Université de Montréal

Feminist Contributions to Industrial Design and Design for Sustainability

Theories and Practices

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Résumé

Ce projet étudie comment des perspectives féministes pourraient informer les théories et les pratiques du design industriel et du design durable. Les diverses perspectives féministes sur et dans le design industriel promettent d'offrir plusieurs contributions uniques et précieuses, en surlignant des problèmes sociaux ou en lien avec la durabilité dans le domaine et en suggérant des options plus durables. Cependant, il n'y a pas beaucoup d'initiatives féministes en design industriel, donc les contributions potentielles d'une perspective féministe ne sont pas bien connues et sont minimalement explorées et exploitées. Ainsi, ce projet demande : comment le féminisme informe-t-il les théories et les pratiques du design industriel et du design durable ? Les buts sont d'identifier les critiques et les recommandations féministes envers le design industriel, d'identifier les relations entre les initiatives féministes en design industriel et le design durable, et d'identifier les connaissances que les initiatives féministes en design pourraient offrir au design durable. L'étude utilise un cadre féministe et constructiviste-critique. De plus, l'étude se base sur une analyse documentaire des initiatives féministes actuelles en design industriel, ainsi que sur l'exécution et l'analyse de trois projets conduits selon la recherche projet participative. Les résultats démontrent que des perspectives féministes permettent d'identifier des problèmes systémiques en design industriel, liés à la présence du pouvoir et de la masculinité, des systèmes de pouvoir inégaux entre les personnes, et les situations négatives auxquelles sont confrontées les femmes. De plus, les perspectives féministes encouragent des changements populaires (*grassroots*) dans le domaine, des interventions guidées par les perspectives des femmes et/ou des perspectives féministes. Les initiatives féministes en design industriel peuvent être perçues comme une sous-initiative dans

le domaine du design durable. Elles peuvent servir d'outils pour le design durable et, en particulier, pour ses dimensions sociales et économiques. Ensemble, les contributions des perspectives féministes en design industriel pourraient guider des changements durables en design industriel, légitimer et encourager des perspectives alternatives et féministes en design industriel, et aider le design industriel à contribuer aux causes féministes et sociales.

Mots clés : féminisme, design industriel, design durable, analyse documentaire, recherche-projet participative, co-design

Abstract

This project investigates how feminist perspectives can inform industrial design and design for sustainability theories and practices. Feminist perspectives on and in industrial design promise to offer a range of valuable and unique contributions to the discipline. Yet, there is relatively little feminist work in industrial design, so feminism's potential contributions are not well known and are minimally explored and exploited. As such, this project asks: how does feminism inform industrial design and design for sustainability theories and practices? It aims to identify feminism's critiques and proposals toward industrial design and feminism's relationships with and insights for design for sustainability. This study employs a feminist and critical constructivist framework. It is based on a literature analysis of existing feminist work in industrial design and the conduct and analysis of three projects applying a participatory project-grounded research strategy. The results show that feminist perspectives identify systemic problems in industrial design based on the presence of power and masculinity, unequal power dynamics between people and negative situations facing women. In turn, they encourage grass-roots changes in the field that rely on actor interventions drawing on women's perspectives and/or feminist perspectives. Feminist work in design can also be understood as a sub-initiative within the broader design for sustainability field and could be applied consciously as a tool for design for sustainability, especially supporting its social and economic dimensions. Together, these insights can inform sustainable changes in industrial design, legitimize and encourage alternative and feminist perspectives in the discipline, and help industrial design contribute to feminist and social causes.

Keywords: feminism, industrial design, design for sustainability, literature analysis, participatory project-grounded research, co-design

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List of Abbreviations

DAWN: Development Alternatives with Women for a New Era initiative

GAD: Gender and Development initiative

LCSDSN: Leadership Council of the Sustainable Development Solutions Network report

WAD: Women and Development initiative

WAE: Women and Environment initiative

WCCW: Women's Center for Creative Work

WID: Women in Development initiative

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Preface

In the tradition of feminist research, this project begins with a personal introduction. However, in the tradition of design research, I resisted including one for many years, until the very end of my graduate studies. I eventually chose to include this personal introduction because it helps explain the reasoning behind this research project, which is an important component in its justification.

I chose to study industrial design at the undergraduate level because it seemed to offer a balance between two areas I excelled at. I was good at math and considered studying engineering, but I remember my mom saying: "it will kill your soul." I also enjoyed fine arts, but never saw it as a viable career. In contrast, industrial design seemed to offer a balance between the technical aspects of engineering and the creativity of fine arts, while remaining a professional field and a promising career path.

However, I was disappointed by industrial design when I began my studies. I've always seen industrial design as a broad field with many possibilities and potential interpretations and areas of application. That said, my experience of industrial design has shown it to be limited and aligned with certain value systems, models of practice and product categories. These not only contradicted my view of industrial design, but they didn't align with my worldview and interests.

Near the end of my undergraduate studies, I enrolled in a women's studies course that prompted a turning point in my relationship with industrial design. The teacher introduced the history of feminist challenges toward the built environment. While her discussion focused on architecture and urban planning, I realized that many of my concerns with industrial design

aligned with this tradition and body of work. Seeing this link helped explain my issues with industrial design. It also showed me that my misalignment with industrial design wasn't a sign I'm not meant to work in the field, but, instead, signalled a problem with the profession itself.

Instead of entering a typical form of professional practice and contributing to a profession I'm critical of, I chose to pursue graduate studies in design where my goal has been to help make industrial design a more positive force in the world. Further, I chose to focus my PhD research on the intersections and interplay of feminism and industrial design.

Before diving-in to the body of this research project, I must acknowledge that I have already published certain parts of this dissertation in a journal article and conference proceedings.

Parts of Chapters 1, 2, 4 and 7 were published in:

Prochner, I., & De Coninck, P. (2013). Shopping for lenses: The implications and potential of 'sex,' 'gender' and 'feminist' approaches on design principles and practices. *Design Principles and Practices: An International Journal – Annual Review, 7*, 69-78.

Parts of Chapters 2 and 8 were published in:

Prochner, I. (2014). Incorporating queer understandings of sex and gender in design research and practice. In Y.-K. Lim, K. Niedderer, J. Redström, E. Stolterman & A. Valtonen (Eds.), *Proceedings of DRS 2014: Design's big debates* (pp. 234-242). Umeå, SE: Umeå Institute of Design.

Parts of Chapters 1, 2, 4, 5 and 7 were published in:

Prochner, I., & Marchand, A. (2016). Recommendations to rebuild the body of feminist work in industrial design. In P. Lloyd & E. Bohemia (Eds.), *Proceedings of DRS2016:*

Design + research + society - future-focused thinking (vol. 7, pp. 2669-2678). London: Design Research Society.

Parts of chapters 1, 2, 6, 10 and 12 were published in:

Prochner, I., & Marchand, A. (2018). Learning from feminist critiques of and recommendations for industrial design. In C. Storni, K. Leahy, M. McMahon, P. Lloyd & E. Bohemia (Eds.), *Proceedings of DRS2018: Catalyst* (vol. 2, pp. 552-567). London: Design Research Society.

Chapter 1. Introduction

1.1 Feminism Today

There have been many claims in the past few decades about the end of feminism and of its relevance where, for instance, "feminism is [perceived to be] unfashionable, *passé*, and therefore not worthy of serious consideration" (Gamble, 2006, p. 38). In these cases, it has been claimed that feminism has achieved its goals and continued action is trivial (see, for example, Hill, 2015) or is, at the extreme, a form of entitlement or bullying against men, as claimed on sites like A Voice for Men (www.avoiceformen.com). However, feminist activity is still going strong. Major celebrities like Beyoncé, Emma Watson and John Legend (Lindner, 2014) and even male heads-of-state like Justin Trudeau (Office of the Prime Minister, n.d.) and Barack Obama (Obama, 2016) are self-proclaimed feminists. They have noted many remaining feminist concerns including the representation of women in positions of political power, equal pay, gender stereotypes and sexual harassment and objectification (Lindner, 2014; Obama, 2016; Office of the Prime Minister, n.d.). The broader public has also repeatedly mobilized to support feminist initiatives. This includes the Pussy Hat Project (https://www.pussyhatproject.com) and the recent #metoo campaign that flooded social media and the public consciousness.

Sometimes the rejection of feminism can be attributed to misunderstandings about its meaning. Feminism "has acquired connotations of separatism, extremism, [and] men-avoiding lesbianism" (Walby, 2011, p. 2). Though, in reality, feminism is based broadly on a fairly simple social justice premise that women live in unjust conditions, which can and should be

changed (McCann & Kim, 2010). Even the most radical feminisms don't typically hold these extreme views.

As the examples of contemporary feminist initiatives show, feminism can be broadly understood as an emancipatory political activity applied by diverse members of society in their private and public lives (Jardine & Smith, 2013; McCann & Kim, 2010). Issues of feminist concern permeate all levels and parts of society, so feminist activities address a range of arenas (Walby, 2011). This includes professional fields like politics, economics, medicine and sports (Walby, 2011). Design and, specifically, industrial design is no exception.

1.2 Feminism in Industrial Design

Issues of feminist concern are present throughout design. For instance, in "Made in patriarchy: Toward a feminist analysis of women and design" author Cheryl Buckley explained that "[p]atriarchy has circumscribed women's opportunities to participate fully in all areas of society and, more specifically, in all sectors of design, through a variety of means-institutional, social, economic, psychological, and historical" (1986, p. 4). This guides perceptions of women's skills and roles and the tasks women are best suited to (Buckley, 1986). Similarly, Clegg and Mayfield were critical of longstanding associations between women and decorative arts and men and technology (1999). They explained that these associations carry into design education where women tend to choose softer design fields like textiles and jewellery as opposed to harder fields like product and furniture design (Clegg & Mayfield, 1999). Next, focusing on a different aspect of industrial design, Vostral and McDonagh were critical of products designed primarily for an able bodied male user, which ignores the needs of other users including women and makes them accommodate to objects

and their surroundings (2010). There is a relatively long history of feminist initiatives in industrial design that identify these and related issues and attempt to resolve them.

While feminist initiatives in any arena are valuable, feminist work in industrial design may have especially high importance. As Buckley noted, social practices and norms infiltrate design. However, design also has the power to reinforce them. Design has an integral place in people's lives and has a broad reach and deep power. As Peter-Paul Verbeek explained, "artifacts are active: they help to shape human actions, interpretations, and decisions, which would have been different without the artifact" (2008, p. 95).

In addition to work in design, feminist theorists have also explored relationships between artefacts and the social world through their work on materiality. Materiality refers to the physical and material world (Alaimo & Hekman, 2008). Feminist work on materiality sees the agency of matter (e.g. the human body, nature, economy) and its role in the social world (Alaimo & Hekman, 2008; Wingrove, 2016). As an example, some feminist theorists have explored how the economy contributes to oppression (Rahman & Witz, 2003). These discussions can easily extend to the agency of design and its social impact.

1.3 Research Problem

Despite feminism's value and potential contributions to industrial design, there is relatively little feminist work in the field. This shortage of work has been noted repeatedly in the existing feminist design literature. It also appears that this shortage of work has been especially prevalent since the year 2000. The bulk of the feminist work in industrial design dates from the 1980s and 1990s. During this period, there were anthology publications (for instance, Attfield & Kirkham, 1989 and Rothschild, 1999c) and conferences on the subject

like the “Re-visioning Design and Technology: Feminist Perspectives” conference in New York in 1995 (Rothschild, 1999c). However, even at that period it was acknowledged that there was little work on the subject, both in theory and in practice (see Rothschild, 1999c). The body of work has deteriorated since then.

That said, there appears to be a recent resurgence of feminist work in industrial design, which has taken place in the last few years. Much of this new work is being conducted by young female design academics like me as part of their graduate research or early career research projects (see, for example, Buchmüller, 2012; Ehrnberger, Räsänen, & Ilstedt, 2012; and Fox, Ulgado & Rosner, 2015). There was also a feminist stream at the last Design Research Society Conference in June 2018.

Despite this recent resurgence, there remains a shortage of feminist work in industrial design, which has serious consequences. From a design perspective, this situation means that feminism’s potential contributions to industrial design are not well known, and are minimally explored and exploited. As a result, problems of inequality, injustice and oppression exist in industrial design and can be perpetuated through its practices, and industrial design remains misaligned with feminism and its social goals.

There are a range of possible explanations for this shortage of feminist work in industrial design. Cheryl Buckley, hinted that the shortage of work was because feminism is a challenging and controversial subject (1999). She said: “Questions about women’s role in design remain tangential to the discipline and are tackled with reluctance” (Buckley, 1999, p. 109). As an extension of this point, Joan Rothschild and Victoria Rosner stated: “[industrial] designers who are women-and who identify as feminist-still remain relatively few ... [and] they have yet to write extensively about their work” (1999, p. 23). These limitations probably

still hold true today. Feminism remains a challenging and controversial subject and there are likely still few feminist designers. Anecdotally, several polls published online show that only a small percentage of Americans consider themselves feminist: the number ranges from 18% (Perry Undem, 2015) to 28% (YouGov, 2013). Further, according to the survey by YouGov, more women consider themselves feminist than men: 38% compared to 18% (2013). This difference is significant to industrial design. In Canada, only about ¼ of industrial designers are female. In 2006, women represented 27% of Canadian industrial designers (Service Canada, 2013) and, according to a 2011 report, 24% of members of the Association des Designers Industriels du Québec (Tison, 2011).

This shortage of feminist work in industrial design could also be explained by realities in the industrial design field. Industrial design can be seen as somewhat structured and restrictive. It grew out of and often remains rooted in modern thinking (see, for example, Ehrenfeld, 2013). Some examples of the structure and restrictions in industrial design follow. Industrial designers typically work in service to/collaboration with clients and the manufacturing industry (Margolin, 1998; 2003; Walker, 2006) to develop mass-produced consumer products. In terms of their specific roles and processes, designers identify and resolve problems and develop creative design responses (Freddi, 2007), often with a dual social and economic emphasis. They balance an advocacy role of "[defending] quality, emotion and user-friendliness in order to meet the consumers' needs" (Frisch, 2010, p. 18) with the priorities of developing cost-effective products aligned with the market (Er, 1997). The resulting design outputs typically privilege functionality, convenience and beauty (Walker, 2006; Willis, 2013), which help enhance users' comfort, pleasure, entertainment and happiness (Margolin, 2002; Skjerven, 2016; Willis, 2013). This entire process is typically

rooted in a model of growth and progress (Margolin, 2002), striving for financial growth (Boehnert, 2014) and continual innovation developing "marvelous new designs with unheard-of-capacities for efficiency, intelligence, speed, and characteristics of which we are as yet unaware" (Ehrenfeld, 2013, p. 26).

Although industrial design incorporates a broad range of theories and addresses many areas of concern, it can be difficult to move beyond this model and there is not always a place and acceptance for alternative practices. For instance, this could include practices that emphasize hand-construction and smaller-scale local production, which don't align with this dominant model in terms of its contexts, production and possibly even its vision of growth, progress and innovation. Similarly, this situation could work against the incorporation of feminist perspectives in industrial design.

Further, each industrial designer is seen to operate in this professional framework in a relatively uniform way, leaving little place for the designer's personal perspective and subjectivity. As Anthony Dunne and Fiona Raby explain, "[m]ost designers, especially industrial designers, view design as somehow neutral, clean and pure" (2001, p. 58). The idea of incorporating a feminist perspective in industrial design goes against this presumed and ideal neutrality.

Finally, the more recent disappearance of feminist work in industrial design could be explained by feminism's changing visibility or strategies to deal with feminism's stigma. In *The Future of Feminism* (2011), author Sylvia Walby explained that feminism has transitioned from a public protest movement to a more institutionalized movement with its own agencies in governments and organizations (Walby, 2011). These agencies' activities are less frequently publicized in the media compared to those of a protest movement (Walby, 2011). Further,

feminism is increasingly combined with other projects like the environment and human rights, and may not be identified in these situations (Walby, 2011). Alternatively, Walby also stresses feminism's stigma (2011). As noted earlier, "[it] has acquired connotations of separatism, extremism, [and] men-avoiding lesbianism" (Walby, 2011, p. 2). In this context, people may avoid using the term feminism, in favour of a related term like equality (Walby, 2011).

Regardless of the cause, this shortage of feminist work in industrial design has serious consequences, as discussed earlier in this section. That said, none of the barriers that discourage new feminist work in industrial design are insurmountable or discredit or devalue a feminist perspective in industrial design.

Although feminism can be controversial, it's a well-established position that has been widely recognized and legitimized. It offers valuable potential contributions to industrial design. Further, in relation to the structure and restrictions within the industrial design field, feminist epistemology would justify opening-up industrial design to the incorporation of many perspectives in knowledge and knowledge building. Namely, feminist scholars are often critical of presumed universal knowledge (see, for example, Haraway, 1988). Rather, they explain that knowledge and truth are not universal and, instead, are "partial, situated, subjective, power imbued and relational" (Hesse-Biber, 2007, p. 9). In return, feminist philosophers typically encourage the incorporation of many perspectives in knowledge and knowledge building, including women's perspectives (Haraway, 1988; Hesse-Biber, 2007).

A range of industrial design theory also supports this point. For example, in "Re-visioning Design Practice: Hot Debate," Victor Margolin noted the possibility and value for alternative perspectives in design:

> There is great opportunity among academic design researchers to challenge the prevailing paradigm of practice and invent something new. This has actually been done

> in other fields and disciplines which support critical communities. The willingness of these critics to raise large questions about how their colleagues practice has resulted in significant changes in fields like anthropology, sociology, law, and social work. (2003, p. 355)

Last, the view that designers can and should be objective is widely challenged. For instance, Dunne and Raby followed-up their comment about presumed neutrality in design to explain that practitioners actually bring their own subjectivity to their work whether they recognize it or not (2001). In addition, Donald Schön (1983) explained that actors bring different reference points to their work that guide their practice. These include:

> The media, languages, and repertoires that practitioners use to describe reality and conduct experiments; the appreciative systems they bring to problem setting, to the evaluation of inquiry, and to reflective conversation; the overarching theories by which they make sense of phenomena; the role frame within which they set their tasks and through which they bound their institutional settings. (Schön, 1983, p. 270)

Finally, the situation where feminist work in industrial design is less visible is not necessarily negative, especially if it's the result of an increasingly institutionalized movement. However, the possibility that feminism is not mentioned due to a stigma is problematic and should be addressed.

1.4 This Dissertation

This doctoral research project responds to the perceived shortage and lack of visibility of feminist work in industrial design. It aims to help fill the void of feminist perspectives in the discipline. Specifically, this study explores how feminist perspectives inform industrial design. It seeks insights that could guide changes to theories and practices, and help industrial design better align with and contribute to feminist and social causes.

It's important to note that my personal positioning has influenced each aspect of this research project. Like everyone, I hold a partial perspective and draw on situated knowledge

(Haraway, 1988). I'm in a privileged position as a white, Western, Anglophone, middle-class, educated and able-bodied person. However, my experience as a woman and member of the LGBTQ community also informs my perspective. I speak from these positions and I'm unable to truly understand or represent perspectives outside these positions. Indeed, I also can't understand or represent the range of experiences within my own positions (e.g. female, Western), given their own diversity.

My positioning has guided my approach to research and thinking, where I work within Western academic traditions and focus on North American and European narratives. It has also limited my research methods and results, which I will discuss in the methodology chapter. As such, this research remains inherently limited and biased. Further, in "Situated knowledges: The science question in feminism and the privilege of partial perspective," Donna Haraway shows that it can be easy to engage in the "god trick of seeing everything from nowhere" (1988, p. 581) when working from a privileged position. Thus, my positioning likely prevents me from seeing bias in knowledge and the full extent of the limits and bias in my own research.

That said, Haraway (1988) explained that subjugated positions can be: "least likely to allow denial of the critical and interpretive core of all knowledge. They are knowledgeable of modes of denial through repression, forgetting, and disappearing acts - ways of being nowhere while claiming to see comprehensively" (1988, p. 584). Thus, my experience as a woman and LGBTQ person could help me see certain limitations in knowledge and openings for other perspectives. I have also been conscious of my positioning throughout this research project and have tried to learn about and represent many perspectives, while not speaking for other groups and experiences.

Please keep my positioning and these limitations in mind as you read this dissertation, and recognize that future projects coming from different perspectives would provide important contributions to this research topic.

1.4.1 Structure and organisation. The next three chapters form the theoretical framework for this project. They explore relationships between feminism and industrial design to understand how feminism can be applied in and inform the discipline. The discussion moves beyond the vague understanding described earlier in this chapter, and provides an important theoretical structure for the project that follows.

- Chapter 2 examines feminism's applications in, interactions with and potential contributions to industrial design in a general sense, based on theory on feminism and its operations.
- Chapter 3 situates these interactions and contributions in relation to a priority area in industrial design: namely, the sub-field of design for sustainability. It suggests that feminist perspectives could inform industrial design, but also design for sustainability theories and practices.
- Chapter 4 draws on a more complex understanding of feminism and its diverse ideological strands, and adds additional nuance to the understanding of feminism's interactions with and contributions to industrial design and design for sustainability.

The focus of each chapter in the theoretical framework and the relationships between them are illustrated in Figure 1.1.

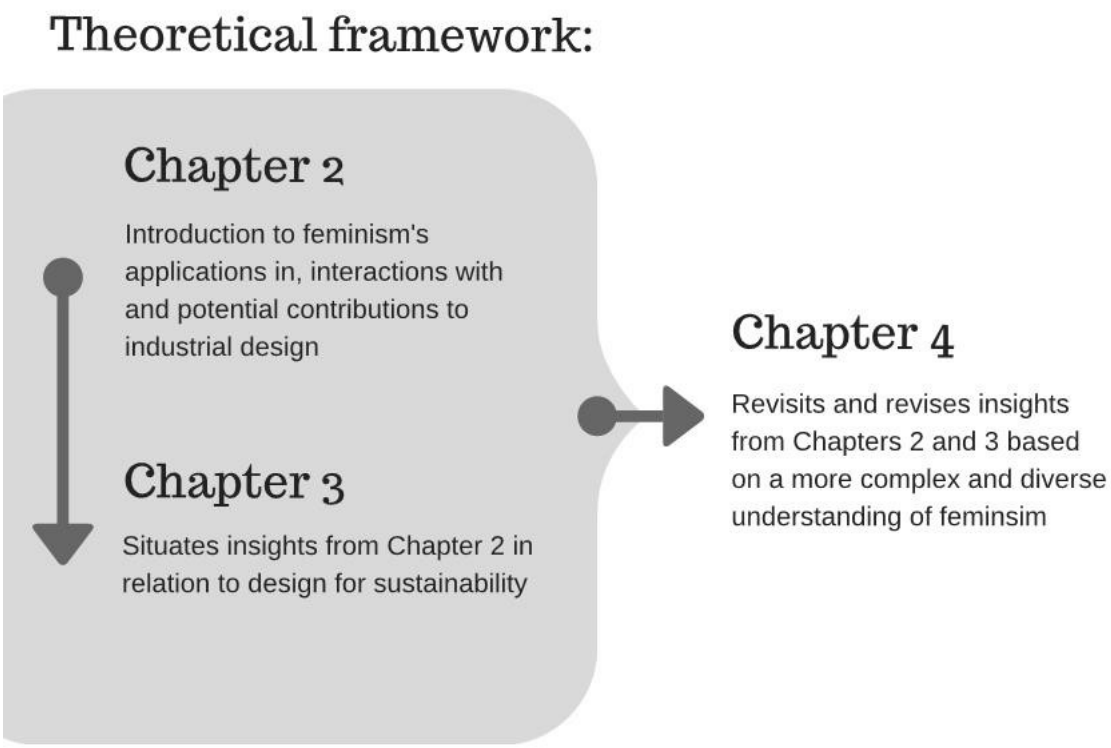

Figure 1.1. Three chapters in the theoretical framework.

The research question and objectives are presented in detail in Chapter 5. Though the theoretical framework suggested how feminism *can* inform industrial design and the sub-field of design for sustainability, the remainder of the research project identifies how it *does*. The research question is: how does feminism inform industrial design and design for sustainability theories and practices? The objectives are based on an understanding of feminism's applications in, interactions with and potential contributions to industrial design and design for sustainability developed in the theoretical framework. As such, some of the precisions and details in the objectives might not be entirely clear or understandable yet.

