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Is Fashion Effecting Posthumanism? A Review of Innovations and Creative Patterns That Are Shaping Fashion's Future

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*University of*  
**HUDDERSFIELD**

***Is Fashion Effecting Posthumanism? A Review  
of Innovations and Creative Patterns That Are  
Shaping Fashion's Future***

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This dissertation is submitted for the 180-credit Dissertation Unit required for the completion of the MSc in Fashion and Textiles by Research

Supervisors: J. Dyer, J. Halbert

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## Declaration

I, Kenneth Anthony Wilkinson, hereby certify

1. that this dissertation is my own account, based upon work actually carried out by me, and that all sources of material not resulting from my own investigation, including observational information, have been clearly indicated;
2. that no part of the work incorporated in this dissertation is a quotation from published or unpublished sources, except where clearly acknowledged as such, and that any specific direction or advice received is also properly acknowledged.

Signed.....



# Abstract

This thesis tested the following hypothesis: *innovation and creativity in fashion are effecting posthumanism*.

Through a review of the literature, five core themes in posthumanism were identified: species equivalence, biotechnological hybridity, embodiment, non-alterity (versus alterity), and subjectivism.

Examples of newness in two areas of fashion innovation and creativity were identified: wearable computing, and smart textiles. These were qualitatively analysed to ascertain the presence of posthuman influence and/or the posthuman fashion-effecting potential within them.

Six theoretical findings resulted from the analysis:

1. Powerful concordances connect the examples with the major themes of posthumanism – ergo, *the hypothesis was supported*.
2. As a result, the Circuit of Fashion Formation can be articulated in higher resolution.
3. The fashion-posthumanism dynamic can be expressed via McLuhan's Laws of Media.
4. The centrality of Artificial Intelligence is deducible through its presence in both areas of newness, so Artificial Intelligence was proposed as the third area of fashion innovation.
5. Reflecting the schism in the literature regarding homogenization versus heterogenization in posthuman society, two posthuman fashion scenarios were proposed: Monograd and Polyopia.
6. "Sans-notumism", an original theorization with futurological as well as fashion-related significance, was defined.

The applications of and implications for these findings in terms of fashion research, education, and professional practice close this thesis.



# 1. Introduction

## 1.1 Rationale

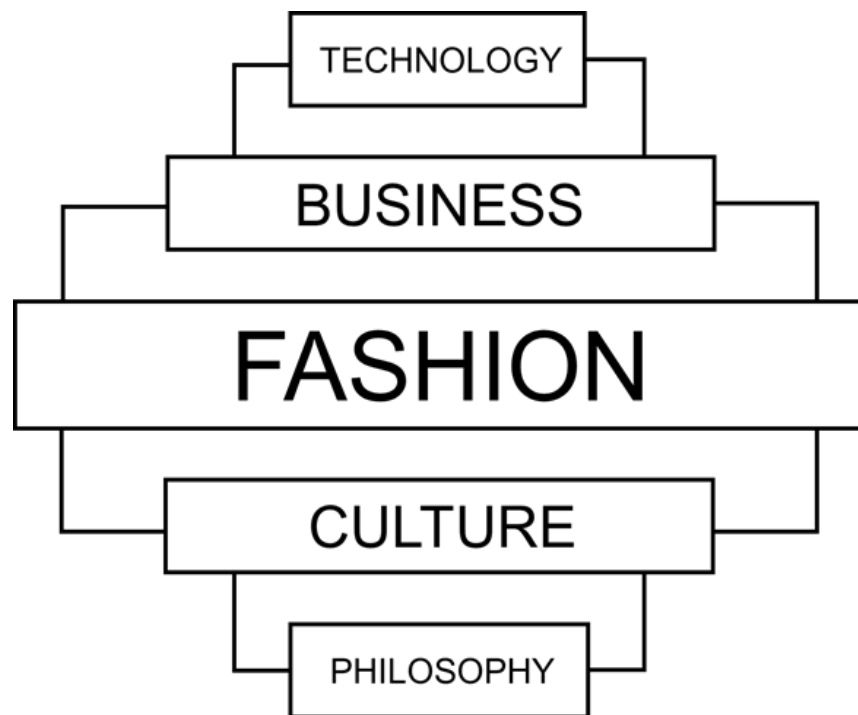
In *posthumanist* ontology, philosophy and technology are explicitly integrated and central. This research examines how fashion will be – or is perhaps already being – informed, developed, or enabled by innovations and creative patterns that maybe described as or invoke notions of the posthuman. To date, little research connects the possibilities and implications of posthumanism to the changes occurring in fashion since the advent of the digital. Posthumanism has profound significance for self and society – forces that are focal in many theorizations and conceptualizations of fashion. This parallel – along with the ever-technologizing nature of production and consumption – justifies this research. Is fashion-by-posthuman imminent?

Kawamura (2018) noted that fashion *evolves*; change is constant; design and style disrupt and diversify. This research follows this observation in light of posthumanism, an expanding, implication-loaded philosophy. This research asks:

- Are innovations and creative patterns in current and recent fashion expediting its posthuman metamorphosis? And,
- if posthuman fashion arrives, what will be its nature?

This research proceeds on an uncontroversial and resilient premise, i.e. that fashion is informed and enabled by identifiable, related forces, principally culture and business. These forces are themselves informed and enabled by philosophy and technology, among other sub-forces (similar is asserted by Barthes, 1967; Lipovetsky, 1987; and Kaiser, 2012). Figure 1 illustrates this relatedness of influence.

Figure 1 The Circuit of Universal Fashion Formation



## 1.2 “Posthuman/ism”: Development, Definition, and Dimensions

Posthumanism covers a broad set of philosophical themes, debates, and concepts that challenge humanist assumptions concerning human primacy. Its origins are debated, but the term appears to have first surfaced in 1977 (Hassan). The “post” relates not to a future without humans but to a future in which the role and position of humans vis-à-vis other living and non-living entities is unlike what it has become in current industrial societies, which function anthropocentrically, i.e. on humanist premises. Thus, posthumanism discusses/proposes a worldview that is post-*humanism* more than post-humans. Posthumanists debate, speculate, and theorise what many of them consider to be the inevitable and in some ways positive erosion of the barriers that demarcate human from non-human. Posthumanism’s core interests therefore address boundary dissolution and traditional taxonomies, particularly those that have ethical and conceptual implications. Thus, for posthumanists, the relationships and power differences between human-animal, human-machine, organic-inorganic, and human-environment are focal matters.

In the context of posthumanist research, the term “new materialism” is a recent development. New materialism was coined by Smelik (2018) to reference the contribution of non-human elements to fashion. Such elements span the ordinary (e.g. cotton) to the technologically sophisticated (e.g. circuits and batteries). “Textility” is also elemental to new materialism: both worn (garment) and wearer (body) possess tactility. New materialists operate on the basis that life generally and fashion particularly both entangle and are entangled by living bodies and non-living factors, such as fibre, textile, product, and technology.

“Transhumanism” was coined by the eugenicist Julian Huxley in 1957.

“Posthumanism” appeared two decades later, in a paper by the postmodernist Ihab Hassan entitled *Prometheus as Performer: Towards a Posthumanist Culture?*: “We need to understand that five hundred years of humanism may be coming to an end, as humanism transforms itself into something that we must helplessly call posthumanism” (Hassan, 1977, p. 843).

While transhumanism has deviated little from its principal concern (human improvement through science and technology), posthumanism has grown into a complex set of philosophical prognostications concerning human destiny. The biotechnological possibilities that engage transhumanists are present *inside* posthumanist debates, in philosophical dialogues around existence-versus-essence, interspecies ethics, tools and evolution, and human-environment coexistence.

Before we proceed, some theorization of the terms “fashion” and “clothing” should be presented. According to Kaiser et al (1991), fashion is the product of combinations of clothing (i.e. style). Eicher (2021) asserted that fashion is the superordinate of clothing, because fashion *encompasses* clothing and many/all other elements of appearance. Eicher also claimed (2001) that fashion in clothing, through its signifying elements, provides period and (albeit to a lesser extent) place relevance. However, for Loschek (2009), fashion’s meanings are, more than clothing’s, a matter of observer perception as much as wearer design. Preceding Kaiser and Eicher, Craik (1993) proposed that clothing and fashion are non-

equivalent concepts: not all clothes are fashion(able). Clothing, like fashion, is however more than either (or both) function or symbol; clothing – through dress codes – forms a “habitus” for its wearer, a “lived milieu” (Craik, 2005, p. 4). Significantly, fashion is “body technique” – an ensemble of social conduct signifiers achieved through clothes (Craik, 2005, p. 8). On “western fashion” specifically, Wilson (1985, p. 9) argued that fashion is an aesthetic expression of the “ideas, desires and beliefs circulating in society”. Modes of dress are defined by fashion, not clothes, which are mundane “dim replicas” of fashion (Wilson, 2003, p. 5).

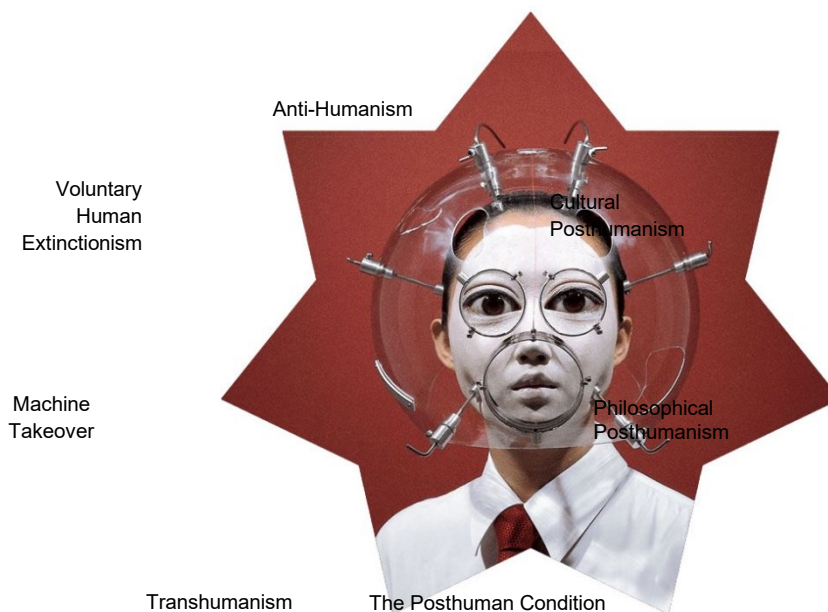
Clothing, for its purposefully impermanent, non-corporeal enhancement of the human wearer – in both functional and aesthetic terms – correlates more strongly with transhumanism than with posthumanism. Fashion, although like clothing in that technology and necessity influence its design and appeal, is driven more powerfully by cultural forces, so is notionally aligned with posthumanist concerns. Posthumanism and transhumanism are often conflated. There are similarities, but the differences help us understand posthumanism in higher resolution. Ferrando (2013) divides transhumanism and posthumanism on the basis of divergent foci: transhumanism emphasises the pursuit of human *enhancement* (hence the “H+” figure that is the movement’s symbol). Posthumanism, on the other hand, concentrates on the *deconstruction* of the human, i.e. the reassessment of human primacy. The posthuman discourse contains a trinity of elements: 1. post-humanism (where multiple humanisms are proclaimed); 2. post-anthropocentrism (where assumptions about the human occupation of the ontological pinnacle are challenged); and 3. post-dualism (which debates the existentiality of interconnectedness and the dissolution of boundaries between humans and other species).

Transhumanism and posthumanism conflict on the matter of anthropocentricity: transhumanism is overtly *anthropocentric*: it seeks human betterment, chiefly through technology; posthumanism, contrastingly, endeavours to extend formerly humanist values to other species and inorganic intelligences. This major difference notwithstanding, transhumanism and posthumanism have a powerful, fundamental commonality. Both are premised on the notion that the human is a fluid, evolving,

and designable, improvable being. Hence, the transhuman can be seen as an intermediating means to the achievement of the posthuman.

Ferrando (2013) separates posthumanism into the following seven (highly related) dimensions:

Figure 1 The Seven Dimensions of Posthumanist Debate



(Image: Lee, 2003)

This taxonomy situates transhumanism *inside* the superordinate that is posthumanism. For the following reasons, this research focusses on *posthumanism* (more than *transhumanism* or any other subdimension):

- Posthumanism covers a wider range of theories and philosophical issues. Significantly for fashion research, posthumanism addresses *culture* and *influence*.
- Posthumanism acknowledges the two-way relationship between technology and consumer. Since this research examines the role played by recent innovations in fashion technologies and creative work vis-à-vis posthuman possibilities, theoretical linkages between technology and consumption/culture were required.



- *Posthumanism* is favoured by philosophers engaged in discussions around ethics and human-machine-other species coevolution. Luxury brands invest heavily in R&D for Corporate Social Responsibility and sustainability initiatives (Cavender, 2018) – provenance-proving applications and non animal-derived materials, respectively. Similarly, fashion’s forecasting is increasingly AI-augmented (Ho & Choi, 2014). *This research examines the impact of advanced fashion-relevant innovations, some of which may reflect changing attitudes in ethics and human-non human relationships.*
- Progress in robotics and Artificial Intelligence suggests that early transhumanist visions of a mechanistic android phase between human and humanoid are unlikely to materialize. Technological evolution must however occur inside a complex social and philosophical milieu. *Fashion – since it is wearable and therefore anthropocentrically sensitive – may constitute an example of a subtle, contextual force of transition.*

This research operationalises the following definition of “posthumanism”:  
*a philosophical movement that debates changes in human identity possibly occurring due to the increasingly proximal nature of humans and their technologies; and, collaterally, discusses the extension of formerly anthropocentric ethics and notions of being to artificial and organic other-than-human beings.*<sup>2</sup>

### 1.3 “Fashion”: Defined

Definitions of fashion fluctuate. The diversity has complicated fashion research and study, but progress toward unification on key concepts has been achieved (Breward, 1998; 2008). Overall, as fashion has changed, so have its definitions – from material to symbolic (Kawamura, 2018).<sup>3</sup>

According to Wilson (2003, p. 5), western fashion is “unified” by capitalism, so reflects industrial age ideals and values. According to Wilson (2003), most historians agree that prior to the end of the Middle Ages, fashion – western

---

<sup>2</sup> This definition derives mostly from the synthesising by Miah (2008) of posthumanism’s major thematic strands (also identified by Ferrando, 2013).

<sup>3</sup> The 1998 conference on Anthea Jarvis dissected issues of costume and fashion theory. Schisms in fashion theory re. costume and dress were rarely reconciled. This research utilises definitions of fashion-associated concepts such as “costume”, “dress”, and gender” that are compliant with the consensus of contemporary fashion theorists. A table of definitions is provided in Appendix A1.

fashion, that is, as it is currently understood, was non-existent. Western fashion emerged with the growth of cities and mercantile capitalism, and expanded and diversified most forcefully through the affordances of industrial processes in the 19<sup>th</sup> and 20<sup>th</sup> century particularly. Breward (2010) noted that fashion and urban culture grew in mutually informing parallel – in 15<sup>th</sup> and 16<sup>th</sup> century Europe, “to be fashionable was to be urban” (p. 227). This notion of fashion-urbanity has humanist connotations: humanism (along with modernism and even futurism) emphasizes the importance of modern cities, science, capitalism, technology, and industry as bold expanders of human potential, and therefore humanistic and clearly positive. Urban expansion and economic growth enable human endeavour and prioritise human interest above other concerns. (We shall see that *post*-humanism appears to proclaim new values that challenge human chauvinism and fashion.)

As the following definitions show, the pattern is not linear. Recent definitions can be material, e.g. Lehmann (2010, p. 30): “‘fashion’ – as distinct from ‘clothing’, ‘costume’, or ‘dress’ – is a social conceptualization of what is worn at a point in time.” Early definitions can be abstract too, e.g. Simmel (1905/1997): fashion reveals deep contradictions within the human-social psyche; fashion expresses the tension between conformity and individuality; fashion reflects the dualistic, dialectical contradiction that marks the human condition.

Some recent definitions appear less nuanced: Pappas (2008, p. 14) claimed that for its “unanimity and mass mutual mimicry”, fashion is simply *imitation*. To Wilson (2003, pp. 116, 268), fashion is “a branch of aesthetics”, a “serious aesthetic medium”.

Many influential definitions stress the social-cultural aspects of fashion’s influence and purpose. For instance, Brenninkmeyer (1963, p. 4) defined fashion as the “prevailing usage of dress adopted in society for the time being ... the result of the acceptance of certain cultural values, all of which are open to relatively rapid influences of change.” Mendes & de la Haye (2010, p. 8) proposed a similar, terser definition: “fashion is an indicator of individual, group, and sexual identity . . . its fluidity reflects shifts in the social matrix”.

In the preceding definitions, several terms have strong conceptual significance for posthumanism, so sensitize this research. They are: *social conceptualization*, *human-social psyche*, *conformity* and *individuality*; *human condition*; *imitation*; *aesthetics*; *cultural values*; *influences of change*; *individual, group, and sexual identity*; and *shifts in the social matrix*.

This research operationalises the following definition: “Fashion is a social process of negotiation and navigation through the murky yet hopeful waters of *what is to come* ... Fashion involves *becoming collectively* with others” (Kaiser, 2012, p. 1). This definition connotes potential and evolution. This research examines a far-reaching, burgeoning philosophy laden with potential for self, society, aesthetics, culture, and many more phenomena imbricated in fashion theorisations.

According to Sapir (1931, p. 142), “fashion is a thing of forms and symbols not material values”. In current civilization, women’s fashion features greater variability than men’s. If fashion is symbolic, then theorists must explain why societies permit, promote, expect, or require this imbalance. Miller-Spillman & Reilly (2019) *inter alios* claimed that gender is a matter of social construction. Corwin (2009) noted that presentations of *self* are dynamic, and nonnormative presentations of gender vary according to context and circumstance. These observations too, as we will see, have posthuman implications. Gender theorizations are not central to this research, but posthumanism has much to say regarding degenderization, and this research reveals the role that fashion may play in this process.

## 1.4 Research Aim

*Innovation and creativity in fashion are effecting posthumanism.*

## 1.5 Research Objectives

RO1

*To identify and elucidate specific areas of fashion that are facilitating the emergence of the posthuman.*

RO2

*To show how recent technology and creativity in fashion may be interpretable as entangled with notions of the “posthuman”.*

RO3

*To assess the relevance of fashion theorisation in light of the digital present and the arguably emergent posthuman.*

## 1.6 Structure

The *Literature Review* reflects the three chronological phases through which the coupling of fashion theory and technology appears to have evolved. The review supplies datum theory and context. Five core posthumanist themes were identified through the *Literature Review*. Two areas of newness were identified by pre-reading into recent fashion innovations and confirmed by the review’s coverage of specific discussions relating technology to fashion. The derivations of the five posthuman themes and two areas of newness (categories of advanced technologies) are summarised in the *Methodology* chapter.

The *Methodology* chapter describes and justifies the research methods. The *Findings* chapter presents a disaggregated, organised account of new fashion technologies and creative accomplishments (thereby informing RO1 and RO2 directly). In the *Analysis*, the findings are interpreted in terms of their implications for posthumanism and the main theoretical and philosophical points revealed in the *Literature Review* (thus fulfilling RO3). A synoptic discussion addresses the Research Aim in the *Conclusions* chapter, which closes this research.



## 2. Literature Review

This chapter contains three sections, each presenting a disaggregated and summarised account of the literature pertinent to this study's Research Aim and Research Objectives. The opening section concerns prominent traditional, i.e. pre-digital, theorizations of fashion. The second section discusses evolving patterns in the conceptualization, promotion, provision, and consumption of fashion. The final section reports posthumanism's origins and core themes. This chapter provides a theoretical account of the past, present, and possibly posthuman future of fashion.

### 2.1. Theorizations of Fashion

Most fashion theories developed long before the digital age. The 1990s is generally recognised as the decade in which the Internet became widely usable, socially and commercially. Hence, this section discusses the traditional theories of fashion likely to be disrupted by technology and posthumanism. Since "self" (alone and in relation to society) and its near-parallel concept "identity" are elemental to many fashion theories, this section begins by examining these terms.<sup>5</sup>

#### 2.1.1 Fashion, Self, and Society

According to Simmel (1905/1997), fashion represents a tension between two oppositional but complementary drives inside the individual: the drive for uniqueness and the drive for identification with a desirable, affirming collective. The individual achieves both by cultivating fashionableness. The self-collective can sometimes be thereby reconciled: the individual's expressive appearance addresses the uniqueness drive and draws acknowledgement from a relevant, i.e. fashion-literate, group that provides the signalling individual credibility and/or identity.

Simmel argued that although fashion's expressive possibilities can be emancipatory, excessive devotion to fashion is suppressive. Fashion's fanatics are

interchangeable herd members identified by urban uniforms. In the broadest social terms, fashion signifies ceaseless modernity and impermanence. For the individual however, fashion represents a potent technology of *self*-design.

Brenninkmeyer (1963) described fashion as expressions of *cultural values* coded through temporarily prevalent modes of dress. Edwards (2007) proposed that fashion situates individuals within *social contexts*, so provides both creative opportunities (through design and expression) and social structuring. Entwistle (2000, p. 44) acknowledged fashion's social nature explicitly: "Fashion is a particular system of dress found under particular social circumstances". In posthumanist terms, fashion is entangled with society. Both influence and are influenced by each other in intricate, multiple ways.

### 2.1.2 "Postmodern" Fashion

In social-cultural theory, "modernism" denotes the contribution of science and technology to the disambiguation of social issues. Modernism connotes swift change, tradition-revision, commercial forces, and choice expansion. Such connotations also accompany modern fashion (Barker & Jane, 2016), prompting the summation that fashion is both a facet and representative instance of modernism.

*Postmodern* fashion borrows indiscriminately, pulping its plunder into "ephemera of floating signifiers that are nothing but self-referential" (Falk, 1995, p. 103). Fashion today might indeed be postmodern – if it is *purely* self-referential, which becomes arguable by observation of persistent, recurrent, and predictable trends like decade-retro, "ethnic", fusion, and subculture-homage. To Baudrillard (1981/1983) and Tseëlon (1995), postmodern fashion is a jumble of coarse, empty signs appropriated unsubtly from anywhere, signalling only the designers' desire to demonstrate originality in a commercial-cultural form whose relevance faded long ago.

Post-1980s fashion is comparable to a haphazard patchwork of normless heterogenous forms (Wilson, 1990). There is "a blurring between mainstream countercultural fashions"; current fashion knows its inadequacies: it "has become

‘stagey’, self-conscious about its own status as discourse” (Wilson, 1990, pp. 222, 223).

If fashion lacks meaning, if neither dress codes nor hegemonic standards exist, then debating subcultural or countercultural fashion is futile (Gottschalk, 1993; Polhemus, 1994).

