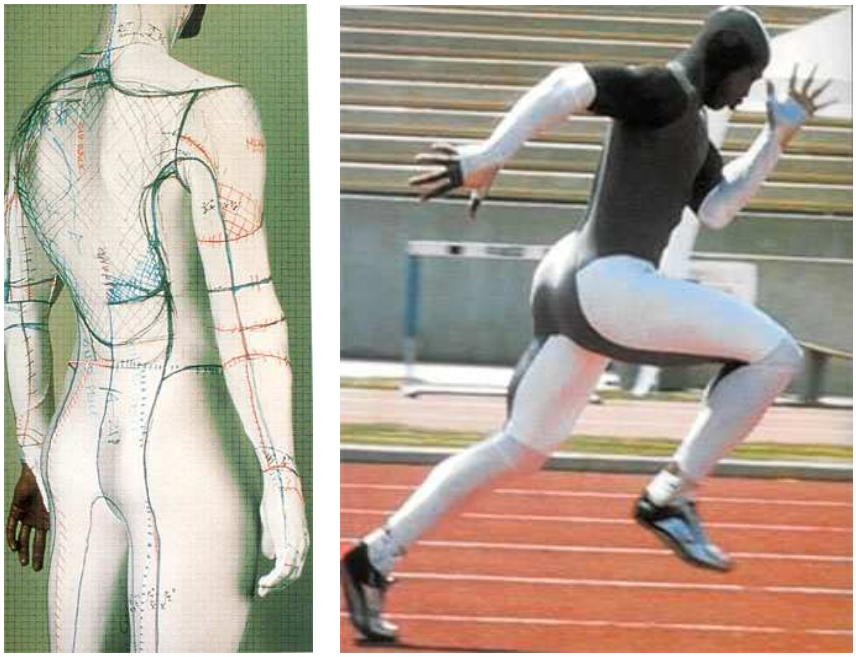


Figure 4.3 Nike's Swiftsuit shown at concept stage on the left and on the right, worn by Maurice Greene. (Source: Braddock and O'Mahony, 2002, p.127)

After garment and pattern development, modeling, simulation and initial prototyping stage requires extensive observations in laboratories to test the prototypes. This stage also requires good knowledge of anthropometry and ergonomics. These studies were formerly used by automotive and space industries only but today they are used to develop functional clothing for active sports as well. Wind tunnels, which are popular in automotive industry for aerodynamics, are used to design clothing and equipment for skiing and cycling. (Figure 4.4)

The British Speed Ski Team is training in the University of Glasgow's wind tunnel, which is located in the Department of Aerospace Engineering. Boston's Massachusetts Institute of Technology also has a laboratory for sports innovation. It's part of the

university's department of Aeronautics and Astronautics. MIT's 'Wright Brothers Wind Tunnel' is used to examine performance in a variety of sports from bobsled racing to downhill skiing and cycling. (O'Mahony, Braddock 2002)

Figure 4.4 Human performance test lab
(Source: Meredith College Human Performance Lab Website, 2008)

Other than university laboratories and government space research areas, commercial sports apparel companies also innovate to develop the fastest suit they can. Especially the companies work harder for the Olympics because as the competitions are won or lost by hundredth of a second. Mackay (2000) in his special report on Sydney Olympics he stresses about how the research teams of Nike and adidas® are bigger than most Olympics squads and design budgets are greater than some nations GNPs that compete in the Olympics.

One of the early examples of development of garment through prototyping in human test laboratories by thorough research is achieved by adidas®. Adidas® has introduced JETCONCEPT in 1998, which is a full body suit. Gold medalist swimmer Ian Thorpe wore this suit for 2000 Sydney Olympics. This suit utilized long grooves, modeled on the channels in airplane wings, to move water more efficiently over the body. (adidas® Swimsuit Development, 2009) Intensive testing of the adidas® JETCONCEPT was not only done in the swimming pool. The adidas® innovation team even put Ian Thorpe in

the wind tunnel to get a better view of how the JETCONCEPT influences the flow and to find the optimal position for the technology. (Figure 4.5 and 4.6)

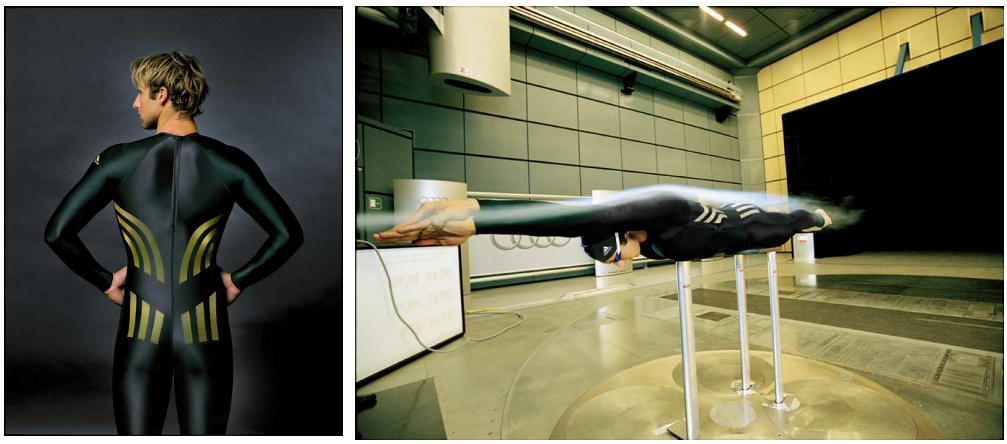


Figure 4.5 Ribbed panels
Figure 4.6 Testing the suit in wind tunnel
(Source: adidas® Swimsuit Development 2008)

Ribbed panels extending from the underarm to the lower back help channel water over the swimmer's back to reduce active drag streamline movement and cut turbulence. The amount of water carried on the swimmer's back is reduced.

In this stage, computer simulations play great role in prototyping. When examining the swimsuits, Speedo's Fastskin is a great example of how much the technology of advanced materials increases performance.

Three-dimensional body scanning and computer simulations to increase the performance in sportswear are used for the development of sportswear garments. Such simulations adapt computer software using 'Computational Fluid Dynamics'. This has allowed Speedo to see exactly how water moves over the body and identify problem areas of friction drag for Sppedo's Fastskin swimsuit, which was mimicking the sharks' skin as outer material. (Clark, O'mahony, 2005) (Figure 4.7)

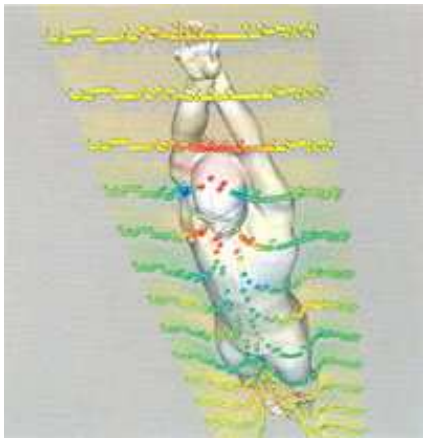
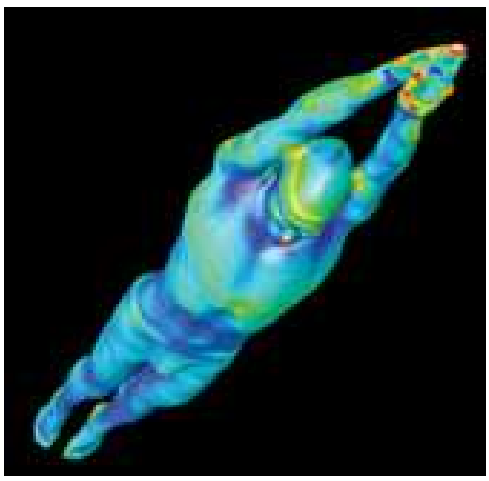


Figure 4.7 Computer software using Computational Fluid Dynamics
(Source: Clark, O'Mahony 2005, p.40)

The fastest swimsuit is developed by Speedo using ultra-lightweight, low-drag, water-repellent, fast-drying fabric called Lzr Pulse. The material is ultrasonically welded and gives the effect of having no seams. The suit has a streamlined shape. Over 400 athletes were scanned and the research team obtained the scan for a series of top athletes. The areas of high friction on the athlete's body are determined and low friction fabric is developed and used by the designers for Speedo. (University of Nottingham, 2008) (Figure 4.8 and 4.9)