The objectives are to:

1. Identify the content of feminism's critiques and proposals toward industrial design when it's applied as a lens on design
2. Identify the content of feminism's implicit critiques and proposals toward industrial design when it's applied as a lens in design
3. Understand the relationships between feminism's interactions with and contributions to industrial design and design for sustainability processes and goals
4. Identify the unique insights feminism's interactions with and contributions to industrial design can provide to design for sustainability theories and practices.

The methodology in Chapter 6 explains that this study adopts a feminist and critical constructivist framework, inspired by a constructivist epistemology, critical interrogation of social structures and enduring knowledge, and attention to power and authority (Hesse-Biber, 2012; Kincheloe, 2005). Broadly, the response to the research question and objectives involves collecting and analysing examples of feminist work in industrial design. To respond to Objective 1, I identify and analyse literature on feminist work in industrial design through literature analysis and thematic analysis. I also conduct and analyse new feminist work in industrial design through participatory project grounded research and thematic analysis. This involves the execution and analysis of collaborative design projects with feminist participants. Broadly, the thematic analysis in both phases of the project involves searching for emerging themes in the data (Mills, Durepos & Wiebe, 2010; Schwandt, 2007). The results from the participatory project grounded research form the main basis of the response to Objective 2. Next, I review the results for Objectives 1 and 2 in relation to a sustainability framework and design for sustainability to respond to Objectives 3 and 4.

Following the methodology, Chapter 7 presents the literature analysis data and results, Chapters 8 and 9 include the participatory project grounded research data and results, Chapter 10 provides an overview of the literature analysis and participatory project grounded research results, Chapter 11 links the research outcomes to design for sustainability, and Chapter 12 is the conclusion. The content and organisation of the chapters is illustrated in Figure 1.2.

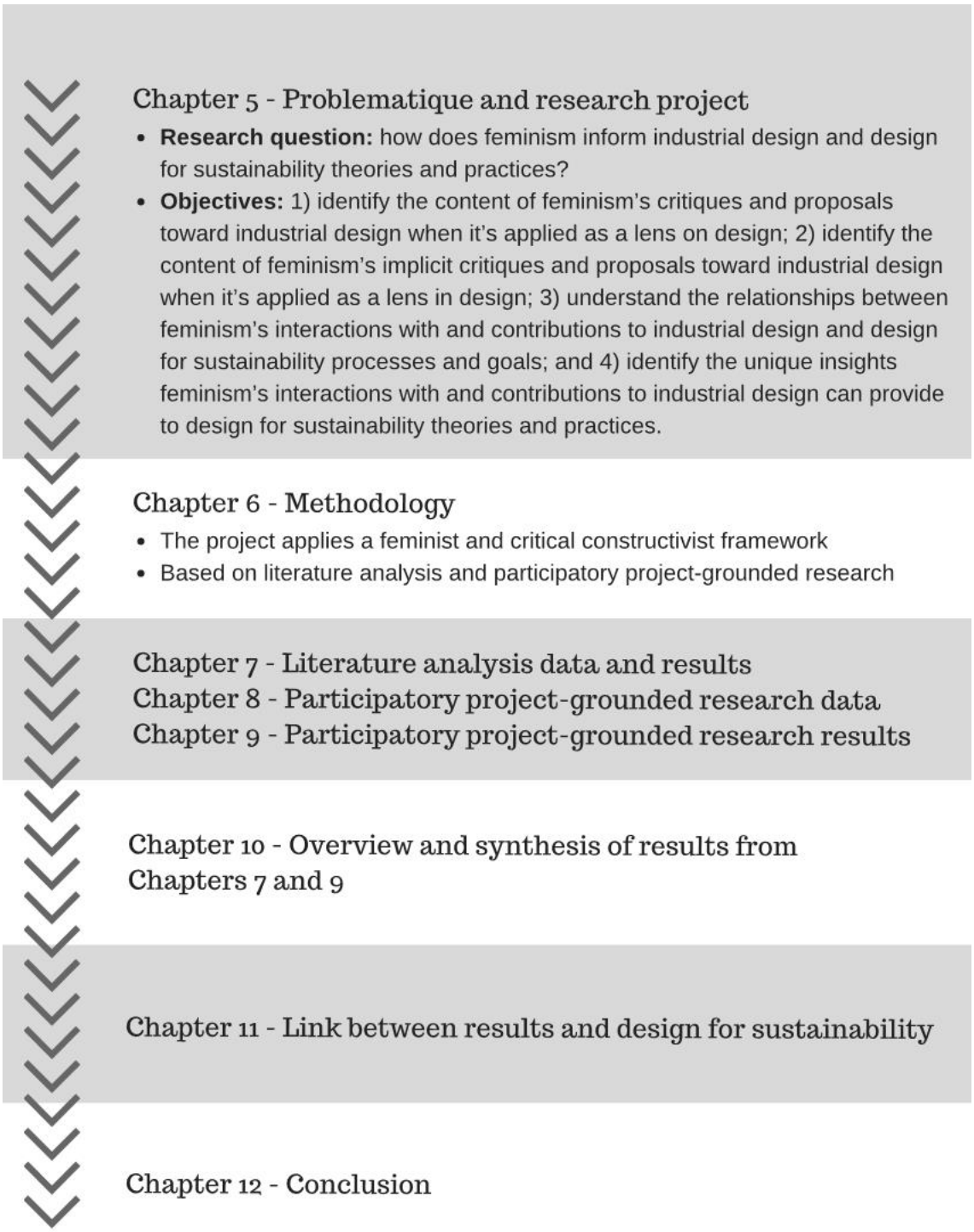

Figure 1.2. Research project organisation.

Chapter 2. Feminism's Applications in, Interactions with and Potential Contributions to Industrial Design

This first chapter in the theoretical framework explores feminism's applications in, interactions with and potential contributions to industrial design in a general sense. It's informed by a theoretical introduction to feminism, which kick-starts the discussion in the first section. This is followed by an introduction to and discussion of the application of feminism in industrial design.

2.1 Introduction to Feminism

This introduction expands on the brief discussion of feminism in Chapter 1. It provides the theoretical underpinnings for this chapter and this first part of the theoretical framework. Though, its important to recognize that feminism is an incredibly complex topic. No discussion could adequately represent its many forms, roles, applications and perspectives. The discussion in this section is especially general, seeking to identify shared aspects within feminism. There are exceptions to these generalizations and this broad discussion ignores many other issues fundamental to feminism. Further, there are often differing perspectives within feminist thinking and this broad and general discussion doesn't adequately represent these debates and tensions. Chapter 4 provides a more complex discussion of feminism that builds on this chapter. However, once again, it only offers a relatively limited perspective.

In general, feminism is based on the view that women live in unjust conditions, which can and should be changed (McCann & Kim, 2010). Feminism often links these conditions to the broad idea of patriarchy, the system "by which men constitute the dominant social group

and masculinity is the dominant social practice" (Chambers, 2013, p. 1). However, contemporary feminism's reach also expands beyond sex and gender issues to address other forms of oppression including those related to race, class and religion (hooks, 2015; McCann & Kim, 2010). [1]

Broadly speaking, feminism identifies and explores systems of domination that negatively affect women and other marginalized groups and establishes and carries out plans for change with the broad goal to improve human lives (McCann & Kim, 2010). In this sense, feminism is centrally concerned with power (Allen, 1998, 2016). This includes the complex, hierarchal power relationships between social groups and the structures that maintain them (Allen, 1998). As an example, feminist initiatives can investigate situations of *power over* others and *power to* resist individually and as a group (Allen, 1998).

Feminism is a critical perspective: much "feminist theory is devoted to the tasks of critiquing women's subordination, analyzing the intersections between sexism and other forms of subordination such as racism, heterosexism, and class oppression… [where] the concept of power is central to each of these theoretical tasks" (Allen, 2016, para. 1). Critique is also a way to develop feminist knowledge. In her blog, *Feminist Killjoys,* Sara Ahmed said: "[w]e learn from what we come up against. And being against what we come up against matters" (2014, para. 25).

Although not always and necessarily the case (see, for example, Ahmed, 2014), feminists often also provide proposals for change in response to critiques. "To be truly visionary we have to root our imagination in our concrete reality while simultaneously imagining possibilities beyond that reality" (hooks, 2015, p. 110). Bell hooks saw these dual

[1] Bell hooks chooses not to capitalise her name (James, 2000).

processes of critique and proposal as a more complete intervention and one that would have a stronger impact than critique alone (2015).

Broadly speaking, feminist initiatives can be seen to strive for equality (Nash, 2000; Rich, 2014), although equality is often a loaded concept in feminism with a lot of discussion and debate surrounding it. For instance, it's not easily compatible with the differences between women and men (e.g. biological) and between different women (Nash, 2000; McCann & Kim, 2010). Related to this second point, bell hooks noted that there are also inequalities between men and between women based on factors like social class and race (2000). In this context, she asked: "which men do women want to be equal to?" (hooks, 2000, p. 19). There is also recognition that equality is not always possible, but in these cases "the consequence of that inequality [should] not be subordination, colonization, and dehumanization" (hooks, 2015, p. 117).

Finally, bell hooks stressed that feminism is for everybody: it's "advanced whenever any male or female of any age works on behalf of ending sexism" (hooks, 2015, p. 116). Feminist initiatives also have a broad impact. They are known to improve women's lives, but also impact society as a whole. For example, Valerie Percival and Tammy Maclean (2017) noted:

> The harm caused by patriarchy and misogyny goes beyond the individual. It has a profound social cost, undermining economic development and human security. The evidence is unequivocal: societies with higher rates of gender equality are more peaceful and prosperous. They have lower levels of corruption and higher levels of economic competitiveness. Both men and women are healthier and happier. (para. 8).

Beyond feminism's general focus, processes, goals and applications explored in the previous paragraphs, feminist thinking also addresses many theories and concepts. The following are several examples. I begin with sex and gender, mentioned in passing several times in this text.

Sex typically signifies biological divisions between female and male (Moi, 1999) and gender refers to feminine and masculine identities developed culturally, socially and historically (Marchbank & Letherby, 2007). While female sex and feminine gender and masculine sex and masculine gender are typically and traditionally associated, they are distinct in postmodern thinking and in many contemporary feminisms. Further, the female/male and feminine/masculine divisions are increasingly seen as a spectrum where people can position themselves anywhere between female and male (Marchbank & Letherby, 2007) and between feminine and masculine (Moi, 1999).

Much feminist thinking also addresses gender roles, the social roles and responsibilities attributed to a person based on their sex and gender (Prentice, 2000). In the mid 20th century, "even more than today, a newborn's sexual anatomy, situated in a network of class, race, and sexuality, demarcated a narrow set of possibilities" (Owen, 2000, p. 220). During this period, many middle and upper class white women would have been expected to stay home and take care of their families, while women in less privileged positions would have likely held low-paid jobs in addition to their own domestic responsibilities. Although less ridged, many gender roles continue today. This includes domestic and parenting responsibilities and the kinds of jobs associated with male and female workers.

Experience is another central concept and tool in feminism. It is based on the premise that the 'personal is political' (Grant, 2000, 2016), which argues that feminism is "happening in the very places that have historically been bracketed as not political: in domestic arrangements, at home … as well as on the street, in parliament, at the university" (Ahmed, 2017, pp. 3-4). Studying experience has been a way to identify these common female experiences and create new knowledge rooted in women's realities (Grant, 2016).

Finally, the last example explored here is situated knowledge. I introduced this theory in the previous chapter, with reference to "Situated knowledges: The science question in feminism and the privilege of partial perspective" by Donna Haraway (1988). Broadly, situated knowledge addresses "how people may understand the same object in different ways that reflect the distinct relations in which they stand to it" (Anderson, 2015, para. 3). As an example, a person's physical location, values and experiences would likely impact their understanding and perspective toward a certain idea (Anderson, 2015).

These are only a few concepts from the incredibly rich and diverse body of feminist theory, but provide an introduction to certain ideas frequently incorporated in feminist work. These are intertwined with feminism's processes, goals and applications in complex ways.

2.1.1 Feminism as an ideology. I introduced feminism as an emancipatory political activity in Chapter 1. However, it can also be seen as a philosophical and theoretical position, an ideology, a movement and a discourse. Indeed, it is all of these things at once.

In the context of this study, I mainly explore feminism as an ideology. An ideology is a conceptual framework that helps us navigate and act in the social and political worlds (Freeden, 2003; Goodwin, 2007; Van Dijk, 1998). In this sense, feminism can be seen to operate as a lens that guides thinking and action. This emphasis on feminism as an ideology helps focus this study and limit its scope. It's a relevant point of focus since ideology is central to feminism's other roles and applications. For instance, a feminist ideology is informed by and informs feminist philosophy and theory and drives the feminist movement and discourse. Ideology also has a known internal structure and operational process, which helps inform the theoretical framework.

It was mentioned earlier that feminism can apply processes of critique and action (i.e. identifying/exploring issues and establishing/carrying out plans for change) to help achieve its goals. These processes are related to feminism's ideological components. Feminism, like other ideologies, typically applies utopian thinking (Sargent, 2013). Utopian thought includes a vision of a model society, a utopia (Tally, 2013), and an understanding of how to achieve it (Hedrén, 2009; Lockyer, 2007). In this sense, feminism's broad vision of a society based on a form of equality and justice for women is utopian and its processes of critique and action - identifying problems like inequality, injustice and oppression of women and establishing and carrying out plans for change- are the utopian thinking to help achieve its utopian vision.[2]

It's important to acknowledge that the relationship between feminism and utopia has been challenged. For instance, utopia can imply impossibility or a "static and codified ideal that … takes the experiences and desires of a part for those of the whole" (Shapiro Sanders, 2007, p. 4). Neither of these meanings is intended here. I use the concept of utopia and utopian thinking mainly to illustrate feminism's processes. There is no intended implication that a feminist utopia is unrealistic. Further, the feminist utopia referenced here is open to many visions coming from different feminist perspectives and changing over time. This view of utopia is based on Lise Shapiro Sanders' proposal in "'Feminists love a utopia': Collaboration, conflict and the futures of feminism" (2007).

[2] Paul Ricoeur's writing in *Lectures on Ideology and Utopia (*1986) adds additional detail to this relationship between ideology and utopia. He explains that ideologies reinforce systems of authority (1986). In contrast, utopias "[introduce] imaginative variations" that can spur social transformation (1986, p.17). Therefore, in addition to being embodied in ideologies, utopias can oppose or effect change in ideologies. Feminist ideologies, utopias and their relationships will be explored in further detail in Chapter 4. The role of utopia in opposing and transforming ideologies, including feminism, will be addressed at that point.

This section presented feminism's central points of focus, its operations as an ideology and its utopian components. These ideas form the basis for the subsequent section, which explores the application of feminism in industrial design and feminism's interactions with and contributions for industrial design.

2.2 Application of Feminism in Industrial Design

The theoretical discussion in the previous section hinted at how a feminist perspective can be applied to industrial design. As an ideology, which operates as a sort-of conceptual framework or lens, feminism could be used as a lens on design to analyse aspects of the design field and its activities or as a lens in design if it were incorporated into actual design activities. Further, feminism could offer a relatively holistic perspective that could operate at many levels of industrial design.

2.3 Feminism's Interactions with Industrial Design and their Contributions

When applied as a lens on or in industrial design, feminism's processes of critique and action could guide critiques of industrial design and could inform proposals for change. In this sense, feminism's critiques and proposals toward industrial design could be considered *feminism's interactions* with industrial design. In turn, the specific focus of the critiques and proposals for change could be considered *feminism's contributions*.

Given feminism's complexity and many roles and applications, this focus on critiques and proposals could be limiting, as it leaves out other ways that feminism could interact with industrial design. However, it provides a valuable structure for this project and narrows the research scope. Critiques and proposals are also a recognized way that feminism interacts with

design. For instance, Shaowen Bardzell identified similar processes in her study of feminism in interaction design (2010). She explained that feminism offers critique-based and generative contributions: "[c]ritique-based contributions rely on the use of feminist approaches to analyze designs and design processes in order to expose their unintended consequences" and "[g]enerative contributions involve the use of feminist approaches explicitly in decision-making and design process to generate new design insights and influence the design process tangibly" (Bardzell, 2010, p. 1308).

Following this general discussion of feminism's application in, interactions with and implications for industrial design, the sections that follow explore the potential focus of feminism's critiques and proposals toward industrial design and their likely actual contributions to industrial design. These provide some examples to guide this research project, but don't represent the full range of feminism's possible interactions with and implications for industrial design.

2.4 Feminist-informed Critiques of Industrial Design

I introduced this first idea in Chapter 1. Namely, at an epistemological level, feminist scholars are often critical of presumed universal knowledge (see, for example, Haraway, 1988). Rather, they explain that knowledge and truth are not universal and, instead, are "partial, situated, subjective, power imbued and relational" (Hesse-Biber, 2007, p. 9). Further, they claim that women's needs and perspectives are not always incorporated in dominant knowledge (Hesse-Biber, 2007).

These feminist critiques at an epistemological level inform the first potential challenges to industrial design presented here. To begin with, they show that the field of

industrial design is too structured and restrictive and that dominant models of industrial design and their general acceptance in the field leave little place for alternative practices. These challenges relate to feminist discussions on *power over* and the situated nature of knowledge.

In addition to these points about the structure and restrictions of industrial design, a feminist epistemological perspective on industrial design could also show that industrial design is often overly 'masculine,' linking back to the concept of gender. As mentioned earlier, typically and traditionally, feminine and masculine genders and their characteristics are seen to be distinct and binary. The Bem Sex Role Inventory is a psychology framework that categorizes American gender characteristics based on a study of socially desirable traits for females and males (Bem, 1974). A review of this inventory provides examples of these gender characteristics, as illustrated in the following table (Table I).

Table I: *Feminine and Masculine Characteristics in the Bem Sex Role Inventory 1974*

Feminine		**Masculine**
Affectionate		Aggressive
Compassionate		Ambitious
Gentle		Assertive
Gullible		Athletic
Loyal		Competitive
Shy		Forceful
Sympathetic		Independent
Yielding		Self-reliant

Note. Data adapted from Bem 1974.

Masculine and feminine are also associated with more abstract concepts. For instance, the masculine is associated with order and linearity and the feminine is said to emphasize process, dialog and the whole (Wilshire, 1989).

Applied to design, feminist epistemology could show that many aspects of industrial design are gendered and masculine. For instance, linear and specialized design activities and designer-driven processes that stress growth and profit are aligned with masculine characteristics (Kennedy, 1981). Similarly, design movements like modernism are said to embody masculinity. Penny Sparke (1995) wrote:

> the language of modernism ... excluded feminine taste from its self-definition through the formulation of a hierarchal, binary system of terms and concepts: thus 'private' was contrasted with, and valued less than 'public'; 'fashionableness' with 'universal values'; 'surface ornament' with 'production'; 'taste' with 'design'; and so on. (p. 22)

As an example, feminist design theorist Cheryl Buckley explained that craft is the feminine counterpart to the masculine industrial design field (1986). Related to this point, the masculine-leaning industrial design field can be perceived as superior to the feminine-leaning craft field (Buckley, 1986).

In addition to feminism's challenges at an epistemological level, feminism also operates at a more concrete level and feminist philosophers are typically critical of situations surrounding issues like the inequality, injustice and oppression of women. It follows that feminism can help identify such situations in industrial design. This ties to the broader feminist focus on power and women's experiences.

Feminist work in industrial design would likely also challenge the relationships between sex, gender and design. This could include women's roles in the field, how designers develop products for female users and how design can perpetuate gender roles. For instance,

feminist theorist Teresa de Lauretis discussed the idea of technologies of gender (1987). In her work, technology is defined broadly to include things like the cinema and design (de Lauretis, 1987). According to de Lauretis, these technologies are some of the major structures that "produce, promote, and 'implant' representations of gender" (1987, p. 18). These are often normative or restricted conceptions (de Lauretis, 1987). In this sense, industrial design can be seen as a technology of gender that likely perpetuates gender norms and restrictions.

The following is an example of a feminist critique of industrial design at this more concrete level found in a research paper and design project by graduate student Karin Ehrnberger and professors Minna Räsänen and Sarah Ilstedt (2012). It exemplifies many of the feminist critiques suggested in the previous paragraphs. The research group applied a feminist lens on and in industrial design. It inspired a critique of gendered industrial design products. The authors noted, for example, that gendered products reproduce a gender hierarchy where masculine products and function are valued over feminine products and form (2012). They point-out that "[f]eminists and design historians have taken the traditional design concept of *form follows function* as symbolic of male oppression of women" and that "IKEA chooses to put girls' names such as *Felicia* and *Alvine* on the soft, intimate, and decorative products like fabrics, rugs, curtains, and upholstery, while more functional products such as bookcases and chairs, receive a boy's name like *Billy* and *Sebastian*" (emphasis in original; Ehrnberger, Räsänen & Ilstedt, 2012, pp. 87 & 90). Further, gendered products reinforce gender stereotypes, roles, and spheres like in the example of feminine kitchenware and masculine tools (2012). These scenarios are instances of inequality and oppression in design and perpetuated through design, and a direct example of how design can perpetuate gender norms.

2.5 Feminism's Proposals for Change in Industrial Design

Moving on, this section explores feminism's potential proposals for change in industrial design. It shows that feminism can offer responses to its points of critique, discussed in the previous section.

In response to their epistemological challenges to universal and masculine knowledge, feminist philosophers typically encourage the incorporation of many perspectives in knowledge and knowledge building, including women's perspectives (Haraway, 1988; Hesse-Biber, 2007). This was noted in Chapter 1. This range of perspectives would help provide richer and more complex knowledge (Haraway, 1988; Hesse-Biber, 2007). Thus, applied to design, a feminist lens could suggest opening the field to new perspectives including women's perspectives. This potential recommendation has links to the broader feminist emphasis on experience and value for situated knowledge.

Next, at a more concrete level, feminism provides responses to its critiques of situations that negatively affect women. This process would apply directly to industrial design where feminism could establish possible solutions to its challenges. This could happen if feminism were applied as a lens on design or in industrial design activities themselves. In the first case, feminism might propose a solution in theory, while in the second case where feminism is applied as a lens in industrial design activities, it might guide a real-life response. This demonstrates the power to resist.

As an example, feminism's solution focus is seen in the case of Ehrnberger, Räsänen and Ilstedt's critiques of gendered industrial design products (2012). Their feminist lens also guided a response to these issues. Namely, the group produced two critical design prototypes to raise awareness toward the issue of gendered products. They redesigned two products—a

power drill typically marketed to men and a hand mixer typically marketed to women—by switching their product language (2012). The result was a 'masculine' hand mixer called the Mega Hurricane Mixer and a 'feminine' power drill called the Dolphia (see Figures 2.1 and 2.2; 2012). The authors note that the products' styles highlight normally invisible product messages and values (2012). The critical designs that attract attention and encourage conversation have potential to help lower the amount of stereotypically gendered products, especially if they reach an audience like product designers or design students. This would, even if in a small way, contribute to better conditions for women and help address gender norms.

Figure 2.1. "Mega Hurricane Mixer," by K. Ehrnberger, M. Räsänen and S. Ilstedt, 2012. Retrieved from "Visualizing Gender Norms in Design: Meet the Mega Hurricane Mixer and the Drill Dolphia," International Journal of Design, 6(3), p. 93. Content in this journal is licensed

Figure 2.2. "Dolphia Drill," by K. Ehrnberger, M. Räsänen and S. Ilstedt, 2012. Retrieved from "Visualizing Gender Norms in Design: Meet the Mega Hurricane Mixer and the Drill Dolphia," International Journal of Design, 6(3), p. 93. Content in this

As another example, Weinthal is critical of how creative disciplines are gendered and positioned hierarchically like in the case of craft and industrial design mentioned earlier, as well as masculine architecture and feminine interior design (2011). In response, she proposes that designers work interdisciplinarily and adopt non-traditional practices to counter these inequalities (Weinthal, 2011).

The feminist emphasis on experience and situated knowledge could also guide further recommendations. In "Critical spatial practices: Setting out a feminist approach to some modes and what matters in architecture," Jane Rendell characterised a feminist approach to spatial practice (2011). Further, in "Feminist HCI: Taking stock and outlining an agenda for design," Bardzell described a vision of feminist interaction design (2010). Both authors noted that a feminist perspective in their design fields would likely focus on women's and human experiences; this includes the various people involved in design (Rendell, 2011) and could emphasize users needs, perspectives and diversity and user involvement in the design process (Bardzell, 2010). Both authors also stressed that the feminist emphasis on situated knowledge could encourage designers to position themselves and deeply consider this positioning

throughout their work (Bardzell, 2010; Rendell, 2011). These feminist recommendations would likely also apply to industrial design.[3]

2.6 Feminism's Contributions to Industrial design

I suggested earlier that feminism's processes of critique and proposal could be considered its interactions with industrial design. In turn, the focus of the critiques and proposals for change could be seen as feminism's contributions to industrial design. Based on this logic, the specific critiques and proposals presented in the previous section are examples of feminism's potential contributions to industrial design. At an epistemological level, feminism could encourage scepticism toward dominant knowledge in industrial design, as well as the introduction of new perspectives and knowledge. Next, at a more concrete level, feminism could highlight important issues in industrial design, pitfalls that designers could choose to avoid.

