“Standing Out While Blending In:” Learning from Experts about Designing Fashionable Wearable Experiences

Shiva Jabari
Gameful Futures Lab, Research Centre of Gameful Realities, Faculty of Information Technology and Communications
Tampere University
Tampere, Finland
shiva.jabari@tuni.fi

Asif Shaikh
Augmentative Technology Research Group, Research Centre of Gameful Realities, Faculty of Information Technology and Communication Sciences,
Tampere university
Tampere, Finland
asif.shaikh@tuni.fi

Çağlar Genç
Gameful Futures Lab, Research Centre of Gameful Realities, Faculty of Information Technology and Communications
Tampere University
Tampere, Finland
id.caglargenc@gmail.com

Velvet Spors
Institute of Computer Science
University of Tartu
Tartu, Estonia
velvet.spors@ut.ee

Johanna Virkki
Augmentative Technology Research Group, Research Centre of Gameful Realities
Tampere University
Tampere, Finland
johanna.virkki@tuni.fi

Oğuz ‘Oz’ Buruk
Gameful Futures Lab, Research Centre of Gameful Realities, Faculty of Information Technology and Communications
Tampere University
Tampere, Finland
oguz.buruk@tuni.fi

Juho Hamari
Gamification Group, Research Centre of Gameful Realities, Faculty of Information Technology and Communication Sciences
Tampere University
Tampere, Finland
juho.hamari@tuni.fi

Abstract

This study examines fashionability in computational fashion wearables (CFWs) through the reflective accounts of ten academic researcher–designers. While wearables are often studied for technical functions, fashionability, a key to adoption and sustained use, has received less attention. Using semi-structured interviews, we captured designers’ reflections-on-action as they revisited their own prototypes and surfaced forms of tacit, practice-based knowledge that are difficult to access through conventional user studies. Reflexive thematic analysis generated five themes: Desirable Friction, Contextual and Sub-Cultural Relevance, Symbiotic Sensory Envelopes, Narrative Social Performance, and Adaptive Longevity and Circularity. These themes reposition CFWs not as seamless devices but as expressive, situated, and evolving interfaces that mediate sensory, social, and cultural experience. Our findings contribute to fashion theory and HCI by showing how designers mobilize friction, context, sensory depth, and temporality as design resources. We conclude with actionable directions for embodied prototyping, multisensory calibration, narrative staging, and modular longevity.

CCS Concepts

• **Human-centered computing**; • **Human computer interaction (HCI)**; • **HCI theory, concepts and models**;

Keywords

Computational fashion wearables, Fashionability, Tacit knowledge, Reflection, Reflexive thematic analysis, Friction

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1 INTRODUCTION

Wearables have traditionally been examined for their sensing, tracking, and technical affordances, particularly in health, wellness, and productivity domains [23, 51]. In recent years, this technical orientation has expanded to include expressive, aesthetic, and experiential dimensions, as researchers explore interactive garments, responsive textiles, ludic wearables, soma-based interfaces, and performative fashion-tech [7, 14, 19, 20, 59, 64]. Collectively, these studies frame wearables not only as tools but as cultural and aesthetic artefacts embedded in social life. Yet one of the central aspects of their integration into everyday dress, fashionability, has not been consistently articulated in HCI.

Computational fashion wearables (CFWs) refer to body-worn garments, accessories, or textile elements that embed sensing, actuation, or computational behavior to enable interactive, responsive, or expressive functions and aesthetics [36]. We approach computational fashion wearables as cultural, sensory, and temporal companions. By companions, we refer to garments that participate in the ongoing rhythms of lived experience: they shape bodily perception, mediate how wearers are read within cultural settings, and accumulate meaning through repeated use, repair, and adaptation. Existing research in this space highlights factors such as user acceptance [39, 56], embodiment and comfort [45, 53], hedonic and utilitarian preferences [34], cultural expression [16, 60], and sustainable practices [10, 27, 38, 60]. While these perspectives shed light on why people adopt or reject wearables, they capture only parts of what makes a device fashionable, that is, desirable and meaningful as dress rather than only as technology. Prior work touches on elements of style or appeal, but how fashionability is defined, enacted, and experienced remains largely unexamined within HCI and fashion-tech research [16, 34, 36, 37].

This gap matters because adoption and long-term attachment depend not only on functionality but on how a wearable aligns with cultural norms, bodily practices, and aesthetic expectations [36, 37, 43, 55]. The struggles of devices like Google Glass show that technical capability alone does not secure social legitimacy [42]. By contrast, garments such as Levi's Jacquard jacket or CuteCircuit's SoundShirt demonstrate that wearables can achieve cultural resonance when aesthetics, sensory engagement, and social signaling work together. Understanding how wearables become fashionable is therefore essential for designing technologies that endure rather than remain novelties.

Although fashion studies offer rich accounts of fashionability, we know far less about how it is enacted in practice within computational wearables. In HCI, the experiential, sensory, and social processes through which designers themselves make sense of fashionability have not been sufficiently addressed. To focus on this gap, we turn to researcher-designer as a source of tacit, practice-based knowledge. Their reflections reveal how fashionability emerges as a dynamic and situated process, shaped through making, wearing, sensory engagement, social feedback, and ongoing iteration, and introduce a vocabulary that captures these experiential qualities.

This reflective, practice-based perspective illuminates how fashionability is felt and negotiated through wearing, how garments draw or deflect attention, shape sensory experience, align or misalign with cultural expectations, and foster long-term attachment through care, habit, and memory. We conducted semi-structured interviews with ten expert researcher-designer working at the intersection of fashion, craft, and computation. Using Braun and Clarke's [12, 13] thematic analysis, we generated five themes that articulate how fashionability is enacted as a situated, sensory, and socially negotiated quality of computational garments.

With this in mind, we ask:

- How do wearable design researchers conceptualize fashionability in computational fashion wearables?
- What kinds of fashionable wearing experiences do these designers aim for and encounter during the design process?

By foregrounding designers' reflective accounts, we aimed to uncover how fashionability is conceptualized, embodied, and tested within computational fashion design.

This study contributes to fashion, HCI, and design research in two ways.

First, it offers a conceptual account of how fashionability is enacted in computational fashion wearables, drawing on the reflective experiences of researcher-designer. Through reflection-on-action interviews, we show that fashionability is not a fixed aesthetic trait but a dynamic, sensory, temporal, and socially negotiated quality. We introduce a vocabulary that captures how researcher-designer understand and shape fashionability through making and wearing their own prototypes, including desirable friction, contextual and subcultural relevance, symbiotic sensory envelopes, narrative social performance, and adaptive longevity. These insights deepen understanding of how computational garments become meaningful in practice and complement existing work by positioning wearables as sensory, cultural, and temporal companions.

Second, the study offers practical guidance by surfacing tacit knowledge that rarely appears in user-only evaluations. Participants described how fashionability shapes through material expressiveness, sensory timing, spatial presence, cultural legibility, and lived wear. Their accounts show how designers tune movement behavior, vibrotactile and thermal sensations, silhouette shifts, and social signaling to shape desirability. Drawing on these reflections, we outline context-specific directions for designing fashionable computational wearables. Together, these contributions provide a nuanced and embodied understanding of fashionability and translate researcher-designer experience into actionable strategies for future design.

The next section situates this study within the wider landscape of fashion theory, embodied HCI and Somaesthetic perspectives, and fashion-tech design research, highlighting the gaps this paper seeks to address.

2 BACKGROUND

Research on computational fashion wearables (CFWs) spans experimental art practices, craft-based design, commercial smart textiles, and multimodal interactive interfaces. Early wearable computing emphasized sensing, data capture, and connectivity [23, 51]. As wearables moved into wardrobes, it became clear that technical capability alone could not guarantee social acceptance or long-term use. Wearables that do not resonate with fashion logic including stylistic coherence, cultural symbolism, and embodied comfort often fail to be adopted [17, 34]. In contrast, designs like Pauline van

Dongen's Solar Shirt or Levi's Jacquard jacket show how carefully balancing technological functionality with aesthetic and cultural codes can produce wearable technologies that users willingly keep, maintain, and identify with [60]. This shift has brought increasing attention to a central question that motivates this paper: what makes wearables desirable as fashion?

2.1 Fashionability in Fashion-Tech (From Theory to Practice)

Fashionability has long been understood as the alignment of dress with cultural rhythms, stylistic codes, and embodied practices [24, 41]. In classical semiotics, Barthes [5] describes garments as sign systems that move from denotation (material form) to connotation (social meaning), making dress a dense site of cultural communication. Within this symbolic system, visual and material cues must remain legible to shared cultural frameworks in order to be read as fashionable.