By such logic, *bricolage* (Hebdige, 1979) is a redundant concept, as are all attempts to conceptualize subculture style. Fashion as signifier/communicator of meaning is losing power; when fashion does project meaning, it is through increasingly hollow signs (Sweetman, 1999). If fashion is mere aesthetics and form play, as Marino (2018) claimed, it deserves meagre ontological effort.

Social theorists Hebdige (1979) and Muggleton (2002) disagreed: fashion carries *time-sensitive social significance*. Without social significance, fashion could offer cultures and subcultures no method of self-defining or value-expressing.

Consumption theorists broadly agree on the issue of where fashion is leading society. With a postmodern flourish, Lipovetsky (1987, p. 27) stated that fashion consumption “accompanies the promotion of secular individualism and the end of the immutable pre-regulated universe of traditional forms of appearance”. We shall soon see that posthumanism has bold, conflicting predictions concerning individuality, subjectivity, homogeneity, and heterogeneity.

### 2.1.3 Summary

Fashion has functions vis-à-vis society. Fashion marks wearers as (non-)compliant with social/cultural values. Fashion can liberate or confine, depending on the degree to which it is followed – a strong dichotomy that accounts neither for a mainstream middle ground nor economic or cultural constraints on choice (and myriad other factors affecting fashion decisions). To many theorists, fashion is a technology that allows the wearer to craft image or experiment with personae.

Fashion products are both repetitious and novel, since the consumer requires both. As a result of fashion’s commodification, *meaning* is almost absent – fashion



being a consumer product like any other, it undergoes renewals, with each iteration further from any concepts or values it may have once represented.

While some theorists regard it as emblematically *modernist*, others describe current fashion as *postmodern*, claiming fashion no longer offers identity cues via a visual language signifying status or (sub)culture membership.

The following table summarises the themes revealed in the preceding review.<sup>6</sup>

Table 1 Fashion Theory's Main Themes and Their Representation/Sources in Literature

| Themes in Pre-Digital Theorisations of Fashion  | Representation/Source  |
|---|--|
| Social significance                             | Baudrillard (1981/1983); Edwards (2007);                           |
| Interrelatedness of fashion, self, and identity | Hebdige (1979); Muggleton (2002)                                   |
| Meaningfulness/meaninglessness                  | Wilson (1990); Gottschalk (1993); Polhemus (1994); Sweetman (1999) |

During the exploration of the above, several topics with implications for posthumanist concepts (all covered in detail in 2.3) were revealed. These were:

- the social and technical interpretation of “self”;
- the “self” as delineator of the individual;
- fashion and consumption as social signifiers/expressions of self; and
- the relatedness of fashion and identity.

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<sup>6</sup> These themes overlap strongly. Where similarity was acute, the themes were collapsed: e.g. because modernist-versus-postmodern fashion is aligned with the debate around meaninglessness-versus-meaningfulness in fashion, the two were merged into a single theme.

## 2.2 Fashion as Technology/Media

Fashion and media have long been symbiotically bound. The first fashion magazine was published in 1672 (Miller, 2013), and the fashion periodical lives on. Even in digital times, printed, glossy fashion magazines persist: their adverts and editorials showcase and seed trend; their voices and aesthetics remain relevant (Belch, 2015). In the 20<sup>th</sup> century, “media” and their nature, possibly as a result of their expanding electric and then electronic/digital forms, became the subject of considerable academic scrutiny.

### 2.2.1 McLuhan’s Laws of Media: Fashion is a Medium

Indirectly predicting posthumanism, McLuhan (1964) conceptualized media as “extensions of man”, and thereby concretized the enduring human-technology partnership. “Media” logically invokes “technology”, and in McLuhan’s view, *all* technologies are media and vice versa. The term “extensions” suggests McLuhan saw tool usage as definitively humanistic. Tools are elemental to human nature, to the extent that tool and user are a “body-medium”. Media, therefore, cannot be reduced to binary transmission/reception processes or, for that matter, to an encoder/decoder dichotomy in the Shannon and Weaver (1949) sense. McLuhan’s body-medium is a *technology-using entity*: only through technology (media), can the body-medium exert agency. McLuhan’s “Laws of Media” describe every technology in media-theoretical terms, and, as the following table shows, comfortably accommodate the technology/medium that is universal fashion.<sup>7</sup>

Table 2 McLuhan's Laws of Media Applied to Universal Fashion

| Law of Media               | Application to Universal Fashion  | Comparison Example: Car   |
|----------------------------|---|---|
| 1. Extends/<br>Enhances    | Skin, hair, nerves  | Legs and posterior  |
| 2. Reverses                | Weather dependence, body-protective skills and senses   | Inertia, isolation, dependency  |
| 3. Retrieves/<br>Amplifies | Attraction and status display, shelter creation, bodily capabilities, mobility  | Motor skills, outdoor recreation, migration/hunting                   |
| 4. Obsolesces              | Function-only dress, traditional textiles, animal skins, dress construction and maintenance skills, environmental constraints | Horse and cart, some forms of public transport, long travelling times |

<sup>7</sup> Many popular texts on McLuhan’s Laws of Media (e.g. Sobelman & McMahon, 2007) cite the example of the car. This table presents the car as a comparative example, to facilitate comprehension of the Laws by illustrating how they can be applied to a specific technology.

Among others, Barnard (2002), Lee-Evenson (2010), and Thurgood-Haynes (2010) maintained that fashion is *communication*. Logically, not all *clothing* can be communicative, but *fashion* may define clothing that communicates. Although the *how* and *why* of fashion communication remain unresolvable, long-lasting, ideologically-laden debates among social-cultural theorists and fashionologists (see 2.1), the consensus accepts that fashion *does* communicate (social semioticians such as Hebdige could make no associations between cultures and fashion otherwise). Since “media” denotes channels through which messages travel, then fashion is a medium in this basic sense, and according to the deeper, wider, media=technology definition by McLuhan.

### 2.2.2 Summary

Fashion is a medium of human expression. Many theorisations of fashion acknowledge the media nature of fashion, the centrality of interactive, ubiquitous media in fashion’s promotion and consumption, and the borderless markets and sources of diversifying/homogenizing fashion product.

Table 3 Themes in Theorisations of New Fashion Media and Modes, and Their Representation/Sources in Literature

| Themes                                    | Representation/Source                               |
|---|---|
| Fashion as media/technology/communication | McLuhan (1964; Foucault (1985/1988); Barnard (2002) |

In the preceding discussion, several concepts with posthuman overtones were revealed (all are covered in detail in 2.3):

- McLuhan’s “body-medium” and Laws of Media;
- “convergence”;
- barrier erosion; and
- homogenisation versus heterogenization.

## 2.3. Posthumanism: Origins to Critique

### 2.3.1 Posthumanism Foreshadowed

Although not focal in his work, McLuhan's media-as-prosthetic concept challenges simpler, earlier theories of embodiment. Through this concept, McLuhan anticipated the work of the posthumanist Hayles (1999), who argued that embodiment enables information flow irrespective of cultural or material conditions. In Hayles' view, information always requires the cooperation of bodies, as processors or phenomena. For McLuhan, the human body is neither a first nor primary medium, as posthumanists often argue; instead, the body is actually a body-medium, so can only be realistically considered a *dualistic* entity.

McLuhan's body-medium appears to have influenced Stiegler (1998), who proposed an elaborate case for the "co-originary" of technology ("technics" is his term) and human bodies. Stiegler argued that humans have always used prosthetics and transmitted prosthetic practices through their cultures. Technics are, therefore, intrinsic to humanity. Whereas according to McLuhan (1964), media are humans' *exteriorisations* or *extensions*, to Stiegler, humans and technics are *co-evolved partners*.

Echoing McLuhan more closely, Kittler's "media science" (1997) is a theoretical focus not on the content of messages or how media are used, but on the *materiality* of media and the social changes that media effect.

To McLuhan, the technology-human pairing (not merging) is foremost, because no matter how humans and technology coevolve and converge, they remain logically, informatically, and materially distinct – technology is the product of humans, not vice versa. By influencing the media and culture theorist Kittler (1997) and the posthumanist Hayles (1996), McLuhan shaped the formative discourse on both posthumanism and cyborgs.

McLuhan and "media science" appear particularly resonant with this research, since fashion is a material medium/technology that communicates (see 2.1.2 and 2.2.1) and, according to its traditional theorists, reflects social values (see 2.1.1 and 2.1.4).

### 2.3.2 Proto-Posthumanism: *A Cyborg Manifesto* (1985)

Although the term “posthuman/ism” is absent from its text, Haraway’s manifesto is the cornerstone of the posthumanist movement.

Haraway’s central argument is that the cyborg is more than a science fiction character (Pohl, 2018). Intelligent machines, even anthropomorphic robots, are in most fiction a powerful, mysterious “other” (which by its inscrutable otherness invokes Said’s 1978 notion of the Westerner’s often oppositional, dependably contrastive “oriental”). Haraway argues that the binary of human-machine dualism is false: machine and human have converged, gradually but definitely.

In the late 20<sup>th</sup> century, humans became biotechnological. Humans have worked technology into so many aspects of their physiological and functional selves that distinguishing technology from self is a redundant exercise. So widespread is this hybridisation that the non-technologically augmented or influenced human is vanishingly rare.

Cyborgs, according to Haraway’s *Manifesto*, are networked elements designed for and intrinsically suited to control-and-command protocols, strongly echoing Cold War nuclear weapons systems. Haraway’s cyborgs possess a rebellious tendency that is, presumably, the contribution of their less teleological organic components. Cyborgs have rarely received critical discussion in the arena of academic feminism, cultural studies, or academia generally. However, technological changes and their resultant cultural developments in the latter part of the 20<sup>th</sup> century were so disruptive, pervasive, and varied that the merging of the biological with the electrical has been mostly accepted, indeed embraced, with neither resistance nor commotion. Arguably, but not argued pointedly by Haraway, this is due to the benefits of communication technologies (outsourcing and mechanization – Haraway’s examples – notwithstanding), generally outweighing the social and existential penalties feared by technophobes.

Haraway cautioned that the cyborg is the offspring of militarist, patriarchal capitalism. If the biases of its genesis are not recognized and the cyborg not

swiftly decoupled from its progenitors' programming, militarist, patriarchal capitalism will continue to shape society and the individual, at cost to the Earth and its human and nonhuman inhabitants. This call-to-action constitutes justification for the use of "Manifesto" in the title.

Even in compositional style, the *Manifesto* expresses the posthuman themes of non-dualism and convergence. Its "infidel heteroglossia" (p. 101) deploys terminology from various fields, including computer science, microelectronics, philosophy, and gender studies. In this sense, it predicts a core preoccupation of posthuman thinking, which is that posthuman ontology is incorporative, agile, and uncontained.

Summarised, Haraway's cyborg is characterised by human-machine kinship and biotechnological corporeal integrity; psychosocial existence in the relevant present; irreverence of origins; simultaneous possession of partial, transient identities and contradictory perspectives; and need for interconnectedness but suspicion of holism. Significantly for fashion, Haraway's cyborg' is beyond gender, anthropocentric self, and social categorisation.

### 2.3.3 Posthuman to Posthumanism

While the exact origination of the term "posthuman" is subject to debate (Herbrechter, 2013), there is general agreement that its first mention occurred in performative work by literary theorist Ihab Hassan (1977). Hence, 1977 is commonly regarded as marking the entrance of posthumanism into humanities disciplines. Hassan proposed a concerted reassessment of human-non-human interrelatedness, focusing on the technology-environment dynamic.

Although the Latin *post* implies that the posthuman follows or replaces human, as mentioned in 1.2, "posthuman" tests rather than negates notions of humanness. This age-old question gathers urgency in the age of the "Anthropocene" (Crutzen and Stoermer 2000), a term created by Crutzen to describe the current epoch, which is acutely, arguably excessively and destructively, anthropocentric. In the current phase of the Anthropocene era, humans' superiority to non-human "others"

(particularly animals) encounters due revisionism because the environmental impact of the human is increasingly negative and far-reaching. Thus, through posthumanism, humanism is purposefully “decentred” (Vänskä, 2018, p. 17) and expanded (or diminished, depending on interpretation) to equalize human and non-human prospects vis-à-vis the environment and related matters of justice and existence. Posthumanism’s practical significance increases as it transcends theoretical discussion and acquires ethical and salvific potentials.

Although the first known use of the term in the public art sphere appears to be in a 1992 exhibition (entitled “Posthuman”) that toured several European cities (Deitch, 1992), it was through Hayles’ influential work *How We Became Posthuman* (1999) that posthumanist concepts reached wider audiences. In the book, Hayles critiqued the aggressive social transformation accelerated by (forced, is the implication) technological progress, in an analysis that is familiarly postmodern – and in 1999 fairly unoriginal – in its challenging of strident modernist optimisms.

The posthuman, non-anthropocentric perspective allows the researcher to move focus from the human to enable comprehension of fashion as a product of human and non-human factors working in complex entanglements. In resonance with McLuhan’s Laws of Media, the term “posthuman” conveys the possibility that the human is intrinsically part of and operating within a technologically mediated world of matter (Braidotti & Hlavajova, 2018).

Posthumanism proposes “nature-culture” (Haraway’s term, 1985), a continuum that replaces dichotomising conceptualizations, as typified by the human-animal polarity, which Haraway deconstructs in various ways (given Haraway’s zoological background, this is unsurprising).

#### **2.3.4 Posthuman Philosophy**

In pure philosophical terms, posthumanism challenges the intrinsically anthropophilic premises of humanism, which place humans at the pinnacle and centre of existence, as unique and agentic entities. Posthumanists dismantle humanist assumptions in the way that postmodernists dismantled the tenets of

modernism (but rather unlike the poststructuralists' more intelligent take on structuralism, which combines refutation *and* extension).

Posthumanism appears to be the primary arena for debates around definitions of "human". Haraway (1985) proposed that not only body-assistive innovations (from crutches to genetic editing) erode the human-machine boundary, but also that the nature-culture boundary is misleading and non-dichotomous – her term "natureculture" conveys the degree of this alleged mutualism. For Haraway, any divisions between human and nonhuman are political imaginaries. Aaltola (2005) claimed that ethicists effectively support Haraway's view, by arguing that animals possess consciousness so must also possess personhood and, by dint of this key similarity, deserve the same ethical protections as humans. In her 2016 book, Haraway argues that surviving the "Chthulucene" (the successor to Crutzen's "Anthropocene") will necessitate a culture premised on "sym-poiesis"/co-making in place of "auto-poiesis"/self-making. Humans and non-humans will thrive by adapting to each other and abolishing, in posthuman manner, unproductive and damaging preconceptions of speciesism and difference. Through these, species will together fix a spoilt planet. Such symbiotic cooperative living and thinking will create better futures for all who share this world.

Braidotti & Hlavajova (2018, p. 40) calls for the abolition of the "binaries" that define humanity (particularly human-versus-nonhuman), positing a worldview of "panhumanity" that incorporates humans, nonhumans, and the environment. Gane (2006a, p. 432) described posthumanism as a new culture of "transhumanism", in which traditional notions of organic humanity clash with newer, more evolved forms that problematize the taxonomizing of species, including humans and machines. In the allegedly imminent posthuman age, Gaines argued (2014), definitions of "human" will grow vague: reliance on the recognisability of body parts will no longer suffice because the human "body" will be the sum of its inclusions, inherited and chosen.

Smith & Morra (2006, p. 7) proposed the term "prosthetic impulse" to denote more than simple technological enhancements i.e. to spotlight a "dialectic of the edges". This dialectic navigates the limits of psyche and body, deepens the meaning of



humanness, and examines how soon-to-be-revised definitions of “human” might be informed by the ubiquity and affordances of technologies.

For cultural theorists, posthuman territory is familiar: concepts present in structuralism, poststructuralism, and psychoanalysis correspond tidily with many posthumanist notions (Barker & Jane, 2016). Concepts that test current or traditional interpretations of self or identity are often labelled “posthuman”, as are philosophical treatises on the nature of personhood, genetics, society and technology, and ethics-as-applied-to-nonhumans. Despite divergence in emphases, posthuman philosophies converge on one theme: the diminishing validity of the hitherto referential anthropocentric omphalos.

Pham (2014) claimed that humanity will survive posthuman existential subsumption by clinging to Cartesian subjectivism, i.e. the human certainty in self-existence. The ability to think enables existence. This defies the predictions of Deleuze (1967/2002) and many other posthuman pontificators, who argue that in the posthuman era, all selves will dissolve in an oceanic, homogenizing melting pot, effectively forming a collective nonself. In this posthuman state, the need to creatively fashion a self evaporates, making the body as a mode of aesthetic, sensory, or communicative function passé. The posthuman self possesses neither the will nor the emotions to motivate appearance authoring. This gloomy prospect implies that of fashion’s two classical functions (protection and expression), only protection survives posthumanism.

### **2.3.5 Posthuman Bodies**

According to Lewis (2008), Haraway and other cultural theorists present cyborgs as figures into which humans are evolving, and cyborg utopias as more egalitarian and inclusive than current or previous human social models. The cyborg body, and therefore, the cyborg society, lacks (or refuses) parameters of race, age, gender, or sexuality. More modest, heterogenous posthuman possibilities are proposed by conservative, less ideological theorists who merely observe the increasingly fused nature of technology and human physiology and the revised understandings of the human condition that this elicits. Existing low-tech examples of such fusion include

spectacles, hearing aids, prosthetic limbs, and – importantly for fashion – medically unnecessary, i.e. cosmetic, body modifications.

On sexuality, Foucault (1984/1985) envisioned a future in which sex and reproduction would be entirely distinct, surrogate motherhood available, and male pregnancy possible. Radical posthumanists make similar assertions but go further, presenting human bodies as emancipation machines and destroyers of categories. On gender, typical posthumanist writing predicts the total merging of male and female, and the optionality of endless combinatory gender variants to achieve creative heterology, novel sexualities and interactions, and/or previously unexplorable physical pleasures.

According to Žižek (2000), posthumanism obsolesces sexuality. Sexuality anchors consciousness in the physical. The abandonment of sexuality by self-replicating posthuman clones *could* make lofty spiritual states accessible, but will *definitely* destroy prospects of spiritual transcendence, a uniquely humanistic existential mission. When cloning eradicates sexual distinction, humanity ceases. The sexual options offered by virtual reality or other posthuman modes of interaction are inferior substitutes.

Somewhat contradictorily, extreme posthumanism has alarming, misanthropic predictions concerning the destiny of the body. Cognitivists like Kurzweil (1999) and Moravec (1988) speculated that the human body is losing necessity; it is mere “wetware” requiring technological support through cryonics, computation devices, or preservation/relocation (*re-embodiment*) of its memories and personality inside digital housings.

Among several new media pessimists of the 1980s-90s, the non-posthumanist Baudrillard (1983) prophesied that digital technologies would create cultural schizophrenia and eventual abandonment of the body. Leaver (2012, p. 3) argued that “embodiment”, although used heavily in cultural theory and even more heavily in posthumanist writings, remains definitionally vague. “Embodiment” might refer to the human and nonhuman instantiation of a self through a biologically inherited form. But in social-cultural theorising, “embodiment” typically relates to

immaterial subjectivities concerning humans' interaction with technology and the psychosocial changes brought about by the adoption of the artificial.

According to McGowan (2007, p. 144), *alterity* (otherness) “emphasizes a sense of difference as separation”. Although increasingly refined as it ascends the ladder of theoretical maturity, *alterity* still proposes the persistence of fetish of the *other* (cf. Said's *orientalism*), while presenting the other-self dichotomy as a relationship demonstrating difference and deferral. Alterity is human; non-alterity is posthuman.

### 2.3.6 Posthuman Utopias

Halberstam & Livingston (1995, p. 4) argued that humanism, with its ideology of inclusiveness, hinders meaning formation since humanism requires “bordered culture”, i.e. humanism is premised on a clear, conceptual separation between human and nonhuman. In *posthumanism*, culture constitutes homogenisation via dominant ideologies or control narratives that constrain diversity and variety. Houellebecq's fiction (e.g. 2001) depicts a posthuman society of clones, “genetically modified asexual humanoids” (Žižek, 2000). Thus, we uncover a paradox within the posthuman paradigm: the posthuman can be anything, but not singular and nonfluid in identity, consciousness, or form. The consistent, independent, and stable entity will likely be non-incorporable in this version of the posthuman future.

Braidotti & Hlavajova (2018) and other radical posthumanists predict a heterogenising liberation. In their posthuman vision, plurality and fluidity in identity, consciousness, and form are available and positive. The posthuman body cannot return to singular selfhood, since its heterological nature nullifies that possibility.

### 2.3.7 Posthumanism and the Non-human

By traditional reasoning, “non-human” most commonly denotes living non-human matter, i.e. plant and animal life. Posthumanists such argue (e.g. Smelik, 2018) that in the technoscientific age, notions of non-human must be expanded to encompass living and non-living non-human matter, such as artificial intelligence, synthetic materials, and robotic devices. Fashion's non-human elements include

natural fibres, artificial materials, technical textiles, sensors, circuitry, among much more, making fashion a prime candidate for posthuman interpretation/appropriation and theorisation.

The posthuman is a hybrid entity. The posthuman figure represents a placeholder or certainty vacuum in which the nature of the human that will be “before, beyond, or after the human” can be contemplated (Clarke & Rossini 2017, p. 14). Unlike Hassan, whose emphasis was on techno-environmental coexistence, Wolfe (2010, p. 8) stressed that posthuman (somewhat ironically) describes the human being in a biotechnological world; and posthumanism denotes the chronological context in which technology decentres humans/equalizes humans and non-humans.

According to Smelik (2020), denial of stasis and finality, what she calls constant “becoming”, is elemental to posthumanist theorisation. Braidotti (2019, p. 2) supports this: “The posthuman is a work in progress. It is a working hypothesis about the kind of subjects we are becoming”. Ergo, posthuman hypothesising is necessary and inevitable because the present is characterised by incomparably dramatic technological advances, pervasive capitalism, and climate change (Smelik, 2020), all of which are rapidly reshaping definitions of the human.

### 2.3.8 New Materialism

In the last decade, fashion scholars have made various arguments for a reappraisal of material and sensory physicality. This “new materialism” (Rocomora and Smelik, 2016) signifies new theoretical interest in the evaluation of designs (Smelik, 2018). Theorisations positing that fashion is the product of complex interconnections of human and non-human actors, as Smelik (2018) claims to be the case, are, knowingly or otherwise, linking fashion to posthumanist notions such as Barad’s quantum entanglements (2003; 2007).

For the new materialist, matter is more than static, lifeless material or mere substance; material is, or can be, agentic and meaningful. New materialists widen the definition of “material” and “matter”. They assert that humans, objects, art, and fashion are *matter*, since all comprise organic and inorganic elements (Smelik, 2018).