These critiques and proposals could also contribute to industrial design theories and practices at a broader level. For instance, they could help open-up industrial design to a broader range of perspectives and could point-out issues in the field and ways around them. Drawing on the insights of these critiques and proposals could also help align the industrial design field with feminism and its social goals, and contribute to the feminist cause.

2.7 Conclusion

This chapter explored feminism's application in, interactions with and potential contributions to industrial design. It showed that feminism can be applied as a lens on design to analyse

[3] Rendell (2011) and Bardzell's (2010) writing also aligns with other parts of the theoretical framework in this dissertation. For instance, as mentioned earlier, Bardzell explained that feminism offers critique-based and generative contributions to human computer interaction (2010). Rendell's chapter also supports various aspects of the discussion on feminist epistemology (2011).

aspects of the design field and its activities or as a lens in design if it were incorporated into actual design activities.

Although this first part of the theoretical framework provided a range of detailed insights, the framework continues in the next two chapters. Chapter 3 situates feminism's interactions with and contributions to industrial design in relation to design for sustainability and Chapter 4 draws on a more complex understanding of feminism and adds additional nuance to the previous sections of the theoretical framework. Each section of the theoretical framework brings important insights to this project and is the foundation for the research project, thoroughly detailed in Chapter 5.

Chapter 3. Relationships between Feminism's Interactions with and Contributions to Industrial Design and Design for Sustainability

The view that a feminist perspective can contribute to industrial design is a major motivation and focus of this research project, as explained in the introduction. The previous chapter hinted-at some of feminism's contributions to industrial design by identifying its specific points of critique and recommendations and exploring how these could inform industrial design theories and practices, feminism and broader social imperatives. However, feminism isn't a widely shared or dominant ideology, as defined by Van Dijk (1998). In this sense, not everyone shares the broad feminist perspective and, therefore, they wouldn't necessarily see the relevance of a feminist perspective in industrial design and the value of feminism's aforementioned potential implications for industrial design. As such, this chapter builds on the understanding of feminism's contributions to industrial design by exploring the relationships between feminism's interactions with and contributions to industrial design and design for sustainability. These additional implications tied to a field of priority and emphasis in industrial design show the more pragmatic and general value of a feminist perspective in industrial design and help justify its relevance for a broader audience.

This chapter begins by introducing the sustainability imperative in industrial design and current approaches to address it. This is followed by a detailed discussion of how feminism's interactions with and potential contributions to industrial design may overlap with and inform design for sustainability.

3.1 Introduction to Design for Sustainability

The industrial design field and its activities have offered many important benefits: they have provided affordable basics to many people that help keep them healthy and safe (e.g. kitchen and bathroom equipment and shoes) and connected (e.g. telephones, computers and bicycles); their innovation has pushed scientific and technological advancements; and the products offer many physical and emotional benefits to their users. However, these same activities also have negative consequences.

There are many known environmental problems resulting from industrial design activities and their outputs; these include issues like pollution and waste (Bhamra & Lofthouse, 2007; Shedroff, 2009). There are also negative social consequences tied to design activities and design products (Tromp, Hekkert & Verbeek, 2011; Whiteley, 1998). An example includes the reliance on unfair and unsafe labour conditions (Bhamra & Lofthouse, 2007). Further, the mass-production and universality of many products can miss-out on contextual relevance with regards to needs or appearance (McDonough & Braungart, 2002), which makes them "culturally damaging in their blanket distribution" (Walker, 2006, p. 10). Finally, designers can manipulate consumers in terms of their perceived needs, their desires and their satisfaction in order to drive continued profit and expansion (Whiteley, 1998).

While designers and design theorists have raised social and environmental concerns pertaining to industrial design since the field's early days (see, for example, Er & Kaya, 2008 and Skjerven, 2016), challenges to the industrial design profession from social and environmental perspectives emerged with relative vigour in the 1960s and 1970s from inside and outside the field (Raizman, 2010). This aligned with other social and environmental

movements at the time (Margolin, 1998). At this point, designers began to address these criticisms through a range of action (Raizman, 2010).

This social and environmental consciousness was further heightened by the establishment and popularization of the concept of sustainable development beginning in 1987. Sustainable development "recommends a set of goals to which the world should aspire" (Sachs, 2015, p. 3).

Design work primarily focused on environmental issues in the 1980s and 1990s (Bhamra & Lofthouse, 2007). Green design came first in response to consumer demands (Bhamra & Lofthouse, 2007; Keitsch, 2012). It involved applying mostly mild environmental principles to existing industrial design processes, manufacturing and products (Madge, 1993). This approach was increasingly replaced by ecological or eco-design in the late 1980s (Madge, 1997). Eco-design applied deeper ecology to design and did so in a more holistic way (Madge, 1997). During this period, the term sustainable would have referred to these types of design practice. For instance, the first reference to sustainable design is said to have been in the 1980s and referred to design that accounted for "the energy and material requirements for manufacturing, the use and the repairability, remanufacturability and recyclability of products" (Keitsch, 2015, p. 166).

Design for sustainability broadened in the 1990s to include greater attention to social factors (Keitsch, 2015). As author Martina Keitsch explained, "designers and developers started to realize that eco-design solutions may easily be lost by inappropriate production and consumption activities at other levels" (2015, p. 167). The new, more multidimensional design for sustainability that developed at this point was increasingly diverse focusing on, for

instance, socio-cultural concerns, user involvement in design and sustainable consumer behaviour (Keitsch, 2015).

3.1.1 Design for sustainability frameworks. The United Nations has been integral in defining and promoting sustainable development (Baker, 2006); at the time of writing this dissertation *Transforming our World: The 2030 Agenda for Sustainable Development* was the United Nations' most recent publication and action plan on sustainable development (United Nations General Assembly, 2015). It sets out sustainable development goals to achieve by the year 2030 (United Nations General Assembly, 2015). The following are some of the goals outlined in the report: "[e]nd poverty in all its forms everywhere," which focuses on ensuring people have adequate financial resources and are resilient; "[e]nsure availability and sustainable management of water and sanitation for all," which centres on availability of and access to water for drinking and hygiene, but also ensuring that the earth's water systems are protected; and "[p]romote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all," which includes ensuring the availability of employment, decent working conditions and economic growth in impoverished countries (United Nations General Assembly, 2015, p. 18).

Sustainable development principles are widely applied. Drawing on *Le Développment Durable—Dynamique et Constitution d'un Projet* by Edwin Zaccaï (2002), Tom Waas and his co-authors (2011) explained that in these situations:

> The term 'sustainable' can … be used separately from the term 'development', for example 'sustainable agriculture', 'sustainable education', 'sustainable forestry', 'sustainable fisheries', 'sustainable business' and so on. In this case, the adjective usually refers to 'sustainable development' and offers the possibility to integrate the concept's fundamental principles into an array of application fields. (p. 1639)

This is the case in industrial design where design for sustainability is a field comprising a range of discussions, principles and strategies (Walker & Giard, 2013) applied in "design practice, education and research that, in one way or another, [contribute] to sustainable development" (Vezzoli et al., 2014, p. 2). Indeed, a global initiative is currently taking place to develop a world sustainable design framework based on the UN's 2030 agenda. This will formally begin at the 2019 Paris Design Summit (Paris Design Summit, 2018).

The initiative at the Paris Design Summit is presumably a response to the current lack of an encompassing design for sustainability framework. For example, design for sustainability is often structured and evaluated by a series of frameworks, which aren't necessarily agreed upon or geared specifically to design (Shedroff, 2009).

Moving on, a three-part sustainability model focusing on environmental, social and economic dimensions is most commonly applied in design (Spangenberg et al., 2010). Design for environmental sustainability is the most longstanding and well-developed sustainability dimension. It considers the environmental effect of the product over its life cycle (Bhamra & Lofthouse, 2007). Thus, design for environmental sustainability addresses a range of arenas including production and consumption systems, product design and human lifestyles, and encourages their modification or redesign to support environmental health (Vezzoli & Manzini, 2008).

Design for social sustainability considers issues like usability, needs (Bhamra & Lofthouse, 2007), health, safety, quality of life and diversity and their relationship to design (McMahon & Bhamra, 2015). There are few definitions of design for social sustainability and terms like social design and socially responsible design are often used in it's place. These are similar, yet broader categories: social design and socially responsible design have a similar

social focus, but don't necessarily tie back to the concept of sustainability and sustainability frameworks. Thus, design for social sustainability could be considered social design and socially responsible design, while social design and socially responsible design are not necessarily 'sustainable.'

Here I will draw on definitions of social design and socially responsible design to position design for sustainability, given the relative availability of this writing. However, it's important to keep their differences in mind.

There have been several prominent publications on social design and socially responsible design in recent years. For instance, the Utrecht Manifesto explains that social design and socially responsible design contribute to a 'good society,' one that "ensures that everyone has access to the goods and services needed for a decent existence. … a world that is fair and just" (Bruinsma, 2016, p. 38). The *Social Design Futures* report adds that social design works toward "collective and social ends, rather than predominantly commercial objectives" (Armstrong et al., 2015, p. 15).

The Utrecht Manifesto also put forward ten principles for socially responsible design based on a series of meetings from 2005-2015 on social design (Bruinsma, 2016). These are summarized in Table II.

Table II: *Ten Principles for Socially Responsible Design*

Engage with society:	Engage users as partners in the design process and listen to what they have to say
Design socially:	Consider social situations and contexts when designing
Act sustainably:	Work sustainably, in terms of social and environmental

	sustainability
Connect ethics and aesthetics:	Design aesthetically pleasing products that encourage ethical behaviour
Aim for commitment:	Develop products that users will want to keep for a long time
Be critical:	Design from a critical and socially-engaged position
Be transparent:	Be transparent about design decisions and the design process, and be responsive to critique
Be supportive and modest:	Contribute to social initiatives, without seeking recognition
Be persistently radical:	Think radically and reimagine social situations
Take responsibility together:	Seek out and engage in collaborative work

Note. Data adapted from Bruinsma 2016.

Finally, economic prosperity is part of the traditional model of industrial design (Vickers, 2014) where the field was established to and typically continues to function as an economic tool to offer competitive advantage and contribute to economic growth (Er, 1997; Margolin, 1998; Sparke, 2013). Design for economic sustainability moves away from the goal of prosperity toward a more basic goal of financial viability, and should also emphasize transparency and accountability (Shedroff, 2009). Beyond this premise, there is little deep development or theory on the concept of economic sustainability in design. However, some additional insights can be drawn from references to design for economic sustainability in literature. As an example, the United Nations Department of Economic and Social Affairs

hinted at the potential for design activities to address poverty and for design work to take place in environments with limited economic resources (2013). Further, in a discussion on design education and the career paths of design graduates, Eric Benson encouraged designers to engage in social entrepreneurship, a more sustainable business model that contributes to social good (2011). Thus, beyond modified expectations for profit, transparency and accountability, these examples hint that design for economic sustainability could also include alternative business models, design work that draws on less economic resources and design work that addresses economic issues.

Following this brief introduction to the sustainability imperative in industrial design and design for sustainability, the discussion now shifts to feminism's potential overlaps with and contributions to design for sustainability.

3.2 Relationships between Feminism's Interactions with and Contributions to Industrial Design and Design for Sustainability

This section examines the relationships between feminism's interactions with and contributions to industrial design, presented in Chapter 2, and design for sustainability. It begins by exploring how feminism's operations at an epistemological level overlap with and contribute to design for sustainability. Next, the discussion repeats, this time focusing on feminism's operations at a more concrete level.

3.2.1 Epistemological level. Design theorists like John Ehrenfeld (2013), Victor Margolin (2003), Stuart Walker (2006) and Anne-Marie Willis (2013) believe that unsustainability is deeply entrenched in industrial design. This can be seen in dominant models and conventions

in design that often emphasize the marketplace, expansion and economic growth over social or environmental priorities. These theorists also propose that most current design for sustainability approaches are not profound or radical enough to fully address unsustainability in design and that, instead, optimal sustainability can only be achieved through holistic changes to industrial design.

As discussed in the previous chapter, feminist epistemology is critical of dominant and universal bodies of knowledge and proposes opening them up to plural perspectives. In this way, feminism's operations at an epistemological level could support these changes for design for sustainability. Its interactions with industrial design would encourage new knowledge and perspectives, some of which might inform profound and holistic changes and provide the means for design for sustainability.

3.2.2 Concrete level. There are also strong relationships between feminism's interactions with and contributions to industrial design and design for sustainability at a concrete level. Namely, feminist scholars' concern for women's conditions has overlaps with design for sustainability, especially its social dimension. For instance, feminism also works toward a vision of a good society and feminist initiatives in design would likely align with many principles for socially responsible design (e.g. engage with society, design socially, be critical and take responsibility together). In this way, feminism's critiques and proposals relating to the inequality, injustice and oppression of women and normative gender roles could be considered design for sustainability processes. The insights gained from these critiques and proposals would also contribute to design for sustainability goals by improving women's conditions in and related to design.

3.2.3 Preliminary conclusions. Feminism's operations at epistemological and concrete levels in industrial design have similar relationships to design for sustainability. In both cases, feminism's interactions with industrial design (i.e. its processes of critique and proposal) could be considered design for sustainability processes. In turn, feminism's specific critiques and proposals and their implications could contribute to design for sustainability goals.

These relationships between feminism in industrial design and design for sustainability can be understood by referring back to the concepts of utopian thought and utopia. Recall that utopian thought was said to include a vision of a model society, a utopia (Tally, 2013), and an understanding of how to achieve it (Hedrén, 2009; Lockyer, 2007). It was also explained that feminism embodies utopian thinking and works toward a utopian vision through its processes of critique and action. The concepts of utopian thought and utopia can also be applied to design for sustainability. Design for sustainability is based on a utopian vision of design practice (e.g. a socially conscious, environmentally benign and economically viable practice), and holds and executes strategies to achieve this vision.

The potential relationships between feminist work in industrial design and design for sustainability hint that there are similarities between feminist and design for sustainability utopian thinking and utopias. It's likely that feminist utopian thinking and the feminist utopia are embodied within the larger design for sustainability utopian thinking and utopian vision. This would explain why feminist work mirrors design for sustainability processes and contributes to design for sustainability goals.

So far, this chapter has repositioned the value and contributions of feminist perspectives in industrial design in a new way, which shows it's more pragmatic and general

value to industrial design. However, the discussion doesn't end here. Digging a little deeper helps show that the relationships between feminism in industrial design and design for sustainability at the concrete level could be particularly extensive and may offer some unique and valuable insights, which moves beyond the proposals in the previous section. These more extensive relationships and contributions are presented in the pages that follow. This continued discussion helps further emphasize the value of feminism in industrial design. It also goes beyond the basic goals of this chapter and shows that the relationship between feminism in industrial design and design for sustainability could be relevant in its own right.

3.3 Feminism's Potential Extensive Relationships with Design for Sustainability

Feminism is known to be attentive to complexity and systems (see, for example McCall, 2005; Tong, 2014; and Wylie, 2012) and operates on the basis of these principles. In this sense, feminist scholars generally recognize that larger social issues and environmental and economic problems can negatively effect women (Walby, 2011) and often take this broader context into account in their initiatives.

At a wider social level, feminist scholars are often attentive to broad and underlying issues like authority, privilege, domination, oppression, discrimination, difference and identity and consider how they impact women and filter through the social world as a whole (Roof, 2007).

Focusing specifically on the negative consequences of environmental problems on women, Sylvia Walby author of *The Future of Feminism* (2011) explained:

> Women are a disproportionate component of the disadvantaged and they are most likely to suffer the downside of environmental changes, being most vulnerable to environmental disasters and least able to buy their way out of them. When there are

> food shortages, women are more likely than men to go hungry. When there is flooding, women are less likely than men to escape. (p. 128)

As another example, Beate Littig author of *Feminist Perspectives on Environment and Society* (2013) explained that, given their proportionally high share of domestic work, women are burdened by the responsibility for environmentally conscious behaviour:

> In many cases it takes much more time and energy to travel by bicycle to a farm to buy natural products there than it takes to bring products from the supermarket in a car, or to scrub a little harder instead of using strong detergents. (p. 64)

Further, women are known to be harmed by economic concerns like poverty, difference in pay, occupational segregation and the double burden of paid and domestic work (Walby, 2011).

In addition to highlighting how larger social issues and environmental and economic problems can negatively affect women, there are also plenty of examples of feminist initiatives that respond to these issues. This includes feminist work to help refine the conception of human rights and labour and develop labour laws (Littig, 2013; Walby, 2011), feminist contributions to environmental initiatives (Braidotti, 1994) and feminist economics (Hanne, 2015).

Feminism's attention to complexity and systems that inspires an exploration of the larger social issues and environmental and economic problems that can negatively affect women has direct relevance for the relationships between feminism's interactions with and contributions to industrial design and design for sustainability. Namely, feminism in industrial design could have parallels with design for sustainability as a whole. Feminism's interactions in industrial design could be considered relatively encompassing design for sustainability processes by highlighting a broad range of issues and offering holistic recommendations for

change. In turn, these specific critiques and recommendations could contribute to design for sustainability goals as a whole.

This broad reach of feminist work in industrial design is illustrated in several examples. Two authors in the anthology *Design and Feminism: Re-visioning spaces, places and everyday things* (Rothschild, 1999c) describe their feminist-driven design work as follows. Amelia Amon proposed that feminism in design should emphasize users' needs and wants and employ "appropriate technologies [and] alternative energy sources which use natural systems" (1999, p. 126). Amon applies this vision in her practice (1999). An example is a solar-powered ice-cream cart she designed for Ben and Jerry's (see Figure 3.1; 1999). Further, Wendy E. Brawer sees feminist-driven design practice as "ecologically and socially responsive" (1999, p. 129). She also applies feminism in her practice (1999). An example is the Deposit Bank, which is a public bottle and can recycling box accessible to 'bottle pickers' (see Figure 3.2; 1999). This product was installed in New York City and provided bottle pickers healthier and more dignified access to recyclables (1999).

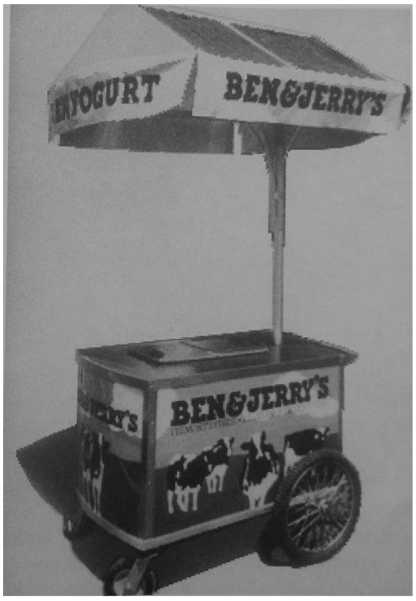

Figure 3.1. "Ice Cream Cart," by Amelia Amon, 1994. Retrieved from "The Domestication of Space-Age Technologies," 1999, p. 127. Reprinted with permission from Amon.

Figure 3.2. "Deposit Bank," by Wendy E, Brawer, n.d. Retrieved from "Sustainability and the City," 1999, p. 132. Reprinted with permission from Brawer, www.WendyBrawer.com.

Both examples stress feminism's combined social and environmental emphasis in design. For instance, critiques against the lack of connection between designers and users and the use of polluting energy sources in design are implicit in Amon's work. In response, Amon proposes a more sustainable way forward driven by a focus on users' needs and the use of environmentally friendly energy sources. Further, Brawer's deposit bank supports the economic dimension of sustainability even though she doesn't mention it directly; it helps provide a source of income to vulnerable populations.

The idea that feminism's interactions with and contributions to industrial design could have parallels with design for sustainability as a whole emphasizes the value of applying a

feminist perspective in design. Further, expanding on this relationship between feminism in industrial design and design for sustainability, it is also possible that feminism may offer some unique insights to design for sustainability based on these broad intersections. These unique insights are presented in the section that follows.

3.4 Feminism's Potential Unique Contributions to Design for Sustainability

This section provides additional detail to the discussion on the relationships between feminism's interactions with and contributions to industrial design and design for sustainability. It expands beyond the previous section to present some examples of feminism's potential unique contributions to design for sustainability.

To begin, recognition of complexity and systems is necessary for design for sustainability (see, for example, Manzini & Jégou, 2003; Shedroff, 2009) and has been part of the initiative from the very beginning. For instance, in his famous book *Design for the Real World*, Victor Papanek stressed that designers must develop products that respond to complex, real human needs of diverse populations and must consider the environmental impact of products: "tool, shelter, clothing, and breathable air and usable water are not only the job but also the responsibility of the industrial designer"(Papanek, 1971/1973, p. 184). However, Papanek recognized that social norms and designers' limited experiences and backgrounds can stifle creative thinking and new ideas (1971/1973). In an attempt to move beyond these limits, he encouraged designers to explore problems outside their everyday experiences (Papanek, 1971/1973). He also proposed a design approach (integrated design) that recognized complexity and systems: "we must think of man, his means, his environment, and his ways of thinking about, planning for, and manipulating himself and his surroundings as a non-linear,

simultaneous, integrated, comprehensive whole" (Papanek, 1971/1973, p. 284). An understanding of complexity and systems in design for sustainability has also increased over time (Margolin, 1998), as mentioned earlier in this chapter. It could even be said that "there is nothing external to design anymore" (Petit & Guillaume, 2018, p. 479).

However, Petit and Guillaume explain that design is often 'big,' operating at multiple scales at once (i.e. time and space), which can overlook the context and specificity of individual scales and their interrelationships (2018). A better alternative would be design that is attentive to scale, "polycentric and systemic" (Petit & Guillaume, 2018, p. 484). Contemporary design for sustainability work can align with this model; an example includes the DESIS Network (http://www.desisnetwork.org; Petit & Guillaume, 2018). However, it's a big task that takes resources and collaboration (Steves & Silver, 2018) and requires a shift in professional practices and structures. Thus, design for sustainability work likely does not always align with this ideal model.

By contrast, feminism has a strong grasp of complexity and systems and is highly attentive to scale, often focusing on grounded and context-specific experiences, as discussed in Chapter 2. When applied to design, feminist work would likely align with this ideal model and could represent an optimal design for sustainability approach.

Next, design for sustainability does not typically focus on women's concerns or the social dimension. This is evidenced by the relatively small amount of work on these topics, especially compared to design for environmental sustainability work. This is particularly the case from a historical perspective, as design for sustainability throughout the 1980s and 1990s focused primarily on environmental issues (Bhamra & Lofthouse, 2007).

In contrast, social and women's issues are feminism's most obvious points of focus. Feminist interactions with industrial design and the problems and proposals it points out in relation to these areas would be rare contributions to design for sustainability. They would respond to sustainability goals that may be missed in other design for sustainability initiatives.

In addition, feminist perspectives could compliment and, potentially, help further develop existing design for social sustainability work. Take, for example, social life cycle analysis, "a systematic process using best available science to collect best available data on and report about social impacts (positive and negative) in product life cycles from extraction to final disposal" (Benoît et al., 2010, p. 158). This is a rich framework that considers the experiences of a variety of stakeholders (e.g. employees, consumers), as well as issues like human rights and cultural heritage (Benoît et al., 2010). A feminist perspective could form part of the 'best available science' and inform the articulation of social issues or the research methods employed in this framework. For example, a feminist perspective would likely emphasize data collection more strongly rooted in experience and participatory approaches.

It was also mentioned earlier that the theory for design for economic sustainability is also relatively underdeveloped. By contrast, feminist economics is a long-standing discipline engaged in the critical and feminist-informed study of economics (Hanne, 2015). It examines underlying assumptions in economics like the idea that economic theories are value free or that economics success can be evaluated solely by GDP and numbers rather than, for instance, human factors like the reduction of poverty and the fulfilment of needs (Hanne, 2015). It examines power-dynamics in the field related to a range of issues including the construction of knowledge, the operationalization and consequences of programs (e.g. a positive view of trade when in fact it can lead to situations of vulnerability and exploitation; Hanne, 2015) and a bias

toward a western economic system where, for instance, “material accumulation results in the exclusion or devaluation of … practices such as sharing, loyalty, and gift-giving” (Zein-Elabdin, 2003, p. 327). It also addresses women-specific concerns related to economic systems such as employment opportunities and pay (Barker & Kuiper, 2003).

