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Reconfigurable Clothing: Unveiling the Possibilities of Adaptable and Multifunctional Garments

Roupas Reconfiguráveis: Desvendando as Possibilidades das Roupas Adaptáveis e Multifuncionais

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This study examines a collection of garments designed to be modified and adapted by the user, referred to as “reconfigurable”. Through bibliographic research, it identifies and analyses the characteristics of different types of reconfigurable garments — namely reversible, modular, transformable, and technological — establishing comparisons with the concepts of “modularity” described by Pine (1992/1994) and with examples of designers and brands that have adopted this approach, either as a permanent strategy or through individual pieces. Hussein

Chalayan, Arket, Osklen, Adidas, Cukovy, and Cointel are among the examples considered. Besides enabling the creation of versatile and personalised pieces, the results indicate that reconfiguration contributes to building a more durable and therefore more sustainable wardrobe. In other words, this approach enhances the value of clothing to the user. User interaction with the pieces is fundamental to their transformation, fostering a closer relationship between the wearer and their garments and thereby strengthening this bond. Analysis of the term "reconfiguration" highlights its significance in designating a process of change and adaptation. The objective of this study is to conceptualise and classify types of reconfigurable clothing to justify the proposed terminology. Furthermore, it reveals the relevance of this concept for circular and adaptable fashion. The prefix "re-" conveys the idea of renewal and circularity, intrinsically linked to the four essential practices of sustainable fashion: rethink, reduce, reuse, and recycle.

Keywords: reconfigurable clothing, sustainable fashion, modularity, customisation, transformable clothing

Roupas Reconfiguráveis: Desvendando as Possibilidades das Roupas Adaptáveis e Multifuncionais

Este estudo investiga um grupo de roupas projetadas para serem modificadas e adaptadas pelo usuário, denominadas "reconfiguráveis". A pesquisa, de natureza bibliográfica, identificou e analisou as características de diferentes tipos de roupas reconfiguráveis (reversíveis, modulares, transformáveis e tecnológicas), estabelecendo comparações com os conceitos de "modularidade" elencados por Pine (1992/1994), e com a exposição de exemplos de estilistas e marcas que utilizaram esta abordagem, seja como uma abordagem permanente ou como peças avulsas. Hussein Chalayan, Arket, Osklen, Adidas, Cukovy e Cointel são alguns exemplos de marcas e estilistas. Os resultados indicam que a reconfiguração, além de permitir a criação de peças versáteis e personalizadas, contribui para a construção de um guarda-roupa mais duradouro e, portanto, mais sustentável. Ou seja, esta abordagem permite que a roupa seja mais valorizada pelo usuário. A interação do usuário com as peças é fundamental para a sua transformação, o que promove uma relação mais próxima entre a pessoa e suas roupas, fortalecendo esse vínculo. A análise do termo "reconfiguração" revela sua importância para designar um processo de mudança e adaptação. O objetivo deste estudo é conceituar e classificar os tipos de roupas reconfiguráveis, de modo a justificar a denominação proposta. Ademais, revela sua importância para a moda circular e adaptável. O prefixo "re-" sugere a ideia de renovação e circularidade, estando intrinsecamente ligado às quatro práticas necessárias da moda sustentável: repensar, reduzir, reutilizar e reciclar.

***Palavras-chave**: roupas reconfiguráveis, moda sustentável, modularidade, personalização, roupas transformáveis*

Introduction

This study is part of a broader master's research project on changeable and adaptable clothing, referred to here as "reconfigurable clothing". Reconfigurable clothing is characterised by its ability to adapt and change to some degree. Such garments feature elements such as reversibility, modularity, transformability, and wearable technology. They are also known as "two- or three-in-one" clothing, "adaptable clothing", "transformable clothing", "multifunctional clothing", "modular clothing", "reversible clothing", and "detachable clothing", among other designations. In all cases, these garments can be altered according to user interaction. This type of clothing has distinct characteristics, hence the need to name and classify its types and use the plural form.