Aesthetic legibility refers to the degree to which silhouette, texture, color, and stylistic cues align with cultural codes [5, 24]. In computational garments, this legibility becomes more complex because actuation, vibration, illumination, and shape-change introduce dynamic behaviors that influence how garments are perceived and interpreted. Fletcher [27] argues that garments must "feel right" across sensory registers to sustain attachment. Our participants likewise described calibrating sensory behaviors to preserve cultural readability while pushing expressive boundaries.

Work such as IntiWear [69] further demonstrates how technological functions can be integrated into fashion vocabularies. Dye-doped acrylic pieces act as solar concentrators while functioning as customizable adornments on a solar coat and a self-charging purse, illustrating how power infrastructure can become part of a garment's aesthetic and cultural code rather than an external technical layer.

Alongside its aesthetic and symbolic functions, fashion also carries memory. Joseph et al. [38] describe clothing as a "mnemonic archive," meaning that garments accumulate traces of past movements, sensations, and social moments. This positions clothing as a repository of embodied experience rather than a static object. In the context of CFWs, this mnemonic quality is amplified: digital traces, haptic patterns, and rhythmic behaviors evolve with repeated use, while sensor logs, actuation histories, and material wear all contribute to a layered record of lived engagement. These accumulating sensory and digital memories shape how wearers understand, value, and remain attached to computational garments over time.

Fashionability in CFWs therefore cannot be reduced to style or technical capability alone. Prior work shows that cultural codes shape how smart wearables are perceived [16] and that fashionability involves balancing sensory pleasure, symbolic meaning, and functional performance [34]. In our participants' accounts, wearables succeeded when they resonated with cultural and stylistic expectations and were resisted when they clashed with established norms.

Taken together, fashionability in CFWs is shaped through the interlay of semiotic meaning, aesthetic legibility, cultural codes, embodied sensation, and temporal attachment. Our study builds on this understanding by examining how these dimensions surface in the reflective accounts of researcher-designer as they design and live with their computational garments.

2.2 Embodiment and Somaesthetic Perspectives

A core dimension of fashionability in computational fashion wearables (CFWs) lies in how garments are felt on, with, and through the body [8, 36]. Fashion is not only semiotic but profoundly embodied: as Entwistle [24] argues, dress is a "situated bodily practice" that shapes how people move, feel, and engage socially. For CFWs, this embodied quality is intensified because garments do not merely cover the body; they sense, actuate, vibrate, illuminate, or transform in response to bodily rhythms.

Somaesthetic and embodiment design approaches [33, 40] foreground this bodily dimension by emphasizing awareness, sensation, and reflective engagement. In fashion-tech, such work shows how computational materials choreograph felt experience: Tsaknaki's Breathing Wings [64] cultivates new relations through shape-change actuation, while Tsaknaki et al. [65] demonstrate how non-habitual breathing rhythms can provoke reflection and embodied attunement. These studies illustrate how CFWs generate multisensory dialogues across vibration, temperature, texture, movement, and light.

Building on this foundation, we draw on soma-based methods such as bodily sensitization, autobiographical design, and somaesthetic prototyping [33, 40], which treat first-person bodily experience as a legitimate site of knowledge. These methods help explain why the researcher-designers, as wearers of their own prototypes in our study, were able to articulate subtle sensory shifts, affective tensions, and micro-adjustments that user-only evaluations often miss. Their reflections demonstrate this sensitivity in practice and align with the soma tradition's commitment to cultivating bodily awareness through iterative wearing and material engagement.

Drawing from these insights, we frame CFWs as cultural, sensory, and temporal companions: garments that participate in lived experience by shaping perception, mediating social presence, and accumulating meaning through repeated wear, repair, and adaptation. This perspective extends earlier work by showing that such bodily and perceptual extensions emerge not only in isolated interactions but also across daily routines, social encounters, and long-term practices of wear and care.

To contextualize these dynamics, we highlight wearables that foreground embodied and somaesthetic experience. The SoundShirt, for example, enables deaf and hard-of-hearing audiences to experience music through vibration, showing how wearables operate as sensory fields rather than merely functional devices. Google Glass conversely illustrates how misaligned bodily and social experience can undermine adoption, while the Levi's × Jacquard jacket and van Dongen's Solar Shirt demonstrate how technological elements gain acceptance when integrated into familiar fashion vocabularies. Similar patterns appeared in our dataset: reversible sequins that "invite continuous touch" (Int. 3) and vibrotactile garments described as "second-skin loudspeakers" (Int. 5) show how sensation itself becomes a measure of fashionability. Taken together, these examples underscore that successful CFWs require attention not only to ergonomic fit but to sensory choreography, ensuring that

tactility, rhythm, and weight feel appropriate across contexts and over time.

In summary, embodiment and somaesthetic perspectives frame fashionability as a multisensory, relational practice rather than a visual attribute. Our findings reinforce this view by showing how researcher-designers negotiate tactile, auditory, and kinetic cues when creating, wearing, and evaluating computational garments.

2.3 Fashion-Tech Studies: Lived and Designed Experiences

Early wearable research centered on technical feasibility, but recent work foregrounds lived experience and designers as the first wearers of their prototypes. Devendorf et al. [20] show how making and wearing co-shape design trajectories. Dagan et al. [19] demonstrate how playful interactions and social encounters during wearing become integral design materials.

This shift aligns with reflective and autobiographical methods. Tsaknaki [64] employs autoethnographic soma design to surface tacit, felt qualities of materials and actuation. Schön's [58] reflection-in-action (thinking through making) and reflection-on-action (retrospective sense-making) explains how designers generate knowledge through embodied engagement. Son et al. [61] further argue that such tacit, embodied forms of expertise remain essential yet under-documented in design practice. Such reflective modes surface intuitive, affective, and bodily judgments that often remain inaccessible in user-only interviews.

Our study builds on this scholarly trajectory by engaging researcher-designers who prototype, test, and reflect on their garments in situ. Their dual role enables access to tacit knowledge about how fashionability is conceptualized (what "feels right"), negotiated (how garments attract or deflect attention), embodied (how tactility and movement shape desirability), and iteratively refined through repeated wear. Prior work shows that garments accumulate meaning through use and care, becoming witnesses to lived experience [9, 28, 38]. Participants similarly described how computational garments acquired sensory familiarity, choreographed habits, and emotional resonance over time. Such dynamics illustrate how fashionability is not only assessed in the moment but cultivated through frequent sensory encounters and lived histories.

Taken together, these insights motivate our methodological choice: to study fashionability through the reflective accounts of researcher-designers. This perspective offers a grounded vocabulary for understanding CFWs as cultural–technological hybrids whose fashionability is shaped through making, wearing, and reflection.

3 METHODOLOGY

To investigate how designers conceptualize and experience fashionability in computational fashion wearables (CFWs), we adopted a qualitative, practice-based methodology centered on designers' reflections-on-action [58]. Fashionability is a tacit, embodied, and culturally situated construct, and its sensory, affective, and symbolic dimensions require in-depth qualitative inquiry, offering insights that critically complement the broader patterns and more generalizable outcomes produced by quantitative studies [54, 61]. Aligned with fourth-wave HCI's focus on lived experience and situated, value-rich practice [1], we conducted semi-structured retrospective interviews with 10 designer–researchers and invited them to revisit their processes and lived experiences of wearing their prototypes. Their dual role as both creators and wearers allowed us to access insider knowledge about how fashionability is felt, negotiated, and iteratively refined during design.

Reflective interviews were epistemologically appropriate because they foreground experiential knowledge that emerges only through making and wearing. This approach enabled participants to articulate sensations, social encounters, and design judgments that are rarely visible in observation or user testing. Schön's [58] distinction between reflection in action and reflection on action informed both our data collection and interpretation. Reflection in action refers to the moment-to-moment adjustments designers make while wearing or prototyping a garment, what Schön calls as a "conversation with the situation." In contrast, reflection on action involves returning to these moments afterward to articulate the tacit judgments that shaped them. Participants described in-the-moment adjustments such as repositioning sensors or modifying silhouettes, as well as later reflections on attention, comfort, failure, or public reception. One participant, for example, explained how shifting the position of the Jacquard cuff altered both the haptic feel and the social visibility of the interaction, and how later reflection informed decisions about fabric stiffness and gesture mapping (Int. 5). Such cases illustrate how reflective practice surfaces experiential knowledge inaccessible to observational or user-testing methods.