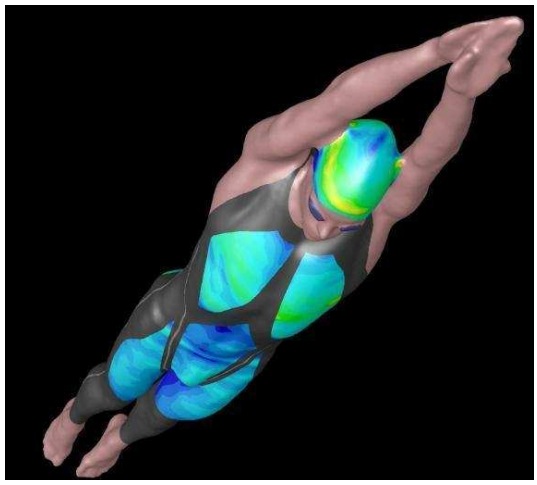


Figure 4.8 Swimmer scanned on Computer Fluid Dynamics Program (Professional Engineering, 2008)
Figure 4.9 Lzr Racer worn body on CFD, image by University of Nottingham and Speedo (Science Daily, 2008)

As well as conception phase, the virtual simulations and testing the prototypes of clothing designed with innovated advanced cut and textiles are other important stages to confirm if the desired end-user needs are going to be fulfilled.

Manufacturing of the approved prototypes is the last stage. In this stage clothing production techniques like ultrasonic welding and bonding, seamless manufacturing, laser cut, laser welding are used to increase performance in terms of function and comfort or aesthetic appearance.

These prototyping techniques during the process apply innovative clothing assembly techniques other than simple needle and thread technology for functional clothing assembly with advanced textiles. Manufacturing technologies are invented and innovated to increase the usability and feasibility of an advanced cut or textile material designed for specific professional functional clothing requirements of an for product-led clothing sectors. For most purposes of protection or increase of performance, a garment needs to maintain a full smooth surface to gain climatic or temperature resistance and impermeability or reduce the weight by omitting the use of simply threading. Gale and Kaur (2000) suggest a more automated clothing design production and argue that:

> …the future design and production of clothes may become as complex a process as automotive design, requiring a design approach much more like that of industrial design or engineering.
>
> (Gale and Kaur 2000, p.172)

Technology which would increase human performance and therefore most likely to be used for professional and recreational sportswear is omitting needle and thread joining totally, is the invention of seamless clothing design. Especially for functional clothing,

which is designed for specific sectors, the seams as joining spots are the weak places of the whole design. In addition, since they sometimes create bulk or stiffness they prevent the garment from being better fit to the body. Seamless knitting technology, which now can be done by sophisticated jacquard machineries and welded seams make the clothing designers think about the design itself from a new perspective. According to Choi and Powell (2005) since the introduction of this technology,

> …[it] has been considered an innovative process and is currently growing in its commercial application around the world. By eliminating the cutting and sewing processes, complete garment knitting provides a variety of advantages in knitting production such as savings in cost and time, higher productivity, quick response production and other advantages.
>
> (Choi and Powell 2005, p.1)

These stitchless and seamless production techniques are becoming adopted in fashion sportswear because they allow the reduction of cost. It finds a way in being commercialized and being easily reached to the consumers in demand. The end-users prefer seamless garments because of the ease, comfort that they provide to the wearer for professional sportswear or for the comfort on the streets. Stitchless production for some materials provides impermeability for outerwear or swimwear. This garment assembly technique is becoming a major production tool for sportswear and for fashion sportswear market gradually, thanks to the innovations done for professional sportswear in search for the reducing of the bulkiness of the fabric and materials in search of the faster human.

A sample of history of seamless manufacturing for sporting industry is summarized by Bramel (2007) (Table 4.4). As seen on this table the seamless production is majorly used for fashion apparel like hosiery in the 1960's and for underwear later in 1980's and with

innovation in laser cut and laser bonding these garment production techniques are welcomed in professional sportswear and back to fashion.

1960s	1970s	1980s	1990s	200s
Hosiery	Seamsealing tapes (in 1978 by *Gore*) Machines to apply (in 1979)	Lingerie market Underwear market	Laser-cut edges Power Lycra (in 1996, by *Lycra*) Fastskin All-in-one swimsuit based on bodymetric research (In 1996 by *Speedo*) Watertight zippers and microseam sealing (in 1998, by *Arc'teryx*)	First seamless performance fitness wear (in 2001 by *Reebok*) Thinner (13 mm.) seam- sealing tapes (in 2003 by *Gore*) Stitchless seam-sealed boardshorts (in 2004 by *Rip Curl, O'neill*) 100% lasercut and stitchless seam-sealed snowboard wear (in 2004 by *Burton Snowboards*)

Table 4.4 Timeline of seamless and stitchless manufacturing techniques by Bramel (Source: Bramel 2007, p.31)

One of the seamless production methods is ultrasonic welding. In this technique high frequency, ultrasonic acoustic vibrations are used to combine the edges of two pieces together under pressure. It is mainly used for plastics. In ultrasonic welding, there is additive material needed to bond two pieces together. There are patent holding companies using this innovation. The area of the application varies from general-purpose sewing, in medical disposable clothing assembly, producing ballistic vests and body armor. The advantages of using this bonding technique is that it's cleanly cut and sealed the edges of synthetics and nonwovens, it eliminates fraying, it doesn't need needles, threads or adhesives, it's four times faster than a sewing machine and ten times faster than an adhesive machine. (Sonobond, 2009)

The seamless garments and or bonded or welded swimsuits and ski jackets, raincoats allow the customer on the street take an advantage of these innovative clothing assembly techniques and forming the basis of fashion sportswear design.

4.4 Collaboration of different disciplines in fashion design process

Throughout the design process from fiber, material to design, innovated methods and techniques are used from different industries to give the textiles extra force, protection, performance or value. Through the agency of these collaborative technologies, textiles and design gain smart properties and advanced functions. The textiles, which are developed and produced with science-contributed properties, add new values to overall design.

These difficult and complex structures area achieved with the innovations made in chemical engineering, biological engineering, genetics, biomimetics, and electronics and most popular by nanotechnology.

Collaboration by different disciplines, industries, professionals, academicians and scientists is important where innovation matters in the design process of the product. Working together is an issue where technology constantly changes and takes different shapes. The sportswear market takes inspiration from science related fields and this blurs the boundaries between unexpected disciplines. The creative design process is often characterized as a process, which is a mixture of codependent functions internally and externally. (Simatupang, Sandroto, Lubis 2004) Clothing design process requires multi-tasking in every stage of development facing a continuously changing environment. There are institutions, research centers, and privately owned firms

investing into collaborative multi-tasking innovation projects in clothing design, textile design, and apparel production techniques. The innovations take shape according to the use and target market with right combination of inter- and multi-disciplinary tasking. Contemporary fashion design is already a multi-disciplinary process that requires 'teamwork and collaboration between various corporate functions' according to Pechoux, Little and Istook:

> Textile/apparel design processes in the literature are covered from both a theoretical and empirical point of view. Since the market and production constraints need to be integrated into the process, a combination of skills and therefore a collaboration of various corporate activities and functions are required.
>
> (Pechoux et al. 2007, p.189)

The collaboration of different disciplines to solve a specific design problem brings the issue of the lack of a given and tested design process that can be followed by every individual from different disciplines. The requirements of professional functional clothing vary from smart clothing to garments with chemical finishings, which requires the change of collaboration from chemical engineering to computer specialists. All of these idea circulation and prototype producing and testing phases bring professionals together to work simultaneously.

4.4.1 Designer's role in design process

The designers, who work to design urban functional clothing, have to work in a holistic design approach. They work with other disciplines, search for a special innovated textile surface to work on, or they might require such surface to be innovated from chemical, genetic engineers or computer specialists. Another task is to determine how these threads and fibers or finishing are going to be used in the design. For prototyping, they

have to work in kinetic laboratories with ergonomics or anthropometry specialists testing the prototypes of the advanced cuts and patterns, which they innovate in various experiments. The concept of 'fashion' steps forward as the category moves down from performance clothing to professional and recreational sportswear.
On the other hand, fashion sportswear clothing designer should have the information about the innovations, which are adopted to fashion market demands by incorporating the pure functional clothing with aesthetical elements.