Feminist economics would likely support most contemporary theorizing on design for economic sustainability like aiming for economic viability and transparency, adopting alternative business models, and engaging in design work that draws on less economic resources and addresses economic issues. However, it could also add a range of new theory to further develop the domain.

Finally, although there are certainly exceptions, design for sustainability frameworks can have a relatively narrow focus: centring on a single sustainability dimension and specific aspects of industrial design rather than the field as a whole (Shedroff, 2009). Consequently, design for sustainability activities often need to be combined for optimal impact (Shedroff, 2009).

Further, many design for sustainability frameworks and activities focus on revising product development activities and decisions taken during the design project. This is a critical point of focus, since this is where designers have the greatest level of influence and where the majority of decisions that impact sustainability are made like, in the words of Tracy Bhamra and Vicky Lofthouse, “cost, appearance, materials selection, innovation, performance, environmental impact, and perceptions of quality such as longevity, durability, reparability” (2007, p. 37). However, as explained earlier, sustainability issues are known to be deep rooted in design, stemming from the prevailing model and contexts of industrial design practice. As

such, much of this current work does not operate at a deep enough level to address these issues.

The following are some examples of existing design for sustainability approaches. Cradle to Cradle is a framework that mostly targets design for environmental sustainability and is applied within the design project. It investigates the health impact of materials and processes on people and the environment throughout the lifecycle of a product for the sake of planning or evaluating design activities (Shedroff, 2009). Dematerialization is a principle to support environmental sustainability and is applied within the design project. It guides specific design methods like reducing the amount of materials used and the amount of waste generated in design and manufacturing (Shedroff, 2009). Finally, localization is a principle that can support many dimensions of sustainability and is applied within the design project. As an example, it guides the use of local materials and local distribution of products, which would support environmental sustainability by reducing waste from transportation and support society and the economy by, for instance, creating local jobs (Shedroff, 2009).

As noted, these existing approaches don't typically address a broad range of sustainability dimensions or aspects of design external to projects. By contrast, feminism's particularly strong grasp of complexity and systems could help it address sustainability concerns more holistically, through a single lens, and at a deeper level than is often seen. The problems and resolutions it points out in this context could be rare and, potentially, unique contributions to design for sustainability.

The insights in this section further expand the relationship between feminism's interactions with and contributions to industrial design and design for sustainability. It demonstrates that feminism's interactions in industrial design could be considered relatively

encompassing, unique and valuable design for sustainability processes that provide an original and encompassing response to sustainability goals based on their focus on complexity, systems and scale, women, social and economic concerns, the range of sustainability dimensions and the breadth and depth of issues in design.

3.5 Examples

Beyond Amon and Brawer's work, there aren't many examples in industrial design that directly reinforce the proposals about feminism's potential contributions to design for sustainability. However, there are relatively well-documented examples of feminist contributions to sustainable development. These cases are likely transferable to design given the close relationship between sustainable development and design for sustainability. They can help justify certain arguments in this chapter: specifically, those that present feminism's extensive relationships with design for sustainability and its resulting unique insights.

These examples of feminist contributions to sustainable development are cases of feminist lobbying of development organizations like the United Nations, feminist work within these organizations, or independent feminist initiatives on sustainable development. They span many years and the first examples date from the 1970s and 1980s. Some of this work predates the term sustainable development and refers instead to development. In this sense, this work could be considered foreshadowing for sustainable development.

To provide some context, development refers to the progression toward an 'ideal' society; moving from a state of underdevelopment based on poverty and its related social consequences like hunger and illness and moving toward optimal development based on industrial production and high and continually growing GDP (Rist, 2014). It was established

as an explicit program in the 1950s and 1960s that was operationalized by the United Nations and the World Bank through programs that provided, for instance, loans and training and built schools and hospitals (Rist, 2014). This model of development was beneficial by raising standards of living (Waas et al., 2011). However, it also had many problems and negative consequences where sustainable development is an attempt to modify the development model to address these issues. In many cases, this feminist work would have been contributing an early sustainable development perspective to development.

To begin, Women in Development (hereafter referred to as WID) is a movement that emerged in the 1970s (Gentile, 2008). It was inspired by Ester Boserup's book *Women's Role in Economic Development* (1970) where she stressed that women were left-out of development programs where, for instance, training programs in technological fields were targeted specifically at men (Connelly et al., 2000). This situation had further negative consequences for women, as it "reduced women's access to both technology and employment" (Connelly et al., 2000, p. 57). WID argued that women's needs should be incorporated into development projects by providing specific access to features like education and funding that would help women enter and integrate into the working world (Connelly et al., 2000; Gentile, 2008). WID argued that these changes to development would need to be based on a strong understanding of women's experiences and, as such, women should be involved in the planning and execution of development projects (Connelly et al., 2000). The group lobbied development organizations with great success; they are credited with changes in policy, the implementation of specialized women's affairs departments in many organizations including the World Bank, as well as the United Nation's Decade for Women implemented in 1975 (Chowdry, 1995; Connelly et al., 2000).

WID transformed in the 1980s (Aguinaga et al. 2013) and its focus moved from women to gender and became Gender and Development (hereafter referred to as GAD; Gentile, 2008). GAD considered new ways to empower women outside the dominant economic narrative by proposing, for instance, greater collectivity (Aguinaga et al., 2013). Further, in contrast to WID, GAD called for changes outside the limited scope of development: it sought changes to gender relations (Aguinaga et al., 2013). GAD's work is credited with the premise of gender mainstreaming, "a systematic process of situating gender equality issues at the center of broad policy decisions, institutional structures and resource allocations" applied in organizations like the World Bank and the United Nations (Bakker, 1999, p. 84).

As another example, Women and Development (hereafter referred to as WAD) is a group that emerged in the 1970s (Parpart & Marchand, 1995). It was wary of integrating women into mainstream development projects and instead proposed women-specific projects and implementation that operated outside of patriarchal institutions (Connelly et al., 2000; Parpart & Marchand, 1995).

Like the proposals relating to feminist work in industrial design, feminist contributions to sustainable development help expand the scope of sustainable development preoccupations. Feminism's specific focus on women led these initiatives to consider how women are served by and can take part in development/sustainable development. The work brought concern for broader social and economic issues through attention to the working world and economic foundations. It also addressed a wide breadth and depth of issues ranging from concrete programs to foundations of economic and gender structures. These critiques and proposals provided unique insights to sustainable development theories and practices by expanding the

understanding of issues and proposing ways to address these more extensive issues. For example, this is demonstrated in the development and application of the premise of gender mainstreaming.

3.6 Conclusion

In an effort to justify the value of feminist work in industrial design to a broader audience, this chapter explored the potential relationships between feminism's interactions with and contributions to industrial design and design for sustainability. At a basic level, it explained that feminism's interactions with industrial design (i.e. its processes of critique and proposal) could be considered design for sustainability processes. It also noted that feminism's specific critiques and proposals and their implications promise to contribute to design for sustainability goals. Next, the discussion went further to explain that feminist work in industrial design could have more extensive relationships with design for sustainability. Namely, feminism's interactions in industrial design could be considered relatively encompassing, unique and valuable design for sustainability processes. Further, its specific critiques and proposals toward industrial design could contribute to design for sustainability as a whole and could provide a more encompassing response to sustainability than seen elsewhere based on its focus on complexity, systems and scale, women, social and economic concerns, the range of sustainability dimensions and the breadth and depth of issues in design.

These past two chapters have provided a relatively rich framework for this research project. However, there is one remaining chapter in the theoretical framework. As noted earlier, feminism is more complex and diverse than has been incorporated in the discussion so far. As such, Chapter 4 introduces a more complex view of feminism and discusses the likely

implications of this expanded understanding on feminism's potential contributions to industrial design and design for sustainability.

Chapter 4. Feminism's Complexity and Diversity and its Implications for Feminism's Contributions to Industrial Design and Design for Sustainability

This chapter includes a relatively detailed theoretical discussion on feminism that stresses its complexity and diversity. This begins with an expanded introduction to ideologies and feminism as an ideology, and is followed by a historical discussion of feminism and feminist work related to design and their changes over time. Last, the theoretical content is followed by comments on its likely impact on feminism's contributions to industrial design and design for sustainability.

4.1 Understanding Ideology

Michael Freeden, a prominent theorist on ideology explained that ideologies are comprised of a system of concepts (1996; 2003). These might include, for instance, liberty, justice, nationhood, power or rights (Freeden, 1996). Each ideology injects its own specific understanding of the concept, drawing on a specific perspective and specific values (Freeden, 1996). As he explains, "[in] one ideology rights may be used to protect human dignity from assault; in another to protect private property and wealth from having to contribute to the common good" (Freeden, 2003, p. 52). The meaning of each concept is further enhanced by their relationships to each other (Freeden, 2003).

In terms of feminism, its core concepts are discussed in a variety of literature on ideology. This section draws on two main sources: Freeden's account of feminism in *Ideologies and Political Theory* (1996) and Clare Chamber's account in her chapter on feminism in *The Oxford Handbook of Political Ideologies* (2013). Based on these readings,

feminism's core concepts can be understood as follows: sex and gender are significant factors in the social and political world; sex and gender are at the heart of social hierarchies and inequalities; and female sex and feminine gender are disadvantaged meaning that women are dominated (Chambers, 2013; Freeden, 1996).

Several core concepts are at the heart of each ideology and are, for the most part, shared by all adherents (Freeden, 2013). However, there are different variants of each ideology. These can prioritize certain core concepts over others or inject additional peripheral concepts (Freeden, 2013). When this happens, the general ideology can be understood as an ideological family with a series of sub-ideologies (Freeden, 2013) sometimes referred to as ideological strands. Feminism is no different; feminism is an ideological family (Freeden, 1996) meaning that it takes diverse forms beyond this general framework. The ideological strands diverge in many respects. They have different understandings of the concept of woman, the extent of the difference between women and men, the specific causes of inequality, and the changes that are needed to address inequality (Chambers, 2013; Goodwin, 2007). Feminism has also become increasingly diverse over time. In the 1980s and 1990s, it expanded beyond a specific focus on women (Krolokke & Scott Sorensen, 2006) to explore how "women's lives are shaped by race, nationality, class, and sexuality, as well as by gender" (McCann & Kim, 2010, p. 22). Today, contemporary feminism is very broad and open to different views, theories and ways of practicing feminism (Krolokke & Scott Sorensen, 2006). Indeed, this diversity leads some feminist scholars to refer to *feminisms* (see, for example, Warhol, Warhol-Down & Herndl, 1997).

I referenced Paul Ricoeur's writing (1986) in Chapter 2. Ricoeur explained that ideologies reinforce systems of authority and utopias "[introduce] imaginative variations" that

can spur social transformation (1986, p. 17). This could be understood in several ways. First, ideologies are always involved in contestations over power where current ideologies work to retain their power and others seek to gain power and recognition of their perspective (Freeeden, 2003). Thus, utopias within ideologies could encourage transformation when they come up against another ideology: they could fight to have their perspective recognized.

Alternatively, Ricoeur's quote could also indicate that utopias within ideologies change over time, and drive changes to their ideology or lead to the development of a new ideological strand. This is an important point: ideologies are in continual evolution and feminism is no exception. Indeed, bell hooks noted: "[a] primary strength of contemporary feminism has been the way it has changed shape and direction" (2015, p. 110)

The section that follows introduces a variety of feminist ideological strands and their transformations over time. This overview is not complete, as feminist perspectives are incredibly diverse, context-dependent and continually evolving. However, it provides an adequate introduction for the purposes of this study.

4.2 History of Feminist Ideological Strands

Feminist history is often told using a wave metaphor, where it has cycled between phases of great mobilisation and slowing (Reger, 2015). The different phases build and respond to each other, driven by world changes and new generations of feminists with different problems, goals and approaches (Naples, 2005; Reger, 2015).

4.2.1 First wave. The origins of contemporary feminist activity are believed to date from the mid-19th century and were inspired by a period of social activism and increasing separation between public and private spheres brought about by industrialization that separated male and

female realms and activities (McPherson, 2000). Feminist activity during this time is often referred to as the first wave of feminism. It aimed to "extend the social contract to recognize women as citizens" and respond to their inequality and exclusion (translation by author; Mensah, 2005, p. 9).

This early feminism emerged as strands of other ideologies (Freeden, 2003). This includes a feminist strand of liberalism that linked female subordination with "customary and legal constrains blocking women's entrance to and success in the so-called public world" (Freeden, 2003; Tong, 2014, p. 2). It held the view that women and men have the same intellectual and physical capacities (Tong, 2014) and that they would be equal if they had equal rights (Taylor, Whittier & Pelak, 2004). As such, it supported issues like access to education and legal rights (McPherson, 2000). Another example includes a feminist strand of socialism that was concerned with the needs of working class women (McPherson, 2000).

Despite differences within the feminist community, they came together in the early 20th century in the fight for women's right to vote (McPherson, 2000). The vote was understood as a means for greater political power that would help facilitate the achievement of other feminist goals (McPherson, 2000). Through these efforts, women gained the right to vote in Canada in 1918 (Jackel, 2013).

Following the wave metaphor, feminism's momentum died down after gaining the right to vote (Charles, 2015). This happened for many reasons such as having achieved a major goal, increased national unity during the World Wars (Krolokke & Scott Sorensen, 2006), and a link between communism and social reform (Ryan, 1992).

4.2.2 Links with design. Feminist activity during the first wave intersected with design through discussions of women's dress. There were various movements for dress reform in the mid–19th century (Nickolai, 2013). This included the work of women's rights activists, as well as initiatives related to health (Nickolai, 2013). Women's rights activists viewed "conventional women's dress as a badge of degradation and recognized its role in enforcing female passivity" (Kesselman, 1991, p. 498). Some women during the period began wearing bloomers, named after Amelia Bloomer, a leader in the movement (Kesselman, 1991). However, this initiative was short-lived; women's rights activists chose to focus on their other, more central goals after experiencing a negative public reaction to their new clothes (Kesselman, 1991).

Many decades later, women's fashion did begin to change for a variety of reasons. This included rationing during World War 1, women's work outside the home and increasing domestic responsibilities for well-off women, due to decrease in domestic help (Nickolai, 2013; Rhode, 2016).

As another example, there were numerous design proposals for utopian feminist cities toward the late 19th century and into the early 20th century (Hayden, 2005; Kanes Weisman, 1994; Roberts, 1991). Many of these designs proposed communal living and division of domestic labour (Vestbro & Horelli, 2012). For instance, in 1916, Alice Constance Austin proposed a city where "[h]ouses were kitchenless, furniture was built in, beds rolled away, heated tile floors eliminated carpeting, and hot meals were delivered through underground tunnels from a central kitchen" (Kanes Weisman, 1994, p. 124).

4.2.3 Second wave. Feminism re-emerged in the 1960s with the understanding that "equality in daily life cannot be obtained through simple legal, political or institutional modifications" (Eichler & Lavigne, 2015, para. 3). Activity beginning in this period is often referred to as the second wave of feminism. Compared to the first wave, it focused on "social relations in a broad sense, and systems of oppression toward women and the institutions that maintain them" (translation by author; Mensah, 2005, p. 9).

Second wave feminism emerged with other civil rights movements in the West (Reger, 2015) and in reaction to their structure and leadership (hooks, 2015). Bell hooks (2015) explained:

> feminist activists (a majority of whom were white) had their consciousness raised about the nature of male domination when they were working in anti-classist and anti-racist settings with men who were telling the world about the importance of freedom while subordinating the women in their ranks. Whether it was white women working on behalf of socialism, black women working on behalf of civil rights and black liberation, or Native American women working for indigenous rights, it was clear that men wanted to lead, and they wanted women to follow. (pp. 2-3)

There were two major branches of feminism at the beginning of the second wave: liberal feminism, a reform movement, and radical feminism (Ryan, 1992). The new incarnation of liberal feminism was inspired by Betty Friedan's critique of women's roles in the home in *The Feminine Mystique* (Ryan, 1992). As Deborah Wills explained, "Friedan's solution for women's emotional enslavement to being mother and wife is to promote the view that women become educated and work outside the home" (2000, p. 214). Thus, the liberal feminist strand held that women can improve their position by working outside the home and entering politics (Taylor, Whittier & Pelak, 2004). Its followers also documented and critiqued sexism, which they associated with gendered socialization like how parents interact with female or male children (Krolokke & Scott Sorensen, 2006). Liberal feminism is still present today, but has

been critiqued and overshadowed by other ideological strands (Tong, 2014). Radical feminism took on this role in the late 1960s (Krolokke & Scott Sorensen, 2006).

While liberal feminism focused on progress in the lives of individual women, radical feminism focused on women as a group and large-scale change (Taylor, Whittier & Pelak, 2004). Radical feminism was inspired by *The Second Sex* by Simone de Beauvoir (Taylor, Whittier & Pelak, 2004), especially the arguments that women are oppressed as other and "the only authentic moral action is women's collective struggle for their own liberation" (Davis, 2000b, p. 39). The radical feminist ideological strand holds that patriarchy is a universal system (Hines, 2015) that emphasizes power, competition and hierarchy (Tong 2014) and results in the "systematic male dominance of women" (Hines, 2015, p. 24). Patriarchy is rooted in institutions like the family, which exploits women through domestic work and keeps them from entering the public world (Hines, 2015). Patriarchy is so entrenched that it "cannot be reformed but only ripped out root and branch" (Tong 2014, pp. 2-3). Radical feminism's fight against patriarchy was so systemic and broad reaching that it supported a break between feminism and other existing ideologies and signalled the beginning of feminism as its own ideological family (Freeden, 2003).

There are several divisions within radical feminism: radical libertarian and cultural. Radical libertarian feminism holds "that patriarchal society uses rigid gender roles to keep women passive … and men active" (Tong, 2014, p. 53). Yet, sex is separable from gender (Tong, 2014). The key to women's liberation is "for both sexes to first recognize that women are no more destined to be passive than men are destined to be active, and then to develop whatever combination of feminine and masculine traits best reflects their individually unique personality" (Tong, 2014, p. 54). In contrast, cultural feminism holds that "it is better for

women to be strictly female/feminine" (Tong, 2014, p. 52). Women's subordination can be resolved by assigning a higher value to feminine gender or by reinventing femininity or 'femaleness' in new terms (Tong, 2014). Some even believe that "women's essential nature [is] better than men's and that women ought to govern men" (Tong, 2014, p. 53).

There were a variety of other streams of feminism in the 1970s beyond the major liberal and radical branches. For instance, socialist feminism, also known as materialist feminism, felt that women were oppressed by a combination of patriarchy and capitalism (Tong, 2014). This is expressed in "Beyond the unhappy marriage: A critique of the dual systems theory" by Iris Marion Young who explained that "the marginalization of women and thereby our functioning as a secondary labor force is an essential and fundamental characteristic of capitalism" (1981, p. 58; Tong, 2014). The socialist feminism during this period would have drawn on elements of the socialist ideological family, but would have been situated in the feminist ideology.

While these different streams created divisions in the feminist movement, the strands began to move together and activists started thinking about their shared goals in the 1970s to 1980s (Ryan, 1992; Tong, 2014). Yet, there was building critique against these ideological strands at about this same time coming from a variety of directions. The second wave had been dominated by typically white, educated and middle-class women (Charles, 2015). As such, the movement was critiqued for excluding more diverse members like working class women, black women or lesbian women and their interests (Charles, 2015; McCann & Kim, 2010). Further to this, radical feminism claimed to represent all women and fight against patriarchy, a dominant and universal form of oppression (Hines, 2015). Opponents argued that this was not always the only or main form of oppression (McCann & Kim, 2010).

Second wave feminism transformed in the 1980s and 1990s as new strands developed and became dominant (Krolokke & Scott Sorensen, 2006). These represent greater diversity and explore how "women's lives are shaped by race, nationality, class, and sexuality, as well as by gender" (McCann & Kim, 2010, p. 22). The term intersectionality refers to the overlap between these different systems (McCann & Kim, 2010). As an example, while Black feminism can be traced to the mid-19th century, it emerged with force in the 1980s (Tong, 2014). It represents the experiences of Black women and combats oppression based on sex but also from issues like race and class (Henwood, 2007; Rich, 2014). For instance, in *Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment* Patricia Hill Collins explained, for instance, that oppression comes from economic and political dimensions: "The economic relegates black women to service occupations [and] the political dimension denies black women the privileges and rights routinely extended to whites" (1990, p. 6; Tong, 2014). These critiques against feminism's previous narrow perspective operated in parallel to and likely inspired by postmodern thinking (Thornham, 2001).

In addition to the popular and social aspects of feminism, a theoretical dimension increasingly emerged (McPherson, 2000). Academics began to link theory from a range of fields to feminism and, as such, a series of new feminist strands emerged (McPherson, 2000). One example is postcolonial feminism, which is "an exploration of and at the intersections of colonialism and neocolonialsm with gender, nation, class, race, and sexualities" (Sunder Rajan & Park, 2008, p. 55). It is strongly inspired by "Can the subaltern speak?" by Gayatri Chakravorty Spivak (1988), which argued that western thought is entrenched in colonialism and doesn't see the subjectivity of other populations (Tong, 2014).

4.2.4 Links with design. There was a lot of diverse design work inspired by feminism during the second wave, and feminist theories and concepts introduced in Chapter 2 like sex, gender and gender roles appear in this work.

For example, there has been a difficult relationship between feminism and domesticity, especially during the second wave in the 1960s and 70s (Gillis & Hollows, 2008). For example, from a liberal feminist perspective, women's roles in the home were seen to "[render] them isolated, powerless and, crucially, lacking a sense of identity derived from their own labour" (Gillis & Hollows, 2008, p. 6). On the other hand, a cultural feminist perspective may have valued domestic work and encouraged a more empowering reconceptualization (Gillis & Hollows, 2008).

In design, Ruth Schwartz Cowan took a critical stance toward domestic technologies in *More work for mother: The ironies of household technology from the open hearth to the microwave* (1983). Writing from a socialist feminist perspective, she argued that the economic system is built on the assumption that women's domestic labour is free (1983). This assumption carries into design and is reflected in household products like the washing machine: operating a washing machine takes time and this work is only viable if women's labour is free (Schwartz Cowan, 1983). In her view, a more positive alternative could include establishing a commercial laundry system, changing gender roles in the home and/or modifying expectations for household cleanliness (Schwartz Cowan, 1983).

In response to male and masculine domination and the gendered nature of space, there was also a move to incorporate feminine psychological traits and/or the female body in design processes and artefacts during the 1970s and 1980s (Rothschild & Rosner, 1999). This was especially prevalent among architects (Rothschild & Rosner, 1999) and represented a cultural

feminist perspective in design. As an example, Margrit Kennedy proposed female (feminine) and male (masculine) psychological principles and distinctions in architecture (see Table III; 1981).

Table III: *Female and Male Principles in Architecture*

Female principles		**Male principles**
More user-oriented	than	Designer-oriented
More ergonomic	than	Large-scale, monumental
More functional	than	Formal
More flexible	than	Fixed
More holistic	than	Specialized
More complex	than	One-dimensional
More socially oriented	than	Profit-oriented

Note. Data adapted from Kennedy 1981.

On another topic, much second wave feminist writing saw feminine beauty rituals like applying makeup and dressing fashionably as "integral both to the production and regulation of femininity and to asymmetrical relations of power between the sexes and among women" (Davis, 2000a, p. 39). Radical feminists initiated a boycott against beauty products during a protest against Miss America competitions in 1968 (Rhode, 2016). At this point, many stopped wearing hair curlers, makeup and fake eyelashes (Rhode, 2016). This move led to real changes where, for example, designers began creating more practical women's shoes, as alternatives to high heels (hooks, 2015).

As the wave progressed, there was also increasing discussion about how beauty privileges a Eurocentric ideal (Davis, 2000a), which came to the fore in the 1980s (Craig, 2006). Namely, "[in] dominant gendered and racialized systems of representation, true women were beautiful, white, and pure" (Craig, 2006, p. 170). In contrast, black feminism celebrated black female beauty and encouraged, for example, natural hairstyles (Craig, 2016).