Our approach also aligns with design research that treats design implications as a form of knowledge in their own right rather than a secondary add-on to empirical work [3, 68]. With this perspective, our five themes operate as generative insights grounded in lived reflections. Embodied moments of friction, sensory attunement, social performance, and material care inform concrete directions for computational fashion wearables. This methodology resonates with somaesthetic and first-person perspectives in fashion-tech [33, 64] and with arguments that designerly autobiographical accounts constitute rigorous HCI knowledge [30, 50].

Data were analyzed using Braun and Clarke's reflexive thematic analysis [12, 13]. The process is outlined in detail in the Procedure section. See Table 1 for the summary of this section.

3.1 Participants

Our study involved ten experienced researcher–designers, each with more than five years of practice in computational fashion and wearable design. We used purposive sampling to recruit information-rich cases [52], ensuring that all participants had direct experience crafting and wearing their own fashion-tech prototypes. Participants were invited via email, received full information about the study, and provided informed consent.

The participants came from diverse professional backgrounds, including interaction design, computational media, material research, fashion design, and textile craft. Their work ranged from social and playful wearables to soft interfaces, embodied ideation techniques, smart textiles, and somatic design. Despite these varied entry points, all shared a commitment to designing and testing computational garments through hands-on, bodily engagement,

Table 1: Methodology

No	Methodological Component	Description
1	Research Aim	Investigate how designers conceptualize and experience fashionability in computational fashion wearables (CFWs).
2	Methodological Orientation	Qualitative, practice-based inquiry focused on designers' reflections-on-action [58].
3	Rationale	Fashionability is grounded in tacit, embodied, and culturally situated experience. While quantitative metrics can capture certain dimensions, qualitative approaches are needed to explore how wearers sense, interpret, and negotiate it in practice [54, 61].
4	HCI Alignment	Follows fourth-wave HCI emphasis on lived experience, situated values, and practice-based knowledge [1].
5	Participants/researcher-designers Perspective	10 designer–researchers working in computational fashion wearables (see Table 2 for profiles). Participants served as both creators and wearers, enabling access to insider, tacit knowledge of how fashionability is felt and negotiated.
6	Data Collection Method	Semi-structured retrospective interviews encouraging participants to revisit design processes and experiences of wearing their prototypes.
7	Epistemological Positioning	Resonates with somaesthetic, first-person, and autobiographical design approaches treating the designer's body as a site of inquiry [30, 33, 64].
8	Analytic Framework	Reflexive thematic analysis [12, 13] emphasizing interpretive, researcher-generated coding.

Table 2: The Profile of Participants

Participants	University	Experience	Expertise & Research Interest
Int. 1	Amsterdam university	More than 10 years	Interaction designer and researcher working on Fashion Wearables
Int. 2	University of Calgary	More than 5 years	Computational media designer collaborating in making fashion wearables
Int. 3	University of California, Santa Cruz	More than 10 years	Researcher in Social Emotional Technology, focusing on Social and playful Wearables with Fashion Design background
Int. 4	Amsterdam university	More than 10 years	Fashion Technology Researcher Designer
Int. 5	Royal College of Art London	More than 10 years	Fusionist designer, and researcher focused on on-body interfaces (wearables), smart devices, and materials
Int. 6	Amsterdam university	More than 10 years	Fashion Technology Researcher Designer
Int. 7	University of Calgary	5 years	Fashion Technology Researcher Designer
Int. 8	Utrecht School of Arts	More than 10 years	Fashion Technology Researcher Designer
Int. 9	Eindhoven University of Technology	More than 10 years	Researcher designer in embodied ideation techniques (soft wearables)
Int. 10	University of Copenhagen	More than 10 years	Researcher designer in smart and craft materials, designing interactive and tangible artefacts and somatic experiences with technologies

offering a breadth of perspectives on fashionability as a lived practice. An overview of participants is presented in Table 2; to protect confidentiality, names and project details are omitted.

3.2 Procedure and Analysis

Each interview lasted 25–40 minutes and was conducted online. We used a semi-structured guide organized around three interconnected areas:

1. *Definitions of fashionability* in computational fashion wearables.
2. *Features and qualities* (material, sensory, social, aesthetic) participants felt contributed to fashionability.
3. *Lived experiences* of designing and wearing their own computational garments, including successes, failures, and shifts in perception over time.

Prompts were explicitly reflective and situated in concrete projects (e.g., Think of a garment you both designed and wore. Describe a specific moment when you were wearing a smart or fashionable wearable. What sensations or feelings did you notice in your body during that moment? What interactions or social reactions did this wearable evoke in others? Explain the experiences caused in you by wearing that smart, fashionable wearables in the public. These prompts were designed to elicit reflection-on-action [58], encouraging participants to revisit specific episodes of making, wearing, and iterating on their prototypes. All interviews were audio-recorded and transcribed verbatim.

We clarify that the first author conducted the initial coding and later analytic reflections. Three co-authors then reviewed selected transcript sections to question and extend these early interpretations. Discrepancies or alternative readings were discussed in weekly analytic meetings, where we compared perspectives, debated borderline cases, and refined our clusters. Themes were finalized only when all authors agreed they were firmly grounded in the data rather than products of individual interpretation.

We analyzed the data using Braun and Clarke's [13] reflexive thematic analysis, approaching it as an interpretive and iterative process rather than a fixed checklist. To illustrate how this worked in practice, we provide an example of how Theme 3, Design for Symbiotic Sensory Envelopes, was developed through successive rounds of coding, clustering, and refinement.

We began by immersing ourselves in the data, rereading transcripts and listening back to audio to attend not just to words but to tone and emotion. During this familiarization stage, we paid special attention to how participants narrated embodied moments, when a wearable "surrounded" them, "mirrored" their breath, or felt like "a second part of the body."

From these impressions, we generated a broad set of open semantic and latent codes such as extension of the spine, digital touch, sensory resonance, feels alive, part of me, monster touching you, breathing with me, persistent presence, and multimodal layering. At this stage, we kept the codes deliberately numerous to capture nuance without narrowing the analysis too quickly.

As we moved into clustering, we began grouping these codes into early conceptual families. Repeated references to second skins, alive surfaces, mirroring, co-presence, and the wearable guiding my movement gradually formed clusters such as hybrid agency, embodied reciprocity, persistent embodiment, and sensory extension. Other codes, for example, vibrations tracing the torso, feeling surrounded, and sound–touch combinations, clustered around multisensory resonance and layered sensation.

This phase was highly iterative. We moved back and forth between clusters and raw extracts, splitting some categories that proved too broad (e.g., pairing "digital touch" separately from "mirroring"), and merging others that overlapped (e.g., combining "co-presence" and "second-body feeling" into a single cluster). Analytic memos and visual maps helped us track how our interpretations shifted as we revisited data that complicated early assumptions.

Through this ongoing refinement, two coherent sub-themes emerged. Symbiotic Co-Agency captured participants' descriptions of wearables that acted with them; garments which were experienced as companions, partners, or subtle co-performers. Multisensory Dialogue described the dynamic interplay of vibration, breath, movement, color, and sound that created a continuous conversation between body and material.

Finally, we returned these sub-themes to our research questions and theoretical framing. We examined how they deepened our understanding of embodied fashionability, how they resonated with somaesthetic and post-phenomenological perspectives, and whether they genuinely captured the richness of designers' lived accounts rather than our own assumptions. This example shows the iterative, reflective, and interpretive approach that shaped the development of all themes in the study.

To make this process more transparent, we included Figure 1 which displays the analytic flow, from initial codes, through clustered categories, to overarching theme 3.

As illustrated in the diagram and described in our reflexive thematic process, Theme 3 was generated through repeated movement between extracts, codes, and developing interpretations. Across the dataset, participants described deeply embodied moments that pointed toward a reciprocal relationship between body and garment. They spoke of wearables that felt "like a mirror touching you" (Int10) or pieces that made fashion "no longer static" (Int7), highlighting sensations of co-movement, attunement, and sensory layering. We first coded these accounts as shape-change, rhythmic resonance, multisensory immersion, and hybrid agency. As we compared excerpts across interviews, these codes gradually clustered around a shared idea of garments and a clear pattern emerged: these wearables were not simply acting *on* the body but *with* it, turning them into the wearer's companion. Through continued review and refinement, this cluster developed into the theme *Design for Symbiotic Sensory Envelopes*, capturing how computational wearables become co-performers that engage the wearer through tactile, acoustic, and visual dialogue.