The semantic choice of the term "reconfiguration" was motivated by the need to avoid conflicts with existing terminology, such as "transformable", and also to name a specific type of clothing. As the research progressed, it was noted that some authors, such as Quinn (2002, 2003), Farrer (2011) and Machado (2011), use the term "transformable clothing". In turn, Li et al. (2018) described and characterised modular clothing in three ways. Körbes (2015) associates transformable clothing with the concept of "modularity", which integrates the approach of mass customisation. There is also the Italian Alessandra Vaccari (2021, 2022), and the Americans Bradley Quinn (2002) and Andrew Bolton (2002), who carried out historical and social classifications and analyses of this type of clothing, each in their respective contexts, using the adjective "transformable" in the case of the first two authors and the definition of "supermodern clothing" for the latter.

However, the reconfigurable clothing group includes: modular clothing, which is usually formed by components or modules; transformable clothing, which the wearer can alter; reversible clothing, which is composed of rolled fabrics, tied to some part of the body, or offers the possibility of wearing either the right side or the reverse side of the garment; and technological clothing, which incorporates some form of electronic or digital device.

This study arose from the motivation to explore how the same garment can be used in different ways, allowing recognition of notable designers and brands that develop fashion products with a mutational approach. Thus, it was possible to demonstrate the practical relevance of this study, as evidenced by scientific research on wearables, such as that highlighted by Oliveira et al. (2023) and O'Nascimento (2021), which shows how these technologies can collect user data to enable the treatment or prevention of diseases. Another relevant aspect is that this type of clothing allows for optimisation during use, thereby delaying disposal and, consequently, reducing the generation of textile waste in landfills, which minimises environmental impact, as Gwilt's (2020) study shows

That said, the objective of this study is to conceptualise and classify the types of reconfigurable clothing in order to justify the proposed terminology. The guiding question is: what are the kinds of clothing with the capacity for mutation, and

what definitions have been assigned to each of them?

Based on this, the second section addresses the relationship between fashion and sustainability. It is followed by the methodology section, which clarifies the methods used. The theoretical framework then provides a definition and classification of reconfigurable clothing, enabling an understanding of how this adaptation is achieved. In the fourth section, the use of the verb "reconfigure" is examined. The fifth section compares the types of reconfigurable clothing, and finally, the study highlights some brands that do not adopt this approach but produce individual pieces of changeable clothing.

Fashion and Sustainability

The era in which we live is often described as "postmodernity", a time marked by transformations in social values. In this context, new ways of living and relating to one another, as well as to objects, emerge. We live in an age where constant change, whether physical or ideological, coexists with hedonism — that is, the pursuit of living intensely in the present. These dynamics are influenced by factors that permeate contemporary life, such as technological advances that have driven the practice of digital culture.

Sociologist Zygmunt Bauman (2000/2021) referred to contemporary society as "liquid modernity", a period in which institutions and rules once considered solid are no longer the centre of social relations, giving way to a more liquid society where everything is transient, ephemeral and unstable. Gilles Lipovetsky and Jean Serroy (2013/2015) describe the current era as "hypermodernity", characterised by an acceleration of phenomena as well as a certain fluidity, where everything becomes commodified and disposable, with a constant renewal of material things.

In this sense, the phenomenon of fashion becomes a protagonist of social relations, symbolising precisely these characteristics: rapid change and the cult of the new. This is particularly evident in large cities, where people live at a fast, unpredictable and insecure pace, valuing socialising in closed and private spaces.

Aware of the urgent need for sustainability, researchers such as Kate Fletcher and Lynda Grose (2011), Alison Gwilt (2011, 2020), Lilyan Berlim (2012), Elena Salcedo (2014), and Payne (2021), among others, are concerned with finding solutions and ways to develop fashion products that are more responsible and aligned with social, economic and cultural issues. One such solution has been to understand the impacts caused at each stage of the garment's life cycle: creation, production, distribution, use, and disposal.

Understanding this social context is important because of its profound relationship with today's actions and consumption choices. On the other hand, Italian sociologist and fashion theorist Patrizia Calefato (2021) argues that fashion is transdisciplinary because it has a complexity that reflects "the contemporary

world in which globality and micro-locality, cultural heritage and future-oriented innovation confront each other" (p. 45). However, the author adds that "fashion becomes an integral part of the global concern for the sustainability of our productive, communicative and consumption behaviours" (Calefato, 2021, p. 46). This is because the clothing production sector is the second most polluting industry in the world, surpassed only by the oil industry.