Finally, feminist perspectives toward technology have varied over the years, moving from a positive view in the 1960s and 70s, to a more negative view in the 1980s (Wajcman, 2010; Wyatt, 2008). During the 1980s, different feminist strands held variations of the view that men controlled technology, technology is gendered (masculine) and male technological expertise is privileged (Wajcman, 2010).

4.2.3 Third wave. The diversity of feminist strands in the 1980s heralded a third wave of feminism in the 1990s (Hines, 2015). The third wave was led by a younger generation of feminists (Orr, 1997) that respected the diversity of different feminist theories and had open views on "who could be a feminist and how" (Marecek, 2000, p. 474). The third-wave is "consequently not one, but many" (Krolokke & Scott Sorensen, 2006, p. 17). Generally, however, third wave feminism is based on a definitively postmodern understanding and contestation of gender and identity, which views both as socially constructed and fluid (Dicker & Piepmeir, 2016).

As Jo Reger (2015) explained, the third wave takes place in a much different context than the second wave:

> Young women and men in the twenty-first century enter feminism in a society dramatically shaped by the movement's first two waves. Through the efforts of second wave activists, a variety of feminist cultural events exist … In addition, feminism is embedded in the institutions in which third wave feminists spend their lives. (pp. 5-6)

Third wave feminists continue to address issues like gender roles, workplace discrimination and violence against women (Reger, 2015). However, they also focus on different issues in response to the second wave and the changing world (Reger, 2015). This includes an emphasis on sexuality, technology and mass media (Snyder, 2008; Starr, 2000). The third wave is also embedded within and employs culture and technology (Reger, 2015).

4.2.4 Links with design. Feminist perspectives toward beauty have evolved over the years and contemporary feminisms increasingly see beauty as a means for power and creativity (Cahill, 2003; Davis, 2000a). This was reflected in some women's comments during an interview with the BBC (Hall, 2015). For instance, a participant named Lou said makeup and glasses are "all part of an arsenal of things you can use to empower you" (Lou cited in Hall, 2015, para. 13).

However, issues raised during the second wave continue. Take, for example, the view that beauty standards are Eurocentric and privilege pale skin. Writing from a postcolonial feminist perspective, Roro Retno Wulan critiqued how women's soaps and lotions in Indonesia privilege whiteness through their packaging and marketing (2017).

In contrast to some perspectives during the second wave, feminists during the third wave often see technology as flexible and possible to reframe (Wyatt, 2008). It can also be empowering to its users and enable their creativity (Wyatt, 2008). However, it must be recognized that there are different experiences of and access to technology across the world (Gajjala, 2003). Feminist Approach to Technology (FAT) is an example of an initiative that responds to this concern. The organization operates in several states in India and runs programs including a STEM innovation lab and a leadership program (FAT, 2018).

On another topic, DIY work like making clothing or zines has been used throughout feminist history, but is particularly prevalent today (Chidgey, 2014; Kempson, 2015). It is seen as a means to express subjectivity (Kempson, 2015) and effect change, while working outside large structures and institutions (Chidgey, 2014). It also supports participation; for example "[even] a cursory look at feminist zines would confirm the importance of 'creating,' 'empowerment,' 'skill-sharing,' 'participation,' and 'learning' within these networks" (Chidgey, 2014, p. 104).

The recent emergence of feminist hackerspaces could be an example of this current emphasis on DIY. Feminist hackerspaces are community spaces that merge creation and feminist activist activities (Toupin, 2014). In feminist hackerspaces, 'hacking refers' to do-it-yourself creation activities and the identity work of 'hacking yourself' through building confidence and empowerment (Fox, Ulgado & Rosner, 2015). As an example of their work, creation activities in Double Union, a feminist hackerspace in San Francisco have included editing women-centred Wikipedia pages to increase the profile of women in popular culture and the arts and modifying mobility and accessibility devices like wheelchairs (Double Union, 2014).

Within the category of DIY, crafting is also prominent and could be seen as a contemporary move to reclaim femininity (Reger, 2015). Pussyhats are a prominent contemporary example of feminist craft. Jayna Zweiman and Krista Suh initiated the project in response to Donald Trump's comments "to de-stigmatize the word 'pussy' and transform it into one of empowerment" (Pussyhat Project, 2018, para. 5). The project draws on femininity through knitting and the pink colour, but also engages with the inclusivity of the third wave.

The simple pattern is available for free online, so anyone can join-in and make their own (Pussyhat Project, 2018).

4.2.1 Discussion. It was noted earlier that the feminist ideological family shares core concepts: namely, that sex and gender are significant factors in the social and political world; sex and gender are at the heart of social hierarchies and inequalities; and female sex and feminine gender are disadvantaged meaning that women are dominated (Chambers, 2013; Freeden, 1996). However, individual feminist strands have different understandings of the concept of woman, the extent of the difference between women and men, the specific causes of inequality, and the changes that are needed to address inequality (Chambers, 2013; Goodwin, 2007). These similarities and differences among feminisms are seen in the history presented above.

To begin, older feminisms and especially cultural feminism would have used the concept of women to refer to a blend of physical and non-physical properties associated with the female sex and feminine gender (McCann & Kim, 2010). In contrast, postmodern feminisms see a separation between sex and gender and unite women mainly based on physical characteristics (McCann & Kim, 2010). In terms of the perceived differences between women and men, strands like liberal feminism would likely see minimal differences, while cultural feminism would accentuate and draw on these differences. Further, radical feminism links inequality to patriarchy, whereas intersectional feminisms see factors like race and class as additional causes of inequality. However, one of the more striking differences among feminisms is their position toward the changes required to address inequality. This stance relates to the strand's position on the other points: the concept of woman, the difference

between women and men and the causes of inequality (Chambers, 2013). To illustrate this point, liberal feminism was troubled by women's social roles and positions and proposed changes in the lives of individual women. In contrast, radical feminism argued that inequality was rooted in patriarchy that could only be addressed through fundamental changes to social systems.

These differences between feminisms are also apparent in their design work and perspectives toward topics like domesticity, beauty or technology. For instance, early radical feminists offered a profound critique against beauty rituals and tools, focusing on a relatively narrow view of women. In contrast, black and postcolonial feminists highlighted relationships between race and beauty.

4.3 Impact of Feminism's Diversity for Industrial Design and Design for Sustainability

As hinted above, this diversity of feminism would impact the intersections and interplay of feminism and industrial design where different feminisms would bring their own perspective, points of emphasis, approach and level of radicality. The range of proposals about feminism's possible contributions to industrial design and design for sustainability outlined in the previous chapters still apply, but feminism's specific orientations may change from case to case.

These differences could impact feminism's epistemological contributions. While feminism in general is critical of dominant and masculine knowledge and would recommend opening industrial design to more diverse perspectives, the extent of the critique and the recommendation for change could vary from case to case. The differences between feminisms could also influence feminism's contributions to industrial design and design for sustainability at more concrete levels. Indeed, different points of focus and different extremes could be

especially visible in feminism's challenges to specific aspects of industrial design and its proposals for change.

The following are examples of feminist interventions in industrial design at this more concrete level that demonstrate these possible variations. These compliment and are in addition to the examples included in the earlier historical discussion. To begin, several authors stress that designer-consumer relationships are patriarchal where the primarily male industrial design workforce controls female consumers through the products they create (Partington, 1989). Namely, designers make products with a specific vision of how they should be used (Partington, 1989) and these products frame consumers' lives (Lupton, 1993). These critiques seem to draw on radical feminism given their direct focus on patriarchy and the distinction between the public and domestic worlds. Also relating to design professionals, Nancy Perkins argued that female designers are best able to understand female users, and "when women are absent ... criteria for what is comfortable, appropriate, and appealing to women may be overlooked" (Perkins, 1999, p. 120). In this case, Perkins likely applied a cultural feminist perspective that drew on women and their gendered interests and characteristics. Finally, in "Representations of Women and Race in the Lancastershire Cotton Trade," Mumby is critical of the export of cotton from Britain to India and China in the 19th century (1989). She explained that this process destroyed local cotton industries in India (1989). Further, prints on the cotton and its advertising had caricatures of Indian women that showed them as poor, passive or sexual objects (Mumby, 1989). Mumby saw these representations as a form of oppression and cultural control (1989). Mumby's arguments seem to draw on postcolonial feminism by critiquing power relations between Britain and India and China, and by focusing on how the textile makers ignored the subject position of Indian women.

Each case is an example of a feminist critique of industrial design that can inform design theories and practices by highlighting issues in industrial design and can help align the design field with feminism and its social goals. However, different feminisms inform the focus of the critique on industrial design that can range from gender to global issues. Further, the specific feminism can guide the depth of interrogation ranging from systems like the relationships between designers and consumers to more concrete issues like women's professional roles.

Next, in terms of design for sustainability, the theoretical framework explained that a feminist intervention in industrial design at the concrete level could have inherent contributions for design for sustainability: feminism's processes of critique and action could be considered design for sustainability processes and would contribute to design for sustainability goals. It was also suggested that the relationships between feminist interventions in industrial design and design for sustainability are extensive and may offer some unique insights to design for sustainability based on these broad intersections. Feminist interventions in industrial design at the concrete level could have parallels with design for sustainability as a whole: they could contribute to design for sustainability goals as a whole and feminism's processes could be considered relatively encompassing design for sustainability processes. As a result, the feminist work in industrial design could provide a more encompassing response to sustainability than seen elsewhere based on its focus on on complexity, systems and scale, women, social and economic concerns, the range of sustainability dimensions and the breadth and depth of issues in design.. Further, a review of feminism's critiques and action could provide unique insights to design for sustainability theories and practices by expanding the

understanding of issues in industrial design and proposing ways to address these more extensive issues.

These statements could apply to the range of different feminisms, although each might have a different relationship with sustainability. For instance, the examples of feminist interventions in industrial design above have different points of focus and levels of radicality that could respond to different parts of the sustainability imperative and do so to different extents. In the examples above, Mumby (1989) offered a particularly deep-rooted critique of industrial design that addressed the intersection of various forms of oppression, whereas Perkins (1999) focused only on women and offered a targeted critique of a relatively specific situation.

4.4 Particular Promise of Certain Feminist Strands

Although this section has stressed the value of each feminism to industrial design, certain feminisms could offer especially promising contributions. This is especially the case with respect to feminism's contributions to design for sustainability. Namely, intersectional feminisms could be especially promising given their more complex understanding of the range of social concerns and their impact on women. Further, feminisms with higher levels of radicality may be better able to address the breadth and depth of issues in design. There is also a specific, unusual type of feminism that could be especially promising to design for sustainability given its areas of interest: namely, eco-feminism. Eco-feminism operates at the boundary of the feminist and environmentalist ideologies. As such, it relates to the environmental dimension of sustainability more strongly and directly than other feminisms.

Eco-feminism emerged around the same time as the environmental movement in the 1970s (Littig, 2013; Mellor, 1997). It draws on many of the premises of the environmental movement (Littig, 2013; Mellor, 1997), but also injects a feminist perspective that investigates the intersection of women's experiences and nature, the underlying causes of environmental concerns and assumptions in the environmental movement (Mellor, 1997). Generally, eco-feminism is based on the view that women and nature are both oppressed by Western patriarchy and both must be liberated (Tong, 2014). However, more specific details about the root of the relationships between women and nature and how these should be addressed differ between types of eco-feminism (Tong, 2014).

4.5 Examples

Just as feminist contributions to sustainable development helped justify and exemplify certain arguments in Chapter 3, these examples can also reinforce the proposals about the impact of feminism's diversity on its relationships with industrial design and design for sustainability and the particular promise of certain feminist perspectives.

First, these examples show how different feminist strands drive the work's perspective, points of emphasis and level of radicality in relation to development and sustainable development. For instance, WID was based on liberal feminism and focused on issues surrounding education and the workplace. In contrast, WAD was based on radical feminism and was concerned with patriarchy and its broad reach. In terms of their radicality, WID sought to integrate women into existing structures and WAD proposed breaking from the existing development projects.

It was also proposed above that certain feminisms could be more promising than others for design for sustainability. This might include intersectional feminism and eco-feminism. To begin, GAD embodied intersectional feminism and addressed issues including class and race. As such, it would likely touch-on a range of social issues beyond gender-specific concerns. There are also examples of ecofeminism in this history of critique of sustainable development. Namely, eco-feminism was operationalized in the Women and Environment movement (hereafter referred to as WAE) in the 1970s (Braidotti, 1994). It critiqued the impact of environmental issues on women (Braidotti, 1994) and felt that women could help address environmental challenges (Dankelman, 2012). For instance, it sent women to deal with specific resource shortage situations (Braidotti, 1994). In this sense, eco-feminism offers a unique contribution to sustainable development theories and practices through its combined social and environmental emphasis.

4.6 Conclusion

In summary, this chapter supplemented the initial theoretical framework by presenting feminism's complexity and diversity and exploring its likely impact on feminism's possible contributions to industrial design and design for sustainability. The discussion showed that the range of proposals about feminism's contributions to industrial design and design for sustainability outlined in Chapters 2 and 3 still apply, but feminism's specific orientations may change from case to case. Different feminist strands could highlight different issues in industrial design and propose different resolutions. Further, each feminist strand would support design for sustainability, but could do so in different ways based on its points of focus and levels of radicality. Finally, certain feminisms could offer especially promising

contributions to industrial design and, especially, design for sustainability based on their unique orientations.

Following this extensive theoretical discussion, the chapter that follows lays out the focus of the original research in this investigation. It outlines the research question, objectives and expected research outcomes.

Chapter 5. Research Project

As introduced in Chapter 1, despite feminism's many possible contributions to industrial design and design for sustainability and the examples of feminist interventions in industrial design presented in the previous chapters, there is still relatively little feminist work in industrial design. This situation means that feminism's potential advantages for industrial design and the sub-field of design for sustainability discussed in the theoretical framework are not well known, and are minimally explored and exploited. Indeed, many of the suggestions in the theoretical framework are educated guesses without concrete proof; they are proposals of how feminism *can* contribute to industrial design, rather than how it does. Further, from a feminist perspective, the shortage of this work in industrial design means that industrial design remains misaligned with feminism and its social goals. As a result, problems of inequality, injustice and oppression exist in industrial design and can be perpetuated through its practices.

As such, this study responds to the shortage and lack of visibility of feminist work in industrial design. It brings forward and examines feminist perspectives in industrial design to gain advantage of feminism's contributions to industrial design and design for sustainability.

This project takes a particularly broad perspective. For instance, rather than focusing on the offerings of a specific theory to industrial design, this project aims to explore a broad range of feminism's potential advantages for industrial design and design for sustainability. This is a relevant choice for this preliminary research project, since it helps fill the void of feminist work in industrial design and promises to provide a range of insights. Informed by these results, future research could then apply a narrower focus to explore promising specific relationships between feminism, industrial design and design for sustainability.

5.1 Research Question

The research question is:

- How does feminism inform industrial design and design for sustainability theories and practices?

Several precisions help further specify the focus of this project. First, the theoretical framework showed that feminism can interact with industrial design at many levels. At an epistemological level, feminism encourages scepticism toward dominant knowledge in industrial design, as well as the introduction of new perspectives and new knowledge. These epistemological contributions would also be a first step toward a holistic revisioning of industrial design for sustainability. Although these are rich offerings, they are relatively straightforward and could be inherent in any feminist intervention in industrial design. In contrast, feminism's benefits to industrial design at the more concrete level are less evident and require a targeted investigation and analysis. As such, feminism's interactions with and contributions to industrial design at this concrete level are the focus of this project.

Further, design for sustainability is a sub-category within the broader industrial design field. It is also a secondary focus in this project, as made clear in Chapter 3. As such, feminism's advantages for design for sustainability aren't addressed until the second half of this project, as the focus of objectives 3 and 4.

Finally, feminism is complex and diverse, as stressed in Chapter 4. As such, this project must specify the feminism(s) included in the investigation. One possible strategy would be to choose a specific feminism like eco-feminism, which has particular promise for design for sustainability. However, feminism itself supports incorporating multiple

perspectives in knowledge construction. As such, this project remains open to the range of feminist perspectives.

This is also a relevant choice for several reasons. First, this is a preliminary research project and understanding feminism's broad and general contributions to industrial design is an appropriate starting point. Future projects could narrow-in on specific feminisms if desired. Further, feminism is context dependent: its priorities and perspectives change across time and place (McCann & Kim, 2010). Selecting a specific feminist perspective would be an artificial choice and examples could be hard to find and may be less contextually appropriate. For instance, although eco-feminism seems like a promising point of focus, it has been critiqued on many fronts. It's seen to essentialise and limit women (Tong, 2014). Further, the link between women and nature has been heavily critiqued, as it's understood that women are not naturally closer to the environment, but that these relationships are actually based on social and power relationships (Leach, 2007). From this perspective, eco-feminism's support for the link between women and nature is inherently problematic (Tong, 2014) and may also risk perpetuating inequalities where, for instance, women are left out of cultural life (Mellor, 1997). It's also considered overly extreme by excluding the positive aspects of modern society (e.g. western medicine) as well as the negative, by proposing such a dramatic separation from existing society (Littig, 2013; Tong, 2014). Based on these critiques, eco-feminism has been out of style since about the 1990s (Leach, 2007) and few people continue to work in this tradition. While it might be possible to find eco-feminist examples for this project, a targeted focus on this perspective might not be relevant.

5.2 Objectives

It was explained in Chapter 2 that feminism offers critiques and proposals toward industrial design. It was also noted that feminism can be applied as a lens on design or in industrial design activities themselves. Its processes of critique and action would take place in both applications, but could provide slightly different results. When applied as a lens on design, feminism would likely identify an issue and propose a solution in theory. In contrast, when applied as a lens in industrial design activities, a feminist perspective would likely offer a more implicit critique, seen in the avoidance of certain processes or decisions. In turn, its proposals for change would be embodied in a real-life response. This investigation draws on insights from both application scenarios to provide the most complete understanding of feminism's contributions to industrial design.

The theoretical framework also showed that feminism's offerings for industrial design are based on the content of its critiques and proposals. These critiques and proposals inform industrial design theories and practices by pointing-out issues in the field and ways around them. These insights can help designers avoid certain issues, can help align the industrial design field with feminism and its social goals and, more broadly, can contribute to the feminist cause.

It follows that Objective 1 draws on the insights (i.e. critiques and proposals) from a feminist lens applied on design and Objective 2 draws on the insights from feminism applied as a lens in design. These objectives are to:

1. Identify the content of feminism's critiques and proposals toward industrial design when it's applied as a lens on design.

2. Identify the content of feminism's implicit critiques and proposals toward industrial design when it's applied as a lens in design.

The next objectives centre on feminism's insights for design for sustainability. As explained earlier, the suggestions in the theoretical framework are educated guesses without concrete proof. They are proposals of how feminism *can* benefit industrial design and design for sustainability, rather than how it does. As such, Objective 3 seeks to investigate and verify the proposals from Chapter 3 of the theoretical framework. The third objective is to:

3. Understand the relationships between feminism's interactions with and contributions to industrial design and design for sustainability processes and goals.

The outcomes of this objective promise to offer a small, but significant response to the research question. They won't provide heaps of new insights for design for sustainability theories and practices. Yet, an understanding of the relationships between feminist work in industrial design and design for sustainability is, in itself, an insight for design for sustainability theories and practices.

Finally, the last objective builds on and compliments Objective 3, providing a bulk of insights to design for sustainability theories and practices. It's inspired by the proposal that feminism's interactions in industrial design could be considered relatively encompassing, unique and valuable design for sustainability processes that provide an original and encompassing response to sustainability goals based on their focus on women, the social world, the range of sustainability dimensions and the breadth and depth of issues in design. Objective 4 is to:

4. Identify the unique insights feminism's interactions with and contributions to industrial design can provide to design for sustainability theories and practices.

5.3 Expected Outcomes

Many potential contributions of this project were mentioned throughout the first chapters; these and others are discussed here. As mentioned earlier, this investigation promises to offer relevant and actionable insights for industrial design and the sub-field of design for sustainability. It will help explore and gain advantage from feminism's critiques and proposals to industrial design to inform industrial design and design for sustainability theories and practices. Its contributions to industrial design theories and practices could point-out issues in the field and ways around them, insights that designers and design researchers could choose to apply in their work. Next, as an insight for design for sustainability, this project promises to show the potential of feminism as a framework for design for sustainability and provide insights for more encompassing design for sustainability theories and practices.

Although this study focuses on feminism's contributions at a relatively concrete level, this project and its outcomes will likely also have epistemological benefits by encouraging scepticism toward dominant knowledge in industrial design and introducing new perspectives and new knowledge, which could be a first step toward a holistic revisioning of industrial design for sustainability.

These research outcomes could inform a variety of different audiences and be employed in different ways. First, they could contribute directly to industrial design and design for sustainability theories and practices. Second, they could help develop feminist design knowledge. This project could help refine the understanding of feminism's advantages for industrial design, which currently remain vague and are partially hypothetical, like in the case of the theoretical framework presented here. Third, the research results could inform the

feminist design community. Discussion on the value of a feminist perspective in design could encourage feminist designers to apply their feminist perspective in their work. Fourth, feminist-informed changes to industrial design and a stronger body of feminist work in the field could contribute to the broader feminist cause and its social goals. Fifth, this research also promises to inform non-feminist designers or those interested, but unfamiliar with feminism.

This final contribution for non-feminist designers or those unfamiliar with feminism is, in itself, a valuable contribution. For instance, bell hooks argued for making feminist thought accessible to a range of audiences through **"[**m**]**ass-based feminist education for critical consciousness" (2015, p. 113). Clear presentation of the research results could educate these designers about the value and contributions of a feminist perspective, and provide an entry point for them to support the initiative and/or get involved. This audience might not learn about feminist perspectives in design otherwise or could be overwhelmed by this sometimes-daunting subject.

Together, the research outcomes and their employment could help address the lack of visibility of feminist work in industrial design and possibly the shortage of this work by legitimizing a feminist perspective and encouraging future feminist work in the field.

Chapter 6. Methodology

As presented in the previous chapter, this research project contributes to filling the void of feminist perspectives in industrial design and aims to learn from them to inform industrial design and design for sustainability theories and practices. The research plan that meets this goal is the focus of this chapter.

This chapter includes a variety of sections inspired by Norman K. Denzin and Yvonna S. Lincoln's model of the range of levels in research that must be accounted-for in research planning (2013). The first and largest level is the researcher that brings their individual perspective (e.g. social, cultural and political position) to the investigation (Denzin & Lincoln, 2013). Next is the interpretive paradigm or framework, followed by the research strategy, research methods, plan for analysis and politics of interpretation (Denzin & Lincoln, 2013). Each category is addressed in this chapter, although their order varies slightly. The first half of the chapter centres on the broad, methodological level of the research plan: it addresses my position as the researcher, the interpretive paradigm and framework, the research and analysis strategies and the analytic frameworks. Next, the second half addresses more specific details pertaining to the research methods, analysis and politics of interpretation.

The model on the next two pages provides an overview of the research plan, with reference to many of the categories mentioned in the previous paragraph (see Figure 6.1). Additional detail to supplement the basic information in the model is provided throughout the chapter.

This project is structured by the researcher's feminist and contemporary Western perspective, along with feminist and critical constructivist research frameworks.

The response to the research question and objectives involves collecting and analysing examples of feminist work in industrial design. This includes:

Existing work found in literature, which mostly applies a feminist **lens on design**. Though some applies a feminist **lens in design**.

The research plan employs **literature analysis** and **thematic analysis.**

Methods: identify the range of writing on the intersections of feminism and industrial design. **Analysis:** 1) identify instances of feminism and mention of industrial design in each text, by applying **frameworks of feminism and industrial design**; 2) identify intersections between the feminism and industrial design coding; 3) identify critiques and proposals relating to industrial design at each point; 4) organize the critiques and proposals into themes and categories.

New work that applies a feminist l**ens in design**.

The research plan employs **participatory project-grounded research** and **thematic analysis**.

Methods: collaborate with feminist participants on co-design projects that integrate a feminist lens throughout the project. **Analysis:** 1) identify instances of/ interactions between feminism and industrial design through a group discussion and researcher-driven analysis, by applying **frameworks of feminism and industrial design**; 2) identify critiques and proposals relating to industrial design at each point; 3) combine the results from each co-design project; 4) organize the critiques and proposals into themes and categories.

Combining and organizing the results based on their similarities/differences and their application of the feminist lens responds to Objectives 1 and 2:

1. Identify the content of feminism's critiques and proposals toward industrial design when it's applied as a lens on design.
2. Identify the content of feminism's implicit critiques and proposals toward industrial design when it's applied as a lens in design.