3.3 Statement of Positionality

Since interpretation is central to reflective analysis, we acknowledge our positionality. The author team consists of seven researchers based at a Nordic university: five trained in HCI and interaction design (three with wearable design experience), one with a background in fashion design, and one in economics. We represent Finland, Germany, India, Iran, and Turkey, and include diverse gender identities. As a group, we work across cloth interfaces, playful smart clothing, and fashion–technology integration. The first author conducted the initial coding and final interpretive analysis, while the co-authors participated in a series of collaborative sessions to generate, refine, and validate the themes. Together, we traced each theme back to the data and discussed how well our interpretations aligned with participants' intended meanings. The final themes therefore reflect collective deliberation rather than any single viewpoint.

This positionality situates our analysis within practice-based, interdisciplinary perspectives attentive to both fashion and computational design traditions. The following section presents the five themes that describe how designers conceptualize and experience fashionability in computational fashion wearables.

4 FINDINGS AND DISCUSSION

The findings from our qualitative study of computational fashion wearables (CFWs) draw on interviews with ten expert researcher–designers working at the intersection of fashion and technology. Using Braun and Clarke's [12, 13] reflexive thematic analysis, we developed five interrelated macro-themes that illuminate how designers negotiate the aesthetic, cultural, and experiential dimensions of wearables. Together, these themes show that fashionability is shaped through lived experience: through the sensations garments evoke, the cultural contexts they inhabit, and the expressive possibilities designers explore as both makers and wearers.

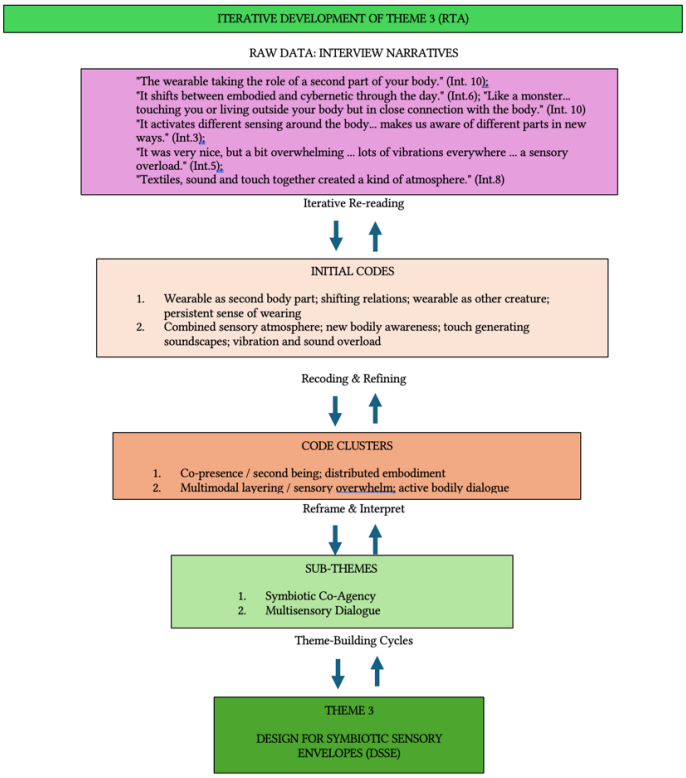

Figure 1: Schematic representation of Theme Construction Process

Table 3: An Overview of the Themes & Sub-theme

No	THEMES	SUB-THEMES
1	Design for Desirable Friction (DDF)	1.1. Tactile Engagement
		1.2. Collective Push-back
2	Design for Contextual and Sub-Cultural Relevance (DCSR)	2.1. Contextual Legitimacy
		2.2. Zeitgeist Alignment
3	Design for Symbiotic Sensory Envelopes (DSSE)	3.1. Symbiotic Co-Agency
		3.2. Multisensory Dialog
4	Design for Narrative Social Performance (DNSP)	4.1. Narrative-Driven Design
		4.2. Presence & Performative Display
5	Design for Adaptive Longevity & Circularity (DALC)	5.1. Modular & Re-configurable Expression
		5.2. Lifecycle & Sustainable Care
		5.3. Adaptive Fit & Sustained Comfort

Our analysis moved iteratively from concrete lived episodes toward more abstract conceptual themes. Table 3 presents the resulting themes and sub-themes. We emphasize that theme development was not a linear process; rather, we moved repeatedly between data, initial codes, and emerging clusters to ensure that the final themes remained grounded in participants’ intended meanings.

Five macro-themes (Table 3) were generated from our analysis. Design for Desirable Friction highlights how moments of resistance, awkwardness, or tactile intensity can be mobilized as positive design resources rather than treated as usability flaws. Design for Contextual and Sub-Cultural Relevance shows the importance of situating wearables within specific communities, zeitgeists, and cultural codes to achieve legibility and resonance. Design for Symbiotic Sensory Envelopes captures how computational garments co-perform with the body, creating multisensory dialogue and creating intimate, hybrid forms of embodied presence. Design for Narrative Social Performance illustrates how wearables act as dramaturgical devices that co-author stories with both wearers and audiences. Finally, Design for Adaptive Longevity and Circularity emphasize the ecological and experiential value of modularity,

repair, and sustained comfort, reframing wearables as evolving garments embedded within circular practices.

In the sections that follow, we present each theme and its sub-themes in detail. The section concludes with a set of actionable design directions that translate our findings into concrete guidance for the future development of computational fashion wearables.

4.1 THEME 1: Design for Desirable Friction (DDF)

This theme highlights how designers intentionally embed resistance, awkwardness, or sensory irregularities into computational fashion wearables (CFWs). Rather than seeing these as flaws, participants framed friction (tactile, social or experiential) as a resource for reflection, attachment, and meaning making. This view challenges dominant HCI and fashion paradigms that prioritize seamlessness and efficiency [22, 48]. Participants highlighted how reversible textures, vibrotactile pulses, and constraining silhouettes can produce micro-moments of surprise or resistance that heighten bodily awareness and spark curiosity. They "push society a little bit" (Int.6), and "create a quality that elicits desire" (Int.5). Such accounts framed awkwardness not as a usability flaw but as a form of aesthetic tension or desirable friction that helps garments prompt reflection, invite attention, and cultivate presence.

The two sub-themes below, Tactile Engagement and Collective Push-back, show how specific forms of friction (tactile resistance and cultural hesitation) shape fashionability and guide design decisions.

4.1.1 Sub-theme 1: Tactile Engagement [making the hand linger]. Participants emphasized the haptic qualities of materials as a key form of friction in CFWs. As one noted, "If it has tactile quality that people like to touch…" (Int. 3), pointing to reversible sequin shirts that "children just love to stroke" (Int. 3). Another stressed, "we focus on the tactility of the materials we use and also use a very empathic soft approach" (Int. 1). Such tactile surfaces deepen bodily awareness and invite playful interaction, making garments approachable and socially engaging.

Haptic resistance also made wearables memorable. Wearing the SoundShirt felt "very nice, but… a bit overwhelming, lots of vibrations everywhere" (Int. 5), while the Breathing Corseto acted "like a mirror touching you" (Int. 10). Such sensations created small interruptions that provoked attention and conversation, reinforcing fashionability through embodied distinctiveness. Tactile engagement also involved constraint. Int. 5 described the Patuki costume, where "your arms are tight here… it's a performance, not clothing." Although uncomfortable, this restriction heightened awareness and produced aesthetic drama, echoing Tsaknaki and Fernaeus's [66] idea of "tactile micro-dramas."

Together, these accounts suggest that tactile engagement is not a barrier but a source of intrigue and expressiveness. By making the hand linger, sparking curiosity, or provoking dialogue, friction becomes part of what makes CFWs fashionable.

4.1.2 Sub-theme 2: Collective Pushback [when culture says no or not yet]. Participants reflected on wearables are judged collectively, and designs that feel 'too different' often trigger discomfort or rejection, creating 'this uneasy feeling in people' (Int. 5). As one explained, 'Everything we make in fashion, we push society a little bit… we do make these frictions happen' (Int. 6). Failures like Google Glass, which 'didn't blend with social codes' (Int. 4), and Dyson's air-purifying headphones, 'People don't want to look ridiculous' (Int. 5), show how technological novelty can clash with cultural expectations. By contrast, the Levi's Jacquard Jacket was praised precisely because it embedded novelty within a familiar silhouette: 'the design was very nice… it looks really good' (Int. 5).