Leonardo Boff (2017) reinforces that the term "sustainability" refers to a set of actions and processes aimed at maintaining the vitality and integrity of planet Earth, as well as preserving ecosystems and sustaining the physical, chemical and ecological elements that enable the existence and reproduction of life, meeting the needs of present generations while protecting those of the future. Thus, the author defines sustainability as "a way of being and living that requires aligning human practices with the limited potential of each biome and the needs of present and future generations" (Boff, 2017, p. 11).

The fashion and clothing industry has adopted regulatory strategies aimed at minimising its environmental, social and economic impacts throughout all stages of a garment's life cycle. However, the sector still faces significant challenges. Ecological problems, such as waste generation, water use, chemical use, greenhouse gas emissions, and impacts on biodiversity, remain a global reality. From a social perspective, labour issues, including safety, health and wages throughout the supply chain, continue to represent critical ethical challenges for the sector (Payne, 2021).

The concept of circularity in design refers to the development of environmentally responsible products throughout their entire life cycle. It is assumed that fashion design should prioritise methods and materials considering their impacts, from manufacturing through to opportunities for extending the useful life of garments and post-consumer recycling.

Both designers and users play an important role in environmental responsibility. The production, use and disposal of fashion garments have a wide range of impacts. It is therefore essential that a garment or product is created with consideration for its life cycle, which

> refers to the journey of a product from the extraction of the raw fibre to the product end-of-life. Recent discourse has pointed to a need to consider this final stage as end-of-use (rather than end-of-life), which is far more appropriate in a circular economy where materials need to be kept at their highest utility and value at all times, never becoming waste. (Gwilt, 2020, p. vii)

In the current climate, environmental issues have significantly influenced how we interact with the world. For this reason, fashion designers, as social agents, engage in dialogue with other social sectors through the development of clothing items, seeking to reflect the needs of the times. In this sense, fashion designers strive to create clothing using sustainable materials and approaches, aligning the fashion industry with environmental concerns.

It is increasingly evident that fashion designers are pursuing alternatives to minimise the impact of clothing production and materials on society and the environment. Contrary to what is preached by "the current mode of production aimed at the highest level of accumulation" (Boff, 2017, p. 17), it is clear that reconfigurable clothing can offer a way out of obsolescence, owing to its capacity for mutation and functionality.

Designers, in turn, are responsible for the objects designed in the world we are born into, through which we learn to understand, live, and develop habits, perceptions and desires. Therefore, it is assumed that they can critically identify new possibilities to promote actions that protect and maintain "a qualitative condition of being over time" (Fry, 2009, p. 43).

For this reason, issues such as social responsibility, sustainable development and conscious consumption have become part of the daily lives of companies, society and government (Moraes, 2008). However, for a product to be considered eco-efficient, it is not enough to meet environmental requirements alone; it is "necessary to satisfy the basic requirements of a product design, that is, the requirements for service provision, technology, economics, legislation, culture and aesthetics" (Manzini & Vezzoli, 1998/2002, p. 105).

In a context of unsustainability, the development of a product with a longer useful life generates value. It suggests a variety of options in the elements that define clothing, without necessarily implying constant investment and acquisition of objects (Machado, 2011). Thus, a modular and transformable design is proposed as an alternative for a more durable wardrobe.

Designers who develop reconfigurable clothing aim to explore the possible forms that a garment can take. This idea is clearly illustrated by Korshi, designer of the Korsh01 brand, who adopts a reconfiguration approach, specifically, a modular one. On his website, he presents a garlic press (Figure 1) as an example of a versatile product. The designer argues that objects should be explored beyond their primary function in order to minimise waste production. In this case, the garlic press also serves as a bottle opener, a nutcracker, an olive pit remover, and a multi-purpose tool, suggesting that the clothes he designs, and others, should have more than one function.