Underlying Smelik's new materialism is the concept of *material agency*, which signifies a gravity transfer away from human agency and toward non-human materialities (textiles, garments, technologies, etc.) and the human body as intelligent, sensory substance. The contributions of material agency facilitate understanding of the role played by technologies in present-day fashion. The insights of new materialism permit keener focus on the material factors of technology-incorporating designs and the incorporation and affordances of advanced fabrics and fibres. In the new-materialist view, designs that unite complex materials and technologies with living skin reflect posthumanist meanings by bridging the body-non-body conceptual space and creating novel, engaging, meaningful new forms, experiences, and perceptions.

New materialism and posthumanism are united by their shared assertion that dualisms must be reconsidered and neutralised. This is possibly posthumanism's most idiosyncratic and philosophically novel contribution to social and ontological theorisation: binary reasoning is a mode of addressing difference generates oppositions or dualisms that are rarely effective in solving complex issues and often deepens rather than decreases differences between, for example, humans and animals, material and non-material. environments and societies.

Through new materialism, binary oppositions are subjected to intensive deconstructions. Posthuman goes further, by arguing that apparently oppositional terms (e.g. "nature" and "culture") are inextricably entangled, so better thought of as "nature-culture" (Haraway, 1985; Ferrando, 2019). Through entanglement, human and non-human exist not in a state of polarity but on a continuum of relatedness.

Smelik places posthumanism *in parallel* with new materialism, a process that necessitates a philosophical and practical "turn to matter". In an age of de-materialization through technology, re-materializing is a bold ambition. The addressing of materiality is long established, but the linguistic turn in structuralism and poststructuralism has delayed the application of critical theory (Barad, 2003).

### 2.3.9 Critique

Although her *Manifesto* is a “big bang” in the discourse on posthumanism, Haraway voiced skepticism about the term “posthuman” (Gane, 2006b, p. 140), claiming in 2006 that it was already overused and too widely appropriated to theorise technology’s role in human evolution.

It is worth considering that the *Cyborg Manifesto* was published in 1985, during the slow thaw of a still icy Cold War. The 80s was an era of lingering geopolitical and ideological polarities: East-West, capitalism-socialism, first- versus second-world countries, etc. Haraway might have been arguing through such reductionist, adversarial, block categorisations. In the opening sentence, she states that we are already cyborgs; but the “we” is undefined – is it all people everywhere, women, feminists, academics, Americans? Haraway claimed that according to the Women’s Movement, the world’s women share common experiences. Pohl (2018) cited Reagon (1981) who argued that universalising gender generalizations are always untrue and impossible.

Also in the 1980s, the appearance of computers in ordinary homes, offices, and schools was generating techno-anxiety. In popular culture, computers were recurrent narrative tokens, typically providing menace via misanthropic shenanigans.

Haraway’s philosophical arguments are underpinned by academically unoriginal and, by 1985, fairly staid postmodern and poststructuralist tropes. Central to poststructuralist theory, especially, is the argument that dualism and boundaries are or will be dissolving. In this sense, the *Cyborg Manifesto* echoes much earlier work by Lévi-Strauss (1963), who challenged dualism in Western philosophy earlier (Pohl, 2018).

Fukuyama (2003) asserted that biotechnologies directly impact politics and culture. Left unchecked, the biotechnology revolution of the late 20<sup>th</sup> and early 21<sup>st</sup> centuries will threaten human existence. Fukuyama argued that biotechnologies could fatally undermine the category of human, so will jeopardize rights, freedom, choice, and democracy, which are the essential, enduring, and unique triumphs of human civilisation.

Several radical feminist and gender-specialising posthuman theorists have adopted militant anti-humanistic stances on the body and the ideological humanism that supports it (Lewis, 2008).

According to Fukuyama (2003), posthumanist revisionism could trivialise or debase human achievement if nonhumans become equal or preferred recipients of hard-won human privileges and freedoms. Dilution would occur if attempts to equalise humans with other species succeeded. Such prospects are anti-humanist and would foment social reversals. For Fukuyama, alterability cannot be permitted to influence human nature, lest human supremacy be surrendered. Human nature in conjunction with religion (a uniquely human invention) equips humanity with its most fundamental values. Technologies powerful enough to remould humans to a degree that forces revision of those values must be treated with extreme caution.

The posthumanist centralisation of the body as the source of existential, social, and ideological dissatisfaction seems overstated, inadequately evidenced, precariously reliant on an implied but seldom transparently argued other/non-other dialectic, and, for these reasons, simplistic. Physicality is undeniably part of human nature, and a source of both pain and pleasure. Posthuman fantasies present few resolutions for the contradictions and conflicts that constitute the human condition (Lewis, 2008). The possibility of human obsolescence – as a result of technologies that outperform people and the ongoing ambiguation of the term “human” – is sparsely addressed in academic posthumanism.

Also worryingly, posthumanist theorisation comprehensively rejects masculinity as being in any way positive. Instead, the literature on posthuman bodies overwhelmingly regards masculinity as negative and as the de facto *other* (this is ironic considering posthumanist predictions regarding the desirable and imminent redundancy of alterity). Maleness features in posthumanist writing as footnotes, or when it can be classified as non-white and non-straight. Logically however, masculinities must vary as much as femininities. Although outmoded and, by posthuman reasoning, artificial, gender typologies are stubbornly indelible in posthumanism.

Most importantly perhaps, the complex heterological vision of radical posthumanists clashes with the homological vision of moderate posthumanists.

### 2.3.10 Summary

Posthumanist narratives are commonplace in popular culture, particularly in science fiction. Analogous concepts (e.g. human-machine hybrids) considerably predate 1977, when the term “posthuman” first appeared. Posthumanist ideas were foreshadowed in the 1960s by the work of McLuhan and others on human-technology integration but entered multiple academic spheres with force via Haraway’s *A Cyborg Manifesto* (1985). Due to its pop culture presence, the figurative/theoretical cyborg is a mainstay of posthuman debate and the default symbol and subject of posthumanist philosophy. Posthumanist thought focusses intensely on body/gender and utopias. In the literature on these topics, themes are apparent: species equivalence, biotechnological hybridity, embodiment, non-alterity, and subjectivity. All five, to varying degrees, have relevance for fashion, whose theories centralise “self” and whose materiality/consumption is technologically facilitated.



## 3. Methodology

### 3.1 Posthumanist Methodologies

Feyerabend's *Against Method* (2010) proposed anti-methods that are facsimiles of posthumanist methodologies, if such can be said to exist. Anti- and posthuman methods both reflect transitoriness and conditionality; posthumanism resists notions of "method" (Ferrando, 2012). Nothing posthuman is definitive; all is dynamic, mutation-prone, shifting, and, possibly, subjective. Thus, posthumanist anti-methodologies must be adaptive and fluid in order to discount nothing, recognise temporalities, and acknowledge possibilities.

In methodological terms, "posthumanist" refers mainly to transitions from humanistic paradigms and anthropocentric *Weltanschauung* toward non-humanistic perspectives and values. "Posthumanism" resides in many disciplines: robotics, genetics, philosophy, and bioethics. Consequently, posthuman texts result from posthumanism "and vice versa" (Ferrando, 2012, p. 11) – suggesting bidirectionality characterises the propagation of posthumanism.

Cause and effect, which is sought by this research, can be directionally ambiguous: causes have effects; effects have causes. In psychosocial studies, declaring directionality and isolating particular causes to particular effects are hazardous epistemological undertakings. Complicated milieux of factors ("rhizomes" in the argot of Deleuze) weaken linear causality hypotheses.

Ergo, by posthuman methodological reasoning, fashion may be effecting posthumanism; posthumanism may be effecting fashion.

This research seeks only to investigate the former position, i.e. fashion effects posthumanism. This supposition is based on several observations and conspicuous commonalities: fashion is both technology and technological; self, identity, and embodiment feature strongly in fashion and posthumanist discourses. For the latter supposition (posthumanism effects fashion) to be true, fashion

creators must be posthumanists and consciously expressing posthumanism through any and all fashion. That is a possibility to be examined elsewhere.

Significantly for posthumanist ontological research, Deleuze (2002) used the term “milieu” to describe the origins and context of phenomena. The “rhizome” gestates inside milieux “from which it grows and overflows” (p. 23). In the rhizome concept, cause and effect are multiplicitous. Any posthumanist “methodology” has rhizomatic correspondences in postmodern revaluations of objective knowledge and fact-skepticism (Ferrando, 2012). This research seeks objective evidence through fact (hence the case study-like findings), rendering posthumanist methodologies suboptimal.

Rhizomes are “biunivocal relationships” (Deleuze & Guattari, 2004, p. 6) that ontologically obviate dichotomy. Rhizomes – or, more precisely, phenomena describable as such – comprise multiple, adventitious roots. Linear cause-effect relationships are absent. In their place are multiplicities of causal roots and effects. The system is fascicular; ambivalence and overdetermination displace dichotomization. The rhizome is an “absolutely subterranean stem very different from roots and radicles” (p. 7). Its form is connections; its whole is heterogeneity. Any point in the rhizome connects to any other. Lacking culminations or terminations, the rhizome is a constant middle, a boundless interior. It “opens up by variation, expansion, conquest, capture, offshoots”. It is an “acentred, non-hierarchical, non-signifying system without a General and without an organizing memory” (p. 23). Whether posthumanism is rhizomatic and whether posthumanist topics can be meaningfully analysed without mention of cause and effect are questions to be addressed in a pointedly philosophical treatise, not here.

Humanism is based on logical and epistemological premises that are disrupted by quantum theory (Barad, 2007). According to Barad and other quantum ontologists, active measurement influences outcomes. Examples include the famed double slit experiment and the Schrödinger’s Cat thought experiment, which aims to show how the fate of a hapless feline is entangled with the lifespan of a decaying atom and the act of observation.

Pedagogic “posthuman assemblages” offer means for exploring entanglements of affect that surround humans and non-humans (Charteris & Nye, 2019, p. 329). The “uneasy assemblage” (p. 329) “deterritorialises” qualitative research practice and facilitates examination of varied media and perspectives.

Similarly, via “agential realism” (2007, p. 44), Barad rejects correlation in favour of causality being an “entangled affair”. Core to both entanglement and posthuman assemblages is that *what* is researched is influenced by *how* it is researched. This is Barad’s “onto-epistemological” offset. Quantum entanglement’s superpositions represent “ontologically indeterminate states” (p. 265): observations effect and affect outcomes. This researcher believes that posthuman manifestations are *not* contingent on his perceiving such. His retrospective observation and analysis of posthumanesque patterns in fashion – *during* the research at least – can only influence manifestations if the finalized research is read and acted upon by fashion shapers.

### 3.2 Humanist Methodologies Applied to Posthuman Research

Through soil analyses and laboratory studies of lactic acid fermentation, Latour (1999) demonstrated how material phenomena translate into scientific knowledge. Using technological examples, he showed that material and researcher converge and mutual transformations result. On the one hand, Latour argued for the value of positivist, materialist ontological (humanist) approaches; on the other, he advocated entanglement, a quantum/posthumanist notion. For this, he might be regarded as a posthuman positivist, but he reasserts – rather than undermines – positivist, humanist models. His ontology pushes back against relativist, postmodern revisionism. His propositions are confidently positivistic: reality *can* be understood, *some* aspects of it *can* be measured, scientific methods applied in the field *do* yield insights and allow hypothesis testing, *some* effects *do* have identifiable causes – natural sciences could achieve nothing otherwise. But entanglements can also describe some phenomena.

This positivist-majority/posthuman-concessionary approach is arguably present in the methodology applied here – *if* the term “posthumanism” can describe the qualitative dimension of the methodology and such taxonomizing is necessary.

This research is not attempting to measure, nor is it aiming to isolate definitive cause-effect relationships in any Newtonian sense. Instead, it aims to show how fashion could be effecting posthuman realities. To do this, its data collection protocols are humanist/positivist. Its qualitative/interpretivist dimension, however, resonates with aspects of posthumanist ontology: this research argues through analysis of recent developments in fashion that fashion is effecting posthumanism (a nebulous, dynamic phenomena whose identification requires qualitative, discursive liberties). In quantum analogical terms, fashion and posthumanism may be “entangled”, but their relatedness is unlikely to be bidirectional: evidence is not sought here for posthumanism’s effecting all fashion – fashion is effected by countless sociotechnical forces that predate posthumanism by centuries. Unidirectionality implies a cause-effect chain. Exploration of the possibility that fashion is linkable to posthumanism is the *raison d’être* of this research.

### 3.3 Derivation of the Five Themes of Posthumanism

The first objective of this research (RO1) is *To identify and elucidate specific areas of fashion that are facilitating the emergence of the posthuman*. To achieve this, it was first necessary to explicate “the posthuman”. This was accomplished in the *Literature Review*, through which five themes were identified. The following table presents the specific derivation of the five themes of posthumanism that emerged from the review. The five represent dominant, recurrent themes in posthumanist writing.

Table 1 Posthumanism's Five Main Themes and Their Derivation

| Five Main Themes                  | Representation/Source   |
|-----------------------------------|---|
| 1. Species equivalence            | Haraway (1985); Aaltola (2005)                                |
| 2. Biotechnological hybridity     | McLuhan (1964) Haraway (1985); Gane (2006a); Gaines (2014)    |
| 3. Embodiment                     | Moravec (1988); Kurzweil (1999); Leaver (2012); Hayles (1999) |
| 4. Non-alterity (versus alterity) | McGowan (2007); Braidotti & Hlavajova (2018)                  |
| 5. Subjectivism                   | Pham (2014)   |

### 3.4 Derivation of the Two Areas of Newness

Preliminary reading into fashion theory and digital era fashion innovations triangulated with the *Literature Review* to present two main areas of relevant, relative newness:

1. Wearable Computing (worn technology) and
2. Smart Textiles (high tech construction/design).

Following reflection, the researcher realised that these areas might be better described as “categories of advanced innovation”. Whichever the term (they are sufficiently similar), both have implications for or direct relatedness to the five main themes of posthumanism.

The following table shows where in the *Literature Review* the areas of newness are most strongly suggested.

Table 2 Two Areas of Newness and Their Derivation

| Source  | The Two Areas of Newness/Categories of Advanced Fashion Innovation |                                  |
|---|--|----------------------------------|
| Literature Review Section                     | 1. Wearable Computing  | 2. Smart Textiles                |
| 2.1 Pre-Digital Theorizations of Fashion      |  |                                  |
|   | 2.1.3 (newness, novelty)   |                                  |
|   | 2.1.4 (novelty)  | 2.1.4 (aesthetics)               |
| 2.2 New Media, Modes, and Markets for Fashion | 2.2.2 (tech=media)   |                                  |
|   | 2.2.3 (digital functionalities)                                    | 2.2.3 (novelty, production tech) |
|   | 2.3.4 (hybridity)  | 2.3.4 (transhumanism)            |
| 2.3 Posthumanism: Origins to Critique         | 2.3.5 (body-self)  |                                  |
|   | 2.3.6 (transhumanism)  |                                  |
|   | 2.3.7 (denaturalisation)   |                                  |
| Correspondent Posthuman Themes                | See <i>Analysis</i> chapter  |                                  |

In the *Findings* chapter, selected instances representative of each of the two areas are explained in detail. Their associability with the posthumanist themes revealed in 2.3 is elucidated in the *Analysis* chapter.

### 3.5 Initial Research

August 2019 pilot searches of the Internet revealed that although the writing on posthumanism is substantial, scarcity characterizes the literature on posthumanism in relation to fashion specifically.

Abstract, philosophical posthumanism is heavily discussed in academic books and journals; innovation in fashion has presence in the same. Creative, technological fashion is also discussed in books and journals, but communicated most through new media, particularly online video and Web writing. Only in book chapters and online reviews of a small number of artists' work (covered in the *Findings* chapter) did the terms "posthumanism" and "fashion" occur *together*.

Pilot searches revealed the media in which relevant concepts and fashion innovations appear, literarily or visually: journal articles and books in the disciplines of philosophy, textiles, business, literature, arts, and sociology; technical and industrial literature; academic textbooks; media articles; and images.

### 3.6 An Inductive Approach

For compliance with its ontological, non-positivist framing and the achievement of its objectives, this research precludes the generalizability affordances of any quantitative methodology. To harness the theory-generative affordances, it utilizes an inductive, qualitative methodology instead.

In the ideal inductive analysis, categories, themes, and patterns arise directly from data, with no prior influences imposed upon or colouring collection or interpretation (Janesick, 1994). In the case of *this* research, background reading and a formal literature review preceded the design and informed the genesis of the aim and objectives – a sequence that is typical in deductive research. Nonetheless, this is inductive research because it “involves the search for pattern from observation and the development of explanations – theories – for those patterns” (Bernard, 2011, p. 7).

This research aimed to acquire ideographic knowledge, because its case studies are few in number but potentially represent complex, techno-social, technical-creative, human-non-human, theory-practice interactions/entanglements.

### 3.7 Case Study Rationale

Case studies support this research because they offer an intensive approach that allowed the researcher to (as per Swanborn, 2010) examine apparent cause-effect possibilities, create rich (“thick”) description, and, if necessary, discuss phenomena as unique but nevertheless valid instances. In posthuman terms, the qualitative case study permitted informed speculation about entanglements.

Mintzberg (1979) stated that researchers discover interactions between phenomena/actors through *hard* (quantitative) data, but only *soft* (qualitative) data enables exploration of what is discovered. Because this research aims (see RO2) to illuminate the fashion-posthumanism entanglement, whose existence is suggested by the researcher’s review of the literature, a soft/qualitative data approach was adopted.

The case study method is ontologically aligned with qualitative methods and therefore suited to objectives that are answerable through a qualitative approach (such as those that guide this research).

The case study method is a rational and practically intuitive tool of heuristic analysis (Merriam, 1998). It helps researchers explain context, influences, and identify other theory-generative forces, including those absent from or underreported in the literature, or unforeseen by the researcher. According to Merriam (1998), case studies are ideal for addressing exploratory – “how?” and “why?” – questions. Since this research seeks to evidence posthumanism in fashion (see RO1 and RO2), the case study method is optimal: it can illuminate the how and why of fashion’s posthuman dimensions (re. RO1 and RO2).

Importantly for this research, case studies enable and facilitate “thick description” of phenomena (Geertz, 1973). Geertz’s titular term stems from this premise: social phenomena are multi-layered, intertwined, dynamic, and network-influenced so require a reporting methodology that is sufficiently flexible, deep, and encompassing to accommodate such complexity. Geertz’s term hails from a strongly humanist context (ethnographic applications of the case study method), but posthumanists, most famously Barad (2003), make a comparable claim: elaborate complexity characterises most, possibly all, forms of interaction, including human and non-human relationships. Posthumanists use the term “entanglement” to describe this interactivity. For depicting such entanglements (which is a meta-aim of this research – re. Research Aim and RO3), the thick descriptions afforded by case studies make the method a logical, useful choice.

Typically, case studies support *inductive* research. They assist generation rather than testing of theory (Eisenhardt, 1989). This research attempts theory evaluation (see RO3). It seeks to show (see RO1 and RO2) and thereby theorise (RO3) that posthumanism is expressed in fashion. An induction-assistive method was therefore required (see 3.6).



### 3.8 Case Study Protocol

This research presents five case studies, with deep description and analysis accompanying each. Multiple case studies generate stronger material for the development of theory: a single case study cannot offer the representativeness and, thus, theoretical substance of multiple case studies (Yin, 2009). This is not quantitative research, but if the research aim is to be met, a very modest degree of generalizability is desirable.<sup>10</sup>

The literature unavoidably, perhaps beneficially, sensitized the researcher to the themes and concepts of posthumanism and thereby influenced the selection and likely analysis of the case studies. The researcher applied informed but independent judgment, selecting cases on the basis of relevance and other factors. Therefore, the selection was *purposive* (Cassell, 2015). The selection rationale for each case is presented in the following table.

| Case Study                                | Selection Rationale   |
|---|---|
| 1. Shannon and Weaver: The First Wearable | Are credited with the creation of the world's first wearable electronic device.   |
| 2. Steve Mann: The Father of Wearables    | The "father" of wearables, Mann produced many body worn devices with multiple conceptual and practical implications. In particular, his AR glasses and general purpose body-worn computer represent milestones in the popularization and progress of wearables. |
| 3. Tiffany Trendera: Art Wearables        | Made many art pieces that make intensive use of technology to force consideration of the human-non-human boundary and the actor-observer relationship   |
| 4. Hussein Chalayan: Sm(A)rt Wearables    | Creator of many worn pieces that incorporate interactive elements and imaginative kinetics.   |
| 5. Iris van Herpen: Sm(A)rt Textiles      | Creator of many worn pieces that are made through highly advanced processes and comprise elaborate advanced and traditional materials in combination. Also researched by Smelik.  |

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<sup>10</sup> (The Research Aim states Innovation and creativity in fashion are effecting posthumanism: the broad phenomenon that is "fashion" – not a singular or minority case – is therefore under scrutiny).

### 3.9 Presentation and Analysis of Findings

According to Janesick (1994) there exists no preferable or superior system of presenting qualitative findings/structuring qualitative narratives; “staying close to the data” (p. 215) is Janesick’s recommendation. The structure of the *Findings* chapter is generally compliant with the protocols of qualitative case study writing applied by Motwani et al. (2005) and recommended by Stake (1995) and Yin (2014). Thus, the *Findings* chapter is divided by headings that identify the topics and foci of the content returned by the searches. Hence the presentation reflects the themes of the literature (known) and discoveries in the information that further illuminate the Research Question (unknown).

According to Stake (2005), who is possibly the most influential writer on the case study method, the case study researcher’s essential tasks are description and holistic explication. Consequently, each case study presented in this research features description (in Chapter 4) and explication/textual analysis (in Chapter 4. primarily and Chapter 5. secondarily, where meta-observations are offered).

Summarizing tables feature in the *Findings* chapter (and elsewhere).

Tables/matrices are one of the two forms of information display proposed by Miles & Huberman (1994) as effective in the conveyance of complex information containing informatively contrastive details.

## 4. Findings

This chapter discusses the two categories of advanced fashion innovations identified in the *Literature Review*. Relevant historical details, definitions, concepts, and instances of innovations, products, and designs are presented herein.

### 4.1 Wearable Computing

By Steve Mann's definition (1998), a "wearable" computer is integrated inside clothing, making it part of the wearer's personal environment. A wearable computer is, of course, worn, wearer-controlled, and both operationally and interactionally *constant*. A wearable computer is body-carried, always powered, and always working or ready for work.