Participants did not view resistance as a setback but as part of the adoption process. "People need time to get used to it" (Int. 6), one reflected. Pushback acts as a pacing device that slows diffusion, invites dialogue, and gives designers room to refine ideas. Crucially, this negotiation shapes fashionability itself. A wearable that initially seems strange can become desirable once its unfamiliarity settles into style, aligning with arguments that hesitation and friction can be productive forces in design [2, 29].

In sum, collective pushback shows how wearables enter fashion not through seamless acceptance but through cycles of hesitation, critique, and eventual adoption. These processes paradoxically help establish their cultural and fashion value.

4.2 THEME 2: Design for Contextual & Sub-Cultural Relevance (DCSR)

This theme shows that computational fashion wearables (CFWs) become fashionable only when they resonate with the cultural, spatial, and social worlds of their users. Participants emphasized that "different communities decide to accept and reject certain things" (Int. 6), and what reads as desirable in one space may feel out of place or even socially risky in another (Int. 5). Initial codes such as social acceptance, subculture, societal readiness, and user-centeredness revealed that fashionability is not a universal property but a negotiated fit between a wearable and its context. Designers described the need to respect local aesthetics, subcultural norms (e.g., streetwear, cyberpunk), and everyday expectations so garments "blend in society more than standing out" (Int. 8). Together, these accounts position contextual and cultural fit not as an afterthought but as a structuring design principle. The following sub-themes, Contextual Legitimacy and Zeitgeist Alignment, illustrate how meaning emerges from where and when CFWs appear.

4.2.1 Sub-theme 1: Contextual Legitimacy [Design for the Room]. Participants underlined that computational fashion wearables (CFWs) gain meaning only within the specific contexts where they are worn. One designer stated, "Actually it should be so contextualized to the … design brief or the goal" (Int.3). Some described how prototyping "on the body, in specific environments" (Int. 1) reveals affordances and breakdowns that studio testing cannot detect. Technology, several argued, should start from the person (Int.4), grounding design in embodied and cultural practice.

Context shaped not only how garments functioned but how they were read. A piece designed for performance could appear "almost magical" on stage (Int. 7), yet in everyday commuting designers preferred pieces that "blend in society more than stand out" (Int. 8). Meaning also shifted across settings: a garment that felt like spectacle on a runway could prompt reflection in a museum, and in daily life might feel "awkward or intrusive" (Int. 5).

These accounts underline that wearables operate as "situated interfaces" whose significance emerges through the environments and practices they enter. The same garment can signal spectacle, subtlety, or discomfort depending on where it appears. Designers described such moments as garments becoming social co-performers [24, 47], testing the limits of fashionability by negotiating visibility, attention, and discretion.

4.2.2 Sub-theme 2: Zeitgeist Alignment [Catching the Current Wind]. If context determines where garments succeed, zeitgeist alignment determines when. Participants repeatedly linked fashionability to cultural timing: "Fashion… is something that is like the present" (Int.2); "If it's fashionable… there is a big crowd of people following this idea right now" (Int.3). societal readiness was seen as decisive. One warned that ideas released too soon risk being dismissed as "a gimmick… not necessarily serving the wearer" (Int.1), and that "sometimes you have the right idea, but the time is wrong and people don't get it" (Int.4). Others described how trends accelerate when timing aligns: "There is a moment when everyone suddenly starts doing it, and then it becomes the trend" (Int.7).

Participants also pointed to cultural signals that foreshadow shifts. Art and design were seen as early indicators: "Art often reflects what's going to be fashionable in a few years" (Int.3). Similarly, one explained, "It has to… relate to… what's going on in the world… like the zeitgeist" (Int.2). Another linked timing to global events, noting that wearables around health and safety "suddenly made sense during the pandemic" (Int.8).

Overall, Zeitgeist Alignment positions temporality as a design material. Rather than treating timing as a marketing concern, designers emphasized anticipating cultural rhythms so garments meet moments of openness and readiness. As Int. 2 and Int. 3 reminded, fashion is "of the present," yet designs must remain flexible enough to evolve as the cultural wind changes.

4.3 THEME 3: Design for Symbiotic Sensory Envelopes (DSSE)

This theme captures how designers conceive CFWs not as symbolic artefacts but as symbiotic sensory envelopes that co-create embodied experience. Participants framed these garments as blurring boundaries between body and technology, enabling new forms of agency, intimacy, and multisensory engagement. Initial codes such as co-agency, tactile resonance, embodied mapping, and multisensory layering revealed a shift from fashion as communication [5] toward fashion as felt interaction. Participants stressed that design must start from the person (Int.4) and approach computation as a malleable design material shaped through bodily practice. This aligns with embodied interaction and post-phenomenological perspectives, which argue that technologies mediate perception and self-expression [33, 35, 67]. Together, these reflections show CFWs as 'co-performing partners' that transform touch, motion, rhythm, and sensory feedback into expressive, relational experience.

What follows unpacks two interrelated sub-themes: Symbiotic Co-Agency, which focuses on garments as co-actors that share agency with the body, and Multisensory Dialogue, which explores how wearables stage embodied resonance across tactile, acoustic, thermal, and visual registers.

4.3.1 Sub-theme 1: Symbiotic Co Agency [when fabric answers back]. Participants described wearables as entities that act with the wearer, extending action, perception, and identity. This view grew from lived experiences where garments appeared animate or responsive. In the Breathing Wings, the expanding textile felt like "a living extension of the spine… a new kind of body, human, but more than human" (Int. 10). Int. 4's AR fabric experiments enabled wearers to inhabit multiple presences, "I could be wearing it on my phone… while you could see me with a different animation," illustrating how identity becomes distributed across physical and digital layers. These garments created hybrid presences, sometimes body, sometimes creature, sometimes avatar, which pushed wearers to negotiate identity in flux.

Other emphasized the importance of embodied mapping between action and response. Int.9 stressed designing "direct mapping… so the wearer is in control," while Int. 7 noted that computation makes fashion "dynamic… it can change and morph and tell that story." Across reflections, wearables moved from decorative layers to co-actors shaping expression, gesture, and bodily ontology. Symbiotic co-agency captures this stance: garments participate in meaning-making by moving beyond passive adornment into co-performing partners.

4.3.2 Sub-theme 2: Multisensory Dialogue [designing for goosebumps]. While Symbiotic Co-Agency highlights shared agency, Multisensory Dialogue focuses on sensory resonance, the felt aesthetics that arise when garments layer tactile, acoustic, thermal, and visual cues. Int. 10's Breathing Corseto mirrored respiration through shape-change, creating an uncanny sensation of being "touched by a monster." Int. 8 described a museum-tested sound jacket that blended tactile fibers with sound feedback across the shoulders. Int. 5 recalled wearing SoundShirt as "a second-skin loudspeaker," at times overwhelming. These examples show how computation becomes felt rhythm, vibration, and atmosphere.

Multisensory Dialogue was also social. Reactive garments "spark impromptu conversations with strangers, like a band T-shirt" (Int. 7), and Int. 3 described designs acting as "ice-breakers" that invite curiosity. The Nebula garment, which produced ethereal soundscapes when touched, altered the wearer's body-space interaction, and blurred private sensation with public intrigue. Collectively, these accounts illustrate that wearables succeed when they generate goosebump moments and sustain fashionability through multisensory intrigue.

4.4 THEME 4: Design for Narrative Social Performance (DNSP)

This theme suggests how designers framed computational fashion wearables (CFWs) as performative interfaces that shape stories between the wearer, the garment, and the surrounding audience. Rather than being static or decorative, wearables were experienced as dramaturgical devices or responsive platforms where narratives unfold over time. One designer stressed the triadic relation between "the wearable itself… the wearer and… the surroundings" (Int.1), positioning garments as live interfaces that mediate between body, technology, and public. DNSP thus highlights how wearables stage presence, generate intrigue, and choreograph social meaning through time-based interaction. To explore this, we identify two

sub-themes: Narrative-Driven Design, which emphasizes garments as unfolding stories, and Presence & Performative Display, which positions the body as stage.

4.4.1 Sub-theme 1: Narrative-Driven Design [stories in motion]. Participants described CFWs as narrative media whose meaning emerges through movement and interaction. "There's always a story in the background… that influences all the design decisions" (Int. 1). These narratives ranged from intimate garments that "lit up when we got near [my dog]" (Int. 7) to multi-layered AR stories in which a wearer appeared with different animations across screens and physical space (Int. 4), and even civic storytelling, such as "bringing awareness to women walking alone at night" (Int. 7).