Figure 1: *Garlic press – Korshi 01*
Source. From *A nova coleção da #Korshi01 mostra que o design inteligente da marca não se resume a uma identidade visual* [Post], by KORSHI 01, 2019, Instagram. (https://www.instagram.com/p/Bxf-2xqnJ4G/?igsh=eXd1czJicWp2cnh5)
Note. Translation: "bottle opener, nutcracker, garlic press, olive pit remover, multi-purpose tool".

Methodology

This research adopted a bibliographic approach, aiming to conceptualise and classify the types of reconfigurable clothing. Data collection was conducted using Google Scholar, which served as the main research base. Searches were performed without time restrictions, as the focus was on identifying relevant articles and books on the subject, given the limited amount of available material. To this end, the following keywords were used: "multifunctional clothing", "modular clothing", "transformable clothing", "reversible clothing", "double-sided clothing".

The criteria for selecting articles and bibliographic sources were as follows: (a) the content should address some clothing reconfiguration; (b) the user should perform the reconfiguration; (c) regardless of the type of reconfiguration, the garments should be able to return to their initial state. Therefore, the choice of bibliography is based on its ability to describe and define the garments, thus allowing us to answer the main question of this study.

The selected articles were analysed qualitatively using content analysis (Bardin, 1977/2011). The data were categorised according to the types of reconfigurations identified in the literature, enabling the construction of a comparative table of the characteristics of each kind. The comparative analysis helped us to identify

the similarities and differences among various types of reconfigurable clothing, as well as the trends and challenges present in this area of research.

It is essential to acknowledge that this research has certain limitations. The reliance on bibliographic sources available in electronic databases may restrict the scope of the analysis. Furthermore, the subjectivity inherent in qualitative analysis may influence the results. However, the methodological rigour employed aims to minimise these impacts and ensure the reliability of the findings.

Definition of Reconfigurable Clothing

Reversible Clothing: Versatility and Optimisation

Reversible clothing, also known as "double face", offers the user the possibility of wearing the same garment on both sides, thanks to the combination of fabrics, colours and patterns. This feature makes the garments versatile and economically advantageous, contributing to the construction of a more sustainable wardrobe.

Quinn (2002) defines this type of clothing as garments transformed solely through the reorganisation of their surfaces, either by means of reversible fabrics or detachable linings. This technique, pioneered by sportswear brands, has gained traction in casual fashion — particularly in coats and winter garments — and in beachwear, where bikinis can be worn on both sides in different colours or patterns (e.g., https://www.tf.com.br/top-biquini-no-dupla-face-verde/p).

Reversibility adds value to the garment, enabling the creation of different looks from a single item of clothing. Ease of use and the possibility of extending a garment's life — even if one side becomes damaged — contribute to more conscious consumption. According to Quinn (2002), the natural wear and tear of fabric can even be valued by more conceptual designers, making each piece unique. The production of reversible clothing involves specific sewing techniques that ensure a flawless finish, allowing the garment to be reversed without compromising its structure or integrity.

An interesting example is the use of expandable fabrics, such as those developed by the Petit Pli brand, part of the Arket label from the H&M Group, which grow with children, thereby optimising clothing use and reducing environmental impact (as can be seen at https://hypnotique.com.br/moda/petit-pli-e-a-roupa-que-acompanha-o-crescimento/).

In addition to garments made from reversible fabrics, other categories fall within this classification, such as clothing that wraps around the body, including turbans, saris and scarves. These garments offer endless possibilities for tying and draping, allowing the creation of personalised looks with each use.

Modular Clothing: Concept of Personalisation and Reconfiguration

Modular fashion represents a significant advance in clothing design, allowing consumers to create multiple looks from a limited number of pieces. Unlike reversible clothing, modularity requires more active interaction from the user, who can personalise combinations according to their preferences and needs.

Gwilt (2020) defines modular fashion as a flexible system that enables the creation of various combinations from a set of basic pieces. This modularity is achieved by subdividing garments into independent modules that can be assembled in multiple ways. For example, a hood can be detached from a jacket and transformed into a bag, or the legs of a pair of trousers can be removed to create shorts.