The critiques and proposals identified in the first stage of the project form the basis for the response to Objectives 3 and 4:

3 Understand the relationships between feminism's interactions with and contributions to industrial design and design for sustainability processes and goals.

4 Identify the unique insights feminism's interactions with and contributions to industrial design can provide to design for sustainability theory and practice.

The analysis for Objective 3 requires several steps: 1) examine how and to what extent feminism's critiques of industrial design and its proposals for change contribute to sustainability goals, by applying a **sustainability framework**; 2) compare these areas of contribution with the contributions of existing design for sustainability initiatives toward design for sustainability goals.

The **first part of the response to Objective 3** involves a statement on the nature of the relationship between feminism's *contributions* to industrial design and design for sustainability *goals*.

This statement then informs the understanding of the relationships between feminism's *interactions* with industrial design and design for sustainability *processes*. These observations about the relationship are then reinforced with a comparison between feminism's interactions with industrial design and existing design for sustainability processes.

The **second part of the response to Objective 3** involves a statement on the nature of the relationship between feminism's interactions with industrial design and design for sustainability processes.

The **response to Objective 4** is based on certain results identified during the methods and analysis in response to Objective 3. Namely, the response to this final objective involves listing feminism's interactions and specific critiques and proposals that contribute to sustainability goals and are unlike those in existing design for sustainability initiatives.

Figure 6.1. Overview of the research plan.

6.1 Researcher Positioning

I introduced my situated position in Chapter 1. I explained that I hold a privileged position as a white, Western, Anglophone, middle-class, educated and able-bodied person. This privileged positioning has guided my research and influenced all aspects of the investigation. This includes my understanding of feminism, industrial design, sustainability and history; my research approach and methods; and my critical and analytic perspective. This work doesn't represent perspectives outside these positions. I'm unable to truly understand them and I believe it would be unjust to speak for other groups and experiences.

That said, I am aware of this limit and attempt to moderate it by looking beyond my specific context, considering different knowledge and experiences, and attempting to include them in appropriate ways. As an example, I've sometimes conducted my research in other languages. This includes French, as well as other languages, where I've used Google Translate to read websites and articles.

My experience as a woman and member of the LGBTQ community also informs my perspective and could help me see certain limitations in knowledge and openings for other perspectives. For instance, I'm attentive to patriarchy, heteronormativity and binaries. However, I don't understand or represent the range of experiences within these positions. I also haven't particularly focused on LGBTQ discussions in feminism. I've chosen instead to explore feminism more broadly.

My professional position is also significant in this project. I am writing from my dual position as a design researcher and an industrial designer; these two perspectives are incorporated throughout the project. My design researcher position is front and centre. Further, in terms of my design practice, my professional insights helped inspire and justify this

research project and my design practice is incorporated in the research strategy. This professional positioning enriches the research project, but creates a potential power dynamic when I engage with research participants. I discuss this issue in more detail later in this chapter.

Finally, this investigation was inspired by a feminist perspective on industrial design and focuses on the application of feminism in industrial design. In this sense, it's clear that I've incorporated my feminist political position throughout this investigation. For reference, I consider myself a postmodern feminist; I hold a postmodern understanding of gender and I'm especially interested in intersectional and postcolonial feminist theories. That said, as I've mentioned before, I investigate feminism in a general sense in this project, and try to move beyond my personal feminist perspective and ideological strand.

6.2 Interpretive Paradigms and Frameworks

In keeping with the feminist motivations and subject matter in this project, this study applies a feminist research framework. Feminist methodologies pay particular attention to "power, authority, reflexivity, ethics, and difference in the practice, writing, and reading of … research" (Hesse-Biber, 2012, p. 16).

This project also applies a critical constructivist research framework, which is closely aligned with the feminist methodology and its principles, as well as the goals of this investigation. According to Joe L. Kincheloe (2005), a frequently cited author on the topic, critical constructivism can be applied to interrogate the history and foundations of traditional disciplines to point out their strengths, limits and bias. It then contributes new and previously underrepresented perspectives to these dominant bodies of knowledge (Kincheloe, 2005).

Critical constructivism sits between and draws on constructivism and critical theory (Kincheloe, 2005). This blending of paradigms aligns with current trends where research paradigms are "beginning to 'interbreed' such that two theorists previously thought to be in irreconcilable conflict may now appear, under a different theoretical rubric, to be informing one another's arguments" (Lincoln, Lynham & Guba, 2011, p. 97). Critical constructivism draws on a constructivist epistemology where reality is socially constructed (Kincheloe, 2005). It's interest in and questioning of social structures is inspired by critical theory (Kincheloe, 2005). Finally, its challenge to objectivity and enduring knowledge (Kincheloe, 2005) may be inspired by both paradigms.

The feminist research framework and critical constructivism inspire many aspects of this research project and are referenced at various points throughout this chapter. Most notably, they inspire the application of a range of feminist research methods discussed in detail in the second half of this chapter.

6.3 Research Strategies for Objectives 1 and 2

While there is little feminist work in industrial design, some does exist, as the examples provided in the first chapters indicate. Much of this existing work can be found in academic and non-academic literature and describes cases where feminism is applied as a lens on design. That said, a small amount of this literature also describes cases of a feminist lens in design. Objective 1 – to identify the content of feminism's critiques and proposals toward industrial design when it's applied as a lens on design - and, to a lesser extent, Objective 2 – to identify the content of feminism's implicit critiques and proposals toward industrial design when it's applied as a lens in design – are based on these existing examples in literature.

However, there isn't enough existing feminist work in design to be the basis for this entire project. This is especially the case for situations where feminism is applied as a lens in design. As such, this project also orchestrates new cases of a feminist lens in design to respond to Objective 2.

The data collection for the existing feminist work in industrial design is based on a literature analysis research strategy. Byrne (2017) introduced this strategy in his distinction between a literature review and desk research. This literature analysis moves beyond a literature review through its depth of analysis and by employing the literature in the results section of the project.

Next, the research strategy that structures the new feminist work follows. While there are many possible ways to inject a feminist lens in industrial design, a series of considerations help define the approach. First, ideologies are embodied in people. Adherents apply them in their lives where they inform their engagement and interactions in the social and political worlds (Freeden, 2003; Goodwin, 2007; Van Dijk, 1998). Certainly, ideologies are described in literature, but these descriptions cannot achieve the holism, detail and subtleties of ideologies held by actual people. As such, the feminism in this study should ideally come from real-life feminists.

Next is the question of who this real-life feminism should come from. While I am feminist, I don't hold a particularly developed or encompassing feminist perspective, and my views would only represent a single feminist perspective. As such, the feminism should come from external participants, a choice that aligns with critical constructivist research and its emphasis on participation and drawing on multiple perspectives (Kincheloe, 2005).

Also related to the source of feminism, it follows that the research participants should come from outside the field of design. As Joan Rothschild and Victoria Rosner stated "[industrial] designers who are women-and who identify as feminist-still remain relatively few ... [and] they have yet to write extensively about their work" (1999, p. 23). This mostly remains the case today where there are still few examples of feminist work in industrial design and feminist designers. Although a necessary choice, there are also advantages of working with participants outside the field of design. For instance, an external source of feminism may be more accurate and authentic, having not already undergone an interpretation or filtering in the context of design.

The last question is how feminism should intersect with industrial design. Feminism is an encompassing perspective with a range of possible intersections with industrial design. As a broad and preliminary research project, it seems appropriate to explore the range of these intersections. As such, this project applies the feminist lens throughout industrial design activities and, specifically, throughout an industrial design project, as projects are the structural unit of design practice (Vial, 2014).

Combined, the reflections behind the research strategy for the new feminist work in industrial design have determined that the feminism should come from research participants and should be applied as a lens throughout an industrial design project. Based on the decision to represent a range of feminist perspectives in this project, participants should work from their own feminist perspective, whatever it happens to be.

To this end, I collaborate with the feminist participants on a co-design project and conduct and analyse the project using a participatory project-grounded research strategy. In

order to maximize perspectives, this investigation is based on multiple co-design projects conducted with different participants each time.

The sections that follow situate the two major research strategies – literature analysis and participatory project-grounded research - in research traditions. Section 6.3.2 also provides a definition of participatory project-grounded research. A detailed description of co-design is provided later, in the second part of this chapter.

6.3.1 Contextualising the research strategies. Christopher Frayling (1993) and Alain Findeli (see, for example, Findeli, 2004) explain that there are three major forms of research in design: research into, through and for design. Frayling explained that research into design is the most common form; it includes historical studies and theoretical investigations into the social or political aspects of design (1993). This form of research in design often follows traditional models of research drawn from other fields like sociology, engineering or management (Findeli, 2004). Research through design integrates creation and scientific rigour (Findeli, 2004). It involves a design process followed by analysis and explicit communication of outcomes (Frayling, 1993). Finally, in research for design, research is integrated in the design process and ends when the artefact is produced (Frayling, 1993). This contrasts with research through design where research continues after the design process ends (Frayling, 1993).

The research strategies presented in the previous section align with two forms of research in design. The literature analysis is research into design and the participatory project-grounded research is research through design.[4] As such, the literature analysis draws on

[4] These projects are not research for design, as this study necessitates a stronger and more explicit research and analysis phase. Further, although research for design can be applied in academic work like in the case of research creation, it is also common in professional practice

established research traditions coming from other fields. In turn, the feminist design projects are based on an emerging body of work, which claims that research can be based on design activity. This argument is based on certain premises.

To begin, theorists claim that design processes develop knowledge. As Pieter Jan Stappers explained in "Doing Design as a Part of Doing Research":

> Through realising 'products', designers absorb knowledge from different directions and confront, integrate and contextualise this knowledge. In this confrontation, much happens that may be of value for the home bases of this disciplinary knowledge, because its theories and hypotheses are put to a kind of test, producing insights. (2007, p. 84)

Thus, design can be integrated in research since design processes develop knowledge and research aims for the "acquisition of knowledge" (Archer, 1981).

There is also a view that design should be part of research in design because it's integral to the realities of the design field (see, for example, Findeli, 2004) and can provide unique knowledge. For instance, "[t]here are circumstances where the best or only way to shed light on a proposition, a principle, a material, a process or a function is to attempt to construct something, or to enact something, calculated to explore, embody or test it" (Archer, 1995, p. 11).

6.3.2 Participatory project-grounded research.

Project-grounded research is a type of research through design that integrates creation and scientific rigour (Findeli, 2004) and involves a design process, analysis and explicit communication of outcomes (Frayling, 1993). Compared to other types of research through

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where it could include investigations into ergonomics or techniques to inform the development of a product (Findeli, 2004). This application in professional practice is quite different from the goals of this study and hints that research for design may not be appropriate here.

design like Chris Rust's practice led research or Wolfgang Jonas' vision, project-grounded research sits at the methodological level where design practice is "a strategic partner in research" (Chow, 2010, p. 151).

Alain Findeli spearheaded project-grounded research and outlines its structure and processes throughout his writing. The major idea is that the design and research components are interrelated but distinct elements (Findeli et al., 2008). The following are the stages of a project-grounded research project:

1) The research starts with either a design problem or a research problem (Findeli & Coste, 2007). If it starts with a design problem, the researcher must transform the design problem into a research question (Findeli & Coste, 2007). In contrast, if the researcher starts with a research problem and question, the researcher then needs to find a field-site for the design project (Findeli & Coste, 2007).
2) The study is rooted in the design project (Findeli & Coste, 2007), where the design project is like a research site or laboratory (Findeli, 2004).
3) The 'design answer' is the artefact (interpretation of Findeli's 2010 presentation by Hemmert, 2013).
4) The 'research answer' is based on analysis of the design project and design answer (interpretation of Findeli's 2010 presentation by Hemmert, 2013). The researcher must reflect on their actions during the project and continue the analysis and interpretation afterward (Findeli & Coste, 2007).

This study includes a research question, so the research planning can skip directly to steps 2-4. In accordance with Findeli's framework, the co-design projects with the feminist participants are the research site/laboratory in this investigation. Further, aligned with the framework

above, the design answer is the project output and the research answer involves analysis of the design project and the design answer.

Project-grounded research is closely related to and draws on elements of existing philosophical and methodological approaches to research including action research, participatory research and phenomenology (Findeli, 2004). When applying project-grounded research, a researcher can also build on these associations by orienting their project even more directly toward one of these points of inspiration (Findeli, 2004). The project-grounded research in this study draws especially on participatory research, which encourages close work with research participants, two-way dialogue and a relatively even power dynamic (Lopes, 2006; Pain, 2004; Sohng, 1996). For this reason, I refer to it as participatory project-grounded research.

This participatory nature is essential for the co-design projects. It also aligns with the broader feminist research framework, which often involves close work with external collaborators and encourages reflection on the relationships between the researcher and external partners (Brinton Lykes & Crosby, 2014; Hesse-Biber, 2014).

6.3.3 Relationships between the research strategies for Objectives 1 and 2. Both research strategies provide different information and each responds to a research objective. This helps provide richer and more extensive results (Flick, 2007). However, the strategies are necessarily methodologically different, which has advantages and disadvantages. In terms of the disadvantages, they don't provide a singular response to the research question and their outcomes can't be immediately or uncritically combined. In terms of the advantages, these differences provide a diverse response to the research question. Further, the strengths of one

strategy help compensate for the limits of another. For example, the literature analysis promises to provide a breadth of data that represents many different feminist perspectives. Yet, literature is a secondary source (Boslaugh, 2010) and certain details and subtleties could be lost through the writing or misinterpreted in my analysis. In contrast, the co-design projects only represent limited cases and limited feminist perspectives, but they provide primary data (Boslaugh, 2010) and a depth of information.

In order to address the disadvantages mentioned above, each strategy is conducted separately according to its own standards and processes, as suggested by Flick (2007). Further, the outcomes of each research strategy are presented separately and then carefully combined. The process of bringing together the research outcomes considers their different contexts, as well as their similarities and differences.

6.4 Analysis Strategies for Objectives 1 and 2

In the subsequent analysis phase, all of the existing and new feminist work in industrial design is then reviewed to identify the interactions between feminism and industrial design and feminism's critiques and proposals at each point. The outcomes of this analysis respond directly to Objectives 1 and 2.

In addition to guiding the data collection, the literature analysis and participatory project-grounded research strategies structure the analysis. This is particularly the case for project-grounded research, which positions the research and analysis phases and describes the components of each. However, this project also employs a general inductive and comparative approach to qualitative data analysis (Merriam, 2009), specifically thematic analysis. Thematic analysis involves coding the data, sorting the data into categories and searching for

emerging themes (Mills, Durepos & Wiebe, 2010; Schwandt, 2007). Thematic analysis complements the other strategies and describes the analysis processes.

6.5 Analytic Frameworks for Objectives 1 and 2

The analysis that responds to Objectives 1 and 2 employs two analytic frameworks: namely, a framework of feminism and a framework of industrial design. Broadly, these help identify instances of feminism and mention of industrial design in the literature and the interaction of feminism and industrial design in the co-design projects. These frameworks are outlined in the pages that follow and their applications are explored in detail in the second half of this chapter.

6.5.1 Feminism. Feminism is identified based on the broad definition of feminism and its core concepts outlined in Chapters 2 and 4. However, this is supplemented in the analysis of the new work in industrial design by a group interview with the participants, which focuses on their personal feminist views.

6.5.2 Industrial design. Broadly, the understanding of industrial design in this dissertation is based on the definition of industrial design provided by major professional organizations. According to the Association des designers industriels du Québec (2010), the Association of Canadian Industrial Designers (2006) and the International Council of Societies of Industrial Design (ICSID; n.d), industrial design is "a creative activity whose aim is to establish the multi-faceted qualities of objects, processes, services and their systems in whole life-cycles" (ICSID, n.d., para 1). However, just as feminism is complex and includes an underlying

theoretical structure, the same is true for industrial design. This more complex and detailed understanding of industrial design is also incorporated in this analytic framework and is relevant given feminism's broad reach and range of possible intersections with industrial design. This detailed framework of industrial design will help identify instances of industrial design, but also situate and organize the interactions between feminism and industrial design.

The framework applied here is an amalgamation of the writing of several key design theorists. A major component includes Kees Dorst's model of design activities he presented in several of his publications and in detail in *Design Expertise*, a book he co-authored with Bryan Lawson (2009). This is supplemented with a range of theory on design projects from Jean-Pierre Boutinet, Alain Findeli and Rabah Bousbaci. To begin, Dorst's model of design distinguishes between different categories and levels of design activity moving from large-scale to small-scale (Lawson & Dorst, 2009). The largest-scale is the profession that refers to the range of design organizations (institutions, associations, and consultancies), design knowledge and theories, and presumably the entire population of designers (Lawson & Dorst, 2009). Next is design practice, which refers to the place and role of each individual in this larger community (Lawson & Dorst, 2009). It refers to their professional identity like their relationships with other practitioners and factors like style, attitudes and interests that they bring to their work (Dorst, 2009). It also refers to their activities including design work outside a project (e.g. developing a company vision or hiring employees) and design work in a project (Dorst, 2009). This is followed by design processes, the methods, and finally the project, which is where design activity takes place and practice and processes are applied (Lawson & Dorst, 2009).

While Dorst's model has a broad perspective on design, other authors focus primarily on design projects. A detailed understanding of design projects is also incorporated in this framework given its importance to industrial design and its place in this research. To begin, the following theory helps refine the definition of a design project and go beyond Dorst and Lawson's preliminary introduction. Alain Findeli talks about design projects throughout his body of work. He explains that the two major sources to understand design projects are Boutinet's writing and "L'eclipse de l'objet dans les théories du projet en design" (2005), an article he co-authored with Rabah Bousbaci (Findeli, 2004). Accordingly, these texts contribute to this discussion and to the industrial design framework. This section draws mainly on the 2012 edition of Jean-Pierre Boutinet's *Anthropologie du projet,* Findeli and Bousbaci's article (2005) and Findeli's review and extension of his work with Bousbaci (2004; 2015). Collectively, these authors reinforce the point that design practice and processes are applied in design projects. For instance, Boutinet explains that a project is driven by an actor or a group of actors and involves a start-to-finish process of developing objectives and carrying out activities to achieve them (Boutinet, 2012). However, the authors also stress the place of design artefacts in a design project. Boutinet refers specifically to design projects through his discussion of *dispositive technique* projects (2012). As he explains, design projects involve the activities to develop an object and end with the establishment of a prototype (Boutinet, 2012). Similarly, Findeli and Bousbaci note: the object is the "product of the design project" (translation by author; 2005, p. 42).

As another unique contribution, Findeli and Bousbaci's article (2005) and Boutinet's book (2012) note the boundaries of industrial design activities, as well as their interrelationships with other realms. Boutinet noted that design projects end with the

establishment of a prototype (2012). In this sense, the objects' future refinement and production and other activities like marketing and distribution would be part of different projects. Further, Findeli and Bousbaci distinguish between two major realms of projects: design activities and object reception (Findeli & Bousbaci, 2005; Findeli, 2004; 2015). In the context of Boutinet's claims, Findeli and Bousbaci's distinction between design and object reception hints that object reception is another project that follows design. These subsequent projects would align with Boutinet's broad definition of a project and may include similar structural components to design projects including the actor, process and object realms. As an example, the project of object reception would involve the design artefact, its user and the user's actions (Findeli, 2004; Findeli & Bousbaci, 2005).

Thus, together the industrial design framework includes the categories: design profession, design practice external to the project and the design project including the sub-categories: design practice in the project, design processes and the design object. This framework is represented in Table IV. However, feminism's contributions to industrial design pertain especially to its social relationships and contexts, so it may also be appropriate to consider related projects that follow industrial design as extensions of this framework. As such, this framework may also include related projects like production, marketing and object reception and their sub-categories revolving around actors, processes and the design object.

Table IV: *Industrial Design Framework*

Design profession: Profession refers to the range of design organizations (institutions, associations, and consultancies), design knowledge and theories, and the entire population of designers (Lawson & Dorst, 2009).

<table>
<tr><td colspan="2">Practice external to a project: Design practice refers to the place and role of each individual in the larger professional community (Lawson & Dorst, 2009). It refers to their professional identity like their relationships with other practitioners and factors like style, attitudes and interests that they bring to their work (Lawson & Dorst, 2009). It also refers to their activities including design work outside a project (e.g. developing a company vision or hiring employees) and design work in a project (Lawson & Dorst, 2009).</td></tr>
<tr><td rowspan="3">Design project: The design project is the structural unit of design practice (Vial, 2014). It involves the activities to develop an object and ends with the establishment of a prototype (Boutinet, 2012). Its components are design practice, process and objects.</td><td>Practice in a project: This is the application of design practice in a design project, as introduced in the previous category (Lawson & Dorst, 2009).</td></tr>
<tr><td>Processes: Design processes are the methods (Lawson & Dorst, 2009)</td></tr>
<tr><td>Object: The object is the “product of the design project” (translation by author; Findeli & Bousbaci, 2005, p. 42).</td></tr>
</table>

Note. The model includes different categories and levels of design activity moving from large-scale to small-scale.

6.6 Research and Analysis Strategies for Objectives 3 and 4

The research and analysis strategies from the first stage of the project also apply here. This second half is based on the results of the review of existing feminist work in industrial design and the original co-design projects. The critiques and proposals identified in the first stage of the project form the basis for the response to Objective 3 – to understand the relationships between feminism’s interactions with and contributions to industrial design and

design for sustainability processes and goals – and Objective 4 – to identify the unique insights feminism's interactions with and contributions to industrial design can provide to design for sustainability theories and practices. Although there is no new data collection at this stage, analysis of the literature analysis and project-grounded research data continues. Thematic analysis is also applied once again.

The analysis for Objective 3 requires several steps. First, it involves examining how and to what extent feminism's critiques of industrial design and its proposals for change contribute to sustainability goals, and then comparing these areas of contribution with the contributions of existing design for sustainability initiatives toward design for sustainability goals. The first part of the response to Objective 3 involves a statement on the nature of the relationship between feminism's *contributions* to industrial design and design for sustainability *goals*.

This statement then informs the understanding of the relationships between feminism's *interactions* with industrial design and design for sustainability *processes*. For instance, if feminism's specific critiques and proposals contribute to design for sustainability goals as a whole and provide a more encompassing response to these goals than seen elsewhere, as suggested in the theoretical framework, feminism's interactions with industrial design can be considered relatively encompassing, unique and valuable design for sustainability processes. These observations about the relationship are then reinforced with a comparison between feminism's interactions with industrial design and existing design for sustainability processes. Like before, the second part of the response to Objective 3 involves a statement on the nature of the relationship between feminism's interactions with industrial design and design for sustainability processes.

Finally, the response to Objective 4 is based on certain results identified during the methods and analysis in response to Objective 3. Namely, feminism's interactions with and contributions to industrial design were compared with the processes and outcomes of existing design for sustainability initiatives. The response to this final objective involves listing feminism's interactions and specific critiques and proposals that contribute to sustainability goals and are unlike those in existing design for sustainability initiatives.

6.7 Analytic framework for Objectives 3 and 4

The analysis process described in the previous section requires a sustainability framework to help understand the contributions of feminist work in industrial design toward design for sustainability processes and goals. There are many definitions of design for sustainability that emphasize different points of focus. However, the common ground between these understandings is an emphasis on a transformation from the problematic current situation to an ideal, sustainable future defined in relation to the broader category of sustainable development (see, for example, Bhamra & Lofthouse, 2007 and Chapman & Grant, 2012). Further, there appears to be a lack of an encompassing design for sustainability framework, as discussed in Chapter 3. As such, the framework is based primarily on the broader category of sustainable development.

As mentioned earlier in this text, the United Nations has been integral in defining and promoting sustainable development (Baker, 2006) and, at the time of writing this paper, *Transforming our World: The 2030 Agenda for Sustainable Development* was their most recent publication and action plan on sustainable development (United Nations General Assembly, 2015). This is a well-accepted sustainable development framework that will form

the basis of the future world sustainable design framework, currently in development (Paris Design Summit, 2018). The United Nations is also in the process of developing indicators aligned with the 2030 Agenda that measure progress toward and achievement of each sustainable development goal. These were published in the "Indicators and a monitoring framework for the sustainable development goals: Launching a data revolution for the sustainable development goals" report by the Leadership Council of the Sustainable Development Solutions Network (hereafter referred to as LCSDSN; 2015). Given their prominence and current and future links to design, these sustainable development goals and their indicators are the analytic framework for Objectives 3 and 4.