Choreography was central: "Choreography… [is] important for displaying the functionality of a garment" (Int. 1), not only on stage but in everyday gestures where bends, breaths, or steps trigger expressive behaviors. Examples included the Aurora/Northern Lights Dress creating luminous public moments, the Breathing Corseto turning respiration into a dramatic pulse (Int. 10), AR outfits enabling "parallel stories" (Int. 4), and the Green-Screen Chroma-dress transforming the wearer into a live chroma-key surface.

Together, these examples show that narrative-driven design uses pacing, rhythm, and responsiveness to script garments as unfolding plots, with body and garment co-authoring personal and social stories.

4.4.2 Sub-theme 2: Presence & Performative Display [the body as stage]. Presence and Performative Display also treats bodily presence and spectacle as core design materials. Participants described how wearables amplified presence, turning someone into "the life of the party" (Int. 7) or creating new embodied forms that "take shape… take space" (Int. 10). This presence was expressive but also risky; as Int. 4 noted, "there's a novelty aspect… you're just drawing attention to yourself." Designers emphasized the need for garments that can shift visibility so wearers can blend in or stand out as desired.

Examples illustrate this range. LED costumes for circus and theatre expanded bodies into shared performance surfaces. The Nebula garment generated ethereal soundscapes that extended presence into atmospheric space, while the Phototrop jacket balanced safety visibility with aesthetic expression for runners. These cases show how presence can empower or unsettle, depending on how visibility is staged.

The sub-theme captures how CFWs help wearers negotiate attention, scale, and public meaning, extending fashionability into choreographed social presence.

4.5 THEME 5: Design for Adaptive Longevity & Circularity (DALC)

Design for Adaptive Longevity & Circularity (DALC) focuses on how wearables live after their initial debut. Participants emphasized that CFWs must evolve with their wearers: "If it doesn't evolve with the person, it's abandoned" (Int. 4). DALC treats wearables as living systems meant to be repaired, refreshed, and adapted, aligning with sustainability research on circularity and emotional durability [27, 57]. Longevity was tied to comfort, modularity, and care: "If something breaks, you should be able to fix it" (Int. 5); and, "You can easily detach it… wash it… and recycle it" (Int. 8). Taken together, DALC shifts wearables from temporary showpieces to adaptive systems whose fashionability is sustained through renewal.

The following sub-themes. Modular & Re-configurable Expression, Lifecycle & Sustainable Care, and Adaptive Fit & Sustained Comfort illustrate how designers translate this stance into practice.

4.5.1 Sub-theme 1: Modular & Reconfigurable Expression [garments as mutable archives]. Participants described modularity as both technical and expressive. Int. 1's Second-Skin LED dress used magnetic petals that could be rearranged to "give the wearer agency over their expression." Thermochromic fabrics offered "modular characteristics" (Int. 10) that refresh a garment's appearance without waste. Int. 3 added that color-changing textiles that "shift hue depending on light and movement," gave wearers "a sense of control over their own expression."

Interviewees framed this adaptability as something visible and performative: a jacket might stay minimal during daytime commuting but transform at night with detachable illuminated panels; haptic patches could be subtle in private but bold on stage. As Int. 7 put it, technology should "streamline with the fashion… and make it look almost magical."

Modularity thus becomes a living archive; each rearrangement rewriting the garment and extending its relevance. Computational modules (LEDs, sensors, behaviors) act as expressive building blocks, echoing Entwistle's [24] notion of dress as a "negotiated interface," now programmable and reconfigurable.

4.5.2 Sub-theme 2: Lifecycle & Sustainable Care [fashions with afterlives]. Participants emphasized care and repair across a garment's life. Detachability was central: "You can easily detach it… wash it… up to the end-of-life so that we can also recycle it" (Int. 8). Circularity, they argued, begins at the design stage, saying wearables should be easy to disassemble, clean, and renew. Int. 6 framed this as a systemic challenge: designers must consider "material, service, system and ecology."

Care was seen as part of fashion expressiveness, not a burden. Garments should "feel like something you keep, not just throw away" (Int. 1), and "if something breaks, you should be able to fix it" (Int. 5). Examples like the Levi's Jacquard jacket's replaceable cuff and the Intimacy Dress [70], which required regular upkeep, showed how maintenance can deepen attachment. These accounts align with sustainable fashion scholarship that treats mending and modular replacement as forms of ongoing engagement [27, 57].

Lifecycle care therefore positions wearables as fashions with afterlives; pieces meant to be lived with, maintained, and reinterpreted rather than discarded.

4.5.3 Sub-theme 3: Adaptive Fit & Sustained Comfort [somaesthetic second skins]. Participants tied long-term wearability to comfort and adaptability. Garments must be ergonomic and non-intrusive: "not heavy, not cumbersome" (Int. 5), and "super comfortable and still supportive" even under strain (Int. 8). Comfort was also temporal; garments must adapt as bodies, contexts, and activities change.

Examples showed how adaptive fit sustains attachment. The Breathing Corseto/Wings (Int. 10) adjusted to bodily movement; thermochromic textiles refreshed appearance without waste (Int. 3); soft material approaches (Int. 1) and seamless integration (Int.

7) supported social ease. Participants warned that wearables lose relevance quickly if they fail to evolve. Int. 6 described a "90-day drop-off," and Int. 4 stressed that garments "have to evolve with the person." Int. 5 noted that overstimulation, as with the SoundShirt's intense vibrations, can diminish long-term comfort.

Adaptive fit therefore involves designing somaesthetic second skins that feel right, remain comfortable, expressive, and adjustable across seasons, bodies, and situations, supporting durable attachment beyond the novelty phase.

5 DISCUSSION

Our findings show that fashionability in computational wearables is not a fixed aesthetic property but a quality designers negotiate through lived, reflective practice. Drawing on their reflection-on-action accounts, we illustrate how fashionability takes shape through sensory attunement, ongoing adjustments, and social interpretation. Our contribution lies in articulating the situated processes and experiential vocabulary that researcher-designers use to make sense of fashionability while making and wearing their own prototypes. This includes qualities such as desirable friction, contextual attunement, sensory envelopes, narrative social performance, and adaptive longevity, which together offer a grounded view of how fashionability is experienced in practice.

We now turn to two guiding questions that shaped our analysis:

1. How do wearable design researchers frame fashionability in computational fashion wearables?
2. What kinds of fashionable wearing experiences do these designers aim for and encounter during the design process?

5.1 How Do Design Researchers Frame Fashionability in Their CFW Projects?

When reflecting on their own projects, participants consistently framed fashionability not as an afterthought but as a central design resource. They explained that fashionability is created through the interplay of making and wearing garments. Speaking in the first person, they described fashionability as a matter of deliberately pushing against boundaries, testing how much friction, awkwardness, or surprise the body can carry. This approach resonates with work showing that discomfort, ambiguity, and friction can serve as constructive experiential materials rather than flaws [6, 44]. At the same time, these experiments had to stay in dialogue with broader cultural rhythms (Theme 1 and 2). As one participant put it, designing wearables is always about "pushing society to look at things differently" (Int.6), but never apart from the cultural moment that shapes what feels acceptable, bold, or absurd. Participants also described how this boundary-pushing carries both creative potential and practical strain, since friction is felt not only on the body but within the social atmosphere that surrounds a garment.

For our researcher-designers, fashionability was less about polish and more about provocation. It happened in textures that invite touch, in constraining costumes that re-choreograph the body, or in garments that shimmer only under certain light (Theme 4). Such strategies turned friction into an asset, echoing research that highlights material expressivity and resistance as aesthetic resources [66].

At the same time, the theme of Desirable Friction makes clear that friction was not always generative. Participants described bodily tensions where sensory intensity, weight, or restricted movement shifted the experience from intriguing to tiring. These moments reflected the limits of friction as a design material: sensory overload could reduce clarity, and constraining silhouettes sometimes produced physical strain rather than expressive tension. Such accounts align with research showing that textile-based wearables can introduce pressure, heat, or fatigue during extended wear [4, 62]. Desirable Friction also surfaced socially, where unusual silhouettes or unfamiliar gestures drew more attention than intended. Participants reflected that certain expressive behaviors could feel out of place or overly bold in public settings, highlighting the balance designers must strike between aesthetic provocation and social comfort. This dynamic echoes somaesthetic perspectives in which heightened sensory expressiveness can deepen bodily awareness while simultaneously increasing vulnerability or social exposure [40].