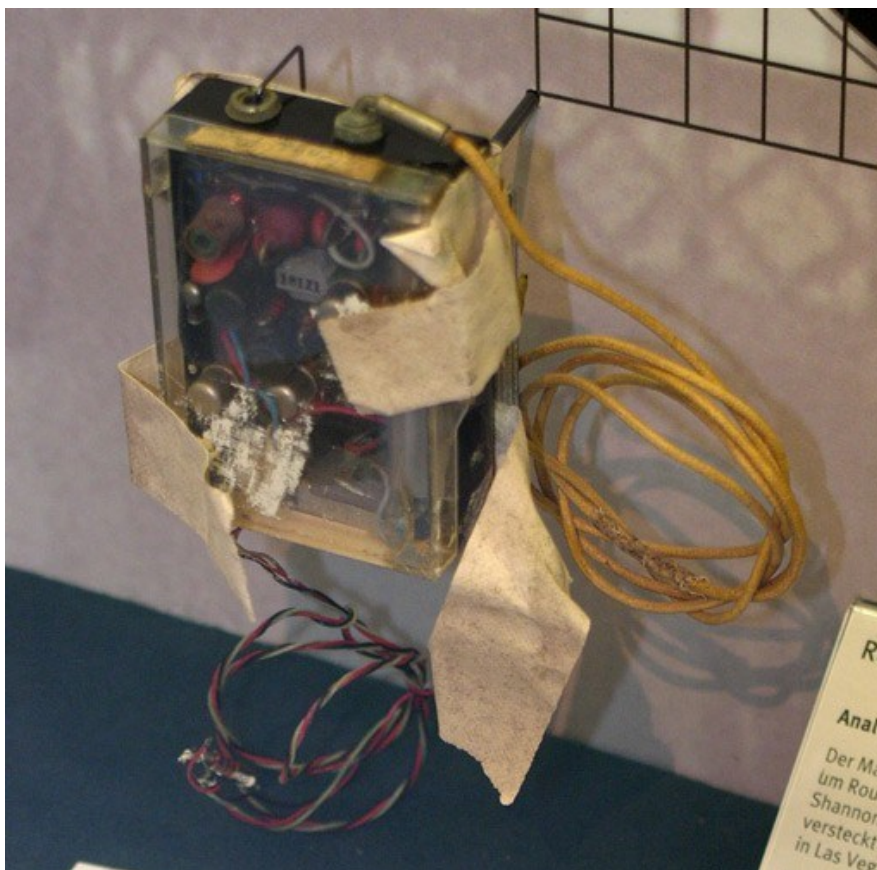
It is prudent to here clarify between technologies that are worn and technologies that are wearable. Worn technologies are both low- and high-tech. The lowest-tech examples include eyeglasses, hearing aids, watches, joint supports, and even belts. Higher-tech worn technologies were often analogue computation circuits wired into otherwise ordinary garments. Later, smaller, more sophisticated and integrated, fully digital devices appeared. These became "wearables". Examples include calorie burn counters, alarms, and pedometers.

Worn technologies of the earlier kind were devices made portable through adapted clothing and compactness (albeit only by the standards of contemporary computer hardware). Such technologies computed but were limited in both computational power and utility. Unlike their low-tech, prosthetic forebears, they seldom augmented the wearer's senses. They could monitor physiology, but not interact with remote services or external hardware. Although biotelemetric systems existed for medical, aeronautical, and astronautical applications, only the most radical of the avant-garde would regard them as commercial, fashionable, or even representative of wider technological trends. In terms of their relatedness to fashion, worn technologies vary but the typical relationship is weak – with the notable exception of eyewear.

#### 4.1.1 Case Study 1. Shannon and Weaver: The First Wearable

Possibly the world's first wearable computer (but hardly fashionable) was created by Edward Thorpe and Claude Shannon and first operated in 1961. This was a cigarette packet-sized analogue device. It featured four physical buttons that the wearer pressed to report the speed of a roulette wheel. Using this input, the computer calculated the outcome of the wheel and sent its prediction via a tone pattern carried on a radio signal received by an earpiece in the wearer's ear. Similar single function wearables designed to beat gaming odds followed, including card-counting LED glasses. In 1981, Mann created a backpack-housed multifunction computer that could operate photographic equipment (Rhodes, 1998).

Figure 2 Thorpe and Shannon's "Casino Buster" - The First Wearable?



Nothing about this device can be considered fashionable or fashion-like: a truly wearable technology is *designed to be overtly fashionable in appearance and also incorporate technologies as a key feature*. Nevertheless, it had profound implications for both fashion and posthumanism.

In fashion terms, the device represents fresh *possibility*. An electronic device portable enough to be worn could, with the necessary time and effort, be crafted for aesthetic improvement and made lighter and smaller, which generates additional possibilities, such as worn-versus-carried and displayed-versus-concealed. Also, if the benefits of such a device's usage were sufficient, the necessity for new fashion product designed to accommodate it or facilitate its usage would arise.

In posthuman terms, the device marks a sharp human-machine proximity increase and barrier lowering, both conceptually and physically. In the 1950s when the device was designed, electronic instruments were proportioned similarly to electrical devices. Their weight and bulk were such that humans typically came to the machines, and operation was a static, careful, deliberate affair. Due to factors of form and cost, the electronic device commanded authority. Conceptual and practical distance separated humans from their electronic devices. Humans were operators and functionality had primacy over usability. The prospect of carrying electronic devices for anything more than battlefield communications was unattractive and costly – the devices were too limited and specific in their functionality to offset the effort and cost of redesign for portability. The Shannon and Weaver device was monofunctional, but it was portable. Its form factor made it bearable more than wearable. Nevertheless, through this device, the notion of other, better, usable, more attractive, and life-enhancing wearable devices gained traction. Its affordances were narrow but were also, albeit in crude terms, transhuman.

In concept however, its implications were distinctly *posthuman*. It signalled a new potential, one of suddenly closer human-machine integration. Its box-like design represented conceptual space. What else might that box contain? Could it act as a station for housing and powering modular, interchangeable sub-devices offering a range of functions? Might it support a tape recorder for the preservation of thoughts or print voice transcripts? Could it provide entertainment or help people cheat at other forms of gambling? The realization of such opportunities can be read as a posthuman watershed moment: people and machines looked set to be integrated in new and powerful ways; both were reaching out to each other – the machines to be embraced and the humans to be assisted in novel and enriching ways. With this would, however, become dependence and, possibly,

new questions concerning the reality of borders of self in an age when portable devices granted new abilities and, perhaps, even granted the owner/wearer social affirmation or elevation.

In 2010, Leopoldina Fortunati claimed wearables would displace handheld mobile computation devices. In 2022, this has yet to happen, but sportswear featuring pockets and pouches designed to accommodate smartphones is commonplace. As the footprint of computing decreases to nano scale, the possibilities for their complete and as-standard integration into textiles multiply. Some effects of this process are visible today in smart watches (an innovation possibly invented by Steve Mann, who many claim to be the father of wearables) that have roughly the same functionality as larger devices but are one fifth of the size. Examples of technologies that have evolved from handheld to wearable are MP3 players and mobile phones (Fortunati, 2010). Thus, a straight lineage from Shannon and Weaver's gambling cheater to invisible wearable multifunction smart devices is perceptible, with human-machine proximity and dependency seemingly increasing with every new device.

#### **4.1.2 Case Study 2. Steve Mann: The Father of Wearables**

Mann's work on wearables commenced with projects to develop computer-mediated vision technologies. Mann designed active sensor-driven eyewear to assist the vision of people working where light levels fluctuate suddenly and extremely, that is, in HDR ("high-dynamic range") contexts. His glasses respond dynamically to achieve range management. Inside the lenses computer-created, projected overlays added or subtracted light to achieve tolerable inputs for the wearer. This achieved what today would be termed basic augmented reality (AR). The device transposes computer-generated output over the wearer's field of vision. The device combines image with actual light in response to light level fluctuation, producing for the wearer a mixture of real and synthesized visual experience. Although overtly transhuman in original purpose, Mann's wearables are rich in posthuman implication. The concept that reality is already a fusion of artificial and natural elements is core to posthumanism. Mann's concepts and patented technologies are present in aircraft head-up displays, animated entertainment, video games, and even architectural simulations. As a result of the

proliferation of its applications, the computer-generated image overlying the raw visual is a familiar presence in daily life. Three posthumanist tenets are reflected in this: the fading border between/deep interconnectedness of environment and human, the fusion of human and non-human, and the machine-mediated experience.

In the evolution of Mann's work, a trend away from the cumbersome and technical toward the ergonomic and discrete is discernible (see Figure 4.). Given the rapidly decreasing physical dimensions of computing hardware, this is an understandable pattern. However, from the posthuman perspective, increased proximity and physical seamlessness corresponds with and strengthens the interrelatedness and holism of the human-non-human hybrid entity.

In 1991, Mark Weiser coined the term "ubiquitous computing", and in the 1990s, IBM introduced the term "pervasive computing"; Hansmann (2001) claimed the two terms are interchangeable. Mann's wearables can be interpreted as progress in mobile, portable computing, which is essential to the achievement of ubiquity. In Mann's vision, wearables transport the benefits of computing wherever the wearer takes them. Thus, his innovations are interpretable as authentic moves toward accomplishing ubiquitous computing in routine life. In posthuman terms, the machine-human hybrid is inevitable and, to some degree, already extant. However, Mann's concept of a general-purpose wearable computer opens possibility vistas that far exceed prosthetics and eyeglasses in their posthuman implications.

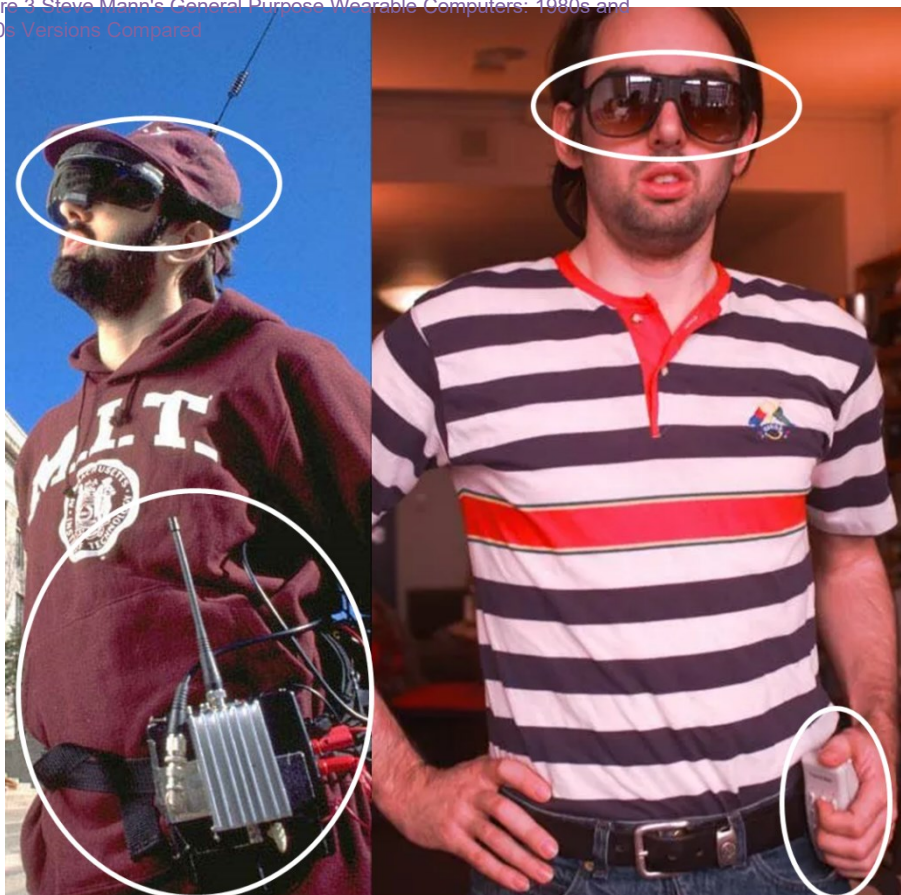
The more a computer can do. i.e. the more general it is in its functionality, the greater its utility, and therefore the more likely it is to become a necessary and permanent (although probably upgradable) component. The versatility of the machine ensures its continuity in the human-non-human hybrid. Seen this way, the presence of computing in fashion is a matter of certainty, since computing will be ubiquitous across space and platform.

Mann's innovations suggest fashion may evolve in new, non-traditional, posthuman ways. For example, through upgrades and selectively offered features, wearables could be made fashion-/time-sensitive, i.e. transient, and therefore



compatible with material fashion's conventions of rapid obsolescence and trend-setting/following. Through their ability to present media content in an instantaneous, geographically unrestricted, and highly targeted manner, wearables – particularly those that augment vision – represent a means of amplifying the reach and returns of commercial messages. Vision wearables could also allow wearers to see non-material fashion ubiquitously, that is outside the magic mirrors where it is mostly confined today. These latter affordances are, though not yet ubiquitously, offered by devices foreshadowed by Mann's inventions. Google Glass (augmented reality glasses) belong to long line of computer-integrating eyewear innovations whose common ancestry seems to be Mann's various computer-mediated/augmented reality glasses.

Figure 3 Steve Mann's General Purpose Wearable Computers: 1980s and 1990s Versions Compared



(source: <https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/wearable-computing>)



Post-2000, wearable computers became known simply as “wearables”. This deformalization in nomenclature correlates with the expansion of the applications of wearables, the falling costs of purchase/usage, and their broadening conceptual and practical acceptance by non-specialist user-wearers.

Invoking posthumanist argot, Farren & Hutchinson (2004, p. 463) describe wearable computers as “cybernetic garments”. The work of Mann and, especially, Shannon and Weaver are difficult to define as “garments” in any familiar sense of the word. They may however represent a posthuman revisionist “garment”, in that they extend embodiment to incorporate the machine, which in turns grants a transhuman functional enhancement. Seen this way, body and device are a complementary, posthuman, if temporary, whole.

Since the 1990s, the situation of technology inside fashion product has generated a dazzling array of forms. Mann’s legacy is traceable only in concept, the formal components being too small or ergonomically accommodating to be recognizable. Passive, active, and interactive sensors are still present, but they mediate predictive entertainment and networking services. Cutting-edge wearables can also incorporate “computationally controllable fabrics, including shape changing polymers, e-textiles, and nano-scale electronics” (Ryan, 2009, p. 309).<sup>14</sup> Mann’s work never entered the realm of intelligent tactility.

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<sup>14</sup> Whether or not such items can be dependably described as ever having been “fashionable” is contingent on the researcher’s definitions and measures. What can be said with more certainty, however, is that tech in products that can be fashionable (e.g. sportswear, see 4.4) exists and has popularity.

#### 4.1.3 Case Study 3. Tiffany Trenda: Art Wearables

Dominant in the oeuvre of this American artist/performer are themes of convergence, embodiment, and interactivity. In all her work, the body and the artificial merge to create a cyborgian, plastic image. The bodysuits feature various familiar technologies, such as QR codes and screens, but in unfamiliar configurations. Multiple, oversize QR codes appear on skin-canvases, screens are framed inside goggles (Figure 7), multiple screens run like sensors in tracks around the body (Figure 8), and a colourful heartbeat is displayed on a large panel fixed in one costume's chest/abdomen area (Figure 9). The artist/performer consistently crafts glossy, figure-tight suits that while accentuating her body shape, reveal no identity.

The performances are based on the technologies embedded in the suits. The play on mobile, embodied Artificial Intelligence through costume is consistent. Public participants are invited to interact with her (or *it*) through their smartphones, through hand-to-hand contact, or mere observation. Convergence is not limited to the human-technical; the sci-fi cyborg/fetish aesthetic of the outfits suggests the artist is prompting observers to reflect on concepts of gender, progress, science, and human-machine relationships. In their forms, the suits declare femininity, but the performance itself appears ungendered. Thus, themes of gender equalization/ accentuation through technology are inferable. The artist may be showing how aesthetic preferences for gender forms could be designed into new techno-humans, but the actions and usages of those techno-humans may be fluidic, anonymous, and variously utilitarian, i.e. posthuman.

Taxonomically, these examples show the utilisation of wearables in art applications. The materials of the designs do not themselves respond to in smart textile fashion (cf. with the case studies presented in the next section); the designs incorporating screens and computing components that interface with participant/observers. In this interfacing sense, a posthuman possibility is arguably attained: through technology, the artist activates performance observers, transforming them into participants that shape the performance. Thus, boundaries dissolve as art, artist, and participant entangle.

Figure 5 "Body Code" (2012)



Source: tiffanytrends.com (2019)

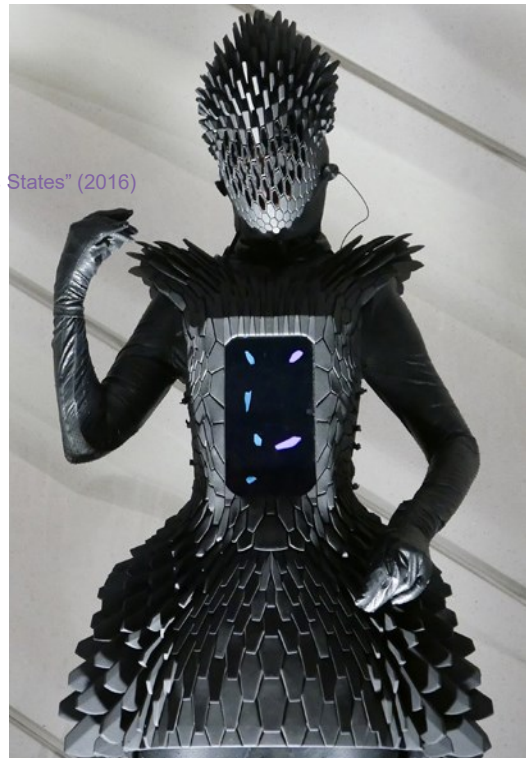
All the materials in the suits are artificial, and participant engagement is technologically mediated. In performances, movement is restricted to repeated sequences, but the suit's behaviour is not mechanical.

Perhaps significantly for this research, some of her exhibitions were described as showcasing "the primordial to the posthuman" (e.g. <http://www.associatesofbrand.org>, 2020), and the posthumanesque term "embodiment" features in many write-ups of her work.

Figure 3 "Proximity Cinema" (2014)



"Ubiquitous States" (2016)



Source: tiffanytrenda.com (2019)

Source: tiffanytrenda.com (2019)

The gestalt of Trenda's creations (Figures 7, 8, 9) elicits the uncanny/unheimlich. In all, the form is clearly that of a young human female, but her (or *its*) personality is inscrutable. Like a machine, specific interactive functionalities occur, but the designs are sufficiently unnatural, fantasy-evocative, futuristic, and mysterious as to be visually intriguing.

"My work explores the *relationship* of the female *body and technology*. I *interchange* my *identity* with screens to represent how we conceal and reveal ourselves through our *devices*. We are no longer living in the present but through the screen. Therefore, our psyche chooses between the physical sensations and the *simulation* of our bodies through *virtual realities* and *social media*. This affects how we *interact* and form memories with the outside world. *Ubiquitous States* is an *interactive* performance that combines live heartbeats into data visualisation. I created a three-dimensional printed garment with an *embedded* computer screen. During the performance, I approach a spectator and place a heart monitor on his/her wrist. Once the sensor reads their pulse,

the imagery on the screen will show both pulses simultaneously. Audiences are then invited to engage in the matching rhythms of our heartbeats.”

(Trenda, in *Future Now*, 2019, p. 202-204<sup>16</sup>)

The Trenda case shows that wearables in conjunction with aesthetics can alter foundational notions of self and appearance, while challenging notions of bordered selves and human-machine separation. Significantly for theories of self/identity and media, new possibilities in proximity and integration offer wearers and observers the opportunity to re-evaluate the meaning and role accorded the body through philosophical tradition (a prospect also discussed by Hansen, 2006).

Trenda’s work is notably more human-accommodating and aesthetically engaging than that of Mann. Wearables combined with design for appearance, as is the case in Trenda’s work, enable the individual to examine and re-project his or her relationship with his/her body. leading to a fresh and transformative understanding of potential through and in fashion i.e. a fashion that is less commercial and more posthuman. If Trenda’s work is indicative, wearable computing represents radical possibilities for identity, embodiment, expression, and individual-environment mediation. Such possibilities are likely to disrupt fashion’s traditional definitions, business models, and marketing methods.

On the role of wearables and wearer-audience, the study by Mackey et al (2017) showed that the wearing of wearable technologies is much more than a matter of material or technological innovation: wearables can provide new and novel possibilities and problems. Mixing traditional clothing with smart technologies creates a "dynamic fabric" that has social meanings and creates new perceptual and interactional experiences (fashion “ecosystems”) for the wearer and observer. Trenda’s work appears to create posthuman meanings: through the wearable-incorporating costume, novel interactions develop and audience-wearer engage to produce new experiences.

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<sup>16</sup> *Emphasis added.* In this quote, emphasis (*italics*) indicates similarity with posthuman-relevant concepts and themes. Note also that these quotes have been chosen *selectively* – for their associability with posthuman concepts and posthumanesque practices. Less posthuman-pertinent statements have not been reported, and the authors of these statements have, to the best of this researcher’s knowledge at least, not used the term “posthuman/ist/ism/esque” in reference to themselves or their work.

According to Walker (2006), through its embracing and popularizing of wearable technology, fashion is acting as a catalyst for imagination, ingenuity, and innovation, which are crucial elements of technological and social progress. Trenda's work, by incorporating technology expresses and stimulates imagination, ingenuity, and innovation, while provoking posthuman possibilities. By promoting wearables, fashion is also participating in the digitization of wider culture (Fortunati, 2010). Through the artistic use of wearable-like technologies, Trenda's creation might also be further digitizing human culture and, along the way, bringing human and non-human together in the production of new, posthuman experiences and sensations.

Theoretically, wearable computing poses conflicting potentials. Commercially, wearables seem attractive. They are another category of saleable product. Augmented reality has made dramatic progress in the last decade, and Steve Mann's wearables have likely inspired this growth, as well as pioneering another form of human-machine interdependence. Whether such devices will endure long enough to become fashion is unknowable, but their size and weight factors are steadily diminishing.

Traditionally, fashion is premised on constant change, fleeting values, and the cultivation of desire among consumers for the momentary capture of an intrinsically impermanent image. If wearable computing can be combined with smart textiles that offer programmable, changeable surface textures, forms, and images – which Ryan (2009) claims is already possible – the need for the replacement of material product may decline. Displacing garment-as-product, programmable technologies could enable users to customise a generic smart garment. By offering such, the wearable liberates the wearer from the machinations and persuasions of fashion companies. (The demolition of determinism in general is another posthuman prospect.) The wearable can also exempt the wearer from the social/identity conformity connoted by fashion following. Resonant with posthumanist theorists, Birringer and Danjoux proposed that mediating technologies, such as wearables, “have profound cultural and political stakes” (2006, p. 41).



#### 4.1.5 Summary, Points, and Posthuman Implications

The worn technology is a body-carried, functionally singular, assistive device; wearables can be multifunctional. The case studies presented in this section show that wearables can have both functional and artistic effects, and both types have extend and embody posthuman prospects and notions. The wearables described in these cases were all designed in tandem with a textile platform. All provide feedback, data collection, information, and performance improvement. The creative wearables provided style and aesthetics too, but an evolution toward this is detectable in the functional examples also.