Li et al. (2018) highlight three key characteristics of modular design: diversity, flexibility and continuity. Diversity allows users to create unique and personalised combinations; flexibility enables the separate sale of modules, making the product more accessible and sustainable; and continuity refers to the possibility of reusing modules in different garments, thereby extending the product's life cycle. The authors classify modular design into three types: component modular design, geometric modular design and compounded modular design. The first type involves dividing a piece into parts that can be recombined in different ways. The second uses geometric shapes as the basis for constructing the modules, allowing for a broader variety of combinations. The third combines the first two approaches, offering even more possibilities for customisation.

Examples of modular garments include Sebastian Errazuriz's zipper dress (as illustrated in the study by Li et al., 2018, p. 30), which allows for countless combinations, and Berber Soepboer's Fragment collection, which uses triangular modules to create versatile skirts. Errazuriz designed a zipper dress containing 120 individual zippers, which acted as modules. When assembled, they could form a skirt or a top (Li et al., 2018). The concept is reminiscent of a modular dress developed by Emmanuelle Khanh in 1966 (https://sweetjanespopboutique.blogspot.com/2012/11/emanuelle-khanh-for-paraphernalia-1966_4.html).

Dombek-Keith and Loker (2011) argue that modular clothing can contribute to more conscious consumption by enabling users to maintain a more versatile and durable wardrobe. Their *Suit Yourself* project exemplifies how modularity can be employed to create high-quality garments with a low environmental impact. As noted at https://new-material-award.nl/en/fragment-textiles/, the skirt was constructed by fitting triangular modules with textiles from Refinity.

The Cukovy brand, founded in 2014, offers flexible and innovative design solutions through reconfiguration, adopting a modular clothing approach. Its jackets include detachable sleeves and hoods, allowing for multiple styling options. Inspired by everyday life, the brand transforms familiar motifs into wearable works of art.

As another example, in 2021, designer Jorge Feitosa developed a piece entitled "Objeto Modular Vestível" (Wearable Modular Object; Figure 2) as part of his Ajuntamento SULANCA por Nós collection. The piece is made from fabric scraps — including cotton, polyester, and viscose — as well as trimmings such as fixed and detachable zippers, which serve as connecting elements in its modular construction. Notably, the creation is composed of modules that can be fitted and rearranged according to the user's preferences and needs.



Figure 2: *Objeto Modular Vestível, 2021, exhibited in* Artistas do Vestir: Uma Costura de Afetos, *Itaú Cultural*
Credits. Ketilley Luciane de Jesus Purpura, 2025

Transformable Clothing: The Evolution of Fashion

Transformable clothing represents a fascinating category within the fashion universe, defined by its ability to change shape and function. Machado (2011) refers to this characteristic as "polymorphism", meaning the capacity to take on multiple forms. Vaccari (2021, 2022) offers a broader perspective, considering all reconfigurable clothing to be transformable. For her, transformation is a process that enables the creation of new identities and forms of expression, promoting gender fluidity and experimentation.

Farrer (2011) proposes a classification of transformable clothing into two types: simple and complex. The former includes garments that can be easily altered, such as a dress that can be converted into a skirt. At the same time, the latter encompasses more elaborate transformations, such as converting an overcoat into a tent. Versatility lies at the heart of this category, allowing garments to adapt to diverse contexts and needs.

In *Techno Fashion*, Quinn (2002) develops this analysis further by dividing transformable clothing into three categories: (a) reorganisation of surfaces: transformation occurs through the rearrangement of fabrics or linings, as in reversible pieces or those with detachable components; (b) multiple functions: garments serve more than two purposes, made possible by reversible fabrics or innovative fastenings; and (c) transformation into objects: garments can be converted into entirely different items, such as accessories or furniture.

An iconic example of this third category is Hussein Chalayan's Coffee Table Dress (https://www.anothermag.com/fashion-beauty/11507/hussein-chalayan-best-shows-coffee-table-dress-airplane-dress-led-dress), which transforms from a garment into a piece of furniture. This merging of fashion and object design challenges the conventional boundaries of clothing and explores new possibilities for the relationship between body and garment.

At the same time, Quinn's (2002) classification intersects with other types of reconfigurable clothing. The category "reorganisation of surfaces", for example, shares characteristics with modular clothing due to its reliance on detachable elements. Similarly, garments with multiple functions resemble reversible clothing.