These accounts remind us that resistance and awkwardness can generate intrigue, reflection, and memorability, yet they also show that the same expressive qualities can unsettle both the wearer and the viewer when pushed too far. Designers noted that pushing boundaries is essential, but they also stressed the need to remain mindful of how far to push, since too much provocation can slip into social rejection. Fashion, in their view, requires experimentation tempered by sensitivity to cultural context. A garment that feels exciting in one cultural scene may be mocked in another, especially when its gestures or silhouettes fall outside familiar visual codes. This dynamic was illustrated by the decline of Google Glass when it clashed with public norms and became a symbol of cultural misalignment rather than innovation. Fashionability, in this sense, was always relational, defined not only by what the designer builds but by how culture receives it (Theme 2).

Equally important was the push into new sensory territories (Theme 3). Wearables like the SoundShirt or Breathing Wings were framed as attempts to create "goosebump moments," where vibration, breath, or movement blur into a felt dialogue between body and garment. Here, fashionability was shaped by both sensory richness and its constraints, such as heavy batteries, fragile electronics, or sensations that risk becoming overwhelming. Designers described these limitations not as failures but as part of the expressive language of the medium, making maintenance and care central to the aesthetic of wearing. This aligns with perspectives that view expressive resistance and sensory tension as integral to experience rather than defects [6, 44].

Finally, designers framed fashionability through time (Theme 5). They spoke of garments as "fashions with afterlives," objects that evolve with their wearers through repair, modularity, and reconfiguration. Longevity became an aesthetic in itself, where sustained comfort, adaptability, and cultural resonance mattered as much as novelty. This suggests that material and energy constraints need not limit wearables to purely functional devices; with thoughful design, they can embody aesthetic and sustainability values, supporting our call for wearables as culturally legible, durable, and sensory-rich garments.

Taken together, these reflections show that for researcher-designers, fashionability is a practice of negotiation between friction and fluency, provocation and acceptance, sensory expansion and material limits, novelty and care. In this sense, it becomes the process through which CFWs function as companions that grow with their wearers, mediating sensation, identity, and care over time. Drawing across these accounts, our study conceptualizes fashionability as an embodied and relational quality that emerges through the wearer's sensory dialogue with the garment, the social reactions it provokes, and the cultural moment it inhabits. Rather than a static attribute or visual style, fashionability is a dynamic process in which designers deliberately calibrate friction, resonance, visibility, and temporality to create garments that feel alive, responsive, and culturally attuned. Our results reinforce prior research that views friction, discomfort, ambiguity, and expressive resistance as valuable experiential materials rather than usability flaws [6, 44, 66]. By framing wearables this way, our study strengthens calls for fashionable interactions [63] and embodied textile practices [40], showing how fashionability becomes a dynamic design resource grounded in lived making, lived wearing, and shifting cultural rhythms.

5.2 How is Fashionability Experienced by the Design Researchers as Wearers?

Participants described fashionability less as a visual effect and more as an embodied, affective, and social experience. For them, fashionability was felt on the skin, through movement, and in encounters with others. Several also noted that these sensations could oscillate between pleasure and strain. A vibration pattern might feel thrilling in one moment yet distracting in another, and the weight or heat of a garment could shift from comforting to demanding over longer wear. A recurring theme was the sense of sensory presence (Theme 3): the wearable could feel "like a monster… touching you or living outside your body but in close connection with the body" (Int.10), or as part of "a new type of body where the boundaries are blurred of the wearer and the wearable" (Int.10). One participant described the Breathing Wings as "something really surrounding you… taking the role of a second part of your body" (Int.10). while the SoundShirt translated music into vibrations across the torso, described as both overwhelming and powerful (Int.5). These experiences highlight how fashionability emerges through resonance, goosebumps, and intimate body–garment dialogues, aligning with recent studies showing how haptic and thermal wearables can reshape comfort and attachment over time [25, 32]. They also support research showing that amplified or prolonged sensory input can tax attention or reduce perceptual clarity in soma-based interfaces [4, 33, 40]. Accordingly, sensory richness requires careful modulation to avoid overwhelming the wearer or diminishing expressive nuance.

Fashionability was also experienced as social performance (Theme 4). The Aurora Dress transformed a private bond with a pet into a luminous public display, while LED costumes and the Nebula garment revealed their full meaning only in collective performance. In these cases, garments acted as dramaturgical media, staging presence and co-authoring stories with audiences. Yet participants also spoke about moments when this visibility felt less controlled. A gesture that was intended to be expressive could be misunderstood or draw more attention than intended, creating brief uncertainty about how to carry or inhabit the garment in public spaces. This resonates with Goffman's [31] dramaturgical model and with Blanco Cardozo's [11] notion of self-fashioning technologies, where identity is shaped through negotiation of visibility, intimacy, and discomfort.

Participants further linked fashionability to comfort and adaptability (Theme 5). A garment was only fashionable if it felt right on the body and could adapt across different settings. As one designer stressed, it must be "not heavy, not cumbersome" (Int.5), while another warned that unless garments "evolve with the person" (Int.4), they risk being abandoned after the initial excitement, often described as the "90-day drop-off" (Int.6). These reflections align with Fletcher's [26] craft of use, Odom et al.'s [49] work on attachment, and Jabari et al.'s [36] review highlighting adaptability as central to long-term fashionability.

Finally, fashionability was experienced as a negotiated risk (Theme 1). Wearing illuminated or unconventional garments in public carried the risk of drawing attention and judgment. For some, this was precisely the point; fashionability meant provocation, friction, and spectacle. For others, it required careful balancing, making technology feel good without alienating audiences. This negotiation mirrors arguments in wearables and fashion-tech research that technologies must align with cultural rhythms, dress codes, and social atmospheres to be embraced [17, 43, 60].

In sum, wearers experienced fashionability as an interplay of sensory resonance, social dramaturgy, comfort, and risk. They also experienced moments of hesitation when sensations, attention, or environmental expectations pushed beyond what felt manageable or appropriate. These tensions show that fashionability is shaped through both connection and constraint. It involved not only looking stylish but feeling connected bodily, socially, and culturally through garments that sustain attachment and provoke reflection over time.

5.3 CONTRIBUTIONS OF THE STUDY

This study contributes to ongoing conversations about fashionability in computational fashion wearables (CFWs) by grounding the concept in the reflective accounts of ten designer–researchers who also wear the prototypes they create. Prior work has called for more fashionable interactions [63], emphasized the embodied and atmospheric qualities of interactive textiles [19], and shown how projects such as Levi's × Jacquard or CuteCircuit's SoundShirt achieve cultural resonance when technologies align with familiar dress codes. We complement this work by offering a researcher-designer perspective that reveals how fashionability is articulated, tested, and negotiated in practice.

Our first contribution is conceptual. We frame fashionability as a dynamic, multi-dimensional quality expressed through five themes: desirable friction, contextual and subcultural relevance, symbiotic sensory envelopes, narrative social performance, and adaptive longevity and circularity. These themes describe how researcher-designers tune movement behaviors, vibrotactile patterns, sensory pacing, silhouette changes, and social signaling to shape desirability.

Our second contribution is methodological. By centering researcher-designers as holders of tacit design knowledge, we show how they link decisions such as actuator placement, material choice, or modular configuration to their lived experiences of comfort, awkwardness, attachment, or rejection. This dual insider perspective complements end-user studies, which rarely capture the reasoning behind a garment's expressive behavior.

Our third contribution offers situated design directions, including calibrating friction, prototyping within relevant cultural scenes, treating sensory mappings as adjustable experiential dynamics, designing garments as narrative media, and embedding modularity and care routines for long-term use.

Together, these contributions position fashionability as a sensory, cultural, and temporal quality shaped through lived making and wearing.

6 DESIGN IMPLICATIONS AND ACTIONABLE DIRECTIONS

Table 4 summarizes the design implications and actionable directions that emerged from our study. Each theme highlights how fashionability in computational wearables can be mobilized as a design resource, ranging from tactile friction and contextual resonance to sensory intimacy, narrative staging, and long-term adaptability. Table 4 presents these themes alongside their key implications and concrete examples, providing a concise guide for designers and researchers.

These directions (table 4) are not universal prescriptions but situated insights drawn from researcher–designer reflections. Together, the five themes show how fashion-oriented concerns can be operationalized in wearable design practice, articulating recurring design logics rather than fixed solutions, and highlighting how fashionability emerges through interaction, context, sensation, performance, and longevity.