As wearables grow in utility and fall in price, they become drivers of technology, so mesh the human with the digital. Wearables offer capabilities that exceed the traditional fashion dualism, i.e. comfort/protection and adornment. For fashion theory, wearables pose several posthuman correspondences:

1. They represent a mode of further merging the technical with the organic.
2. By their constancy and communicability, wearables provide the functions of computing while obviating the handheld medium.
3. Wearables are *intelligent* – the data they capture can be utilised for technical or artistic effect, and when coupled with form-adaptive textiles (see next section), change a garment's physical attributes.
4. Today's wearable designers work according to triple criteria: aesthetics, comfort/protection, and appropriately intelligent, garment-suitable technologies. Garments and the devices they house must be complementary. By merging the technical with the traditional, design will achieve relevance, continue to reflect and grow cultural digitalisation, diminish human-technology boundaries ,and, through the foregoing, contribute to the effecting of posthumanism.

## 4.2 Smart Textiles

### 4.2.1 Case Study 4. Hussein Chalayan Sm(A)rt Wearables:

This designer is known for bold, futuristic designs that utilise novel materials and incorporate electrical and electronic components to adjust shape or display effects. Dramatically augmented and remoulded human forms result. The examples shown here illustrate how smart textile and wearable can be hybridized the textiles are smart because they respond electronically to external stimuli; the designs are definable as wearables because their smart responses are computed by inbuilt sensors and processors. Such integration is construable in posthumanist terms as entanglement.

The entire surface of this loose-fitting tube (Figure 10) is a soft LED screen. On it appear blinking and moving stars of colour, of different sizes and vibrance. The 15,000 LEDs can be organised through software to display low resolution – but bright! – moving or still images. Abstract colour

forms are easily displayed. The dress is an overt medium – a worn video screen. No other design features are remarkable. Many designer-artists have incorporated LEDs and light arrangements in their pieces, but few have functionalized a garment so totally. This design homages the Mondrian dress in digital form. The triadic notion of smart clothing/wearable computing/aesthetic enhancement is prompted.

The “Before-Minus-Now’ dress (Figure 8, next page) consists of silvery-grey fabrics and solar panel-like mirrors running down strips to create linear mosaics. The hanging strips form the lower two thirds of the piece. In response to a switch<sup>^</sup>-trigger, the strips can be raised and lowered by extension struts that radiate – like umbrella spokes – from the hip area. When raised, the strips produce a Moon Lander silhouette. The space between the strips reveals the wearer’s legs. Aircraft

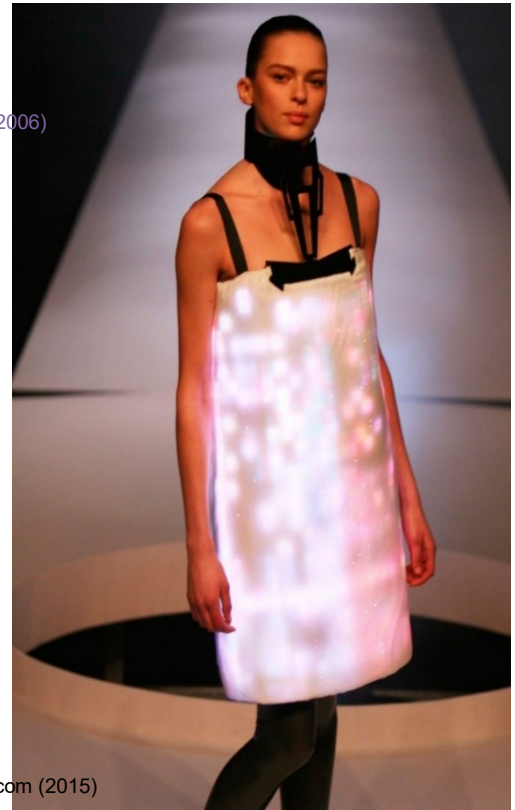


Figure 8 “LED Dress” (2006)

Source: amsterdamflv.com (2015)



materials feature in the construction. The image is architectural and mechanistic but humanized by the fabric components and the light play of the mirrors. The colour scheme is cosmonaut.

To Hu & Babu (2008), “intelligent textiles” describe garments made from various fibres but invariably featuring *interactive* capabilities. Chalayan’s work evidently earns this classification. But materiality-oriented definitions of “intelligent textiles” also exist, and, importantly for this research, resonate strongly with new materialist notions: intelligent textiles typically combine advanced fibres, fabrics, and electronics, but can also incorporate traditional materials. Chalayan’s creation satisfy this posthuman synthesis criterion too.

Figure 9 “Before-Minus-Now Dress” (2009)



Source: impactlab.net (2009)

The “Airplane Dress” (Figure 12) is a case in point. It is no mono-fabric affair; nor are its lines ergonomically generous. It is a sectional body shell of matt-white, aluminium-like plastic. Its various sections (mostly asymmetrical) are hinged to

allow manual lowering and raising, suggesting control surfaces on aircraft wings. The colouring, streamlining, and fine outline patterning further connote aeronautic design. The rigidity grants no anatomical concessions: shoulders merely dangle the piece. A body cast encloses the torso, then flares out from the hip like a nose cone. In motion, dress and occupant resemble a bell and clapper. When the flaps are retracted, an impression of curved aerodynamic smoothness is achieved (but harshly disrupted by the occupant's head and limbs). When the flaps are lifted, the piece is enlarged, extended edges appear, gaps between the cone and section plates open wide, revealing more of the occupant. The impression is one of clinical, engineered sleekness and organised kinetics over bodily accommodation; a precision conflation of the artificial and the living.

Figure 4 "Airplane Dress" (2011)



Source: caseofcuriosities.com (2011)

“The body, in some respects, is the biggest *symbol of tradition*. That is why I am interested in *reanimating* certain thoughts around it, because you can *alter the idea of the body* in the way you present it.”

(Chalayan, in Ricci, 2016, p. 266<sup>18</sup>)

Chalayan’s work can be seen as intelligent systems. Post-millennial definitions reflect the popularization of *systems concepts*. To Schwarz et al. (2010), a smart textile is a system that senses, actuates, communicates, stores information, and interconnects with external systems. Smart textiles systems are complex melds of *fabrics and electronics* that offer many sophisticated capabilities (Hertleer & Van Langenhove, 2006).

Because they feature user- or environment-triggered kinetic elements, Chalayan’s smart textiles can be categorised as “active” by Koncar’s (2016) terms. Based on presence or absence of specific capabilities, a smart textile can be further, more subtly categorised as sensing, actuating, or adapting (Tao, 2001) – capabilities that may require the attachment of a separate electrical/electronic component, or an additional textile-supported structure such as a woven-in antenna or battery pack. On such criteria, Chalayan’s work comfortably qualifies as “smart” and fittingly convey posthumanism of alterability, fluidity, organic-inorganic, human-machine holism.

Illustrating the conceptual and practical proximity of the two terms (and indeed their posthuman overlaps), Chalayan’s smart textiles works are also classifiable as wearables because they utilise worn electronics to change state for aesthetic effect. Thus, an electronically responsive textile piece is simultaneously a “wearable”. Such a convergence is construable as another posthuman-fashion convergence conveniently exemplified by Chalayan’s oeuvre.

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<sup>18</sup> *Emphasis added*. In this quote, emphasis (*italics*) indicates similarity with posthuman-relevant concepts and themes. Note also that these quotes have been chosen *selectively* – for their associability with posthuman concepts and posthumanesque practices. Less posthuman-pertinent statements have not been reported, and the authors of these statements have, to the best of this researcher’s knowledge at least, not used the term “posthuman/ist/ism/esque” in reference to themselves or their work.

#### 4.2.2 Case Study 5. Iris van Herpen: Sm(A)rt Textiles

Active and positively received for nearly 20 years, this designer/artist is renowned for imaginative experiments with the human body canvas. Her methods are as innovative and unorthodox as the resultant designs are non-commercial and “futuristic” (every reviewer’s favourite adjective). Daring, delicacy, intricacy, and refusal of convention characterise her work. Many of her designs were created using recent technologies, particularly 3D printing, and the combining of soft and hard synthetics with non-fabric materials such as metal, leather, and plastics.

Figure 51 “Synesthesia”: Look 14 (2010)



Source: irisvanherpen.com (2020)

Figure 52 “Synesthesia”: Look 01 (2011)



Source: irisvanherpen.com (2020)

In Figure 13, burnt bronze slinky springs meet leather tassel magnetic coils in an orderly but kinetic, biotech body loom. The design surrounds rather than wraps the wearer. Cleaving in some places and sprouting in others, the profile is three-dimensional. Lines and space dominate. Its surfaces are spaced strips, which in rings form arm tubes and in grids form flaps. From all angles, the creation departs from the human figure through bold contours and dark crevices that overwhelm and obscure the body. By contrast, the design in Figure 14 is a bone and space cut-out. Its scant materiality consists of skeletal sprays and joints. Featuring more



voids than substance, it is an elaborate but minimalist 3D doily that florally pastiches hips, spine, and chest.

Figure 15 shows an example from the “Hybrid Holism” exhibition of 2012. This Gigeresque melting beetle shell comprehensively disguises and distorts the anatomy – a head and shoulders emerging from the Bezier and bell curves reminds us that a human is somewhere inside. The high-sheen, liquid jet blackness suggests extreme sci-fi/gothic-alien rubber vampire, with hints of oil spill. Posthuman thoughts of human-animal mergence are strongly provoked.

Source: irisvanherpen.com (2020)



Figure 14 “Sensory Seas”: Look 15 (2020)

The dress in Figure 16 comprises two integrated elements: a nearly invisible underbody of transparent plastic, and an overlay of draped, art nouveau-style chrome filigree soldering. A stylized printed circuit board inside a jelly fish comes to mind. Lithe, intricate silver veins swirl and curve – never crossing. They are widest on the chest, where they culminate in Mesoamerican, soft space-age symmetries. Toward the waist, they taper into platinum threads. At the hip, they thicken again as they are carried outward along fins of diaphanous fabric, resembling vertically oriented hills rendered in topographer’s lines. As with the last example, a posthuman sensation of human-non-human is



elicited - in this case, a human-gelatinous sea creature or human-liquid metal biomechanical organism.

“Fashion is sometimes too focused on the outside, when it is so much more complex than that. Our experiences come from so many *different levels* and I'm trying to understand these and bring them into my work. Fashion is much *more than just the garment* – it's *connected to who we are and where we are going*. It's not only a thing to *consume*, and I don't think it should be placed in that box; it can relate to *architecture, design, science, biology*. To me, all of these worlds are *connected* and I can't look at them separately.”

(Van Herpen, in *Mono Kultur*, 2019, p. 4<sup>19</sup>)

Van Herpen's work experiments boldly with materiality. Smelik is unequivocal about the ontological situation of van Herpen's work, placing it firmly in the posthuman camp (2020). Van Langenhove et al. (2008) argued that materiality is fundamental to smart textiles, but van Herpen's work (these examples at least) do not change their textile structures in response to any stimuli. They come pre-formed and already strikingly unlike non-smart textiles. Nayak and Rajiv (2014) claimed that a textile must satisfy several clear material criteria to be “smart”: it must be manufactured using high-tech materials or finishes contain shape-memory polymers, phase change-capable materials, or electronic or e-textile elements. These examples of van Herpen's work only satisfy the first in that list. However, van Herpen's work is sufficiently complex in design, hybrid in its materials, and conceptually imaginative to be considered posthuman.

The materials of smart textiles include biopolymers, nanotech, self-decontaminating textiles, organic dyes, “victimless” leather, and other bioengineered substitutes for animal-derived materials. Leather and synthetics

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<sup>19</sup> *Emphasis added*. In this quote, emphasis (*italics*) indicates similarity with posthuman-relevant concepts and themes. Note also that these quotes have been chosen *selectively* – for their associability with posthuman concepts and posthumanesque practices. Less posthuman-pertinent statements have not been reported, and the authors of these statements have, to the best of this researcher's knowledge at least, not used the term “posthuman/ist/ism/esque” in reference to themselves or their work.

feature strongly in van Herpen's work, as do technologically advanced production methods, such as 3D printing.

#### 4.2.3 Summary, Points, and Posthuman Implications

In alignment with the logic of this research, Weiser (1991) connected smart textiles directly to wearable computing, specifically the "smart object" that is essential to the achievement of "ubiquitous computing" (see 4.1.1). Thus, smart textiles and wearable computing attain conceptual and functional proximity.

Near-parallel terms ("smart", "intelligent", and "technical") codify slightly differing emphases but converge in their denoting of textiles that possess technically sophisticated properties that supply performance capabilities that significantly surpass those provided by traditional, i.e. non-"smart" textiles. The examples shown in the preceding case studies demonstrate that the triadic combination of smart/intelligent capabilities, technical/high performance textiles, and wearable computing can create novel, powerful enhancements and value-adding synergies that exceed the limits of non-smart material and generate affordances that resonate with several powerful posthumanist (and less powerful transhumanist) notions:

1. By incorporating circuitry and processors running on power from embedded sources or generated through wearer motion, smart textiles enable wearable computing, whose posthuman significance was shown in 4.1.
2. Smart textiles can offer strong and novel aesthetic and qualitative advantages when necessary, automatically, responsively and in proportion to stimulus. Thus, they display a degree of *Artificial Intelligence*, which has profound human-non-human and organic-inorganic boundary implications for posthumanism.
3. Like wearables, smart textiles may grow or recede in relevance for basic reasons. Many smart textiles achieve aesthetic effects that "dumb textiles" have successfully, albeit less effectively, achieved for centuries. Nonetheless, the intelligence intrinsic to smart textiles suggests this category of product exceeds the mere materiality present in McLuhan's dualism. Fashion creatives, by building product around intelligent technologies, fuse affordances with capabilities to the degree that product and capability are inseparable. The designer of both smart material- or

wearable computing-incorporating fashion considers expression and capability simultaneously. His/her skillset is accordingly diverse.



## 5. Analysis

The previous chapter presented examples of advanced fashion innovation and creativity that appear to be effecting or invoking posthumanism. These examples correlate variously with the five main themes of posthumanism. Both categories of advanced fashion innovation (wearable computing and smart textiles) correspond with at least one theme. The following table summarises the correspondences.

Table 3 Correlated: The Two Categories of Advanced Fashion Innovations and The Five Main Themes of Posthumanism

| Categories of Advanced Fashion Innovation | The Five Main Themes of Posthumanism |                            |            |              |              |
|---|--------------------------------------|----------------------------|------------|--------------|--------------|
|   | Species Equivalence                  | Biotechnological Hybridity | Embodiment | Non-Alterity | Subjectivism |
| Wearable Computing                        | N/A                                  | Strong                     | Strong     | Possible     | Strong       |
| Smart Textiles                            | Possible                             | Possible                   | Strong     | N/A          | N/A          |
|   |                                      |                            |            |              |              |
|   |                                      |                            |            |              |              |

### 5.1 Species Equivalence

Of the five main themes of posthumanism, “Species Equivalence” is least associable with the two categories. “Species equivalence” could however be perceived in the demand for artificial instead of natural materials in fashion product, with obvious candidates for replacement being fur and leather. Progress in non-organic materials for fashion products likely results from the pursuit of business efficiencies and the affordances of artificial substitutes (e.g. smart textiles). But animal rights and sustainability issues also exert influence, and both relate to interspecies ethics. Species equivalence may also be seen in the animalesque/organic designs that feature in work by designers such as van Herpen.. Also, species equivalence may also be implied by the presence of non-animal and non-organic materials that van Herpen utilises liberally in her design. Several examples shown in 4.2 suggest such possibilities.

### 5.2 Biotechnological Hybridity

This theme was revealed most visibly in the discussions of worn technologies and, least surprisingly, wearable computing. It is also present as an aesthetic property

in some of the creative work of Trenda and van Herpen. This theme is elemental in Haraway's cyborg (1985) and McLuhan's "extensions of man" (1964). Hybridity reflects transhumanist more than posthumanist values. Only smart textiles are not readily associable, since the term is variously definable and textiles, being removable, are difficult to interpret as truly integral to the wearer. In posthumanist terms, however, the temporality of a particular mode of human-technology integration is decidedly less significant than the constant phenomenon that is general human-technology integration. Because smart textiles are frequently combined with wearables to produce intelligent, assistive affordances, they are utilisable in performance and appearance enhancement so have meaning for fashion. Smart textiles relate to biotechnological hybridity, to transhumanism, and therefore to posthumanism.

### 5.3 Embodiment

Both categories have strong implications for the self and the body's place in the conception of self, i.e. embodiment (Leaver, 2012; Hayles, 1999). Both represent options for replacing or supplementing organic aspects of self. Consequently, both prompt a reassessment of the physical, social, and psychological person and its boundaries. If "embodiment" concerns immaterial subjectivities, human interaction with technology, and the psychosocial effects of adoption of the artificial (as many posthumanists suggest), then both categories play a part. They ambiguate the borders separating human from nonhuman, natural from unnatural. Both categories offer physical and psychosocial potentials unavailable to a non-enhanced self. Several creative examples shown in the case studies visually express what might be interpreted as posthumanist questions around self in relation to the material housing it. Van Herpen's designs, for example, both expose and conceal the body, prompting thoughts about the (im)balance or equality of wearer and work.

### 5.4 Non-Alterity

For McGowan (2007), *alterity* is otherness. Alterity is human; non-alterity is posthuman (Braidotti & Hlavajova, 2018). Appearance adjustment, particularly in the de- or re-humanizing designs exemplified in the creative work of Trenda,

Chalayan, and van Herpen, relates most strongly to the achievement of posthuman non-alterity. Advanced technology fashion options allow the individual assimilation with or differentiation from others in higher resolution than is possible with lower tech fashion options. If appearance is influenced by perceptions of self via audiences (as McGowan, 2007 suggested), then the adjustability of appearance through technology implies that perceptions or expressions of self will acquire extreme plasticity, because technology is enabling audiences to become participants in posthuman enactments (see Trendera's work for examples). Through technologically facilitated posthuman performances, both the self and other acquire unprecedented levels of transience, pliability, and autoteleological potential. Through wearables especially, constant co-presence with others (near or far) is softening barriers between self and other, further facilitating posthuman (non-) alterity.

## 5.5 Subjectivism

Pham (2014) claimed that enduring certainty in definitions of humanness will facilitate human continuity.. Fashion – according to this research – could support either prospect (see 5.8). Wearable computing and appearanceadjustment could engender differentiation *or* similarity. However, subjectivity may evolve through technologies that permit redesign of the self (or at least its appearance) through fashion.

The question of subjectivity is illuminated by the understanding of *who* or *what* performs the design – self or other? If self designs self, then subjectivity leads most logically to heterogeneity (being different, each designs itself differently). If design is by other, then subjectivity may lead to homogeneity and, ultimately, non-subjectivity), since an other can know of but not possess to the same extent another ego's desire to self-author and self-express. The former possibility seems to reflect the posthuman-like practices of hackers or DIY creators; the latter possibility results from a technological amplification of traditional commercial models, in which fashion creativity is commoditized and mass markets for similar product generated. Where creativity is centralised, homogenization is more likely than heterogenization.

Posthuman discussions commonly include subjectivism in treatments of gender. Technology is non-gendered; androgyny is a posthuman-relevant concept (Haraway, 1985, 1988). Alongside “species equivalence”, *gender equivalence* is another posthumanist pillar. Species and gender equivalence both have implications for subjectivism, but gender equivalence through fashion alone would likely be more superficial and temporary, since clothing can be changed far more easily than a physiology can be modified. However, the superficial and temporary nature of fashion may represent a stepping-stone toward posthuman fashion and subjectivist re-evaluations.

## 5.6 McLuhan’s Laws of Media Applied to Posthuman Fashion

McLuhan’s Laws of Media foreshadowed posthumanist principles. By proposing the examples discussed in the *Findings* chapter as potentially effecting posthumanism, this study supports the applicability of the Laws of Media to posthuman fashion. Posthumanism in fashion both complies with *and extends* the Laws of Media. The following table summarises the confirmations and extensions.

Table 3 McLuhan's Laws of Media Applied to Universal and Posthuman Fashion

| Law of Media               | Application to <i>Universal Fashion</i>   | Application to <i>Posthuman Fashion</i>  |
|----------------------------|---|--|
| 1. Extends/<br>Enhances    | Skin, hair, nerves  | Environment and body sensors, haptic enhancement, worn sensation, adaptive sheltering and appearance   |
| 2. Reverses                | Weather dependence, formerly required body protective skills and senses   | Environment dependence, cost-versus-ethicality conflicts, maintenance obligations, durability concerns, physiological unawareness                            |
| 3. Retrieves/<br>Amplifies | Attraction and status display, shelter creation, bodily capabilities, mobility  | Attraction and status display, multi-environment functionality, physiological monitoring/reporting, athleticism, longevity, recovery, and general efficiency |
| 4. Obsolesces              | Function-only dress, traditional textiles, animal skins, dress construction and maintenance skills, environmental constraints | Separate or non-integrated hardware, environmental constraints, function-or-form dichotomies, disposable clothing, unaware or non-reporting bodywear         |

## 5.7 Artificial Intelligence and Digital

In the course of researching the case studies, the emerging importance of Artificial Intelligence became apparent. Like all modern industries, fashion’s evolution rides on waves of technological development that enable the efficient mass production

of goods (Tortora, 2015). Alongside less cutting-edge, but still powerful digital technologies, AI has improved fashion's production and logistical processes significantly. The contributions of AI to both the production and consumption sides of the fashion equation are indisputable: AI is heavily utilised in the design, production, and retail of fashion product (Luce, 2019). Its fashion applications are *extremely* numerous (see Appendix A2).

AI and virtual changing rooms could encourage atomisation of style. In a postmodern, non-binary fashion future, trend will probably continue to exist, but higher variety within trend is likely as fluidities multiply, and options and customisability increase in response. Non-trend, amateur-led, hacker-tech, and DIY fashion (as typified in, for example, "street fashion") is both disrupting traditional, top-down fashion systems while invoking the posthuman. Interestingly for fashion theorists, in 1985, Baudrillard used the term "ubiquity" to describe the endless saturation of images that create the "hyper-reality" of (post)modern society. Wearables along with screen technologies are more effective image suppliers than any 1980s technology, so might be enabling "hyper-reality".

Given the current ubiquity and lifestyle necessity of information technologies, fashion companies will soon need to be as creative and competitive in their technological offerings as they are in their more traditional capacities, i.e. garment design and manufacture. Luxury brands, for example, could offer technological options as prestigious and differentiating as the design and materials of their traditional product. Fashion design could become an evenly and fully hybridized technological-aesthetic operation.

The wearable-equipped posthuman customer (much like today's) will apply the informatically incomparable power of the Internet to product discovery and purchasing. Consumers obtain knowledge and draw solutions promiscuously, with expedience and value driving selection. In turn, by logical inference, the posthuman's usage, modal choices, and content of expression will grow more eclectic and/or specific.