Wearable Technologies: The Convergence Between Fashion and Technology

The intersection of fashion and technology has given rise to a new type of reconfigurable clothing: garments incorporating electronic components. According to Oliveira et al. (2023), these garments serve specific functions, adapting to individual or collective needs.

Vieira Pinto (2005) defines "technology" as the set of techniques used by a society. In the context of fashion, wearable technology refers to the integration of electronic elements into clothing, enabling it to collect and process data from the

human body. O'Nascimento (2020) emphasises the proximity between technology and the body, facilitated by sensors and actuators embedded in garments.

Tobbin and Cardin (2021) expand this definition by describing wearables as devices that measure physiological signals — such as heart rate and sleep quality — and transmit this data to other devices. These technologies are widely employed in sectors such as healthcare and sport, while also gaining relevance in entertainment and industry. The basic components of a wearable system are:

- Sensor: collects data about the body or environment;
- Processor: analyses the data collected by the sensor;
- Actuator: displays the results of the analysis through sounds, vibrations, or other signals.

The internet of things plays a crucial role in the evolution of wearable technologies, allowing for the interconnection of multiple devices and the aggregation of large volumes of data. Laghari et al. (2021) underscore the transformative potential of the internet of things in reshaping our interactions with technology and the world around us.

Wearable technologies have applications across multiple fields, including:

- Health: monitoring vital signs, early disease detection and treatment tracking;
- Sports: performance analysis and customised training;
- Entertainment: virtual and augmented reality, interactive gaming and immersive experiences;
- Industry: monitoring personnel in hazardous environments and process optimisation.

However, the development of wearable technologies raises pressing questions concerning privacy, security and surveillance. The collection and use of personal data through such devices may raise concerns regarding control, ownership, and the ethical handling of this information.

Examples such as the InvisDefense jacket, which uses camouflage patterns to avoid detection by surveillance cameras, and facial-recognition helmets worn by Chinese police, illustrate the ethical complexities and challenges inherent to the advancement of these technologies.

Another notable example is clothing that changes colour when exposed to light or sunlight. The Japanese brand ANREALAGE merges high technology with innovative material use, employing photosensitive fabrics. Figure 3 shows two images from the brand's 2023 catwalk show in Paris, where the garments changed colour in real time. The previously all-white garments instantly transformed into colourful and patterned pieces through the use of photochromic pigments activated by ultraviolet light.



Figure 3: *Anrealage — Paris, 2023*
Source. From *Quem disse que moda e tecnologia não caminham juntas? Na semana de moda em Paris, a grife @anrealage_official, do designer Kunihiko Morinaga* [Video], by Steal the Look, 2023, Instagram. (https://www.instagram.com/reel/CpOLq5JJSdG/)

The convergence of fashion and technology promises an increasingly connected and personalised future. The development of smart materials, the integration of artificial intelligence, and the miniaturisation of electronic components are some of the key trends that will influence the evolution of wearable technologies.

These innovations mark a revolution in how we experience fashion and interact with the world. By merging functionality and style, wearable technologies open up new possibilities for personal expression and enhancing the quality of life. Nevertheless, the advancement of these technologies must be accompanied by critical discussions on their social and ethical implications, ensuring that their benefits are maximised while minimising potential risks.

The Use of the Verb "Reconfigure"

So far, we have classified several types of clothing that share the characteristic of being adaptable or modifiable, including reversible, modular, transformable, and technologically enhanced garments. To encompass this diversity and their possibilities for transformation, we use the term "reconfigurable".

The choice of the verb "reconfigure" was not arbitrary. According to the Dicionário Michaelis (n.d.), "reconfigure" means "to configure (something) again or in a new way". The etymology of the word, derived from the Latin *figura*, reinforces the idea of transformation in form and appearance. This broad definition includes everything from simple surface reversals in reversible clothing to more complex transformations seen in modular and technological pieces.

In addition, the prefix "re-" suggests repetition or renewal, aligning with key discussions surrounding sustainability and circularity in the fashion industry. Authors such as Fletcher and Grose (2011), Gwilt (2011, 2020), and Salcedo (2014) emphasise the importance of designing garments that are more durable, versatile and adaptable over time. Within this framework, reconfiguration emerges as an effective strategy for extending the life cycle of clothing and, consequently, reducing the environmental impact of the fashion industry. In this sense, it is directly connected to the principles of the sustainability "Rs", which also encompass user-led actions, particularly in the context of clothing.