In training designers with these skills, the role of education cannot be underestimated. The fashion sportswear market's design demands need to be fulfilled by special trained clothing designers. There are special programmes or divisions offered by universities' design faculty for sportswear clothing or accessory design, which open new fields and ways of professionalization within clothing industry. These programmes offer courses like study of ergonomics, knowledge about international sportswear brands, study of performance textiles, and other relevant topics. As much, it is pointed out by Gale and Kaur there is a 'gap' between science and design. They remark that the scientific properties and aspects of the textiles are not entirely stressed in all education areas and curricula. Further, they stress that even textile design and textile science are taught in much more different courses:

> The science-design gap may provoke a radical rethink of textiles education; as the science of textiles grows more complex there will undoubtedly arise different perceptions and definitions of what textile 'designer' is, and in some instances terms drawn from engineering and science will be just as pertinent as terms drawn from art and design.
>
> (Gale Kaur 2000, p.172)

4.4.2 Collaboration of disciplines in clothing design process

Product development process for fashion-led design and function-led clothing design require collaboration from different disciplines as discussed in previous section from the designers' point of view. This collaboration includes multi- and inter-disciplinary work and education. Multidisciplinarity keeps its methodology and makes use of several disciplines at once. (Dictionary Reference, 2010) Interdisciplinary means by Merriam-Webster dictionary that 'involving two or more academic, scientific or artistic disciplines'. (Merriam-Webster, 2010) Inter-disciplinary means that two or more specialists having different disciplinary backgrounds working jointly and continuously to interlink their analyses, whereas multi-disciplinary means that the 'researchers from different disciplines working independently on related problems.' (Oregon State University Glossary, 2010) Interdisciplinarity is a term used for education where different academic disciplines 'cross-traditional boundries' to solve a common problem where new needs and professions emerge. Mitchell (2005) best explains all of these terms:

> In an article addressing research capacity and collaboration in developing countries, Rosenfield (1992) proposed a taxonomy that provides meaningful distinctions among these three terms. She proposed that multidisciplinarity is present when researchers 'work in parallel or sequentially from disciplinary-specific bases to address common problems.' Interdisciplinarity consists of 'researchers work[ing] jointly but still from disciplinary-specific basis to address a common problem' (Rosenfield, 1992, p. 1351).
>
> (Mitchell 2005, p. 332)

It means that inter-disciplinary and multi-disciplinary experiences bring people together from different backgrounds. Inter-disciplinary thinking or working enables professionals to see the problems or topics from different perspectives and open their minds by changing their methodology and problem solving methods. It suggests new areas of development to the individual. (Interdisciplinary Network, 2010) Interdiscipinarity allows

comparing, contrasting, connecting, and sorting of information and knowledge from different disciplines and background thus helping to emerge a new dimension of information and solutions to possible problems come to a focus. (Carp, 2008) Multidisciplinarity allows textile designer, computer or chemical engineers work on their work independently and separately where interdisciplinary work allows a clothing designer to exchange ideas and proposals how a certain cut would work in a most feasible way with the textile designer, getting further suggestion from a chemical engineer about how to protect the surface in terms of finishing.

The creative design process is often characterized as 'a process which is a mixture of codependent functions internally and externally.' (Simutpang et. al. 2004, p.1) That is why the product development processes for fashion design and for functional product-led clothing design have different approaches of collaborative work. At the beginning of a project, every specialist from different disciplines uses the word 'design' in their own context. As Lawson states, 'a fashion designer creating a new collection might be slightly puzzled by the engineer's use of the word design'. (Lawson 1997 in Seymour 2009 p.25)

Function-led clothing design focuses on pure performance functions that is related to industry, military, health sectors and requires collaboration with other disciplines like electronics engineering, computer engineering, wireless systems engineering, chemical engineering, biomimetics and nanotechnology.

In functional product-led clothing, primarily the design should fit product requirements than fashion demands. Motor and influential source for scientific and technological improvements are interpreted later in the product cycle and used in fashion products.

In product-led functional clothing design process, different industries' specialists have to work on the functional design problem as an interdisciplinary project management in the frame of an independent timeline. In fashion design, the work is multidisciplinary and the process tries to meet time requirements that derive from the target customer demands. When looking at function-led fashionable clothing design, the design considerations that have to be thought during the creative design process have crucial factors. As Seymour contributes design considerations for wearable technology which she calls 'fashionable wearables' (2009, p.23) have different approaches that shape the design problem in different angles to satisfy the requirements. These considerations are born because of one design factor that needs to be evaluated and solved during the design process. These design considerations by Seymour (2009) for 'fashionable wearables' show that the variety of the considerations which create another design problem is subject to the exploration and work from a different specialist from different disciplines. (Table 4.5)

FACTOR	DESIGN CONSIDERATION
Body ergonomics/ wearability	placement, form language, human movement, proximity, sizing, attachments, weight, accessibility, heat, body shape, comfort, cut of the garment, compartments
Perception	aesthetics, look and feel, design, cultural and psychological functions
Functionality	usable interaction with the system (inputs and outputs), wearer's control, modular construction for multi-purpose
Technology	ubiquitous computing, sensor technology, embedded systems design, physical computing
Materials	interactive or reactive materials/ textiles, electronic textile, washing/cleaning, shielding, durability
Energy	batteries, solar, kinetic, fuel cells
Recycle	ecological, biodegradable, modular construction for dissemble

Table 4.5 Design considerations of a fashionable wearable (Source: Seymour 2009, p.23)

That is why interdisciplinarity becomes a current issue in trying to combine fashion and performance in clothing design. According to Seymour:

> … the emergence of conductive and electronic materials demands a greater collaboration between scientists, technologists and designers when creating wearables. The 'technocraft' and do-it-yourself (DIY) movements combine various disciplines in their work and cultivate the beginnings of interdisciplinary collaborations.
>
> (Seymour 2009, p. 25)

All of these issues, which urge academicians and professionals to work collaboratively, reveal challenges like bringing together the output of research work and end-user requirements in product-led clothing. Creating multi-disciplinary and inter-disciplinary teams of product designers and engineers in fashion design and fashion fused with performance design works. As multi-disciplinary work, a fashion designer collects information about market, past sales data along with the innovations in cut and material. The designers use information from other fields and use them to come up for a solution in their own methodology. The inter-disciplinary work, which is defined for smart functional clothing design process, occurs when the computer specialist or electronic engineer learns the properties of a material from a textile engineer and therefore modifies their design methodology according to the characteristics of that material. Also a clothing designer has to modify his/her pattern making or sewing methodology to meet the requirements of the innovated material or smart attachments he/she is using in their design.

The creative design process in a fashion firm is described that it is widely known to have a high level of task uncertainty and strong dependency upon other functions within a firm. (Moxey and Studd, 2000) This uncertainty and dependency on other departments create possible and potential problems like not having a common language among all of these specialists. This problem can slow down the design process and the multi-

disciplinary and inter-disciplinary project management itself. A universal language is missing among the people who work in the project who include the clothing designer, textile designer, computer engineer, industrial designer and other professions from creative industries. A very well point is stressed by Seymour (2008) that the people, who do the actual craftwork in putting together the garment, lack information and proper technical language. She states that:

> Often the hands-on expertise on the craft-in particular garment construction-is not considered in the design process. A seamstress that understands the flow of electricity in a garment is rare and could soon be know-how in high demand.
>
> (Seymour 2008, p.177)

As mentioned above, designing functional clothing with advanced textiles that are smartened with different technology applications requires multi-disciplinary and inter-disciplinary work in progress. New production techniques emerge with new technologies with which textile or apparel staff is unfamiliar. These issues create new fields of labor and expertise that the production process can flow without mistakes. Innovations and techniques need to be documented for a common language to ease information flow among the disciplines. This know-how of creating such textile or designs are strictly protected, documented, and copyrighted. These are workflows, data charts, methods carefully documented after persistent trials and experimentations. (ASTM 2010) The American Society for Testing and Materials is one of the international organizations that develops and publishes technical standards for materials, products, systems, some of which are concerning smart functions and innovations made in textile development technologies. Gale and Kaur (2000) stress about this topic that:

> …the future progress of textiles will depend on techniques, knowledge and methods well beyond the traditional craft origin and scope of textile design and construction.
>
> (Gale and Kaur, 2000, p.172)

Although it is a new emerging field with a lot of multi- and inter-disciplinary work requirement, the clothing design area, which is fusing fashion and function, requires resources of product development process documentation and documents about the job descriptions and education of such fields.