Digital communications' already deep involvement in shopping is shaping fashion consumption. Social media sharing, reviews, search engines, images and video, and digital purchasing are all factors at play (Bendoni, 2014; Luce, 2019). Present patterns indicate that demand and supply are better balanced – digital's influencing of demand is already knowable. Only the matters of how extensively and how rapidly every area of fashion will be transformed remain uncertain.

## 5.8 Expanding the Circuit of Fashion Formation

The Circuit of Fashion Formation was presented in the *Introduction* (Figure 1 and 25). The findings of this research suggest that “Culture” and “Business”, fashion's main forces of influence, are informed by philosophies, social phenomena, and technologies associable with or definable as posthuman or posthuman-effecting (Figure 26). Specifically, through the contribution of “Philosophy”, “Culture” is informed by the five posthuman themes. Similarly, through the contribution of “Technology”, “Business” and “Independent” entities can utilise advanced fashion innovations identifiable as evoking or enabling posthuman possibilities.

Undoubtedly other social phenomena, influential philosophies, and advanced innovations exist and exert force on fashion. Those forces, if sufficiently potent, may mediate, weaken, or quell posthuman outcomes. However, *since posthumanism is the only philosophical trend/social phenomenon that explicitly centralizes and addresses the human-technology interrelation while encompassing issues such as animal rights, environmentalism, gender, social composition, and ethics*, it seems safe to postulate that posthumanism and its collateral debates *will* influence patterns and are doing so already.

In the new circuit (Figure 26), posthumanism sits between philosophy and culture, which both inform fashion. Posthumanism is more than a set of abstractions concerning society and culture, like, say, postmodernism. But posthumanism *is* philosophical. It is a philosophical, socio-cultural phenomenon that influences culture variously. Many philosophies – abstract and practical – inform culture, such as pragmatism, social contract theory, and free versus controlled market advocacy. Posthumanism has its place among these: its ramifications for society,

individuals, species interaction, commerce, and performativity/symbolic interactionism are far-reaching.

From the foregoing, a new question is prompted: “What will be the *effect* of these posthuman themes and their facilitators?”. This is addressed in the next section.

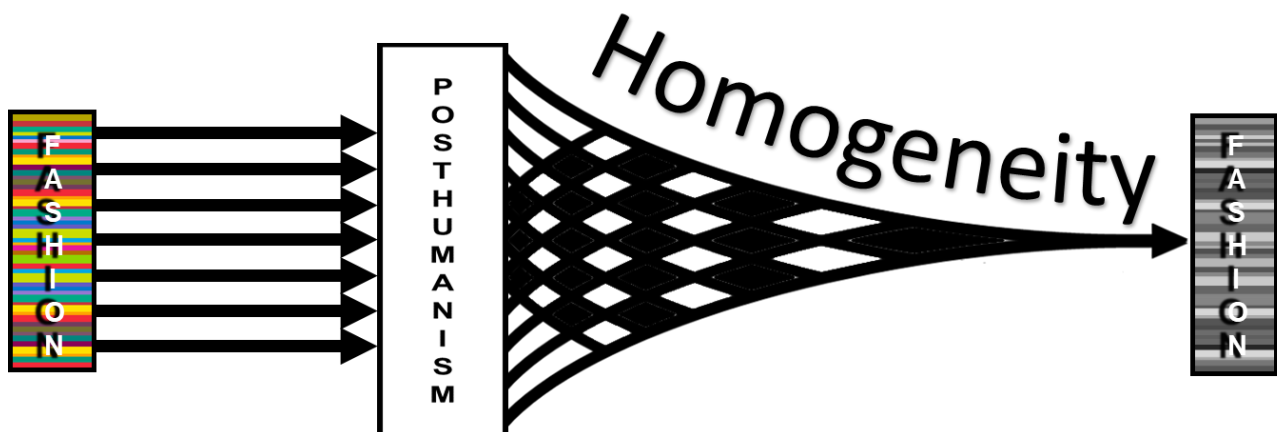
## 5.9 Posthuman Fashion Futures: Monograd or Polyopia?

In futurological terms, fashion faces two possible – non-binary so not exclusive – posthuman scenarios. I call these Monograd and Polyopia, i.e. homogenization and heterogenization. Posthuman fashion will effect the emergence of both and the possible dominance of one. The possibility of both occurring in simultaneous space or time (even to unequal degrees) seems improbable, but not impossible in the depolarized posthuman future due to their inescapable entanglement. .

### 5.9.1 Monograd

In this scenario, fashion variety atrophies relative to the present. Fashion homogenizes and standardizes. Posthumanism mashes individuals into a selfless hive consciousness.

Figure 15 Monograd, Where Posthumanism Drives Fashion Homogeneity

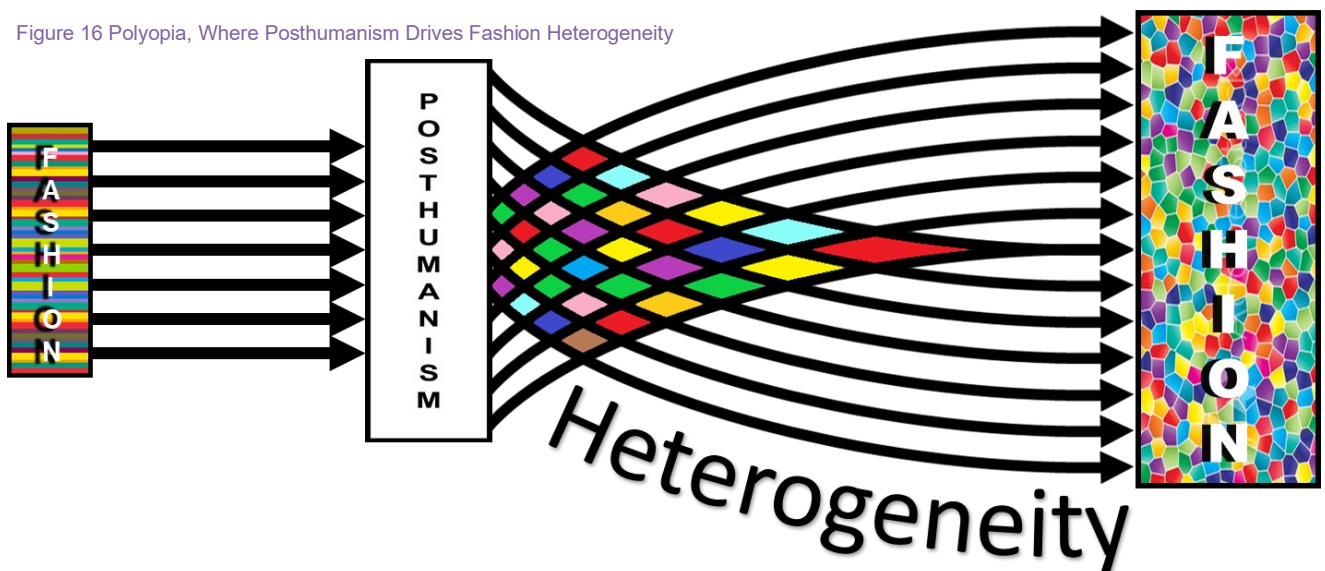


Monograd is populated by interchangeable, ungendered, biotechnological hybrids. Sameness characterises this posthuman existence Society divests itself of all distinguishing criteria, inflicts and reflects uniformity, and efficiently eliminates the

possibility and necessity of identity, obsolescing expression-through-fashion. Thus, fashion regresses to the function of its ancient ancestor, i.e. body protection. Fashion degenerates into mere clothing. It decays into something monochromatic and anonymizing. Reflecting its *en bloc*, collectivist, static uberculture, fashion in Monograd is *uniclectic*. This scenario corresponds with the posthuman future feared by Žižek (2000).

### 5.9.2 Polyopia

In this scenario, fashion variety expands relative to the present. Fashion heterogenizes and atomizes. Near-infinite multiplicities occur. Fashion manifests in forms as diverse as its wearers and designers.



Posthumanism accentuates individualities, equipping acutely agentic egos with advanced technologies to cultivate radically differentiated, unique selves, as frequently and as creatively as they wish. Technology facilitates and amplifies the drive to achieve and communicate uniqueness, resulting in an explosive multiplication of expression-through-fashion. Here, fashion vigorously transcends its primitive shelter function. Its aesthetic powers assume heightened existential consequentiality: diversities in form reflect and reimagine their authors. Fashion grows – like a posthuman rhizome – into a medium of self-expression par excellence. Retaining only those few protective functions that internally integrated



technologies cannot provide, fashion becomes hyperfashion. It evolves into an “art-of-self”. Reflecting its ad hoc, individualist, fluid non-culture(s), fashion in Polyopia is *kaleidoscopic*. This scenario corresponds with Haraway’s posthuman future.

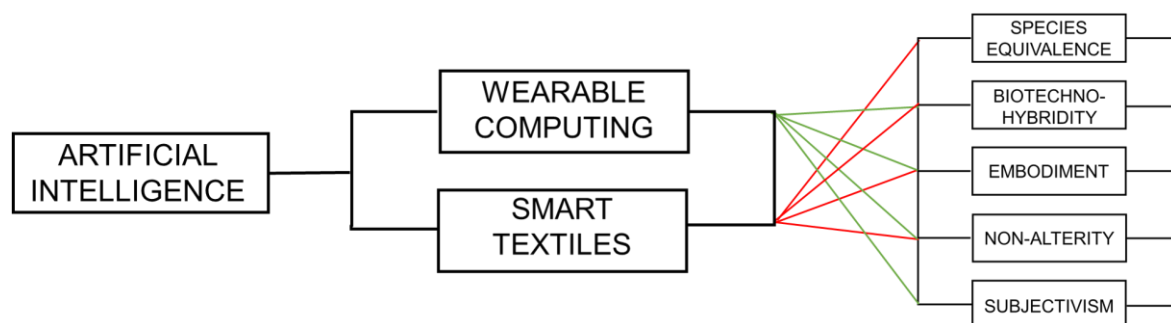
In both scenarios however, the *trend* aspect of fashion is obsolete. In Monograd, people are too similar to seek differentiation through trend; in Polyopia, people are too individualistic. In these posthuman futures, trend fashion is absent. If it continues it does so as an antiquated custom practiced by refusenik anti-posthumanists.

## 6. Conclusions

This research examined the role played by fashion innovations in manifesting the posthuman. Five themes of posthumanism were identified in the literature; two categories of advanced fashion innovations were identified. A third category – Artificial Intelligence – was deduced from these but this awaits articulation in a future study. It must suffice at this point only to say that AI is a common denominator in all recent fashion innovations – creative and functional.

To varying degrees, the five themes are reflected in the two categories, as the following diagram depicts (the correspondences are discussed in the preceding chapter).<sup>34</sup>

Figure 17. Correlated: Fashion's Categories of Advanced Innovations and Posthumanism's Five Main Themes



### 6.1 The Research Aim and Research Objectives Addressed

#### Research Aim

*To argue that innovation and creativity in fashion are effecting posthumanism.*

An understanding of posthumanism as it pertains to fashion was developed from a correlation of posthumanist concepts described in the *Literature Review* with the

<sup>34</sup> This diagram should not be considered definitive. Naturally, lines and box-bound terms are necessarily reductionist, hence suboptimal for depicting dynamic phenomena. This diagram merely illustrates the most apparent connections uncovered in this research.

advanced fashion innovations and examples of fashion creativity provided in the *d case studies*. The *Analysis* argued that innovation and creativity in fashion are contributing to the emergence of posthumanesque potentials.

## RO1

*To identify and elucidate specific areas of fashion that are facilitating the emergence of the posthuman.*

The literature identified specific areas of creativity and technology that have posthumanist implications for fashion: Two areas of posthuman-evoking fashion newness were identified from the literature: wearable computing and smart textiles. The posthuman implications of each were elucidated through case studies. Of the five themes of posthumanism identified, four were directly relatable to the two areas of newness, and to AI by deduction *Species Equivalence* was also relatable, but less obviously (see 3. following).

The areas of fashion newness identified and elucidated in this research evoke all three elements of the posthuman trinity (Ferrando, 2013):

1. Post-humanism. Technology enhances the appearance and capabilities of the human, and by so doing surpasses the natural, facilitating expression of individuality/identification (multiple humanisms) while addressing and reflecting diversity. Innovations in fashion that involve organic substitute materials may encourage re-evaluation of the human-non-human dynamic, leading to de-anthropomorphization.
2. Post-dualism. Digital interconnectedness enables fashion diversity and reduces cultural and perceptual distance. Performer and audience, consumer and consumed, wearer and worn, inter alia are, in the posthumanist sense, all de-bordering.
3. Post-anthropocentrism. This is interpretable in the fashion innovator's movement toward synthetic, often smart, non-animal derived textiles and designs that challenge human-non-human imbalances. The presence of another intelligence in extreme proximity to the dermal layer prompts re-

examination of the self's boundaries and recognition of non-human actors and their contribution to life.

## RO2

*To show how recent technology and creativity in fashion may be interpretable as entangled with notions of the “posthuman”.*

Posthumanesque motifs and concepts appear in the work of and fashion-utilising artists, typically in work labelled “futuristic”. Smart textile and computing-incorporating technologies with roots in the work of Shannon, Weaver, and Mann feature in fashion product, with sportswear being an obvious host. Creators are probably not, however, consciously expressing posthumanism through their designs. none of the artistic or technical creators featured in this research used the term when discussing their output. Nevertheless, technical and artistic fashion designs seem to be communicating posthuman themes.

The case studies demonstrated that wearables and smart textiles have already significantly augmented human form and capability. Ballardian notions of bodily alteration for pleasure through the intrusion or inclusion of technology have strong posthuman resonances. Worn product can enable such alterations, albeit impermanently.<sup>35</sup> Posthuman enhancements could occur through innovative fashion product, but radical, long-term, biotechnological alterations cannot be facilitated by clothing/fashion alone.

More speculatively, the widespread adoption of advanced fashion innovations might engender the psychosocial acceptance of more permanent modes of obtaining posthuman affordances. A public that lacked familiarity with the advantages of powerful body-enhancing technologies may resist the prospect of permanent bodily augmentations. Today's advanced fashion innovations could be interpreted as a steppingstone on the path toward a fuller, more literal, less metaphorical cyborgian posthuman body.

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<sup>35</sup> Conversely, fashion could also anthropomorphize artificial humans (cyborgs).

### RO3

*To assess the relevance of fashion theorisation in light of the digital present and the arguably emergent posthuman.*

If advanced fashion innovation is a steppingstone into a posthuman future in which identity is eroded and protective capabilities are inbuilt or genetically/surgically provisioned, the necessity for fashion as it is traditionally conceived of may decline. Pre-digital theories concerning cycles, consumption/usage, expression, self, culture, and identity may all require revision due to the posthuman trajectory revealed by this research. For example: if the posthuman creature is a hive biped indistinguishable from any other and incapable or undesirous of self-expression, then fashion-as-communication becomes obsolete; if posthuman bodies feature apparatus and gene edits that permit functioning in all manner of environments, then clothing-as-protection also becomes redundant. If the posthuman being is not a cyborg but a decategorized fluidic enjoying the advantages of a non-binary, de-anthropomorphized reality, then what will such a liberated being need of or desire from fashion? Is this knowable? Might posthumanism (in whatever form it takes) spell demise of fashion as it is today understood? This researcher believes it will.

Theorisations around normality, (sub)cultures, heterogeneity, homogeneity, authenticity, duplication, inspiration, and cultural symbolism all occur in discussions of both posthumanism and fashion. Future research could investigate these interrelations and prognosticate further on whether and what posthuman fashion will be.

## 6.2 Theoretical Outputs

This research yielded six theoretical/conceptual outputs.

Concordances connect the major themes of posthumanism with specific examples of innovation in fashion (1). These suggest that newness in fashion is contributing to posthumanism (see 6.1). Consequently, the Circuit of Fashion Formation can be developed (2): between “Technology” and “Business” now exist three categories of advanced fashion innovation that evoke or enable posthumanism; between “Philosophy” and “Culture” are now five fashion-relevant posthumanist themes (see Appendix A2). The applicability of McLuhan’s Laws of Media (3) to posthuman fashion become apparent: all four laws are tidily extensible to posthuman fashion (see 5.6). The centrality of AI to current fashion and the effecting of posthumanism (4) became deducible through analysis of advanced fashion innovation (see Appendix A1). Two non-exclusive posthuman futures were proposed (5): Monograd and Polyopia (see 5.9). These parallel the homogenization versus heterogenization schism in posthumanism debates.

Such is the degree of convergence marking posthumanism and fashion, a new theorization became possible (6). This I term “sans-notumism” and explain in 6.7.

## 6.3 Problems and Limitations

Any fashion technology, indeed fashion itself, and, for that matter, clothing, can be argued to be part of the posthumanizing progress that has existed since humans mastered fire (arguably the first “technology”). With definitional, conceptual leniency, *any* innovation is interpretable as posthuman, since “technology” is not precisely defined by posthumanists and is not a proprietary or protected term. Mastery too is non-posthuman; in concept, it is closer to transhumanism. Technology and posthumanism are neither synonymous nor necessarily coupled. Conceptual posthumanism is more likely than cyborgian biotechnical posthumanism and has more fidelity with the writings of Haraway and other key posthumanists. Furthermore, by using case studies, this research employed a humanist approach. By presenting actual instances from fashion, this study aimed to evidence the current and growing presence of posthumanism, not to argue for

the validity of posthumanism positions, which would be a separate ontological endeavour.

The present-future dichotomisation is an unavoidable imprecision. The future is, of course, a potential, and the present is ever transient. Nevertheless, in studies such as this, there exists a need to separate what currently is from what might be. The analysis also assumes continuity and progress, since it is by the observation of the extant that extrapolations concerning the possible have been formed. There is no inevitability in the predicted developments. They are subject to innumerable factors of change.

This study intentionally overlooks the role of fashion brands. Commerce is addressed, but not in detail. It was beyond scope. The prospects of fashion vis-à-vis posthumanism are to be considered more deeply in elsewhere. However, brands appear to be acting in posthumanesque manner. For example, Gucci's recently initiated "Equilibrium" campaign (<https://equilibrium.gucci.com/>) seems to express several posthuman themes: improved social equality, diversity, and sustainability. For fashion businesses, concerted attempts to commercialize the unattainable posthuman may define the posthuman-business dynamic. This study omits discussion of the significance of celebrity and the evolving relationship between media, the consuming public, and influencers.

### 6.3.1 Conceptual Issues

Society is the source, destination, crucible, and, often, *raison d'être* of technology and philosophy. Society is informed by and informing of both. Through technologies, the individual can appear, behave, think, and perceive in ways unimaginable to earlier, less augmented humans. Posthumanism in a pretechnological scenario is a challenging prospect. And from the critical perspective, technological newness is secondary to the psychosocial; newness for newness' sake is merely a posthuman collateral. Primarily, ironically, posthumanism holds that the future human is somehow *other*: the posthuman has transcended the limitations and definitions that define the heretofore human.

In the posthuman future, today's humans are unrecognisable or absent. Psychosocial and technological forces concoct new phenomena of being, of which one must be fashion, albeit radically reconceptualized, since its nature is psychosocial and technological. Even without technology, posthumans would be alien. Most importantly, they would be *designed* – by self or other. Current humans are the product of accidental and deliberate evolution. In humanist terms, civilised times (the minority of historical time and very recent in evolutionary terms) enable selective reproduction quite unlike any posthuman teleology, which is a function-driven, amorphous continuity that effects and expresses social purposes. The question of whether these purposes are intentionally, explicitly planned or develop *laissez-faire* through an evolution-like process of response to environment and/or gene improvement over time, is directly addressed by very few posthumanists. However, since all design is deliberate and because sophisticated technical or societal change is rarely sustained otherwise, posthuman society must be a planned outcome. Other questions then arise: What consensus commissioned this outcome? Does technological capability incur inevitability? What will become of the evolutionarily orthodox but less technological reproductive and social strategies that have performed successfully enough to enable humanity to discuss fundamentally reauthoring the existential kernel through posthuman thinking?

## 6.4 Applications and Implications

Reproduction in posthumanism and its implications for various functions of fashion, such as sexual attraction through adornment (related to fashion-as-communication), deserve exploration. For posthumanists, fashion theorists, and fashion businesses, the multifaceted issue of gender – relations, perceptions, appearances – warrants intensive discussion. Other topics also deserve empirical and theoretical attention, e.g. fashion brands in the posthuman/post-social world, AI as designer, AI as influencer, twinning of virtual skins and physical fashion, and the implications of non-fungible tokens.

The present research may prompt fashion educators to consider the methods and content of their teaching. Digital/blended pedagogies seem appropriate to the subject matter. Students may require awareness of the features of the fashion



environment: digital ubiquity is unremarkable but its influence on fashion may remain a black box until pedagogically illuminated. Effective fashion teaching will address technical literacies, analytics, data visualisation, fashion system visibility and transparency, and product ethics and traceability, all of which will involve what I term the “NDT” (New Digital Trinity: blockchain/ cryptocurrencies, AI, and the Internet of Things). Higher education programme designers must incorporate analytics competencies, digital society studies, and virtual fashion into curricula.

For researchers too, this study presents directions. In some senses, fashion is simply becoming more of what it has always been, i.e. a techno-creative practice, but traditional concepts of fashion appear to be weakening. The global, digital age is stressing prior certainties. Sustainability through smart textiles is strongly researched, but the utility of AI in achieving end-to-end sustainability and operational visibility is an intriguing prospect. Hands-free management of AI fashion businesses is another potential research area. Methodologically, such areas may demand a hybrid, posthuman approach. Thus, a blurring of qualitative with quantitative may be needed. The quantitative is naturally applicable to data working; but for design creation, fashion media, marketing, the human dimensions of supply chain management, and generally predicting the fate of fashion in an increasingly online, sustainability-sensitive world, mixed methods might be optimal.

For fashion students, the ramifications of this study are similar. Technology can only grow in importance. Numeracy and high-level technical skills (coding and analytics) in conjunction with traditional, qualitative fashion fluencies will define the optimum arsenal. For knowledge, critical and contextual studies may assume heightened value: qualitative appreciation of historical/cultural considerations retain their current worth, but to be maximised will need the supplementation of analytics, data interpretation, creative independent research skills, blue-sky thinking, and AI collaboration acumen.

The designer too must acknowledge culture change. Design remains a technical/creative hybrid skillset, but the posthuman designer possesses operation-level digital crafting competencies and applies non-binary thinking to

problem-solving. In William Morris style, design may return to a craft of production, making the designer equally technician and artist, a bicameral, posthuman imagineer-engineer. Precision tools and smart materials offer fresh creative languages that must be imagined, mastered, and commercialized. Conversely, well-resourced designers may soon be freed from the necessity to design according to material properties. Design will be unshackled from textiles, so constrained mainly by imagination, which has new conceptual liberties courtesy of the expanding posthuman milieu.