Feminism's critiques and proposals toward industrial design are analysed with respect to their level of support for these goals and this measurement is enabled by the accompanying indicators. The sustainable development goals and indicators are outlined in a table in Appendix 1 (Table VII), along with more specific details about how these goals and indicators are applied in the analysis. That said there remains a leap between sustainable development and design for sustainability that must take place in response to Objectives 3 and 4. This includes understanding how the support for sustainability goals translates to the support for design for sustainability goals, and comparing feminism's contributions to sustainability with the contributions of existing design for sustainability initiatives. This process does not apply a formal structure, but is instead a more informal discussion based on my background knowledge.

6.8 Methods and Analysis

The previous sections focused on the broad, methodological level of the research plan. Now, the discussion changes focus to address more specific details pertaining to the research methods, analysis and politics of interpretation. As explained previously, the results from the literature analysis and the co-design projects come together to respond to Objectives 1 and 2. Further, the results from Objectives 1 and 2 form the basis of the response to Objectives 3 and 4. This section presents each stage of the research process, including details about the literature analysis, the co-design projects, and the data synthesis and further analysis to respond to the objectives.

6.8.1 Literature analysis. The literature analysis sought the range of writing on the intersections of feminism and industrial design. These works were identified through Google**,** Google Scholar, Google Books, the Université de Montréal book and article catalogues and UQÀM, Concordia and McGill library catalogues. Combining Google with more formal and academic databases helped identify a broad range of literature including books, articles, theses and dissertations, blogs and interviews. The search used the keywords feminism and feminist along with industrial design and design, and their French translations féminisme, féministe, design industriel and design. Although the broad topic of design was beyond the scope of this exploration, the search term helped identify general discussions on the intersections of feminism and design that encompass and apply directly to industrial design. It also helped identify industrial design sub-fields like product design that may have been missed by the industrial design search term alone.

The literature identified in this first review was briefly evaluated and certain texts were excluded; namely, works where feminism was merely mentioned and wasn't the focus of at least 1 paragraph and works based exclusively on a review of other literature. Certain texts not identified in this review were also added at this point. This was the case for certain prominent and widely referenced works in the feminist industrial design community that apply directly to industrial design, but are anchored in a parallel field. This includes *As Long as Its Pink: The Sexual Politics of Taste* by Penny Sparke (1995) that addresses taste and interior decoration, but also applies to industrial design products. Other examples are major works on feminist technology like Judy Wajcman's *Feminism Confronts Technology* (1991) and the more recent *Feminist Technology* anthology edited by Layne, Vostral and Boyer (2010). As Joan Rothschild and Victoria Rosner noted, "[d]iscussion of industrial design and its relation to women is more likely to be found in the feminist literature on technology" (1999, p. 23).

This literature exploration may not be complete or entirely representative of the intersections of feminism and industrial design due to the limits of the literature identification methods like the focus on English and French texts, the focus of this study on industrial design and not on other design fields, the requirement that texts directly mention feminism and the addition of certain key texts after the fact. It is certain that I have missed other important readings with links to this research topic. This could include work that I simply didn't find during my search. It also includes writing that doesn't mention feminism, but explores related concepts. An example of this second point is the body of work on gender and design, which I could have identified through search terms like gender, femininity and masculinity. This work has relationships with feminism through its focus on the concept of gender. However, it does

not always mention feminism, so many of these texts were not included in the literature analysis.

I could have used more search terms to identify additional texts, but there would be risks to this approach. In the case of gender and design, some of this literature does not employ a feminist perspective at all. For instance, there are articles that simply list the characteristics of a feminine or masculine product, without employing a critical perspective. Alternatively, if a feminist perspective is present, the writing doesn't necessarily go beyond a basic discussion of gender to draw on feminist research traditions or other feminist concepts and theories (e.g. sex, sexism, experience and situated knowledge). As such, this work wouldn't necessarily relate to the research focus on feminist perspectives and could skew the research results. Finally, identifying feminist perspectives in writing that isn't explicitly feminist would be challenging, highly subjective and potentially problematic. I could easily identify instances of feminism when it isn't really there. These and other risks could also apply if I added other additional search terms.

As discussed in the previous paragraphs, there are restrictions and limits in the data collection. Yet, despite their disadvantages, these helped focus this research on feminism, limit the research scope and ensure the feasibility of the project. The search still provided a relatively thorough foundation of information where more than 50 texts passed the first screening process and were included in the full analysis. Appendix 2 includes a list of these texts.

6.8.1.1 Analysis. The initial analysis took place in several phases. First, instances of feminism and mention of industrial design were highlighted in each text, using the feminism and

industrial design frameworks. At this point, I looked for content that aligned with feminism's broad definition. I didn't focus specifically on related concepts like experience or situated knowledge. In terms of industrial design, this coding applied the broad industrial design framework that incorporates related projects like production, marketing and object reception. Further, each mention of industrial design was positioned in relation to this framework. For instance, it was noted whether the case referred to the profession, practice or process levels. This coding process typically took place using the QDA Miner program, although this wasn't always possible. Certain files were incompatible with the program, so I reviewed and highlighted the documents using Adobe Acrobat. I also conducted this process by hand for printed books.

There are several limits to the coding process due to strategies implemented for efficiency. This literature exploration examined more than 50 texts including many full books; a completely thorough coding process would have taken months and would likely have been overkill. I typically scanned the works for instances of feminism, then returned to look for mention of industrial design. In cases where feminism was limited to certain sections of the text, I focused the coding for industrial design on these sections. Many texts included a review of existing feminist arguments in industrial design. I didn't code these sections unless the author put forward an original perspective and, instead, focused on the author's original contributions and the primary sources. Finally, I began to reach data saturation (Lewis-Beck, Bryman & Futing Liao, 2004) toward the end of the review process where certain arguments had already been stated many times. In these cases, I focused my attention on any original points in the text. While a completely thorough coding process would have been ideal, it

didn't seem necessary to my research goals. Further, the strategies implemented for efficiency likely had a minimal impact on the analysis process and the research results.

As a next step, I reviewed each document and looked for intersections between the feminism and industrial design coding and, specifically, cases where feminism addressed an aspect of industrial design. I looked for critiques and proposals relating to industrial design at each point. This includes implicit critiques and proposals when the text referred to feminism applied as a lens in design. An implicit critique was seen in the avoidance of certain processes or decisions and implicit proposals tended to be embodied in a real-life response. Next, I organized these critiques and proposals in relation to the categories and sub-categories of the industrial design framework, the type of feminism applied in each case, the application of feminism as a lens on or in industrial design, and the article's context in terms of time and place. In certain cases, the author identified their specific feminist perspective and, in other cases, I guessed at their alignment based on their focus and arguments. Finally, I reviewed the data as a whole and organized it into larger themes and categories pertaining to feminism's critiques and proposals toward industrial design and the application of feminism as a lens on or in industrial design. I focused on general categories and themes, as well as those that only applied to certain parts of the industrial design framework, certain feminisms or certain contexts. In this final stage of analysis, I drew on the theoretical framework as a whole, including proposals about the intersections of feminism and industrial design and topics like domesticity, beauty, technology and DIY, often seen in feminist design work.

6.8.2 Participatory project-grounded research. The participatory project-grounded research strategy involves several co-design projects. Beginning with a definition, co-design is

"collective creativity as it is applied across the whole span of a design process" (Sanders & Stappers, 2008, p. 6). It involves collaboration between people with different expertise like between designers, researchers, specialists, business stakeholders and users (Steen, Manschot & De Koning, 2011). In this case, it draws on my research and design expertise and the participants' feminist knowledge. Together, the co-design team shares and combines their knowledge to collectively carryout the design project (Kleinsmann, 2006; Steen, 2013). The co-design projects and their analysis required a range of steps, as follows.

6.8.2.1 Participant recruitment and project organization. To begin, project participants were identified through community organizations, and specifically feminist organizations. This helped facilitate the recruitment process, as identifying project participants from the general public would be a large and difficult task. Further, recruiting participants through a feminist organization helped ensure that each participant held a relatively well-developed feminist perspective. Initially, the study focused on feminist hackerspaces as a site for participant recruitment. As introduced earlier, feminist hackerspaces are community spaces that merge creation and feminist activist activities (Toupin, 2014). In feminist hackerspaces, 'hacking refers' to do-it-yourself creation activities and the identity work of 'hacking yourself' through building confidence and empowerment (Fox, Ulgado & Rosner, 2015). They emerged in North American cities in 2012 (Fox, Ulgado & Rosner, 2015) and there are currently at least eight spaces in operation. The blend of feminism and creation in feminist hackerspaces was especially promising for this study, since it's helpful to have a slight overlap of knowledge in co-design projects, as too much separation or too much similarity can hinder collaboration and

learning (Kleinsmann, 2006; Postrel, 2002). The hackerspace members' interest in creation combined with my feminist knowledge would provide this overlap.

I began by identifying the feminist hackerspace(s) that would be the site(s) of recruitment for this project and, out of respect for the organization, seeking their permission to involve them and their members in this research. While there are feminist hackerspaces in many places around the world, I focused on spaces in the United States and Canada to ensure the participants and I shared a strong common ground. As noted in the previous paragraph, it's important to have some shared knowledge in co-design projects. This could include knowledge drawn from social, political and economic experience, which could be relatively similar in the United States and Canada and potentially very different elsewhere. Within this restriction, I compiled a list of feminist hackerspaces through a Google search, as well as a review of articles and blogs on the topic. The list was then narrowed down to ensure each space was appropriate for this research; namely, each needed to self-identify as feminist, as opposed to being labelled feminist in an outside source, and be currently active. I also sought hackerspaces with physical sites that could ensure the co-design group would have a space to work. This was especially important if the group was located outside Montreal, as I wouldn't be able to host the project myself.

This list was then ordered by level of preference and relevance for this study, where hackerspaces at the top of the list would be the most ideal collaborators. As the name implies, many feminist hackerspaces are oriented toward computer-based creative work. As such, my preference was for sites with the strongest orientation to physical creative work and therefore the greatest overlap with industrial design. This analysis of each feminist hackerspace was

done through a review of their online presence including their website and social media pages and, in the end, left me with an ordered list of 6 spaces.

I then contacted the feminist hackerspaces through an e-mail asking their permission to engage in a project in their space. If there was no answer within one week or if the response was negative, I moved to the next feminist hackerspace on the list. The goal was to identify one or more spaces to host the co-design projects. Unfortunately, no feminist hackerspaces agreed to participate in this study.

As such, I widened the search for potential project sites to include feminist creative organizations more generally. One site in particular was especially promising given these broader criteria: namely, the Women's Center for Creative Work (hereafter referred to as the WCCW) in Los Angeles. The WCCW is a feminist organization dedicated to a range of creative activities. This site came to my attention during the initial search for feminist hackerspaces, but was eliminated from the list because it wasn't a hackerspace. However, given the broader criteria, I returned attention to the WCCW and contacted its organizers following the same processes of recruitment as before. The organizers responded positively and agreed that I could contact their members and conduct the study at their site. In terms of participant recruitment, I posted a call for participants in the WCCW monthly newsletter. The project was open to any interested participant, regardless of, for example, age, ethnicity or social class. Those interested were asked to contact me by email. I then explained the project to each interested participant in detail through e-mail and a Skype call.

Given that this study aimed to conduct multiple collaborative projects, I sought as many participants as possible. Literature on working-group size suggests that optimal groups have 3 or 4 members to enable rich collaboration and avoid a division of labour (Harasim et

al., 1997). As such, I sought 2-3 participants for each project. The intention was for each project to last 1 month where the group would meet in person 2 times per week for at least an hour. This structure was chosen to enable a balance between an in-depth project and a level of participation that would be reasonable to expect from volunteer participants.

In total, I organized three collaborative design projects that took place at the WCCW in Los Angeles between January 25 and March 2, 2016. Two of these projects were organized through the newsletter posting and the third developed through a version of snowball recruitment once on-site. Snowball is a process of participant recruitment where "a participant recruits people he or she knows to be in the study, and so on" (Allen, 2017, p. 1613). While I remained open to new participants and projects throughout my time at the WCCW, there was no further interest in the project.

Dividing participants into groups happened organically, as participants agreed to take part in the project over several weeks. I began a co-design project once sufficient participants were available. Any new participants that contacted me after a project began were drafted into another, new co-design group.

Basic information about each project, its participants and scheduling is presented in the table that follows (Table V). The table demonstrates that despite the proposed structure for each co-design project, each project varied depending on the participants' desires and schedules. The most notable example is the project in the second row, which took place during a single daylong meeting. In this case, the participants were interested in the project, but were only available for a one-time event. Further, the project in the third row involved four participants, which is more than the suggested amount. This project was particularly unique. The reason for its larger number of participants, as well as its circumstances will be discussed

in detail in the results section of this study. However, despite the variation between projects, each developed to about the same level of complexity and took place over about the same number of working hours.

Table V: *Overview of the Co-design Projects*

Participants	**Meeting period**	**Number of meetings**	**Meeting length range**	**Total working hours**
Betsy and Samara	January 25-March 2, 2016	6	1-1.5 hours	8.5 hours
Amanda and Sabina	February 27, 2016	1	6.5 hours	6.5 hours
Ana, Wale, Ashley and Rocio	February 18-March 1, 2016	3	2.5-3 hours	8.5 hours

The WCCW is a non-profit organization, but charges participants a membership fee for use of the space and its resources (e.g. internet). While participants were not directly compensated for their time, I paid their membership fees for the duration of the project. This was a way to support the WCCW and ensure participants didn't indirectly pay to participate in this project. I also purchased all the design materials, as well as refreshments for each meeting, since the WCCW was far from any shops or restaurants. This included drinks and snacks for short meetings and lunch for the daylong meeting.

6.8.2.2 Co-design project activities. This study incorporated a range of feminist research methods, which aligns with the broader feminism and critical constructivism research frameworks. Although feminist research has many characteristics, one of its main points is for a non-hierarchal and respectful relationship between the researcher and participants (Gannon & Davies, 2007). Co-design is already closely aligned with these principles; however, they became even more central with the application of a feminist methodology. I tried to ensure an equal power-dynamic between all members of the co-design team, including between the participants and I. The non-hierarchal relationship was also extended from the design project to the analysis/research project where participants were encouraged to participate in the analysis. Further, participants had a say on many other issues including whether they'd like to carry the design and collaboration forward after the end of this project.[5]

This attention to positioning and hierarchy was especially important given the relationship between the participants and I. Namely, I was a researcher and professional, while they were research participants that often didn't have design experience. While it would be impossible to eliminate or completely balance-out these differences, my attention to our relationships and my responsiveness to their needs and requests helped address this power

[5] I explained in the first sentences of this dissertation that I was unsure whether to include a personal introduction, which is a tradition in feminist research, but is more unusual in design. This hints at one of the major dilemmas I had when planning this research project. This project was inspired by feminist questioning and is based on feminist subject matter, but I was unsure whether it was necessary to apply a feminist research framework. Further, I thought that a more traditional research approach could help balance-out and legitimize this relatively untraditional research project. However, I realized immediately once I began the fieldwork that a feminist methodology and feminist research methods were not only relevant, but essential. It seemed disrespectful not to align the research activities with feminist principles since this project took place in a feminist creative environment. As such, I modified the research plan to account for this new understanding. However, given this context, the feminist framework is not thoroughly integrated throughout the research project.

imbalance. As an example, many aspects of the project with Ana, Wale, Ashley and Rocio (e.g. working environment, group composition) were in response to the participants' needs and desires. Details about this negotiation with Ana, Wale, Ashley and Rocio are provided in Chapter 8.

The discussion in the pages that follow outlines the specific methods applied throughout the co-design projects. Despite several differences between each co-design project, each followed the same basic structure.

6.8.2.3 Group interview. Before each project began, it was necessary to develop an understanding of the feminism held by each participant and the similarities or differences across the group. This understanding of feminism was the basis for the feminist analytic framework for each project. To this end, I conducted a group interview with each co-design team. I took-on the role of interviewer and moderator, which meant that I asked participants questions and encouraged their individual responses and participation in a group discussion (Liljestrom, 2010). I sought to maintain a relatively informal and cheerful interview environment to enable exploration of ideas, participant engagement and to set the tone for the collaborative design work that would follow. To this end, I applied guidelines for this style of group interview outlined in the literature. The suggestions included using unscripted, informal language, calling on participants individually, and asking participants to elaborate on their responses (Liljestrom 2010).

The group interview questions are outlined in Appendix 3. However, despite this structure, participants were encouraged to bring up other ideas or break away on tangents if they wanted.

Each group interview was tape recorded, then transcribed and coded (Olsen, 2012) to identify content that responded to each question. This was done using the QDA Miner software and the Scissor and Sort Technique where I coded texts according to themes and then drew insights from this organized content (Stewart, Shamdasani & Rook, 2007). I then summarized the outcomes and presented them to the participants for their review and comments.

6.8.2.4 Design work. Despite equal participation in co-design, different team members have different roles. Designers contribute their experience and skills associated with the design process, visual skills like sketching, and their understanding of technologies, production and business (Sanders & Stappers, 2008). Those not trained in design contribute their own background knowledge and skills (Sanders & Stappers, 2008). Finally, researchers are the facilitators: "[t]his means leading, guiding, and providing scaffolds, as well as clean slates to encourage people at all levels of creativity" to participate (Sanders & Stappers, 2008, p. 14). Thus, as the designer and researcher in this project, I contributed my design skills and facilitated participation.

Many tools and techniques have been developed to structure activities in co-design projects, and fulfil the designer and researcher's responsibilities. These are described through several texts written by Liz Sanders and Pieter Jan Stappers (see, for example, Sanders & Stappers, 2013 and Sanders & Stappers, 2014). In their view, the processes for co-design projects should cycle between making (e.g. drawing, prototyping, collages), telling (e.g. stories, brainstorming, interviews) and enacting (e.g. role playing, observation, improvisations; Sanders & Stappers, 2013). The co-design project can begin at any of these

stages, although the different activities provide different types of information and results (Sanders & Stappers, 2013). Thus, certain activities can be especially helpful at particular design stages. In this perspective, enacting could be particularly helpful in the early phases of a project because it can help explore the ideas, experiences, hopes and dreams that set the foundation for the project (Sanders & Stappers, 2013). Making could be especially pertinent once the design idea has started to develop, since it can help express tacit knowledge and explore the features of a design artefact (Sanders & Stappers, 2013). Last, telling could be particularly helpful toward the end of the project, as it can help advance the design concept on many fronts (Sanders & Stappers, 2013).

As the designer/researcher in this project, I prepared several design activities for each meeting inspired by this general framework, although I also sought and was responsive to participant input throughout the project. The following is an outline of the basic activities that took place in each project. These various stages of activities took place at different paces from group to group, and certain groups spent longer on particular stages than others.

To ground the project in feminism and get the project rolling, I started the first meeting by asking the group to identify problematic and utopian situations from a feminist perspective. In the first part, I used keywords pertaining to feminism drawn from the earlier group interview as prompts to identify the problematic situations. I encouraged the group to brainstorm at least 10 situations. This work was then filed away and followed by a visual, future-focused activity. The task was to make a collage to represent a feminist utopia using images and words from magazines and writing and drawing. Next, the group examined the problematic situations and utopian images in parallel and aimed to identify the similarities and differences between them. The goal was that design ideas could emerge through this tension

and, indeed, the groups developed many ideas in this context. Following this, I asked participants to choose one or two favourite design ideas and develop them through their preferred form of expression; a range of drawing and model-making supplies were provided. The participants then presented their ideas to the group and the group collectively determined the favourite idea to carry forward. Last, the chosen design was refined through discussions, prototyping and, in some cases, discussions with potential users.

6.8.2.5 The place of my feminist perspective. It was explained at various points in this dissertation that my feminist perspective motivated this research project, but I study feminism generally and avoid incorporating my personal feminist lens in the investigation. This point is especially relevant for the co-design projects. The participants' feminism did not necessarily align with mine. If I had actively applied my own feminist perspective in the co-design projects, this would likely have led to debate and disagreement on feminism. Yet, it didn't seem necessary or appropriate to engage in feminist debate in the context of this study, especially considering that the participants were invited based on their feminist expertise.

Although it's nearly impossible to think and act without ideology, I avoided injecting my specific feminist perspective into the projects and discussing it during the group interviews. Instead, I focused on my role as designer and researcher and operated based on my general understanding of feminism and based on what participants said about it.

This approach had a further advantage. I have many ideas about feminism's potential intersections with industrial design and specific feminist perspectives that would have particular promise for industrial design and design for sustainability. Following the

participant's lead on feminism helped avoid this interference and incorporated a more authentic feminist perspective in this project.[6]

6.8.2.6 Data collection and planning for analysis. Like the literature exploration, the analysis in this phase of the project was based on identifying and understanding the intersections and interactions between feminism and the multiple dimensions of industrial design. The intra and inter subjective spaces framework described by Frido Smulders, Louis Lousberg and Kees Dorst in their article "Towards different communication in collaborative design" (2008) helps explain how feminism could intersect with design in these co-design projects and how these intersections and interactions could be identified.

Intra subjective space refers to an individual's personal cognitive activities involved in executing a design project (Smulders, Lousberg & Dorst, 2008). Inter subjective space refers to the social activities that take place between two or more individuals in a design project (Smulders, Lousberg & Dorst, 2008). These spaces are interrelated, as project participants draw on their personal knowledge from their intra subjective space when engaging with other participants in the project in the inter subjective space (Smulders, Lousberg & Dorst, 2008). The social activities in the inter subjective space include communication, cooperation and negotiation (Steen et al., 2013). Reviewing participants' intra subjective reflections in parallel

[6] Just as the feminist methodology and feminist methods were applied to the research project once on site, I had considered applying my own feminist perspective in the co-design projects. In fact, I briefly presented my feminist perspective during the first group interview, which took place with Betsy and Samara. However, it was clear after this first interview that the participants' feminism did not align with mine. I was troubled by the implications of this miss-match and decided to avoid applying my specific feminist perspective in the projects, including in all subsequent meetings with Betsy and Samara.

to the group's inter subjective work could help identify how feminism and industrial design come together.

The intra and intersubjective framework inspired the data collection throughout each project and structured the analysis. In addition to work during each meeting, all group members documented and reflected on the project in two ways. The inter subjective group activities were collectively documented using the Process Reflection Tool developed by Peter Dalsgaard and Kim Halskov (2012) in compliment with visual recordings. This tool enabled documentation, description and organization of events throughout the design project (Dalsgaard & Halskov, 2012). Specifically, the group recorded the activities, decisions and discussions that took place during each meeting. In addition, each group member was asked to keep a personal diary of their ideas and reflections throughout the project (Pedgley, 2007). This documentation tracked reflection mainly in the intra subjective realm. The idea was to record personal thoughts and feelings about the different facets of the project, as well as ideas and hopes for its development.

While the Process Reflection Tool was specifically designed for application in co-design projects, I replaced it with a shared Google Document during the second and third projects. The Process Reflection Tool was slightly complicated to navigate and use, and the participants hadn't been using it. I hoped that a simpler tool would encourage greater participation.

6.8.2.7 Analysis. Some aspects of the analysis were collaborations between the participants and I, and others were my responsibility alone. Identifying the interactions of feminism and industrial design and feminism's critiques and proposals involved a combination of

collaboration and researcher-driven analysis. In contrast, I was solely responsible for analysis pertaining to sustainability. Design for sustainability seemed less relevant to research participants and the analysis required specific professional and theoretical knowledge.

To begin, the analysis involved identifying the interactions between feminism and the multiple dimensions of industrial design and then pinpointing feminism's specific critiques and proposals. The feminism in each project was defined during the group interview and the industrial design framework was the same as during the literature analysis.

The analysis took place project by project. For each co-design project, the collaborative analysis was first and took place during the last group meeting. It was a simplified and more accessible version of the subsequent researcher-driven analysis. I summarized the feminism derived from the group interview and the project stages on poster-boards. I then encouraged participants to discuss how the feminism interacted with the project, using components of the industrial design framework as prompts. The discussion primarily revolved around the industrial design project and its actor, process and object components. As throughout the project, I encouraged participants to document the discussion in their personal journals and in the collective Process Reflection Tool/Google Document.

The researcher-driven analysis took place next. The first phase involved synthesizing the outcomes of the collaborative analysis. This involved noting and clarifying the interactions between feminism and industrial design identified in the group discussion and identifying or confirming implicit/explicit critiques and proposals relating to industrial design at each point.