4.5 Multidisciplinary critical path for fashion sportswear

Innovation in creative design process of function-led clothing design finds its place by repeated prototyping and testing of the product by different specialists in modern laboratories equipped with smart technologies and human kinesis and ergonomics testing laboratories. Scientific developments from different fields and production techniques are innovated by multidisciplinary approach and are expected from the clothing designer to be interpreted, fit with the design problem that is defined in the beginning of the process.

With the adaptation of function-led clothing design production techniques and advanced textiles by commercializing them and putting into larger use of target consumers, a new field of process comes forth to be analyzed and documented. This new field's product development process emerges from multi-disciplinary work from fashion-led clothing design and function-led clothing design. The process essentially forms a multi-disciplinary critical path that takes multitasking of both fields into consideration.

According to Mc Cann, Hurtford and Martin (2005) the research and development of attractive smart clothing demands merging of science and technology with art and

design. Since the concept of wearable technology of clothing design using smart functions and/or advanced textiles is a new discipline and therefore a common language is needed which includes a systematic design process.

The critical path of Mc Cann, Hurford and Martin (2005) is specifically constructed for innovative smart clothing as was discussed earlier from innovation focus perspective. This critical path introduces a common language, in which the flow of the chart takes shape by the end-user needs from 'fiber to end-of-life recycling of the garment'. (Mc Cann et. al 2005, p.2) (Table 4.6) The critical path considers all of the end-user requirements and technology appropriate for the end-user requirements along the functional clothing design process, which is suitable for possible smart clothing. When the product development process of Carr and Pomeroy (1992) added to this path the process of product development became longer since it requires more collaborative work and repeated testing to confirm an effective prototype.

For the technical formation of the fashion sportswear design process, the critical path for smart clothing with or without electronic components is intertwined with the contemporary fashion sportswear design process, taking design considerations of 'fashionable wearables' (Seymour, 2009) in focus.

THE CRITICAL PATH (according to Mc Cann et al. 2005)		COLLABORATING DISCIPLINES
The origin of styles	Fibre/Yarn	Textile / chemical Eng. /Bioeng. etc.
	Fabric	Textile Eng.
	Dying and Finishing	Textile / chemical eng. /Bioeng. etc.
	Coating and Laminates	Textile / chemical Eng. /Bioeng. etc.
Development of samples	Body Measurement Sizing and fitting	Patternmaker/ sales professional/ designer
	Garment Development	Clothing designer/ patternmaker
	Pattern Development and Grading	Clothing designer/ patternmaker
	Modeling, Simulation and Inıtial Prototyping	Clothing designer/ patternmaker
	Integration of smart and wearable technologies	Clothing designer/ computer professional/ sewing expert
	Fitting	Clothing designer/ patternmaker/ computer expert
The attainment of commercial products	Manufacture (Cutting/Bonding)	Technical designers of necessary disciplines
	Mass Custom	Technical designers of necessary disciplines
	Distribution	Sales/Logistics

Table 4.6 The process of apparel design and product development adapted from Carr and Pomeroy (1992)with critical path for smart clothing by Mc Cann et al. (2005) with collaboration of disciplines according to the need.

According to this path, the end-user requirements are the main indicator of the selection of the innovation during specific steps of the path. During this chapter, the focus was on the end-user requirements in function-led clothing and in fashion-led clothing design.

The designers who design for recreational sportswear and fashion sportswear need a critical path of the design process that derives from retail fashion design process and functional clothing design process. The function related and fashion related end-user

requirements shape the stages during the process and determine the focus of the innovation level necessary.

The collaboration of disciplines in the contemporary fashion design and smart clothing design processes along with the end-user requirements are combined all together in the figure suggested above for fashion sportswear.

Fashion sportswear opens a new field for the education area of expertise and craftsmanship for the clothing designers to learn about ergonomics, anthropometry, innovative production assembly techniques and material knowledge and special application areas of fashion trends to this specific market.

CHAPTER 5

Brand Development of

Fashion Sportswear by Advanced Textiles

In the formation of fashion sportswear, innovations and the designs are shaped by end-user requirements as mentioned earlier. The motivating social and cultural factors that shape social formation of fashion sportswear is established by demands, also the required design process for such product development is largely affected by the needs. As design process being considered as a part of the marketing mix (Hines and Bruce 2007, p.212); one can say that historical, social and technical formation of fashion sportswear have inseparable relation with the branding of the fashion sportswear.

Sportswear branding is on the route of fusing function and fashion. Sport is considered as a lifestyle influence and it is reflected in our today's utilitarian, comfortable clothing. Sportswear was born to give comfort and ease to the athletes in the performance competitions. Athletes, sports personalities, sports stars and the sportswear firms with pushing their brands to promote, made this apparel category to evolve more towards an area in quest for finding co-branding possibilities by designer collaborations. The figure 5.1 shows the placement of fashion sportswear in the world of the clothing sector. Fashion sportswear is in the intercepted area of the professional functional clothing and contemporary fashion clothing clusters. (Figure 5.1)

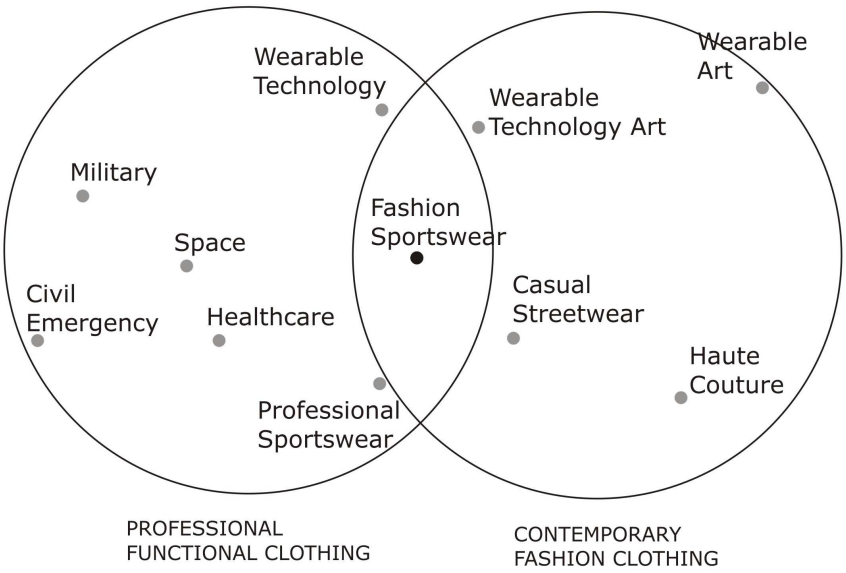


Figure 5.1 Placement of markets using functional clothing with advanced textiles

As the sporting events became popular and sports apparel is technologically advanced and mass-produced, the need for creating demand to consume this new style has become an issue. Sports apparel products with innovative cuts that can suit daily living conditions are pulling interest from brands.