## **6.5 Fashion and Posthumanism: Parallels and Possibilities**

Arguably like fashion, posthumanism is not necessary – and posthuman fashion less necessary still – but it appears to be approaching nonetheless. Will the products of posthumanism be extracted from their original expressive usage and incorporated in utilitarian applications for commercial purposes? Could a hacker-created intelligent shoe, for example, become the standard shoe once its affordances prove marketable? There is a precedent in fashion: in online worlds, virtual skins were originally shared freely among players. Selling rapidly followed. Professional virtual skin designer-retailers are now common. This is interpretable as the tendency of creative work to be appropriated (or, from a different ideological perspective, rationally utilised) for capitalist purposes.

One posthumanist concern (or cyborgism) is emblemising fluctuation in the quality of difference. Such intellectuality could be manipulated by cynical commercial forces. According to Ansgar Allen (2020), cynicism in attitude or action is characterised by opportunism, gain seeking, and rare positive contributions. The products of posthumanism may undergo appropriation, like the cultural products that fashion appropriates. Haraway and other influential posthumanists advocated for the co-option (appropriation?) of useful technologies for posthuman purposes. Significant quarters of fashion are mired in appropriation controversy. Appropriation connotes massification, i.e. popularisation. Fashion and popularity have strong theoretical linkages. Might the popularisation of posthumanism (partly through fashion, which is what this research suggests is occurring) result in its massification and, ultimately, debasement? If normal results from normalised,

what else might posthumanism make normal? Questions concerning whether popularity necessitates commercialization (and vice versa) will be confronted.

Amateur technologists are wont to work with functionless products, and often share technical knowledge freely. Through posthumanism, might the amateurs' way become the de facto way? In the posthuman future, might the fashion amateur offer realistic alternatives to commercial fare? With the growing availability of highly capable technology, is *prosumer* (Toffler's term, 1981) fashion likely, and would this make tomorrow's fashion less commercial and more heterogenous as a result? Interest in the non-essential may have implications for expression and inspiration (appropriation?). Fashion's contributions to culture could be further reaching and livelier. Posthuman fashion may not be necessary, but it will be contingent.

## 6.6 Sans-Notumism

This term defines my theorization of the posthuman and fashion. Both shed their *nota*.<sup>39</sup>

Through technology and social momenta, fashion's labels expire: brands are diminished by prosumption; looks, styles, and period influence become invalid descriptors, all elements being too diffusely inspired and ambiguous in origin to identify. In the interim, anti-labels proliferate, possibly as a response to fast fashion – accelerationist amateurs attempt to (un)make label fashion. From this arises fashion that companies (labels) cannot mimic and traditional labels (linguistic and commercial) cannot describe.

Posthumanism evolves into post-posthumanism/sans-notumism. The fluidic, dynamic self defies labelling. Like any other term, the term "posthuman" becomes antiquated. It is another discarded label, born of a time passed, when problematic categorisations and inherited concepts persisted, frustrated, and inspired philosophical debate.

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<sup>39</sup> Latin: plural of *notum* ("note", "mark", "label").

Sans-notumism pushes back against the imminently passé posthumanism discussed earlier. But a static posthumanism is neither needed nor compliant with all posthuman thought. Posthumanism can usefully persist as a general placeholder for futurological, sociological debates in which conceptual fluidities can be fielded, reductionism weighed against abstraction, what-is highlighted against what-could-be, and stasis and dynamism made mutually informing. Posthumanism can function as a term for constantly changing labels – assuming taxonomies remain necessary. The power of posthumanism resides in its conceptual flexibility (although this complicates the reliable assignation of the term to anything); posthumanism has an analogical purpose. Fashion too. Both have postmodern potency: fashion can depict and drive change; posthumanism marks the moving terrain of intellectual discourse. Both chart the discarding of absolutes, the dissolution of conventions, and the reassessment of mainstays.

## 7. References

- Aatola, E. (2005). *Personhood and animals: Three approaches*.  
[https://www.academia.edu/1800582/Personhood\\_and\\_animals\\_three\\_approaches](https://www.academia.edu/1800582/Personhood_and_animals_three_approaches)
- Allen, A. (2020). *Cynicism*. MIT Press.
- Amsterdamflv.com (2015). <http://amsterdamflv.com/archives/15609>
- Associatesofbrand.org (2020). *Beyond embodiment opens January 25*.  
<https://associatesofbrand.org/beyond-embodiment/>
- Barad, K. (2003). Posthumanist performativity: Toward an understanding of how matter comes to matter." *Signs: journal of women in culture and society*, 28(3), 801–831.
- Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning*. Duke University Press.
- Barker, P. (2003). *Michel Foucault: An introduction*. Edinburgh University Press.
- Barker, P., & Jane, M. (2016). *Cultural studies: Theory and practice*. (5th ed.). Sage.
- Barnard, M. (2002). *Fashion as communication*. (2nd ed.). Routledge.
- Baudrillard, J. (1983). *Simulations*. (P. Foss, Trans.). Semiotext(e). (Original work published in 1981)
- Baudrillard, J. (1985). The ecstasy of communication. In H. Foster (Ed.), *Postmodern culture*. (pp. 126-134). Pluto Press.
- Bendon, W. (2014). *Social media for fashion marketing*. Bloomsbury.
- Berger, A. A. (2016). *Media and communication research methods: An introduction to qualitative and quantitative approaches*. Sage.
- Birringer, J., & Danjoux, M. (2006). The emergent dress: Transformation and intimacy in streaming media and fashion performance. *Performance Research*, 11(4), 41-52.
- Bloodgood-Borden, J. (2014). High-tech apparel, electronic textiles, and smart textiles. In J. Blanco (Ed.), *Clothing and fashion: American fashion from head to toe*, 4. (pp. 150-152). ABC-CLIO.
- Bonoma, T. V. (1985). Case research in marketing: Opportunities, problems, and a process. *Journal of Marketing Research*, 22(2), 199-208.
- Boodro, M. (1999). Is fashion art? *Fashion Theory*, 2(1), 51-72.

- Borden, J. (2015). High-tech fashion. In J. Blanco (Ed.), *Clothing and fashion: American fashion from head to toe*, 4. (pp. 150-152). ABC-CLIO.
- Braidotti, R. (2019). *Posthuman knowledge*. Polity Press.
- Braidotti, R., & Hlavajova, M. (2018). *Posthuman glossary*. Bloomsbury Academic.
- Brenninkemeyer, I. (1963). *The sociology of fashion*. Librairie du recueil Sirey.
- Breward, C. (1998). Cultures, identities, histories: Fashioning a cultural approach to dress. *Fashion Theory*, 2(4), 301-313.
- Breward, C. (2008). Between the museum and the academy: Fashion research and its constituencies. *Fashion Theory*, 12(1), 83-93.
- Breward, C. (2010). Fashion cities. In J. Eicher & P. Tortora (Eds.), *Global perspectives: Berg encyclopaedia of world dress and fashion*, volume 10, 226–229. Bloomsbury.
- Calvert, R. E. (2012). *Fashioning the artist: Artistic dress in Victorian Britain, 1848 – 1900* [PhD Thesis, Glasgow University].
- Cargocollective.com (2014). <http://cargocollective.com/lesiaturbat/E-TRACES-memories-of-dance>
- Caseofcuriosities.com (2011). <http://caseofcuriosities.com>
- Cavender, R. (2018). The marketing of sustainability and CSR initiatives by luxury brands: Cultural indicators, call to action, and framework. In C. Lo, & J. Ha-Brookshire (Eds.), *Sustainability in luxury fashion business*. (pp. 29-49). Springer-Verlag.
- Charteris J., & Nye A. (2019). Posthuman methodology and pedagogy: Uneasy assemblages and affective choreographies. In C. Taylor, & A. Bayley (Eds.), *Posthumanism and higher education*. (pp. 329-347). Palgrave Macmillan.
- Clark, A. (2013). Reinventing ourselves: The plasticity of embodiment, sensing, and mind. In M. More, & N. Vita-More (Eds.), *The transhumanist reader: Classical and contemporary essays on the science, technology, and philosophy of the human future*. (pp. 113-127). Wiley-Blackwell.
- Corwin, A. (2009). Language and gender variance: constructing gender beyond the male/female binary. *Electronic Journal of Human Sexuality*, 12. <http://mail.ejhs.org/Volume12/Gender.htm>
- Cox, D. (2017). Do compression sports clothes really improve performance? *The Guardian Online*. Jun 19. <https://www.theguardian.com/lifeandstyle/2017/jun/19/under-pressure-do-compression-sports-clothes-really-improve-performance>

- Craik, J. (2005). *The face of fashion Cultural studies in fashion*. Routledge.
- Crutzen, P., & Stoermer, E. (2000). The 'Anthropocene'. *Global change newsletter*, 41, 17–18.
- Deitch, J. (1992). *Posthuman (catalogue of art exhibition)*. FAE Musée d'Art Contemporain.
- Deleuze, G. (2002). How do we recognise structuralism? In M. Taormina (Ed.), *Desert islands and other texts 1953-1974*. (D. Lapoujade, Trans.). (pp. 170-192). Semiotext(e). (Original work published in 1967)
- Deleuze, G. and Guattari, F. (2004). *A thousand plateaus: Capitalism and schizophrenia*. Continuum.
- Duggan, G. G. (2001). The greatest show on earth: A look at contemporary fashion shows and their relationship to performance art. *Fashion Theory*, 5(3), 243-270.
- Edwards, T. (Ed.). (2007). *Cultural theory: Classical and contemporary positions*. Sage.
- Eicher, J. (2021). Dress, the senses, and public, private, and secret selves. *Fashion theory: The journal of dress, body and culture*, 25(6), 777-797.
- Eicher, J., Evenson, S. & Lutz, H. (Eds.). (2000). *Divisible self: Global perspectives on dress, culture and society*. Fairchild Publications.
- Entwistle, J. (2000). *The fashioned body: Fashion, dress and social theory*. Polity.
- Eriksson, P., & Kovalainen, A. (2016). *Qualitative methods in business research*. (2nd ed.). Sage.
- Falk, P. (1995). Written in the flesh. *Body and society*, 1(1). 95-105.
- Farren, A., & Hutchinson, A. (2004). Cyborgs, new technology, and the body: The changing nature of garments. *Fashion Theory*, 8(4), 461-476.
- Faurschou, G. (1987). Fashion and the cultural logic of postmodernity. *Canadian Journal of Political and Social Theory*, 11(1-2), 68-84.
- Ferleger-Brades, S. (1998). *Addressing the century: 100 years of art and fashion*. Hayward Gallery.
- Ferrando, F. (2012). *Towards a posthumanist methodology: A statement*.  
[https://www.researchgate.net/publication/270900549\\_Towards\\_a\\_Posthumanist\\_Methodology\\_A\\_Statement](https://www.researchgate.net/publication/270900549_Towards_a_Posthumanist_Methodology_A_Statement)

- Ferrando, F. (2013). Posthumanism, transhumanism, antihumanism, metahumanism, and new materialisms: differences and relations. *Existenz: An International Journal in Philosophy, Religion, Politics, and The Arts*, 8(2), 26-32.
- Ferrando, F. (2019). *Philosophical Posthumanism*. Bloomsbury.
- Feyerabend, P. (2010). *Against method*. (4th ed.). Verso Books.
- Flick, U. (2015). *Introducing research methodology*. (2nd ed.). Sage.
- Fortunati, L. (2010). Wearable technology. In M. Eicher (Ed.), *Encyclopedia of world dress and fashion volume 10: Global perspectives and cumulative index*. (pp. 100-108). Oxford University Press.
- French, D. N., Thompson, K. G., Garland, S. W., Barnes, C. A., Portas, M. D., Hood, P. E., & Wilkes, G. (2008). The effects of contrast bathing and compression therapy on muscular performance. *Med Sci Sports Exercise*, 40(7), 1297-1306.
- Fukuyama, F. (2003). *Our post-human future: Consequences of the biotechnology revolution*. Profile Books.
- Future Now (2019). *Future now: 100 contemporary artists from the Aesthetica art prize*. Aesthetica.
- Gaimster, J. (2015). *Visual research methods in fashion*. Bloomsbury.
- Gaines, E. (2014). The identity of the freak. In *Reading posthumanism: Collected essays, Fall 2014*. (pp. 48-55). Loyola University.
- Gane, N. (2006a). Posthuman. *Theory, culture and society*, 23(2), 421-434.
- Gane, N. (2006b). When we have never been human, what is to be done? Interview with Donna Haraway. *Theory, culture and society*, 23(7-8), 135-158.
- Gottschalk, S. (1993). Uncomfortably numb: Countercultural impulses in the postmodern era. *Symbolic interaction*, 16(4), 351-378.
- Halberstam, J. & Livingston, I. (Eds.). (1995). *Posthuman bodies*. Indiana University Press.
- Hammersley, M. (2001). On 'systematic' reviews of research literatures: A 'narrative' response to Evans and Benefield. *British Educational Research Journal*, 27(5), 543-554.
- Hansen, M. (2006). *Bodies in code: Interfaces with digital media*. Routledge.
- Hansmann, U. (2001). *Pervasive computing handbook*. Springer-Verlag.
- Haraway, D. (1985). Manifesto for cyborgs: science, technology, and socialist feminism in the 1980s. *Socialist Review*, 80, 65-107.



- Haraway, D (2017). *Staying with the trouble: making kin in the Chthulucene*. Duke University Press.
- Haraway, D. (1988). Situated knowledges: The science question in feminism and the privilege of partial perspective. *Feminist Studies*, 14(3), 595–596.
- Hassan, I. (1977). Prometheus as performer: Toward a posthumanist culture? *The Georgia Review*, 31(4), 830-850.
- Hauskeller, M., Philbeck, T. D., & Carbonell, C. (Eds.). (2015). *The Palgrave handbook of posthumanism in film and television*. Palgrave-Macmillan.
- Hayes, S. G., & Mcloughlin, J. (2015). Joining techniques for sportswear. In *Textiles for Sportswear*. (pp. 119-149). Woodhead Publishing.
- Hayles, K. (1996). Narratives of artificial life. In G. Robertson (Ed.), *Future natural: nature, science, culture*. (pp. 146-164). Routledge.
- Hayles, M. K. (1999). *How we became posthuman: Virtual bodies and cybernetics, literature, and informatics*. University of Chicago Press.
- Hebdige, D. (1979). *Subculture: The meaning of style*. Routledge.
- Hertleer, C., & Van Langenhove, L. (2006). Intelligent textiles for children. In H. Mattila (Ed.), *Intelligent textiles and clothing*. (pp. 434-449). Woodhead Publishing.
- Ho, D., & Choi, T. (2014). Collaborative planning forecasting replenishment schemes in apparel supply chains: Cases and research opportunities. In T. Choi, C. Hui, & Y. Yu (Eds.), *Intelligent fashion forecasting systems: Models and applications*. (pp. 29-42). Springer-Verlag.
- Hoaglin, D. L., Light, R. J., Mcpeek, B., Mosteller, F., & Stoto, M. A. (1982). *Data for decisions: Information strategies for policymakers*. Abt Books.
- Hodge, R., & Kress, G. (1989). *Social semiotics*. Polity Press.
- Hollander, A. (1975). *Seeing through clothes*. University of California Press.
- Holme, I. (2000). Climate of change. *Textile month*, July, 25-28.
- Houellebecq, M. (2001). *Atomised*. Vintage.
- Hu, J. (2007). *Shape memory polymers and textiles*. CRC Press.
- Hu, J., & Babu, K.M. (2008). Testing intelligent textiles. In J. Hu (Ed.), *Fabric testing*. (pp. 275-308). Woodhead Publishing Series in Textiles.
- Impactlab.net (2009). *Designer Hussein Chalayan – wearable, portable architecture*. <http://www.impactlab.net/2009/04/12/designer-hussein-chalayan-wearable-portable-architecture/>

- Irisvanherpen.com (2019). <https://www.irisvanherpen.com>
- Jameson, F. (2007). *Archaeologies of the future: The desire called utopia and other science fictions*. Verso Books.
- Janesick, V. (1994). The dance of qualitative research design: metaphor, methodolatry, and Meaning. In N., Denzin, & Y. Lincoln (Eds.), *Handbook of qualitative research*. Sage.
- Jocic, D. (2016). Smart coatings for comfort in clothing. In J., Hu, (Ed.), *Active Coatings for Smart Textiles*. (pp. 331-354). Woodhead Publishing Series in Textiles.
- Kaiser, S. (2012). *Fashion and cultural studies*. Bloomsbury.
- Kaiser, S., Nagasawa, T., & Hutton, S. (1991). Fashion, postmodernity and personal appearance: A symbolic Interactionist formulation. *Symbolic Interaction*, 14(2), 165-185.
- Kawamura, Y. (2018). *Fashion-ology*. Bloomsbury.
- Kell, J. (2014). *Athletic apparel: Outperforming the competition in 2014*.  
<https://fortune.com/2014/12/25/athletic-apparel-top-performer/>  
<https://wearesocial.com/blog/2018/01/global-digital-report-2018>
- Kim, S. B. (1999). Is fashion art? *Fashion Theory*, 2(1), 51-72.
- Kittler, S. (1997). *Literature, media, information systems*. Overseas Publishers Association.
- Koncar, V. (2016). *Smart textiles and their applications*. Woodhead Publishing.
- Kun, M., Chan, C., & Ramakrishna, S. (2018). Textile-based scaffolds for tissue engineering. In S. Rajendran (Ed.), *Advanced textiles for wound care*. (pp. 329-362). Elsevier.
- Kurzweil, R. (1999). *The age of spiritual machines*. Viking Press.
- Land, N. (2017). *A quick-and-dirty introduction to accelerationism*.  
<https://jacobitemag.com/2017/05/25/a-quick-and-dirty-introduction-to-accelerationism/>
- Landier, J. (2013). *Who owns the future?* Simon and Schuster.
- Larsson, R. (1993). Case study methodology: Quantitative analysis of patterns across case studies. *Academy of Management Journal*, 36(6), 1515-1546.
- Latour, B. (1999). *Pandora's hope: An essay on the reality of science studies: Essays on the reality of science studies*. Harvard University Press.
- Lee, H. (2003). *Altering facial features with RH5*. <http://hyungkoolee.kr/portfolio/the-objectuals-altering-facial-features-with-rh5/>

- Lee, S. (2005). *Fashioning the future: Tomorrow's wardrobe*. Thames and Hudson.
- Lee, R. (2009). Social capital and business management: Setting a research agenda. *International Journal of Management Reviews*, 11(3), 247-273.
- Lee-Evenson, S. (2010). Dress as costume in the theater and performing arts. In M. Eicher (Ed.), *Encyclopedia of world dress and fashion volume 10: Global perspectives and cumulative index*. (pp. 136-148). Oxford University Press.
- Lehmann, U. (2010). Art and fashion. In V. Steele (Ed.), *The Berg companion to fashion*. (pp. 30-35). Bloomsbury.
- Lévi-Strauss, C. (1963). *Structural anthropology*. Basic Books.
- Lewis, J. (2008). *Cultural Studies*. (2nd ed.). Sage.
- Lewis, R. (2001). Foreword. In X. Tao. (Ed.), *Smart fibres, fabrics and clothing*. (pp. xi-xii). Woodhead Publishing.
- Licoppe, C. (2004). 'Connected' presence: The emergence of a new repertoire for managing social relationships in a changing communication technoscape. *Environment and Planning D: Society and Space*, 22(1), 135-156.
- Lipovetsky, G. (1987). *The empire of fashion*. Princeton University Press.
- Loschek, I. (2009). *When clothes become fashion design and innovation systems*. Bloomsbury.
- Luce, L. (2019). *Artificial intelligence for fashion: How AI is revolutionizing the fashion industry*. Apress.
- Mackey, A. M., Wakkary, R. L., Wensveen, S., & Tomico-Plasencia, O. (2017). Can I wear this?: Blending clothing and digital expression by wearing dynamic fabric. *International journal of design*, 11(3), 51-65.
- Mackrell, A. (2005). *Fashion and art: The impact of art on fashion and fashion on art*. Batsford.
- Madianou, M. (2016). Ambient co-presence: Transnational family practices in polymedia environments. *Global Networks*, 16(2), 183-201.
- Madianou, M., & Miller, D. (2011). Mobile phone parenting: Reconfiguring relationships between Filipina migrant mothers and their left-behind children. *New media and society*, 13(3), 457-470.
- Malinowsky, E. (2010). *Banned shoes bring big business to basketball startup*. <https://www.wired.com/2010/10/nba-banned-shoes/>

- Marino, S. (2018). Fashion: A conceptual constellation. In G. Matteucci, & S. Marino (Eds.), *Philosophical perspectives on fashion*. (pp. 47-72). Bloomsbury.
- Martin, R. (1999). A note: Art and fashion, Viktor and Rolf. *Fashion Theory*, 3(1), 109-120.
- Mattila, H. (Ed.). (2006). *Intelligent textiles and clothing*. Woodhead Publishing.
- Mautner, T. (2005). *Dictionary of philosophy*. Penguin Reference.
- Mann, S. (1998). *Definition of "wearable computer"*.  
<http://wearcam.org/wearcompdef.html>
- McCann, J. (2005). Material requirements for the design of performance sportswear. In R. Shishoo (Ed.), *Textiles in sport*. (pp. 44-69). Elsevier.
- McClusky, M. (2015). *Faster, higher, stronger: The new science of creating superathletes, and how you can train like them*. Penguin/Plume.
- McGowan, K. (2007). *Key issues in critical and cultural theory*. McGraw-Hill/Open University Press.
- McLuhan, M. (1964). *Understanding media: The extensions of man*. McGraw-Hill.
- McLuhan, M., & Zingrone, F. (Eds.). (1995). *Essential McLuhan*. Anansi.
- Mendes, V., & de la Haye, A. (2010). *Fashion since 1900*. Thames and Hudson.
- Miah, A. (2008). A critical history of posthumanism. In B. Gordijn, & R. Chadwick (Eds.), *Medical enhancement and posthumanity*. (pp. 71-94). Springer.
- Miles, M., & Huberman, A. (1994). *Qualitative data analysis: An expanded sourcebook*. Sage.
- Miller, S. (2013). Fashion magazines. In D. Bartlett, S. Cole, & A. Rocamora (Eds.), *Fashion media: Past and present*. (pp. 13-21). Bloomsbury.
- Miller-Spillman, K., & Reilly, A. (2019). *The meaning of dress*. (4th ed.) Bloomsbury Fairchild.
- Mitts, V. (2014). Reestablishing gender roles in cyberpunk futures. In *Reading posthumanism: Collected essays, Fall 2014*. (pp. 93-99). Loyola University.
- Moravec, H. (1988). *Robot: Mere machine to transcendent mind*. Oxford University Press.
- Morrison, J. (2012). *How Speedo created a record-breaking swimsuit: After officials banned the swimsuit that caused records to fall at the 2008 Olympic Games, scientists are back with a new outfit that could break more records*.  
<https://www.scientificamerican.com/article/how-speedo-created-swimsuit/>

- Morse, J. (1994). Designing funded qualitative research. In N. Denzin and Y. Lincoln, (Eds.), *Handbook of qualitative research*. (pp. 220-235). Sage.
- Motlogelwa, S. (2018). Comfort and durability in high-performance clothing. In J. McLoughlin & T. Sabir (Eds.), *High-performance apparel: Materials, development, and applications*. (pp. 209-219). Elsevier.
- Motwani, J., Subramanian, J., & Gopalakrishna, P. (2005). Critical factors for successful ERP implementation: Exploratory findings from four case studies. *Computers in Industry*, 56(6), 529–544.
- Munk Gallery (2020). <https://galerie-munk.de/kunstdrucke/thema/Figuerlich/19/page:221>
- Muggleton, D. (2002). *Inside subculture: The postmodern meaning of style*. Berg.
- Murphy, E., Dingwall, R., Greatbatch, D., Parker, S., & Watson, P. (1998). Qualitative research methods in health technology assessment: A review of the literature. *Health Technology Assessment*, 2(16), 1-274.
- National Portrait Gallery (2020) <https://www.npg.org.uk/collections/search/portrait/mw241355/Jane-Morris-ne-Burden> accessed 21/08/2020
- Nayak, R., & Padhye, R. (2014). Care of apparel products. In R. Sinclair (Ed.), *Textiles and fashion: Materials, design, and technology*. (pp. 799-822). Elsevier.
- Nordstrom.com (2015). 'Pro Hyperwarm' engineered print compression tights. <https://shop.nordstrom.com/s/nike-pro-hyperwarm-engineered-print-compression-tights/3749215>
- Osnat, F. D., Mason, B., Katz, L., & So, R. (2016). Sports and technology. In W. Vanlandewijck, & R. Thompson (Eds.), *Training and coaching the paralympic athlete*. (pp. 150-171). Wiley and Sons.
- Panofsky, E. (1955). *Meaning in the visual arts*. Penguin.
- Pappas, N. (2008). Fashion seen as something imitative and foreign. *The British Journal of Aesthetics*, 48(1), 1-19.
- Pedersen, P., Laucella, P., Geurin, A., & Kian, E. (2020). *Strategic sport communication*. Human Kinetics.
- Peräkylä, A., & Ruusuvuori, J. (2013). Analyzing talk and text. In N. Denzin, & Y. Lincoln (Eds.), *Collecting and interpreting qualitative data*. (4th ed., pp. 277-307). Sage.
- Pfitzinger, P., & Douglas, S. (2019). *Advanced marathoning*. (3rd ed.). Human Kinetics.