Desirable Friction reframes moments of resistance or delay not as usability failures but as expressive resources that can shape bodily awareness and social curiosity. Contextual and Sub-Cultural Relevance highlights how wearables gain meaning when designed for specific social worlds, emphasizing situated prototyping and adjustable visibility over universal aesthetics. Symbiotic Sensory Envelopes foreground the body–garment relationship, showing how subtle multisensory feedback can foster intimate, reciprocal experiences. Narrative Social Performance extends this relational view to public settings, positioning wearables as garments that scale their expressivity across intimate, social, and performative contexts. Finally, Adaptive Longevity and Circularity situate fashionability over time, emphasizing modularity, repair, and comfort as prerequisites for sustained engagement.

7 LIMITATIONS OF THE STUDY

While this study offers new insights into the fashionability of computational fashion wearables (CFWs), several limitations must be acknowledged. Our participants were ten experienced researcher–designers working at the intersection of fashion and technology. Their dual role as creators and wearers offered privileged access to tacit knowledge but also narrows the range of perspectives represented. Professional designers differ from everyday wearers, consumers, and marginalized groups, so the findings should not be generalized to broader markets where motivations, comfort thresholds, and cultural codes may vary.

Methodologically, the study relied on semi-structured, reflective interviews that favored participants' retrospective interpretations. Such accounts are effective for accessing embodied and tacit knowledge but are shaped by selective recall. Because no quantitative or mixed-method triangulation was used, we cannot make claims about prevalence or comparisons across user groups. Future work combining reflective accounts with wearability metrics, physiological sensing, or controlled evaluations could offer complementary insights.

Although we encouraged participants to recount concrete wearing episodes and project histories, the data remain situated within narrative rather than observational evidence. Complementary methods such as ethnographic shadowing [18, 46], longitudinal wear trials, or participant wear diaries would strengthen ecological validity and help capture the temporal dynamics of attachment, discomfort, and acceptance.

Finally, many examples discussed such as the Breathing Corseto, Second-Skin LED dress, and Phototrop jacket were research prototypes used in performative contexts rather than everyday environments. These cases reveal experimental design thinking but may not predict adoption trajectories or long-term use in ordinary settings.

8 CONCLUSION

This study deepens understanding of computational fashion wearables (CFWs) by identifying five themes, Desirable Friction, Contextual and Sub-Cultural Relevance, Symbiotic Sensory Envelopes, Narrative Social Performance, and Adaptive Longevity and Circularity. Together, they show that CFWs are not merely functional devices but cultural artefacts that mediate sensory experience, identity, and meaning.

Friction was seen as a meaningful yet demanding design material. It was both generative and demanding. Participants described how tactile resistance, awkwardness, and disruption can spark curiosity and attachment, while also noting that excessive intensity or visibility can fatigue the body or feel socially out of place. Designers treated these tensions as part of an ongoing process of attunement. Participants described tactile resistance, social awkwardness, and moments of disruption as qualities that could spark curiosity, prompt reflection, and deepen attachment. These accounts align with research that positions discomfort and ambiguity as constructive experiential resources. At the same time, participants recognized the limits of friction. Stiffness, heat, or weight could fatigue the body, and unfamiliar gestures or silhouettes could draw more attention than expected. Rather than treating these challenges as failures, designers approached them as part of a continuous process of attunement, adjusting intensity and visibility so that friction remained expressive without overwhelming wearer or context.

Contextual resonance was equally important: wearables succeeded when they aligned with local dress codes and cultural rhythms. Symbiotic sensory envelopes illustrated how garments extend bodily perception, though these sensory extensions can

Table 4: Design Implications and Actionable Directions

No	THEMES	DESIGN IMPLICATION EXTRACTED FROM THE DATA	ACTIONABLE DESIGN DIRECTIONS BASED ON THE DATA PARTICIPANTS' DESIGN SUGGESTION	DESIGN EXAMPLES	HOW ARE THEY RELATED
1	Desirable Friction (DDF)	Mobilize friction as a design material resource not as a flaw.	a. Craft intentional [micro-] frictions (Int. 3, 5 & 10) b. Use friction to prompt social interaction (Int. 7 & 9) c. Design temporal friction (Int. 6 & 2)	e.g. a garment that only illuminates after some seconds of contact with light or proximity	This creates a brief micro-friction that slows the wearer's gesture, invites curiosity from observers, and uses timing as an expressive element rather than an error.
2	Contextual & Sub-Cultural Relevance (DCSR)	Ensure designs echo with specific contexts and communities rather than universal appeal.	a. Prototype in lived environments (Int. 1, 5 & 8) b. Co-design with subcultures (Int. 3 & 6) c. Modulate visibility (blending vs. standing out) (Int. 4 & 8)	e.g. garments with two modes: 1. Camouflage mode: muted colors, textile-only affordances, hidden electronics. 2. Spectacle mode: illuminated, sound-emitting, or shape-changing features activated through a gesture or mobile app.	This dual-mode design supports prototyping in different social contexts, allows designers to tune the garment with specific subcultures in mind, and makes visibility an adjustable quality that can shift between blending in and standing out.
3	Symbiotic Sensory Envelopes (DSSE)	Design wearables as multisensory companions.	a. Design for goosebump moments (Int. 5 & 10): Create brief sensory contrasts (stillness → vibration, quietness → light) that feel alive on the body. b. Create reciprocal body–garment mappings (Int. 9 & 10): Let the garment respond directly to something the wearer does (breath, steps, posture, proximity), forming a feedback loop. c. Use embodied prototyping (Int. 1, 8 & 10): Test sensations on the body to ensure the timing, intensity, and placement feel coherent and meaningful in use.	e.g. a motionless and dim shoulder piece suddenly performs a five second vibration along the shoulder blade and a gentle sweeping light across the collar, when the wearer reaches a personal milestone (e.g., hits a step-count goal).	The body and garment co-create experience: This creates a small goosebump moment (a brief surprise by shifting from stillness to sudden vibration or light) and establishes a reciprocal loop where the garment responds directly to the wearer's bodily action.
4	Narrative Social Performance (DNSP)	Design wearables as dramaturgical media.	a. Embed narrative arcs (Int. 4, 7 & 10) b. Movement-based storytelling (1 & 7) c. Support multiple performance scales (Int. 7 & 8)	e.g. a jacket designed for three levels of visibility: 1. Intimate: small texture shifts, gentle haptics, subtle fabric "breathing." 2. Social: medium light patterns or small silhouette changes. 3. Spectacle (on stage): bold animations, AR effects, or projection-ready surfaces.	This layered visibility lets the jacket tell different stories in each setting, helping the wearer communicate quietly in physical proximity, stand out in social spaces, and perform boldly on stage.

5	Adaptive Longevity & Circularity (DALC)	Design wearables that evolve, endure and repair	a. Build modular, reconfigurable systems (Int. 1 &10) b. Embed care and repair into design (Int. 6 & 8) c. Prioritize ergonomic, adaptive comfort (Int. 2, 3, 5 & 8)	e.g. a modular light-enabled coat with snap-off LED panels, interchangeable sleeves, and relocatable haptic modules.	Users can repair or replace parts as needed and adjust the modules for comfort, allowing the coat to evolve with their needs over time.

become overwhelming if not carefully balanced. Narrative Social Performance highlighted wearables as dramaturgical media, and Adaptive Longevity reframed sustainability as an embodied practice of modularity, repair, and evolving fit.

Overall, the study reframes CFWs as multimodal interfaces as sensory companions, mnemonic archives, performative stages, and evolving ecosystems of care. They act as cultural, sensory, and temporal companions that participate in how people sense, move, express identity, and build attachment across time. This perspective enriches fashion theory by showing how computational wearables transform garments into live, sensory, and culturally negotiated experiences, moving beyond traditional semiotic interpretations that treat meaning as static. It contributes to HCI by foregrounding embodiment, temporality, friction, and cultural resonance as essential design resources. It also clarifies that fashionability is negotiated across the dimensions reflected in our themes, comfort and adaptability (DALC), attention and visibility (DNSP), cultural alignment (DCSR), and expressive risk (DDF), rather than being determined by aesthetic form alone.

Finally, the study demonstrates the value of researcher-designer reflections for accessing tacit, experiential dimensions that conventional usability methods often cannot access.

Future work could include longitudinal wear trials, cross-cultural studies, and participatory prototyping. For practice, the themes point toward strategies such as attuning friction, treating sensory mappings as expressive materials, scripting garments as narrative systems, and embedding modularity and care throughout the garment's lifecycle. In this way, computational fashion moves from spectacle toward resonance, becoming part of the lived cultural fabric of everyday life.

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