There are problems that prevent from achieving a fully integrated result in arranging a profitable marketing mix in fashion sportswear. The design companies face with problems like reducing price, high cost of advanced materials and investment on research and development for innovation, which is essential for the promoting of the niche merchandise. Incorporating technology with fashion is the core issue for this market. Because of the cost, these materials are risky for seasonal fashion goods, it is more appropriate for lasting functional performance wear. The components of innovation in contemporary fashion lie in new materials, new production techniques and new utility area and functions. These innovations need to meet with the end-users in the world of fashion without being quickly discarded and consumed efficiently for a longer time. The functionality of the garment lengthens the product life cycle. In professional

functional clothing, the collaborative innovations and technological advancements bring forth a very detailed critical path for design development to follow but also shorten the life cycle of the product as soon as the innovation is replaced with a newer version. In contemporary fashion clothing, the fashion trend is shortening the cycle. Therefore, fashion sportswear needs right design input including awareness of global trends by its designers and knowledge of popular materials with innovative production techniques, which will result in the consumers to keep interest in the sportswear brands. (Gale and Kaur, 2004)

5.1 Adoption of advanced textiles by fashion sportswear brands

Product itself and the design process at the end of which the product comes out, are essential parts of the marketing mix. The functional designs developed with advanced textiles by active sportswear designers and professionals through multidisciplinary experimentation, are major input, which forms fashion sportswear as a market niche. As these products are promoted, the niche where ready-to-wear combines its resources, knowledge, market research, and production capabilities with performance sportswear emerges. (Hines and Bruce, 2007)

Co-founder and chairperson of Nike's Phil Knight commented in an interview (Willigan, 1992) that 'the design elements and functional characteristics of the product itself are just a part of the overall marketing process.' This comment gives the idea of how the right combination of the innovations in these elements shapes the right conditions of entering in a market.

The fashion sportswear's biggest concern is combining function and aesthetics in a desirable and pleasing way to offer to the consumers of such niche. Design priorities differ from sportswear to fashion. The fashion labels create designs for sportswear

without losing the aesthetic aspects of garment design and the stylistic change and need of the consumers according to changing trends as seen in the table 5.1. Fashion has design priorities paying attention to style, three-dimensional designs, detailing for aesthetic purposes, focus on lining and every day use. Sportswear has the design priorities like paying attention to performance, two-dimensional design, detailing for further protection and performance, less attention to lining and sport-specific use.

Fashion	Sportswear
Style	Performance
Three dimensional design	Two dimensional design
Detailing for aesthetic purposes	Detailing to further protection or performance
Special attention to lining	Less attention to linings
Everyday use	Sport-specific use

Table 5.1 Design priorities in fashion and sportswear (Source: Bramel 2005, p.39)

This change in design priorities of the consumers who go experience mobility in their daily living conditions redefines the existing clothing system habits along with the help of the technology. The garment bonding techniques, innovated materials and the sporting clothing systems change and adapt themselves to the contemporary fashion area. Bramel (2005) in her article put the key trends in sportswear design together and the main design aspects show that the use for active sportswear and outdoor use and casual wear is merging. According to Bramel, a new generation of smart garments are bringing together and making the sportswear industry evolve faster than ready-to-wear, giving design and innovation ideas to fashion.

5.1.1 Commercial value of advanced textiles in fashion sportswear brands

The adoption of sportswear in fashion brands finds its way in the industry through casual street wear brands developing collections that introduce smart applications to enhance the functionality and durability of the garment. This can appear as audio connection through the garment or advanced textile treatments like Teflon coating to enhance fluid resistance. All of these advanced fibers, textile technologies, and smart functions, computerized functional wear do also change the social experience of clothing and it has come to a point where the penetrating to the fashion market is inevitable. The understandings of the social, technological, and historical reasons help to analyze and set right goals to penetrate the fashion market.

Casual wear is the sector where the smart function's commercialization plays a great role. The low-cost advanced function that adds a value can be used in casual wear garments like the moisture wicking and water resistance functions, which are developed and produced in textile companies with fabric coating methods. These fabric coatings also can be processed under regular apparel production brands and do not need special equipment to be constructed. Being water-repellent, stain-free and self-cleaning are passive functions, which are the most popular among the end-user needs. Thermo-regulative fabrics are being processed and commercialized easily due to the ease of production techniques and consumer demands and they are found in commercial brands, which design sports and casual wear. On the other hand , wearable technology or display functions are smart functions that are more difficult to commercialize in casual wear because of the difficulty in production processes, and washing and caring. In

addition to this, wearable technologies require care from the user and end user's knowledge at some extent.

In today's sportswear market only 25% of the sold sporting apparel is used for its professional purpose and the 75% uses for non-sport activities. (Bramel 2005, p.38). These non-professional sporting activities might include leisure or outdoor use. As the sporting events became popular and sports apparel is technologically advanced and mass-produced, it catches the attraction of big fashion apparel companies. Many designer labels created their own fashion sportswear labels and try to meet the ratio of functionality and fashion from the consumer's point of view. Fashion influences sports, and sports collections designed with advanced textiles for purely high performance, are becoming stylistic. (Bramel, 2005)

The commercialization level of sports merchandise and innovations is affected by the multidisciplinary nature of the design and product development process as suggested in the table 5.2. If the process is not financially feasible; than the product will not be sold at a reasonable price and this would effect the availability of the merchandise by the consumers.

Commercialization Levels of Popular Smart Functions for Casualwear

Easy	Difficult
Moisture/Water Functions (Fabric Coating)	Wearable technology
Visibility functions (Reflect)	Display Functions
Heat Regulation	

Table 5.2 Commercialization Levels of Popular Smart Functions for Casualwear

Casualwear uses the compatibility and content of the fibers and textile properties, which pursue collaboration with textile companies to promote the brand as a competitive marketing strategy because it is fulfilling consumers' primary functional needs. Cailliez (2003) talk about 'star fibers' like Goretex, Kevlar and Coolmax in Gale and Kaur (2004, p.82), by attracting up the end-users and consumers with their irresistible properties that satisfy basic functional needs and promote the brand. On the other hand, in some of the sportswear companies, the merchandise is most likely to be adopted by the society with using brand recognition through collaborations with designers and sport stars who uses garments made out of 'star fibres'. Gale and Kaur argue that 'products are constantly designed and developed to sustain and facilitate brand identity…' (Gale and Kaur 2004, p.74):

> …rather than brands existing to sell more of a product, products are developed as a means of extending and consolidating the brand.
>
> (Pavitt in Gale and Kaur 2004, p.74)

Casualwear is a market where customers on the street buy clothing for daily use where they expect the most functionality from the garments. That is why the most companies for this sector make collaborations with the textile research firms or textile companies, using recently developed materials to lengthen the life of the merchandise they are offering. This also gives a reason to market their product on and gives quality assurance to the end-user. This is the first type of adoption of advanced textiles in fashion sportswear. With the advancements in nanotechnology and other fields, the materials started to be more durable, stain-free and these are functions which are irresistible for a wide spread commercial clothing market with low production cost to use.

5.1.2 Adoption of sportswear design by fashion brands

A way of adopting advanced textiles to high fashion is through luxury fashion brands, which develop their own sportswear collections with high cut variations or advanced properties of the textiles used in the collection. According to Gale and Kaur (2004, p.81) it is not for sure if fashion is influenced by fashion or it's affected by the fabric developments of the fashion companies. This is a new area, which is a competitive marketing strategy for luxury fashion companies. Jackson (2004) in Bruce and Kratz (2007) define the luxury brand as 'characterized by exclusivity, premium prices, image and status, which combine to make them desirable for reasons other than function.' (Bruce and Kratz 2007, p.131) That means that the luxury fashion brands have to catch up with the spirit of the times and fulfill the demands of their younger more mobile consumers to sell their products. In Bruce and Kratz's article it is evident that 'changes in consumer lifestyles meaning 'demand from young and senior people' (2007, p.135) is seen as a market opportunity for the luxury fashion brands to pursue. This opportunity is well-defined, new collections like sportswear enhanced with advanced cut variations, and textile treatments are introduced by brands like Prada Sport or Hilfiger to maximize their profits in this market segment. Prada Sport and Tommy Hilfiger are fashion luxury brands who develop their own sportswear collections under their own brand name. These firms reach to the consumers who want to be fashionable, comfortable or active but want to maintain their social status by keeping using a luxury brand name. Consequently, the social experiences and status-consciousness start to play a role also in the sportswear market.

The other efficient way to merge fashion with sportswear to make fashion consumers more conscious about advanced textiles by co-branding. Co-branding is a popular

activity, which offers positive associations to both brand names. According to Chang (2009) the global branding activity where a global strategy in combining two well-known brands is a co-branding activity, which suits the case of the fashion sportswear brands. This is preferred by sportswear companies to be adopted by fashion industry, done through active sportswear brands making collaboration with a fashion designer to introduce smart applications, and advanced textile properties along with adding fashion designer name awareness to the collection. This is a competitive marketing strategy for the sportswear companies. With the sports apparel, companies need collaborations with fashion designers in order to make the customers wear clothes that are more fashionable than sporty, to incorporate clothing with our daily lives.