- Pham, I. (2014). Posthumanism does not inhibit our humanity. In *Reading posthumanism: Collected essays, Fall 2014*. (pp. 107-114). Loyola University.
- Pohl, R. (2018). *Donna Haraway's 'A cyborg manifesto' – a MACAT analysis: Science, technology and socialist-feminism in the late 20<sup>th</sup> century*. Routledge.
- Pointon, M. (2014). *History of art: A student's handbook*. Routledge.
- Polhemus, T. (1994). *Street style: From sidewalk to catwalk*. Thames and Hudson.
- Reagon, B. (1981). Coalition politics: Turning the century. In B. Smith (Ed.), *Home girls: A black feminist anthology*. (pp. 356-368). Kitchen Table: Women of Colour Press.
- Rheingold, H. (2000). *Tools for thought: The history and future of mind-exploring technology*. (2nd ed.). MIT Press.
- Rhodes, B. (1998). *A brief history of wearable computing*.  
<https://www.media.mit.edu/wearables/lizzy/timeline.html>
- Ricci, S. (Ed.). (2016). *Across fashion and art*. Mandragora.
- Roach-Higgins, M. E., & Eicher, J. B. (1992). Dress and identity. *Clothing and Textiles Research Journal*, 10(4), 1-8.
- Robertson, K., Roux, C., & Wiggins, K. (Eds.). (2017). *Forensic Examination of Fibres*. CRC Press.
- Robinson, K. (2011). *Defining "creativity"*.  
<https://www.youtube.com/watch?v=NtnRaa7AqLs>
- Rocamora, A., & Smelik, A. (2016). Introduction to thinking through fashion. In A. Rocamora & A. Smelik (Eds.) *Thinking through Fashion: A Guide to Key Theorists*, 1-27. I. B. Tauris.
- Ruppert-Stroescu, M. (2009). *Technology and creativity: Fashion design in the 21st century* [PhD Thesis. University of Missouri-Columbia].
- Ryan, S. (2009). Re-visioning the interface: Technological fashion as critical media. *Leonardo*, 42(4), 307-313.
- Said, E. (1978). *Orientalism*. Routledge.
- Saiffee, F. (2009). The influence of knitwear on smart wearables. In J. McCann, & D. Bryson, (Eds.), *Smart clothes and wearable technology*. (pp. 111-130). Elsevier.
- Sapir, E. (1931). Fashion. *Encyclopaedia of the Social Sciences*, 6. (pp. 139-144). Macmillan,

- Saussure, F. (1966). *Course in general linguistics*. (W. Baskin, Trans.). McGraw-Hill. (Original work published in 1915)
- Schindler, W., & Hauser, P.J. (2004). *Chemical finishing of textiles*. Woodhead Publishing.
- Schneegass, S., & Amft, O. (2017). Introducing smart textiles. In S. Schneegass, & O. Amft, (Eds.), *Smart textiles: Fundamentals, design and interaction*. (pp. 1-12). Springer International Publishing.
- Schreier, M. (2012) *Qualitative content analysis in practice*. Sage.
- Schumpeter, J. (1934). *The theory of economic development*. Harvard University Press.
- Schwarz, A., Van Langenhove, L., Guermonprez, P., & Deguillemont, D. (2010). A roadmap on smart textiles. *Textile progress*, 42(2), 99-180.
- Schwartz, M. (2002). *Encyclopedia of smart textiles*. Wiley.
- Seymour, S. (2008). *Fashionable technology: The intersection of design, fashion, science, and technology*. Springer Wien.
- Shinkle, E. (2014). Fashion's digital body: Seeing and feeling in fashion's interactives. In D. Barlett, S. Cole, & A. Rocamora (Eds.), *Fashion media: Past and present*. (pp. 174-183). Bloomsbury.
- Simmel, G. (1997). The philosophy of fashion. (M. Ritter, & D. Frisby, Trans.). In D. Frisby, & M. Featherstone (Eds.), *Simmel on culture: Selected writings*. (pp. 187-205). Sage. (Original work published 1905)
- Silverman, D. (2001). *Interpreting qualitative data: Methods for analysing talk, text, and interaction*. (2nd ed.). Sage.
- Smelik, A. (2018). New materialism: A theoretical framework for fashion in the age of technological innovation. *International Journal of Fashion Studies* 5 (1), 33–54.
- Smelik, A. (2022). Fractal folds: the posthuman fashion of Iris van Herpen. *Fashion theory*, 26(1), 5-26.
- Smith, M., & Morra, J. (Eds.). (2005). *The prosthetic impulse: From a posthuman present to a biocultural future*. The MIT Press.
- Sobelman, D., & McMahon, K. (Directors). (2007). *McLuhan's wake* [DVD]. The Disinformers.
- Sparks, L. (2007). Sports goods retailing. In J. Beech, & S. Chadwich (Eds.), *The marketing of sport*. (pp. 365-369). Prentice Hall.

- Speedo.com (2020). *Fastskin LZR Valor Closedback*.  
<https://www.speedo.com/uk/en/fastskin-lzr-racer-x-closedback-kneeskin/809753B452.html>
- Stake, R. (1995). *The art of case study research*. Sage.
- Steele, V. (1985). *Fashion and eroticism: Ideals of feminine beauty from the Victorian era to the jazz age*. Oxford University Press.
- Stiegler, B. (1998). *Technics and time Vol.1: The fault of Epimetheus*. Stanford University Press.
- Stoppa, M., & Chiolerio, A. (2014). Wearable electronics and smart textiles: A critical review. *Sensors*, 14(7), 11957-11992.
- Stokes, J. (2018). *How to do media and cultural studies*. (2nd ed.). Sage.
- Sudhakar, P., & Gobi, N. (2008). Camouflage fabrics for military protective clothing. In E. Wilusz (Ed.), *Military textiles*. (pp. 293-318). Woodhead Publishing.
- Sundh, E., & Wing, S. (2015). *Vintage hairstyles: Simple steps for retro hair with a modern twist*. Chronicle Books.
- Sweetman, P. (1999). Anchoring the post-modern self? Body modification, fashion and identity. *Body and Society*, 5(51), 52-76.
- Tao, X. (2001). Smart technology for clothing and textiles. In X. Tao. (Ed.), *Smart fibres, fabrics and clothing*. (pp. 1-5). Woodhead Publishing.
- Thomas, R. O. (2015). Terminated: The life and death of the cyborg in film and television. In M. Hauskeller, T. D. Philbeck, & C. Carbonell (Eds.), *The Palgrave handbook of posthumanism in film and television*. (pp. 57-65). Palgrave-Macmillan.
- Thurgood-Haynes, M. (2010). Ceremonial and special-occasion dress. In M. Eicher (Ed.), *Encyclopedia of world dress and fashion volume 10: Global perspectives and cumulative index*. (pp. 59-68). Oxford University Press.
- Toffler, A. (1981). *The third wave*. Pan Books.
- Tiffanytrenda.com (2018). <https://www.tiffanytrenda.com/>
- Tortora, P. (2015). *Dress, fashion and technology: From prehistory to the present*. Bloomsbury.
- Tseëlon, E. (1995). *The masque of femininity: The representation of woman in everyday life*. Sage.
- Van Herpen, I. (2019). The unknownness of everything single. *Mono Kultur*, 47.



- Van Langenhove, L. Hertleer, C., & Schwarz, A. (2008). Smart textiles: An overview. In P. Kiekens, & S. Jayaraman (Eds.), *Intelligent textiles and clothing for ballistic and NBC protection. NATO science for peace and security series B: Physics and biophysics*. (pp 119-136). Springer.
- Vänskä, A. (2018). How to do humans with fashion: Towards a posthuman critique of fashion. *International Journal of Fashion Studies* 5(1), pp. 15–31.
- Walker, S. (2006). *Sustainable by design: Explorations in theory and practice*. Earthscan.
- Waqar, S., Wang, L., & John, S. (2015). Piezoelectric energy harvesting from intelligent textiles. In D. Tilak (Ed.), *Electronic textiles: Smart fabrics and wearable technology*. (pp. 173-198). Woodhead Publishing/Textile Institute.
- Weiser, M. (1991). The computer for the 21st century. *Scientific American*, 94-100. <https://www.ics.uci.edu/~corps/phaseii/Weiser-Computer21stCentury-SciAm.pdf>
- Wilson, E. (1990). These new components of the spectacle: Fashion, postmodernism. In R. Boyne, & A. Rattansi (Eds.), *Postmodernism and society*. (pp. 209-236). Macmillan.
- Wilson, E. (2003). *Adorned in dreams: Fashion and modernity*. Tauris & Co.
- Wilson, J. R. (2015). Hip-hop fashion. In J. Blanco, (Ed.), *Clothing and fashion: American fashion from head to toe*, 4. (pp. 153-156). ABC-CLIO.
- Yin, R. (2014). *Case study research: Design and methods*. (5th ed.). Sage.
- Zhang, X., & Tao, X. (2001). Smart textiles: Active smart. *Text. Asia*, 49–52.
- Zimmerman, T. G. (1995). *Personal area networks (PAN): Near-field intra-body communication* [MSc dissertation, MIT Media Laboratory].
- Žižek, S. (2000). *No sex, please, we're post-human!* <https://www.lacan.com/nosex.htm>

## 8. Appendix

### A1. Definitions

Table 4 Definitions of Fashion-Associated Concepts Relevant to and Applied in This Research

| Term                            | Definition  | Source                          |
|---------------------------------|---|---------------------------------|
| <i>Costume</i>                  | "[comprises] body supplements and modifications that indicate the out of everyday social role or activity. [The word] is reserved for use in discussions of dress for the theatre, folk and other festivals, ceremonies and rituals." | Roach-Higgins & Eicher (1992)   |
| <i>Creativity</i>               | "is the process of having original ideas that have value. It is a process; it's not random."  | Robinson (2011)                 |
| <i>Dress</i>                    | "[is] the total arrangement of all outwardly detectable modifications of the body and all material objects added to it."  | Miller-Spillman & Reilly (2019) |
| <i>Gender</i>                   | "[is the] social construction of one's male or female identity."  |                                 |
| <i>Innovation</i> <sup>40</sup> | [is] "a new product or service or a new quality of both that no one has launched yet."  | Schumpeter (1934)               |

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<sup>40</sup> Schumpeter provided five definitions of "Innovation". They are probably the most academically cited. In this research, only the first of these five is relevant so that is the definition applied.

## A2. Artificial Intelligence

Table 5 Fashion Supply and Demand Applications of AI – with Corresponding Functions Aligned

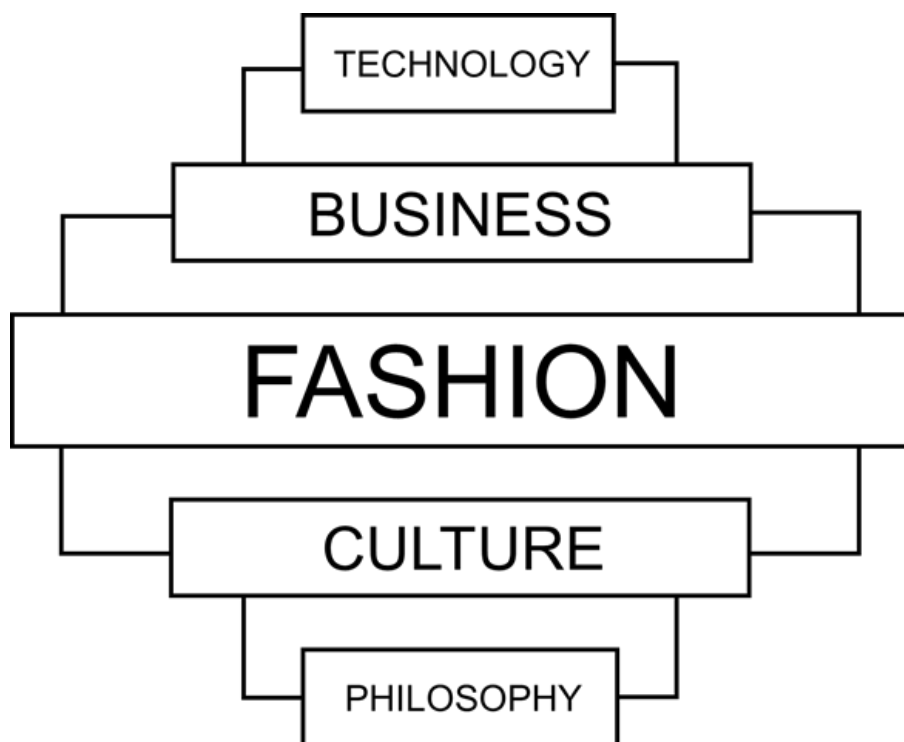
| Supply-Side Applications  |                                      | Demand-Side Applications   |  |   |                                    |
|---|--------------------------------------|--|--|---|------------------------------------|
| Supply and Creation   | Retail                               | In-Store Shopping  | Online Activities  |   |                                    |
| Full pipeline transparency (product provenance)   |                                      |  |  |   |                                    |
| Full pipeline data security/privacy (e.g. via blockchain)   |                                      |  |  |   |                                    |
| Full pipeline visibility (quality control and product location)                                     |                                      |  |  |   |                                    |
| Product Lifecycle Management (from design* to delivery through Product Data Management)             |                                      |  |  |   |                                    |
| Dematerialization of transactions (paperless and cashless audit trail)                              |                                      |  |  |   |                                    |
| Full pipeline delivery window estimates (from Tier <i>n</i> supplier to customer)                   |                                      |  |  |   |                                    |
| Ultra-high-resolution supply base data picture  |                                      | Ultra-high-resolution market data picture  |  |   |                                    |
| Full pipeline frictionless purchasing   |                                      | Cashless shopping  |  |   |                                    |
| Warehouse/distribution centre management  |                                      | Stock level transparency   |  |   |                                    |
| Inventory management  |                                      |  |  |   |                                    |
|   |                                      |  |  | Stocking, restocking, and in-store location | Website content population         |
|   |                                      |  |  | Space optimization (sales density)          | Bespoke online shopping experience |
|   |                                      |  |  | Intelligent product presentation            |                                    |
| Market-sensitive postponement   |                                      | High resolution product performance data;<br>Sales- and customer-derived forecast data;<br>Customer data point-based predictions |  |   |                                    |
| On-demand manufacturing (agile)   |                                      |  |  |   |                                    |
| Make-to-stock economies/lean capability   |                                      |  |  |   |                                    |
| Production planning   |                                      |  |  |   |                                    |
| Virtual sample prototyping  |                                      |  |  |   |                                    |
| Logistics greening  |                                      |  |  |   |                                    |
| Transport optimizing  |                                      |  |  |   |                                    |
| Supplier selection and management   |                                      |  |  |   |                                    |
| Supplier Quality Control and auditing   |                                      |  |  |   |                                    |
| Materials management  |                                      |  |  |   |                                    |
| Design generation (*data from every application identified in this table is potentially utilisable) | Virtual changing rooms/smart mirrors |  | Social media learning  |   |                                    |
|   |                                      |  | Web scraping and crawling  |   |                                    |
|   |                                      |  | Pre-emptive personalization;<br>Virtual fitting tools;<br>Virtual models |   |                                    |
| Website Functionality   |                                      |  |  | Chatbots and chat analysis                  |                                    |
|   |                                      |  |  | Ad and other copy creation                  |                                    |
|   |                                      |  | Image selection, optimization, and location                              |   |                                    |
|   |                                      |  | Predicted social media impact of purchase/display of product             |   |                                    |
|   |                                      |  | product  |   |                                    |

### A3. The Circuits of Fashion: Original and Expanded

In the original circuit (Figure 1 and 25), fashion is mediated primarily through “Business” and “Culture”, informed by “Technology” and “Philosophy” respectively. The revised circuit (Figure 27) shows technology’s democratisation of fashion by enabling mediation through both “Business” and less commercial “Independent” actors.

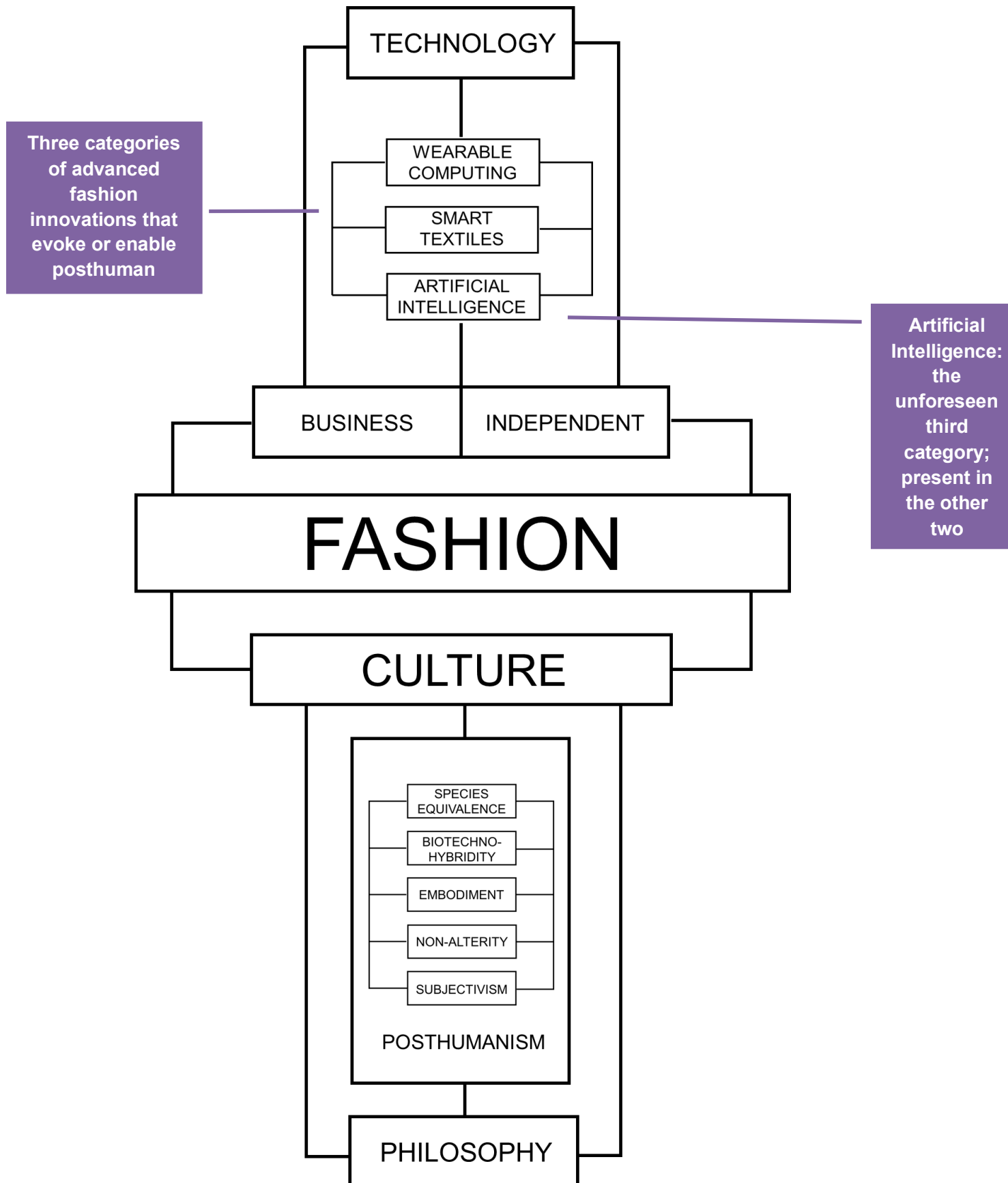
Because technology cannot possibly be limited to the categories presented in either circuit, technology must inform business and independent fashion mediators in ways not accounted for in this research. These other technological influences are indicated by the vertical lines that bypass the categories in the new circuit.

Figure 26 The Circuit of Universal Fashion Formation



In the new circuit, posthumanism (with major constituent themes identified) sits between “Philosophy” and “Culture”. Other sociocultural phenomena exist, and their influences are indicated by the vertical lines that bypass the “Posthuman” box in the new circuit.

Figure 19 The New Circuit of Posthuman Fashion Formation



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