It is also worth noting that the term "reconfigure" is used in other domains, such as computer science. However, its application in the field of fashion assumes distinct nuances, closely related to creativity, individual expression and the dynamic relationship between the body and clothing.

Comparative Analysis Between Types of Reconfigurable Clothing and Modularity

Modularity — the ability of a system to be composed of independent parts that can be combined in different ways — is a fundamental concept for understanding the construction and adaptation of reconfigurable clothing. Pine (1992/1994) identifies various types of modularity, each with distinct characteristics and applications within the fashion industry.

Table 1 presents a comparison between the types of modularity proposed by Pine (1992/1994) and their relationship with reconfigurable clothing. It can be observed that mix modularity and sectional modularity are most closely aligned with transformable and modular clothing, respectively.

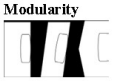
Types of modularity	Definition	Relationship with clothing	Interaction with the user
Component-Sharing Modularity  *Credits.* Adapted from Pine (1992/1994, p. 216)	In this type of modularity, "the same component is used across multiple products to provide economies of scope" (Pine, 1992/1994, p. 216).	Watches with interchangeable straps from the 1980s exemplify component-sharing modularity.	Simple
Cut-to-Fit Modularity  *Credits.* Adapted from Pine (1992/1994, p. 216)	This technique occurs when "one or more of the components is continually variable within preset or practical limits" (Pine, 1992/1994, p. 219).	Garments tailored by a bespoke tailor or offered by brands that provide this type of customisation.	Simple
Component-Swapping Modularity  *Credits.* Adapted from Pine (1992/1994, p. 216)	This technique arises when "different components are paired with the same basic product, creating as many products as there are components to swap" (Pine, 1992/1994, p. 217)	When the customer becomes a co-creator of the product, customising a standard base with various components — such as colours, types of laces, brand logo designs, and raw materials — to create a unique model.	Simple
Mix Modularity  *Credits.* Adapted from Pine (1992/1994, p. 216)	The clear distinction here is that "the components are so mixed together that they themselves become something different" (Pine, 1992/1994, p. 220).	Transformable clothing.	Complex
Bus Modularity  *Credits.* Adapted from Pine (1992/1994, p. 216)	Pine defines it as "a standardised structure [that] allows variation in the type, number and location of modules that can plug into it" (p. 221).	In clothing, brand and composition labels are typically placed in a predetermined location, as specified by the company. Some brands choose to embed the label inside the garment, while others display it on the outside as a means of easy identification and brand promotion.	Simple
Sectional Modularity  *Credits.* Adapted from Pine (1992/1994, p. 216)	This is the most customisable type of modularity, as it enables easy reconfiguration. In this approach, the configurations between modular components are virtually limitless, made possible by standardised interfaces. In product design more broadly, Lego building blocks exemplify interfaces that seamlessly connect.	Modular clothing.	Complex

Table 1: *Types of modularity*

Mix modularity, for instance, enables various combinations from a limited set of components, similar to transformable clothing, which assumes different shapes and functions. Sectional modularity, marked by high customisation and flexibility, mirrors modular clothing, which can be readily disassembled and reassembled.

Körbes (2015) emphasises the significance of modularity in the clothing design process. From conception to construction, garments are viewed as assemblages of parts that can be combined in multiple ways. This modular approach facilitates customisation and adaptation to the wearer's individual preferences and needs.

The painting *The Planetarium* by Öyvind Fahlström (1963; Figure 4) vividly illustrates the concept of "modularity" in fashion. The work features human figures adorned in various combinations of garments, demonstrating the potential to create an infinite number of variations from a limited set of elements.