Here, the sportswear brands answer the functional requirements of the end-users, in collaboration with the fashion luxury brands to fill in the expressive and aesthetic needs of the end-user. Thus, they add a value to reach the masses that do not even work out or are sports fans. Movies, new work out methods, movie, music and fashion design stars are all collaborating with sportswear firms to bring the sports apparel to a higher ground. The dynamic image of sportswear merchandise enhanced with smart technologies and advanced textiles, attracts end-users on the streets who would like to consume such merchandise for recreational or functional use with aesthetical aspects in their daily lives.

5.2 Social adoption and social experience in fashion sportswear

The social adoption of advanced cut, design, materials in fashion sportswear is done in two ways. First, the end-user requirement is mostly coming from pure functional needs of the young people who dwell on the streets of the city and find smart cut and

attachment of device solutions due to the need of mobility. The need is born at the bottom, meaning the need derived from the street and pushes the design professionals to develop solutions and reach to a wider market who are sharing the same culture in different geographical locations. The end-user creates and shares a social experience together and a shared mutual need is born around the same social strata sharing same lifestyle.

The other social adoption of fashion sportswear is widely known and forms by the fashion sportswear researching 'star' cuts and materials, which are pushed into the needs of the market by sportswear brands. Fashion sportswear companies are promoting new products and materials of high level of innovation, they need spokesperson for the promotion, and they are usually called 'opinion leaders'. Firms that produce for performance sportswear also need celebrities that are publicly wide known to gain attraction to the new and upcoming merchandise, which might be unconventional but want to be sold to the consumers on the street.

5.2.1. Celebrity endorsement in developing brand identity

The sports apparel firms use their brand identity associated with sport stars to promote their merchandise. Using a celebrity, someone the public loves, is becoming popular for brands to market their products and stand for the commodity. The consumer transfers the good image and communication for the celebrity, to the commodity that he/she is standing for. Sports stars and sport brands have the closest relationship in bringing active sportswear more integrated with mass market. The leading sports apparel firms were established not for fashion but reason of function. After a while, with the using sport celebrities endorsing for their products and using them in advertisements in front

of the public, the majority of people wanted to have the apparel that was promoted by the most loved sports celebrity.

Athletes are among the people of social, political, and economic importance and they are opinion leaders. Popularity of sporting events allowed the community to admire the spot stars. The consumers desire to be more like them. The athletes are fashion leaders since they are famous having charisma, talent, and popularity. What they wear is of great importance for the people who watch them on TV or read in the newspapers what they wear, how they did in the previous performance so that gives the spectator a reason to imitate them. Some of the famous names who have been in association with promoting apparel lines are Michael Jordan, Tiger Woods, Roger Federer, David Beckham and others. (Stone, 2001)

Brand and sports personality relationship is highly used in sports apparel industry marketing. The end-users tend to wear the clothing, which a respected sports star wears, and thus he/she becomes a personality for that brand. The sports apparel marketing is using 'remote intimacy' created between the end-user and celebrity and this affects the everyday lives' of individuals. (Tungate, 2004)

An earlier version of sport star signing endorsement for sport brand is done with Charles Taylor. 1923 was the year when semi professional basketball player Charles 'Chuck' Taylor became associated with Converse All-Star shoe. It was one of the first examples of a sport star-brand association in terms of modern selling style. Furthermore, he became a sales person for the company and he toured the United States of America promoting them. (Tungate, 2004, p.179)

Boorstin argues in Andrews and Jackson that 'the celebrity is a person who is known for his being well known. The hero is distinguished by his achievement; the celebrity by his image or trademark and hero is created by himself, celebrity is created by the media. (Boorstin 1992 in Andrews, 2001, p.2) In sports star case, the sport star has to be a hero in the end for a fruitful relationship as an endorser for an apparel company. (Andrew and Jackson, 2001)

5.2.2 Analysis of three brands

Nike is one of the leading sports apparel brands in the industry with their innovation, use of technology and celebrity endorsements and had that fruitful relationship with Michael Jordan. Michael Jordan signed up by Nike in 1984 to wear his shoes after Los Angeles Olympic Games and he seemed capable of delivering Basketball to the entire country. Nike Air Jordans found a place in the shelves and the 'Just do it' campaign was launched. (Tungate, 2004) Jordan had a charismatic presence and with the help of TV ads, commercials, later on with the theme and jingle 'Everybody wants to be like Mike' he became the true sports hero. The Air Jordans are more than 20 years old but they remain the best selling sneaker line in history. (Esterl and Kang, 2006) The Michael Jordan has been a successful sports hero, influencing millions of teenagers and promoting merchandise with innovative cut and designs made it easier for the product to enter the market and to be used on the streets. Nike is using a mix of superstar athletes today including basketball players Lebron James and Kobe Bryant, tennis player Serena Williams. Nike pursues well-informed marketing by introducing innovative materials or cuts by fan-loved sports heroes. Nike is one of the leading sportswear firms which use new innovated textiles for professional performance but quickly bring down to the availability of the end-users on the street at a reasonable price so that the

advanced textile used in design contributes a value added to the brand recognition. Nike's 'Dri-Fit' fabric which is a fabric designed for 'moisture management' is worn by Federer, Sharapova and Nadal who are professional tennis players, also recreational sportswear merchandise made of this fabric is sold in stores for the end-users who would demand such comfort and technological advancement. (Nike Press Release, 2009)

The second recent global example of sport brand and sport celebrity collaboration is adidas® and David Beckham. In 1949 adidas® is registered as a company, named after its founder: 'Adi' from Adolf and 'Das' from Dassler. In 1954, Germany battled Hungary with a competitive advantage. They were wearing adidas® soccer boots which for the first time featured removable studs. (Adidas®, 2009) Adidas® teamed up with David Beckham, famous English soccer player to market its products to a wider audience. Today Beckham is still endorsing for latest adidas® products professionally. This is considered by the consumers to be an opportunity to build an emotional communication with a sports hero with pursuing the suggested lifestyle clothing. David Beckham is a good example for stylish sports celebrity. He is a hero because of his good play on the fields and he inspires therefore brands to endorse them for performance clothing. He endorses for many brands varying from footwear to sunglasses and gave his own name to a product line in adidas® promoting textile materials with high performance properties.

Adidas present a good example of co-branding by collaborating with fashion designers. adidas® does not promote or put in exposure their advanced textiles with 'star' intelligent properties, but they focus on the aesthetical and expressional values of the merchandise to reach farther audience. Adidas® has a co-branding agreement with

Stella Mc Cartney for a couple of years and this collaboration helped adidas® to be recognized by different social strata where a wider target consumer range is taking advantage of advanced textiles and also have the possibility of wearing a fashion brand. Stella Mc Cartney made a debut line of functional and fashionable running and tennis wear. This is a partnership very popular in the world of sports right now combining best of technology with the latest in design trends, which is the newest 'battleground' in the highly competitive athletic-apparel market according to Park. (Park, 2006)

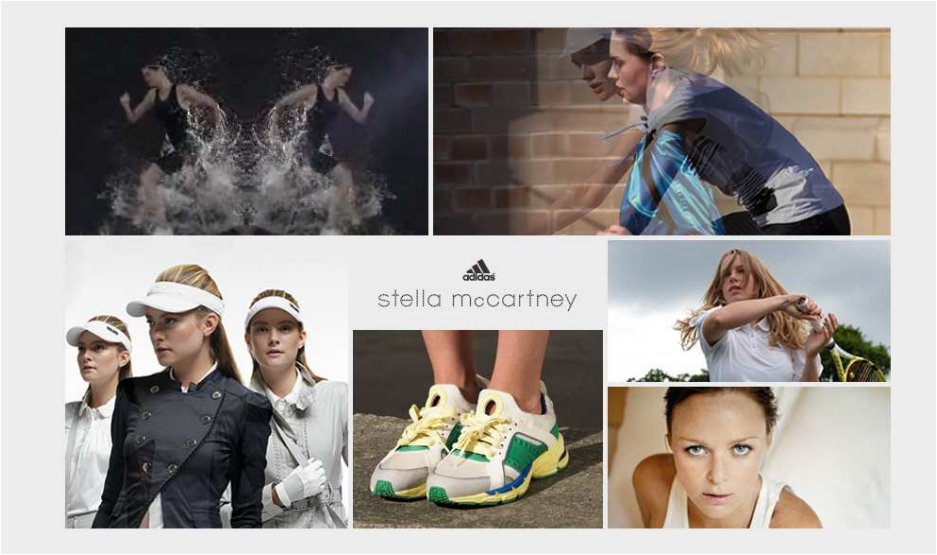


Figure 5.2 Stella Mc Cartney collection intro page in Adidas Website
(Source: Adidas Stella Mc Cartney Campaign Website)

Puma is the third imporatnt brand name who is using designers to promote their merchandise, building collaboration with fashion and industrial designers. Puma has benefited from the professionals by using their expertise on advanced cuts and unique design style to fuse performance garments and shoes with fashion to be used on the street. The brand had collaborations with Philippe Starck and Alexander Mc Queen and their latest involvement is with Hüseyin Çağlayan. Hüseyin Çağlayan became creative director for Puma and designed a collection for Puma in which he fused performance

with fashion. The collection is called 'urban mobility' and it is focusing on the mobile life in the modern city. (Puma, 2010)

A recent remarkable lifestyle item that was promoted by a celebrity is the case of Onitsuka Tiger. In movie 'Kill Bill' the lead actress, Uma Thurman is wearing the Japanese OnitsukaTiger sneakers and along with the movie's launch everywhere were filled with yellow Tiger shoes and yellow tracksuits. That is the power of trendsetting, sports brand names, the endorsements of the movie star and sports brand.

The celebrities help any innovation to be adapted and adopted by the consumers easier and with less resistance and find a way to promote the technological advancements turn into commercial products, which will be obtained by any consumer on the street. That is the main goal in fusion of function and fashion in 21st century and advanced textiles are the main ingredient in the promotion of the functional sportswear to the fashion consumers by celebrities making the unconventional products to be a part of the daily life styles.

5.2.3 Social experience in fashion sportswear globally

The regional differences in collections and ranges of fashion sportswear choices are shaped by distribution channels and by different customer profiles and types of design identities that emerge in various parts of the globe and shape the cultural difference in consumption of the designs. It's connected with local design cultures and technological innovations that are intertwined with the sociological structure of a country mostly and for global corporations, global trends and lifestyles are affecting consumers.

Consumption of advanced textile developed clothing changes according to spatiotemporal needs. The urban modern life shapes the needs that the society has along with the social risk areas that exist, are the possible potential consumption reasons. There is a difference in consumption of fashion sportswear designs compared with people living in smaller cities in developed or developing countries.

The general needs of consumers around the globe cause same lifestyles with little local cultural differences and global trends to emerge and thus increase the creativity in user areas and needs.

In modern global cities of the developed countries, the street life and the requirements of self- produced aesthetic and functional needs produce clothing styles that are accepted in local crowds in same metropolitan areas. An example is the 'messenger style' of New York of the 1990s which made sportswear/casual street wear widely used because being on the streets all day long required garments which are functional and ergonomic and also be in touch with the portable devices. Having a job that keeps the people mobile all day long requires clothing and attachments in that urban society. It is defined as being the producers of the street fashion and is defined by Kawamura (2006) that teenagers with their creativity can lead the fashion on the street and subculture as being the leading role in making a clothing style to be socially adopted and commercialized. Kawamura's article shows the immediate relation between consumption and the production of fashion at the same time. He points out that the consumption and production of fashion does give almost same results for same age group of consumers especially in sportswear market.

In popularization of the merchandise designed with advanced textiles, sportswear market brands play the greatest role in turning these innovations into salable products reaching the masses. The multinational sportswear brands that have a history of leading cut and textile innovations in professional sportswear culture are aware that advanced textiles are one of the most important value-added item to their brand, making contribution to their brand equity.

These sportswear firms who have innovations in advanced textiles history, created brand recognitions and names in the world's 'firsts' and therefore they create some level of brand loyalty for the sportswear consumers who buy products for professional or recreational purposes. In sportswear industry, the consumers make their buying choices according to the sports figures, celebrities, heroes they admire, according to the teams and or the brands they wish to wear as mentioned earlier. (Newbery in Tong and Howley, 2009) Sportswear clothing designed with advanced textiles is an important part of brand equity in gaining competitive advantage.

Nike establishes an example of adding value to brand equity through customer experiences. Nike's networking website 'Joga.com', which was set up in 2006, was the topic of Ramaswamy's article (2008) about how the sportswear brand co-creates value through customer experience. (Ramaswamy 2008) The customers were invited to upload their soccer talent by uploading videos and thus rating, sharing comments from a large audience, followers. Nike had the opportunity of learning the current needs of their customers and design. The customers innovated new products based on their needs. The need comes from the core requirements of their customers. Nike even took this 'co-creating value of the brand' as far as asking twenty some sneaker culture leaders to

design a shoe. (Ramaswamy 2008, p.10) The users then vote these shoes again on the internet.

This shows that over a million global brand followers of Nike share the same interest and preference of sportswear clothing worldwide and that brand building for a sportswear brand using innovation focuses on cross-national market segmentation. As Ko et. al (2007) puts it in that way as:

> It has been suggested that we are seeing the emergence of a new group of consumers who have similar preferences and buy similar brands that are promoted globally as well as in local media. These new consumers have been referred to as 'global consumers' who exhibit similarities to people in other nations in terms of lifestyle and consumption patterns. [Hassan et al 2003]
>
> (Ko et al 2007, p.631)

Lifestyle segmentation is important in sportswear and the idea of lifestyle for sports gets its roots from historical background of innovations and the survival necessity for better, easier, more practically functioning clothing with the new social needs of the modern times. The pre-mentioned topics build a group of end-users who create a potential global consumer group who share same contemporary functional, aesthetical and expressive needs with slight difference in values and interests. The global sportswear companies which already reached the trust from the consumers with proven patented innovations in advanced cut and textiles, have contributed to the sportswear history and culture and focus on building a global consumer group by connecting them through internet and their globally shared lifestyles.

The consumption of sportswear is becoming more intertwined with fashion lifestyle than just related with performance. The global consumers sharing the same values and

needs, share same clothing style and benefit from the technology and innovation at the same time. Even though the design centers are localized, the consumption and adoption of fashion sportswear spreading with social experience globally.

5.3 Marketing sports as lifestyle to fuse performance with fashion

In global consumption of sportswear as mentioned in earlier parts before, lifestyle segmentation plays a very important role. As defined by Gutman and Mils (1982) and Ko et. al (2006) in Ko et. al (2007), 'fashion lifestyle is defined as consumer attitudes and interests and opinions related to the purchase of fashion products.' (Ko et.al, 2007, p.631) The lifestyle for the sportswear brand is the experiences of its consumers that the brand aspires to overlap with the merchandise they are offering which should well fit with the daily end-user needs. The concept of 'lifestyle' is becoming more popular as a marketing tool for sports goods to be integrated more with fashion. The contemporary consumers' demands, the physical and social image that the contemporary consumer builds within the society shapes the ultimate functional and fashionable designs made with advanced textiles. Different kind of needs that is brought with the modernity in terms of clothing with advanced textiles produces the sportswear clothing. Lifestyle marketing is the marketing type where the brands and firms are trying to get into consumer's lives, try to offer the product as it is a complimentary to the life they are living. In lifestyle marketing, it is important where the target market is eating, going out, is shopping, or going for vacation.

This marketing tool is the main reason of the sports fans to follow the sports stars and fashion. Consumers are more individualized than ever, expecting every good, service and experience to be addressing their unique and important selves. The more they are

experienced, they know which quality and price is the best. There is a new need of attracting the attention of the consumer and that is offering the sincere and intimate product to the customer in the guise of 'lifestyle'.