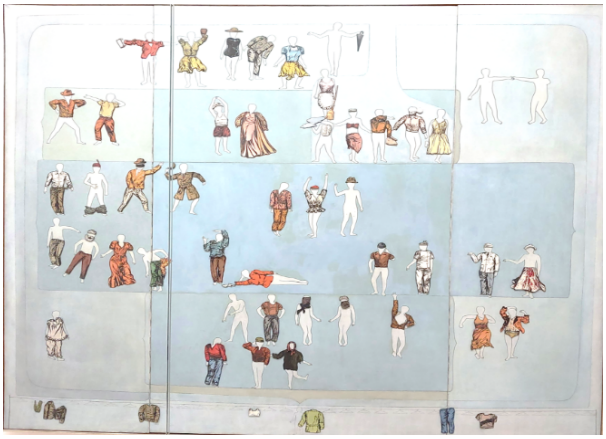


Figure 4: The Planetarium — *Öyvind Fahlström, 1963. Photograph taken at the Pompidou Museum in Paris*
Credits. Ketilley Luciane de Jesus Purpura, 2023

Understanding the various types of modularity is crucial for comprehending the complexity and diversity of reconfigurable clothing. By analysing the characteristics of each modularity type and its relationship with clothing, new possibilities emerge for designing and producing more personalised and sustainable garments.

Brands With Reconfigurable Clothing Items in Collections and Lines

Here we have selected a few brands that have produced individual items of clothing with reconfigurable features. The selection criteria were their relevance at the national (Brazil) and international levels. These brands illustrate how, despite being limited, there is interest among major labels in developing garments using this approach, as demonstrated by Adidas and Osklen below.

Osklen, a Brazilian brand known for its commitment to sustainability and the Rio de Janeiro lifestyle, offers a reconfigurable item. The detachable jumpsuit (https://www.osklen.com.br/produto/macacao-destacavel-caqui-caqui-66172-17) is a notable example, allowing for various combinations from a single piece due to its modular design and the use of Velcro. This versatility, combined with the use of sustainable materials such as organic cotton and fish leather, positions Osklen as a benchmark in sustainable and functional fashion.

Adidas, a giant in the sportswear market, also explores the concept of reconfigurability in some of its pieces. The rib two-in-one Leggings (https://www.adidas.com.br/legging-canelada-2-em-1-always-originals/HF2085.html?-_) from the Originals line exemplify how the brand combines performance and versatility. The snap-on system allows the leggings to be transformed into shorts or even a complete outfit by adding the matching top. Although Adidas places greater emphasis on sports performance, this piece demonstrates the brand's effort to meet the demands of consumers seeking functional and sustainable products.

Both Osklen and Adidas demonstrate a growing interest in reconfigurable garments that combine fashion, functionality, and sustainability. The modularity and versatility of these garments meet the demands of increasingly conscious and discerning consumers. However, there remains ample room for brands to explore this potential more broadly by offering a wider variety of reconfigurable garments and encouraging a circular economy.

Final Considerations

This study has successfully conceptualised and classified the types of reconfigurable clothing, providing a foundation for the proposed terminology. It was noted that, although each approach has distinct characteristics, authors often group them under the same nomenclature, which can lead to confusion regarding their specific functions.

The research also highlights the growing interest among fashion brands and designers in sustainability, underlining the relevance of reconfigurable clothing as an innovative and sustainable alternative within the fashion industry. By enabling a single garment to assume multiple forms and functions, reconfiguration contributes to creating more versatile and durable wardrobes, thereby reducing excessive consumption and the need for premature disposal.

User interaction plays a fundamental role in the potential of reconfigurable clothing. Allowing individuals to personalise and adapt their garments fosters a more intimate and meaningful relationship between the wearer and their clothing. This customisation is especially valuable for individuals with specific needs, such as those with disabilities or limited mobility.

Beyond sustainability and personalisation, reconfigurable clothing opens new avenues for individual expression and aesthetic experimentation. Designers

like Hussein Chalayan exemplify how reconfiguration can transcend traditional fashion boundaries, transforming garments into true works of art.

The integration of technology within reconfigurable clothing further expands the possibilities for the future. The use of smart materials and connectivity with electronic devices can enhance both functionality and customisation. Consequently, reconfigurable clothing represents a promising trend in fashion, with the potential to transform how we conceive, create, and consume clothing. By combining creativity, technology, and sustainability, reconfiguration offers an innovative alternative for a more sustainable and customised future.

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