When the sportswear market is observed, Puma strikes as the sportswear company, which discovered 'lifestyle' marketing at an early stage to use as a marketing niche to promote their goods. Puma has a low-profile style in performance sportswear market. They are not mainly focused only on technical innovation but they use sportswear designs moving more towards fashion and lifestyle. They sponsor categories like golf, swimming, women's clothing and motor sport. (Foster and Milne, 2006) They call this approach 'sportlifestyling'. (Puma, 2009)

Jochen Zeitz, the CEO of Puma AG says that he is more the person for clean design. He deemphasized sport in favor for more fashion driven-thinking, which includes color, line and style. He set up a division called 'sport lifestyle' and first collaboration was with Jill Sander in 1998. The German designer took Puma Classic's visual elements of football and reinvented the style with fashion fabrics matched with sports design and cuts. They made the retro sneaker that was worn by Pele an item that is sold not only in sports store but also in high-end fashion department stores. (Sacks, 2006) Famous designers like, Alexander Mc Queen and even Philip Starck made their latest collections from different fields. Sacks considers Zeitz as if:

> … he 'turn[ed] his company into an open-source design playground. He has enlisted outside designers-from France's Xuly Bet to Japan's Yasuhiro Mihara-to produce an ever-expanding list of product reincarnations, pioneering a new sports-lifestyle category that fuses fashion and performance.
>
> (Sacks 2006, pp.59-60)

On the other hand, Nike has a sportswear collection by promoting them as lifestyles, trying to get public exposure by casual wear design elements besides factors that would affect performance.

This means that only technological innovation is not enough to reach the masses. Also adidas® has own 'Originals' collection which is a casual wear collection, being promoted by the brand as trendy clothing for young people. For instance Y-3 is a higher fashion collection line which is a co-branding activity realized with Yohji Yamamoto. As seen in table 5.3, among the three sportswear brands Puma, adidas® and Nike, the basis of co-branding and collaboration with sports heroes and celebrities shift between fashion and performance.

Sportswear brands and relation to fashion and performance on the basis of lifestyling Co-branding with fashion designers or sports star/celebrity endorsement		
	Sport-lifestyling on casualwear basis	**Sport-lifestyling on performance basis**
Puma	The black label Mihara Alexander Mc Queen Sergio Rossi Hüseyin Çağlayan	Puma Running, Basketball, Football, Sailing etc.
Adidas®	Originals Y-3	Performance Adidas by Stella Mc Cartney Porsche design sport Chelsea FC (Football team co-brand) Brotherhood (Basketball sport heroes)
Nike	Nike Sportswear	Nike Running, Basketball, Football Golf etc.

Table 5.3 Popular fashion sportswear brands and lifestyling

Different collaborations are done in fashion and casual wear while maintaining to keep launching other collaborations promoting performance with fashion opinion leaders. Puma is stressing sport-lifestyling on casualwear basis mostly where adidas® is focusing on sport-lifestyling on performance basis. Nike is focusing only on performance, trying to keep down the collaboration with famous fashion leaders or creative directors but promoting the advanced properties of a material by sports heroes and focus on training merchandise using smart technologies and serving sport performance without fashion as a lifestyle.

The fashion sportswear merchandise, which is technologically enhanced during the creative design and product development process, becomes the center of attention of the brands as a market niche to be presented to the intelligent consumers of today's casualwear market. These garments are served to the sport enthusiasts as necessary items of consumers who chose sports and active living as a lifestyle.

CHAPTER 6

Conclusion

The main research question of this research thesis was to find out what role advanced textiles play in the formation of fashion sportswear. This main research question is aimed at finding out what makes the use of advanced textiles to become an indispensable part of the daily lives of different end-users. This question has brought different points to be mentioned and analyzed in order to achieve a fruitful investigation on the main question.

To respond the subquestions of the research, chapter 2 is focused on the main reasons for the need of advanced textiles innovated clothing design. Chapter 3 is focused on finding out what kind of social and psychological needs make innovative clothing design and advanced textiles as a major design input. In the fourth chapter, the analysis was on how the end-user requirements shape the design process of fashion sportswear and the fifth chapter made investigation on how innovative clothing design and advanced textiles reach end-users through branding.

The reasons for the need of advanced textiles innovated clothing design is researched culturally through out the modern times of the human beings. It has found out that the fashion sportswear segment derived from other functional clothing design segments, which initially serve for military, space, aviation, emergency explorations and staff along with the innovations done for the health improvement and well-being. These garments,

which are developed through time and cultural necessity, have used for the performance enhancement of people in professional and recreational sportswear markets. As a result the physical formation of fashion sportswear emerged form these markets in the end, offering numerous possibilities for the active living contemporary and metropolitan end-user.

To find an answer on the social and psychological factors that forms fashion sportswear, the end-users of urban life were in focus. The contemporary metropolitan life creates design dimensions on psychological and social levels in which the urban design problems become more apparent. To answer these design problems, designers feed from these psychological and social factors, create design concepts like social awareness and urban nomadism, and use design methods to create feasible design solutions. These concepts and methods contribute to the social formation of fashion sportswear.

To be able to thoroughly investigate the formation of fashion sportswear, the evolution and function of the design process is thoroughly researched. The variety of end-user needs cause different innovation foci. These innovation foci and design considerations cause complex structures in the stages of creative design and product development process. Therefore, the design process for fashion sportswear has a multi-disciplinary nature and thus making it a detailed progress in implementation and realization of the process in the formation of the fashion sportswear brands.

As seen in the table 6.1, advanced textiles used in innovative clothing design is being consumed for various end-users for various reasons. The historical and cultural formation of innovative clothing design by the end-user requirements affects the evolution and formation of related innovations and technology. The cultural and social

formation of the need for such sportswear segment brings the multi-disciplinary design process approach under the umbrella of fashion design. By merging the technologies and functional designs with fashion during the creative design and product development process, the designs reach consumers on the street thus making the innovation available for everyone and expand the fashion sportswear market globally for everyday consumption. (Table 6.1)

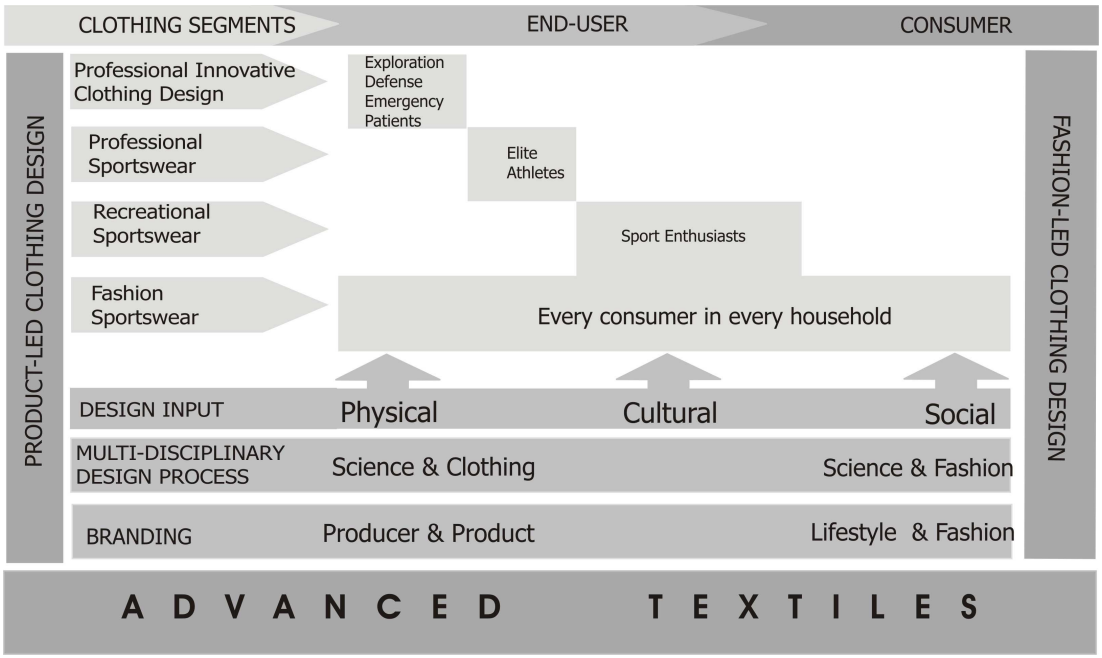


Table 6.1 Transformation from end-user to consumer through the use of advanced textiles

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