The next phase involved a new, second analysis. The project documentation was uploaded to QDA miner and coded for evidence of feminism and mention of industrial design. As during the literature analysis, I reviewed each document and looked for overlap between

the feminism and industrial design coding and, specifically, cases where feminism addressed an aspect of industrial design. I then searched for implicit or explicit critiques and proposals relating to industrial design at each point. Comparing the intra and inter subjective documentation provided an additional source of data. Cases where feminism or industrial design appeared in the intra subjective documentation but didn't transfer to the inter subjective realm were additional, more subtle, instances of interactions between feminism and industrial design. For instance, if a design idea wasn't incorporated into the project, it could be a sign that it conflicted with feminist thinking. I studied these cases and looked for implicit feminist critiques and proposals relating to industrial design at each point.

Next, I combined the results from the collaborative and researcher-driven analysis and organized the critiques and proposals in relation to the categories and sub-categories of the industrial design framework. I also organized the data in relation to feminism, since project participants didn't always have the same feminist perspective. I then reviewed the data as a whole and organized it into larger themes and categories pertaining to feminism's critiques and proposals toward industrial design. I focused on general categories and themes, as well as those that only applied to certain parts of the industrial design framework, certain feminisms or certain contexts.

As a final step, I combined the outcomes of each co-design project and conducted a final thematic analysis focusing on general conclusions, as well as conclusions based on certain aspects of industrial design and certain feminisms At this stage, I drew on the theoretical framework including proposals about the intersections of feminism and industrial design and topics like domesticity, beauty, technology and DIY.

6.9 Data Synthesis

Given the methodological differences between the literature analysis and co-design projects, I cautiously combined their results. I took into account the contexts and similarities and differences of each strategy and their results.

6.10 Analysis for Objectives 3 and 4

Moving on, the results for Objectives 1 and 2 form the basis for the response to Objectives 3 and 4. I cross-referenced the critiques and proposals with the sustainable development analytic framework. I identified areas where a critique or a proposal promised to support a sustainable development goal and evaluated its extent of support based on the accompanying sustainable development indicators.

Appendix 1 includes the sustainable development analytic framework. It also presents details about the framework and its application based on the LCSDSN report (2015). Namely, it's noted that the report distinguishes between indicators that are generally applicable and a range of complimentary national indicators. These complimentary indicators can be applied optionally, depending on needs and context. The report also categorizes indicators according to topics of special concern. Certain categories like industrialization; science, technology and innovation; and sustainable cities and human settlements have particular relevance to industrial design.

Although all goals and indicators were considered in the analysis, certain were given greater weight and importance. Namely, the general indicators were given greater weight than the complimentary indicators, unless the complimentary national indicators appeared to have particular relevance to industrial design. Further, the indicators dealing with topics of special

concern with particular relevance to industrial design were also given greater weight. While industrial design should ideally address the range of sustainable development goals and indicators, it's especially critical for industrial design to address elements directly related to its activities and position in the larger social context.

As a next step, I summarized these outcomes to characterise the relationships between feminist contributions to industrial design and sustainable development goals. I then translated these insights to design for sustainability based on my existing background knowledge in the area. Finally, I compared these areas of contribution with the contributions of existing design for sustainability initiatives toward design for sustainability goals.

These analysis processes informed the first part of the response to Objective 3: namely, a statement on the nature of the relationship between feminism's *contributions* to industrial design and design for sustainability *goals*. This statement then informed the understanding of the relationships between feminism's *interactions* with industrial design and design for sustainability *processes*. For instance, if feminism's specific critiques and proposals contribute to design for sustainability goals as a whole and provide a more encompassing response to these goals than seen elsewhere, as suggested in the theoretical framework, feminism's interactions with industrial design could be considered relatively encompassing, unique and valuable design for sustainability processes. These observations about the relationship were then reinforced with a comparison between feminism's interactions with industrial design and existing design for sustainability processes. Like before, the second part of the response to Objective 3 also involved a statement on the nature of the relationship between feminism's interactions with industrial design and design for sustainability processes

Finally, the response to Objective 4 was based on certain results identified during the methods and analysis in response to Objective 3. Feminism's interactions with and contributions to industrial design were compared with the processes and outcomes of existing design for sustainability initiatives. The response to this final objective involves noting feminism's interactions and specific critiques and proposals that contribute to sustainability goals and are unlike those in existing design for sustainability initiatives.

6.11 Politics of Interpretation

After arriving at the end of the research project, Denzin and Lincoln (2013) encourage one final step: namely, to position the research outcomes. The approach here was guided by the feminist methodology and critical constructivism and their emphasis on multiple perspectives and the evolution of knowledge (Hesse-Biber, 2007; Kincheloe, 2005). For instance, critical constructivism stresses that research outcomes should be understood as a single perspective, specific to the context of the research project, which could be added to or challenged in the future. This point of view is applied in this research project: I recognize that the research conclusions about feminism's critiques and proposals regarding industrial design, the relationships between feminist interventions and design for sustainability and the original insights this feminist perspective can provide to design for sustainability theories and practices are based on the context and structure of this research project and may be added to or challenged in the future.

Further, critical constructivism encourages the researcher to critically analyse their position throughout the project and its impact on the methods and outcomes (Kincheloe, 2005). I have situated my perspective and its potential impact on the project at several points

throughout this dissertation. I also engage in this process in the conclusion and limits section at the end of this dissertation.

6.12 Conclusion

In summary, this chapter described the research plan, addressing components like the researcher's position, the interpretive paradigm and framework, the research and analysis strategies, the analytic framework, the research methods and analysis and politics of interpretation. This discussion is followed by the research results presented in the chapters that follow:

- Chapter 7 outlines the literature analysis results
- Chapter 8 introduces the participatory project-grounded projects
- Chapter 9 outlines the results of the participatory project-grounded projects
- Chapter 10 responds to Objectives 1 and 2 based on a synthesis of the research results
- Chapter 11 responds to Objectives 3 and 4

Chapter 7. Literature Analysis Data and Results

This chapter presents a response to Objective 1 – to identify the content of feminism's critiques and proposals toward industrial design when it's applied as a lens on design- and Objective 2 – to identify the content of feminism's implicit critiques and proposals toward industrial design when it's applied as a lens in design. As mentioned earlier, most of the literature applies feminism as a lens on design, although there are cases of a feminist lens in design.

The bulk of this chapter discusses the literature as a whole, regardless of the kind of application of feminism. As such, the responses to both objectives are presented in parallel. That said, this chapter ends with a clear presentation of the responses to Objectives 1 and 2 in the discussion section.

Although the application of feminism doesn't figure heavily into the presentation of results, the results are still rigorously organized using a range of frameworks and structures. To begin, the literature analysis results are organized primarily in relation to the categories and sub-categories of the industrial design framework and the critiques and proposals toward industrial design. However, there are also several other significant structural features in the organization of the results. This includes the type of feminism applied in each case, the work's social and historical context and themes in the literature. The use of thematic analysis in this research project promised to help identify themes in the data. The purpose of choosing this approach was to identify common critiques and proposals across different literature. However, it also helped highlight broader themes that united the critiques and proposals pertaining to different parts of the industrial design framework and coming from different feminisms,

applications of feminism and contexts. It is these broader themes that provide additional structure to the results.

This results chapter includes three main sections. It begins with a more detailed discussion of the broad themes in the literature. This is followed by the bulk of the literature exploration results and, finally, a discussion section. Each section responds to the objectives in different ways. The middle section with the literature exploration results responds to Objectives 1 and 2 by presenting the range of feminism's critiques and proposals relating to industrial design; it includes a paragraph-or so dedicated to most texts. In contrast, the first section on the themes in the literature and the final discussion section include an analysis and synthesis of the literature analysis data, which provide a more direct and concise response to Objectives 1 and 2. As mentioned earlier, the discussion section at the end includes the first main distinction between the response to Objective 1 and Objective 2.

7.1 Themes in the Literature

It has been stressed throughout this text that feminism can intersect with industrial design at many levels including the epistemological and the range of concrete levels including each part of the industrial design framework. It has also been emphasized that feminism's processes and goals are relatively similar in each application. However, it was also stated that feminism's points of focus can vary depending on their level of intersection with industrial design. Feminism would be critical of universal and masculine knowledge at the epistemological level and encourage the incorporation of many perspectives in knowledge and knowledge building, including women's perspectives. Further, at the concrete level, feminism would be critical of issues like the inequality, injustice and oppression of women and provide responses to these

situations. Feminist perspectives would likely also interrogate the relationships between sex and gender and design like the role of design as a technology of gender, and encourage designer positioning and a focus on women's and human experiences in design.

I chose to focus on feminism's contributions to industrial design at the concrete level in this research project. That said, the industrial design framework applied here is particularly broad; it addresses concrete topics like projects, but also more abstract topics like the profession and an individual's practice. These more abstract levels have relatively strong and direct links with epistemology, since they address design knowledge in addition to more concrete topics like the design community or design companies.

As a result, despite my goal to focus on feminism's contributions to industrial design at the concrete level, this analysis also highlighted feminism's intersections with industrial design at the epistemological level. Although slightly unexpected, this situation had several positive consequences. Examining feminism's intersections with the multiple levels of the industrial design framework emphasized the similarities across feminism's intersections with industrial design and, indeed, the similarities of feminism's points of focus at epistemological and concrete levels. Issues of universal and masculine knowledge and the inequality, injustice and oppression of women are symptoms of the same problem, taking different forms at different levels. Looking at feminism's critiques of industrial design moving from abstract to concrete levels shows the transformation of the same issues and their materialization in different contexts.

This point about feminism's focus and the similarities and differences depending on its level of application is not new and was described in the theoretical framework and in the paragraphs above. However, the illustration of this situation in the research results was helpful

from a conceptual perspective, since it provided a concrete illustration of a complex and abstract relationship. It was also valuable to this research project and its question and objectives. It showed that the problems feminism finds with industrial design are systemic and similar from case to case. This helped me understand the literature including the problems it identifies and the responses it proposes when feminism is applied as a lens on or in design. The major themes that run throughout the literature are discussed in the sub-section below.

These similarities across the body of work also helped me understand the logic and structure of the arguments in the literature. Many writers critique or make proposals to industrial design that address multiple levels of the framework. In addition, an author's critiques and proposals rarely address the same levels of the framework. This is yet another sign that these issues are systemic and require an appropriate response. However, the different alignments of the critiques and proposals on the industrial design framework provide an additional insight. While a systemic problem might seem to require a systemic solution and a response at the highest social and institutional levels, feminism's responses are typically grass-roots, relying on the actions of individual design practitioners, design educators and users.

7.1.1 Main critiques and proposals. As described in the previous chapters, feminism's core concepts are that sex and gender are significant factors in the social and political world, sex and gender are at the heart of social hierarchies and inequalities, and female sex and feminine gender are disadvantaged meaning that women are dominated (Chambers, 2013; Freeden, 1996). Feminism often links these conditions to the broad idea of patriarchy, the system "by which men constitute the dominant social group and masculinity is the dominant social

practice" (Chambers, 2013, p.1). In response, feminism aims to eliminate the problems and inequalities that negatively affect women.

At an epistemological level, feminism is critical of presumed universal knowledge. Rather, it explains that knowledge and truth are not universal and, instead, are "partial, situated, subjective, power imbued and relational" (Hesse-Biber, 2007, p. 9). Further, it claims that women's needs and perspectives are not always incorporated in dominant knowledge (Hesse-Biber, 2007). Next, at a concrete level, feminism is critical of the inequality, injustice and oppression of women. Applied to design, feminism promises to show that the field of industrial design is structured, restrictive and masculine-oriented and that these dominant models of industrial design and their general acceptance in the field leave little place for alternative practices and perspectives. Further, it would likely identify situations of the inequality, injustice and oppression of women, as well as problematic relationships between sex, gender and design like the role of design as a technology of gender.

These hypotheses about feminism's implications for industrial design are confirmed by the results. The following are the major themes that run throughout its critiques:

- Feminism identifies and challenges power and masculinity embedded in multiple aspects of industrial design. This power and masculinity can be defined literally or symbolically, as illustrated in Chapter 2 (e.g. masculinity is associated with competition, order and linearity).
- Much of the literature is critical of technology, which is seen as a symbol of power and masculinity.

- Feminism is concerned with power dynamics between individuals associated with industrial design in its largest sense including between colleagues, between designers and users, or between factory workers and users.
- Feminism identifies and critiques situations where an aspect of industrial design harms, excludes, disregards, disrespects or controls women.

In response to its epistemological challenges to universal and masculine knowledge, feminism encourages the incorporation of many perspectives in knowledge and knowledge building, including women's perspectives (Hesse-Biber, 2007). This range of perspectives would help provide richer and more complex knowledge (Hesse-Biber, 2007). Further, at the more concrete level, feminism provides responses to its critiques of situations that negatively affect women. Applied to design, feminism would likely suggest opening the field to new perspectives including women's perspectives. In addition, it would propose solutions to its challenges at the concrete level, likely emphasizing women's and human experiences and designer positioning.

Once again, these hypotheses about feminism's implications for industrial design are confirmed by the literature. The following are the major themes that run throughout feminism's proposals for change:

- Feminism supports and drives redefinitions of any aspect of industrial design associated with power and masculinity based on women's perspectives and/or feminist perspectives. These women's perspectives are sometimes associated with feminine characteristics, as presented in Chapter 2 (e.g. compassion, dialog). While women, the feminine and feminism are different concepts, feminist perspectives are also often associated with feminine characteristics in the literature.

    - As a baseline, these redefinitions ensure that industrial design does not harm or hinder women in any way, but would ideally go further to benefit women.
- Feminism seeks to inject women into industrial design as active and empowered and recognized and respected actors.

7.2 Detailed Results

7.2.1 Design profession. As explained in the analytic framework, the largest category of industrial design is the profession that refers to the range of design organizations (institutions, associations, and consultancies), design knowledge and theories, and presumably the entire population of designers (Lawson & Dorst, 2009). The first cases from the literature focus on industrial design at this professional level and challenge design knowledge and theories, specifically their values and alignments with universal claims, power and masculinity and their rejection of women's experiences and perspectives. Aligned with the themes discussed above, they support a reorientation of design knowledge and theories based on women's and often feminine perspectives. In some cases, this change would be based on women's initiatives in design practice and projects.

Writing from Western and likely radical feminist perspectives applied on design, Cheryl Buckley (1986) and Penny Sparke (1995) critiqued industrial design's rooting in the modern paradigm. Penny Sparke focused on modernism (1995), the translation of modern thinking to design. Sparke explained that design movements and tastes are gendered and political where modernism is a masculine and patriarchal design style: it is a "'high-minded', authoritarian, and heavily politicized programme of architectural and design intervention and

reform, based on rational principles" (1995, p. vii). Sparke also explained that modernism rejects feminine taste and minimizes women's power through its rules for good design that minimize the typically female consumers' creativity and agency (Sparke, 1995). Similarly, Buckley noted that design's foundations help bolster its legitimacy and authority through assumptions of objectivity, universal truths, and perceptions of good and bad design (1986).

In response, Sparke was hopeful that postmodernism could enable positive changes by challenging design rules and norms and engaging with more feminine aesthetics (1995). That said, she was wary that postmodernism remained anchored in professional and patriarchal thinking and that its urban context was removed from typically feminine and domestic spheres (1995). Further, she added that its impact would be minimal without broader social changes and long-term commitments to change (Sparke, 1995).

Other work is more concerned with design's alignments with the marketplace and other priorities that could be viewed as masculine through their emphasis on features like ambition and competition. From a Western and radical feminist perspective applied on design, Joan Rothschild was critical of "entrenched economic and political patterns that oppress and exclude, patterns and practices that deny access and benefits to those without privilege and resources" (1999b, p. 5-6), but also believed that design does not need to perpetuate this model. Instead, she proposed a balance between market priorities and contextual, social and sustainability concerns (Rothschild, 1999b). From a Western and eco-feminist perspective applied on and in design, Amelia Amon was critical of industrial design's alignment with the military and corporations (1999). Instead, she proposed that design should become more closely aligned with human needs and environmental protection. She believed that women's perspectives on technology could help drive these changes:

> Although there is no universal women's value system, that we are seen as less hierarchal, more contextual, and more influenced by relationships and compassion can encourage us to bring these attributes to bear in a world that needs them. In our design work, we should recognize and apply our own capabilities, aesthetic sensibilities, wisdom and concerns. (Amon, 1999, p. 128-129)

These principles guided her practice and processes based on small-scale local production for niche markets, environmental protection and aesthetics (Amon, 1999).

Finally, the most extreme example comes from a Western and socialist feminist perspective applied on design, which argued that the industrial design profession as a whole including its foundations and its activities is problematic because it perpetuates inequalities through its associations with capitalism, "a system which thrives on the exploitation of labor, theft of resources, and facilitates vast accumulation of wealth among a tiny percentage of global elite, while simultaneously impoverishing the majority of the world's population" (Cole & Dahl Crossley, 2009, p. 2). Given this heavy and profound critique, the authors didn't see much potential for change in industrial design.

7.2.2 Design profession and practice. Moving on, this next section sits between the design profession and practice levels. Recall that design practice refers to the place and role of each individual in the larger professional community (Lawson & Dorst, 2009). It refers to their professional identity like their relationships with other practitioners and factors like style, attitudes and interests that they bring to their work (Dorst, 2009). It also refers to their activities including design work outside a project (e.g. developing a company vision or hiring employees) and design work in a project (Dorst, 2009).

The first article outlined here is Cheryl Buckley's 1986 article, "Made in patriarchy: Toward a feminist analysis of women and design." Although a radical or perhaps socialist

feminist text from design history, it is a foundational work applied explicitly and implicitly in many different contexts including by authors adhering to different kinds of feminism and addressing different aspects of industrial design. That said, the subsequent literature does build on, extend and, sometimes, argue against its insights. This subsequent literature is also presented in this section.

Buckley's article and the follow-up discussions touch-on nearly all the themes mentioned above. They argue that industrial design is a masculine field through its associations with technology and technical skills, and that this vision is also rooted in and perpetuated through design scholarship, education and practice. This harms women by excluding them from these areas, making them feel that they aren't suited to work in design or not recognizing their place and contributions. This also creates power dynamics between women and men working in design and between industrial design and less masculine fields. In response, they propose reconceptualising industrial design and related activities like design scholarship, education and practice based on women's perspectives and feminism. This should also involve reconceptualizations of their respective professional communities and processes. Finally, feminism encourages women's participation and recognition in each of these areas.

7.2.2.1 Buckley's foundational article. Buckley explained that "[p]atriarchy has circumscribed women's opportunities to participate fully in all areas of society and, more specifically, in all sectors of design, through a variety of means-institutional, social, economic, psychological, and historical" (1986, p. 4). This guides perceptions of women's skills and roles and the tasks women are best suited to (Buckley, 1986). For instance, women are more closely associated with the decorative arts than with design because of the gendered

associations of each field: the decorative arts are more feminine and linked to appearance, domesticity, tradition, emotion and instinct, while design is associated with masculine activities and traits like innovation, intellect and business (Buckley, 1986). As another example, women are often seen as consumers rather than design professionals (Buckley, 1986). Adding to this situation, patriarchy values masculinity and male activities over femininity and women's activities, which creates a hierarchy between the decorative arts and design and between designers and consumers (Buckley, 1986). This situation is perpetuated through design education and directly impacts female design students and designers, who often need to adopt masculine values to be successful (Buckley, 1986).

Buckley linked these arguments to her design history focus and explained that these issues are perpetuated and exacerbated by design history writing and approaches: "These methods, which involved the selection, classification, and prioritization of types of design, categories of designers, distinct styles and movements, and different modes of production, are inherently biased against women and, in effect, serve to exclude them from history" and when women are included "they are either defined by their gender as designers or users of feminine products, or they are subsumed under the name of their husband, lover, father, or brother" (Buckley, 1986, p. 3).

In response to these problems, Buckley proposed changes to design history approaches, introducing the idea of feminist design history (Buckley, 1986). In her view, feminist design history and, indeed, any history focusing on women in design must be informed by feminism and feminist theory (Buckley, 1986). Further, she proposed a range of additional recommendations, as follows. Feminist design history should recognize the role of patriarchy in women's relationships to design and in the hierarchal positioning of women's

roles, which can help show that women's experiences in design were not necessarily based on choice or due to a lack of ability (Buckley, 1986). It should also involve cautious use of political and loaded terms like feminine and decorative (Buckley, 1986). Finally, she proposed several re-conceptualizations in design history like redefining design to include craft production and recognizing the range of actors engaging with design including users; both cases help add women to design history (Buckley, 1986).

This article inspired a range of writing on the practice of design history, design scholarship, design education and on industrial design practice itself. The following are subsequent articles in each category that address similar issues to Buckley and are also positioned between the profession and practice levels of the industrial design framework.

7.2.2.2 Subsequent design history thinking. Certain works provide examples to illustrate Buckley's claims, while others operate at a more theoretical and analytic level. The first two texts were inspired by radical feminism applied on design and explain that, historically, women had limited and gendered roles in industrial design. Buckley (1989) and Kirkham (1989) explained that, in the rare cases that women did participate in design, they often had gendered roles. Their roles were assigned based on perceived female traits of being physically weak (Kirkham, 1989) and suited to delicate tasks (Buckley 1989). Women decorated pottery in the pottery industry (Buckley, 1989) and upholstered furniture in the furniture industry (Kirkham, 1989). That said, there were exceptions based on unusual circumstances. For instance, women would have taken on more responsibilities during a war when men were away and daughters of furniture makers with no sons may have taken over the family business (Kirkham, 1989).

The next articles supplement the theoretical and analytic dimensions of Buckley's arguments (1986). In a Western article inspired by general feminism applied on design, Judy Attfield responded to the shortage of women in design history (1989). She reiterated some of Buckley's 1986 arguments like to broaden the scope of design histories to include more women through, for instance, recognizing design work that took place through craft-based production (Attfield, 1989). She also recommended that design historians identify female designers to serve as role models (Attfield, 1989). However, in order to make a large impact, design historians would need to present these female designers in relative detail and must also address the way history is told at a more methodological level (Attfield, 1989).

Suzette Worden and Jill Seddon also discussed design history in two Western, radical feminist articles from 1994 and 1995, which applied the feminist lens on design. Worden and Seddon were critical of design histories, specifically those that focus on male heroes and leave out female contributions and feminine concerns like the social context of design and collaborative processes (1994). They argued that these issues anchor the vision of men as designers and women as consumers (Worden & Seddon, 1994). In response, Worden and Seddon recommended a series of initiatives (1994). They reiterated the proposals to redefine design to include women's work and experiences, writing design histories that include women, and highlighting the reasons why women did or did not have opportunities in design (Worden & Seddon, 1994). They also proposed creating women's advocacy groups in design and conducting feminist analyses of design (Worden & Seddon, 1994). The authors stressed that combining these initiatives would enable design historians to respond to multiple feminist concerns and would help situate women as designers and not just users (Worden & Seddon, 1994).

Worden and Seddon presented several additional recommendations for design history in their 1995 article. This includes using autobiography and biography methods, which situate the context of each woman's practice and aren't restricted to existing history frameworks and understandings of history (Worden & Seddon, 1995). They further stressed recognition of the differences between women and their experiences (Worden & Seddon, 1995). Finally, in terms of feminism, they warned against recklessly and uncritically applying contemporary feminist perspectives to women's histories and allowing disagreements within feminism to neutralize each other (Worden & Seddon, 1995).

Finally, Cheryl Buckley followed-up her iconic 1986 article with a book chapter in 1999. This new radical feminist text that applied feminism on design reiterated some of her previous arguments like modifying the definition of design and the scope of design history (Buckley, 1999). However, Buckley also introduced the new critique that feminist design history hasn't been taken seriously or incorporated thoroughly or in its entirety in dominant design history (Buckley, 1999). In response, Buckley stressed the value of continuing to conduct feminist design histories, which she viewed as relevant to industrial design more broadly by highlighting issues in design and possibly helping guide changes and proposals.

7.2.2.3 Design scholarship. In a recent Western article based on a general understanding of feminism applied on design, Teena Clerke problematized design scholarship and publishing, explaining that the fields involve unequal and gendered power dynamics (2010). There is a lack of female authors and visibility of those that do exist, which means that design knowledge misses out on women's concerns and perspectives, women are less likely to move up in the academic hierarchy and, as such, these inequalities are unlikely to change (Clerke, 2010). In

response, Clerke proposed to move beyond feminist traditions in design academia including, for instance, a tight-knit community, critique and an additive approach to design history (2010). Instead, she proposed to reach out to broader audiences and invent new and engaging feminist approaches to rhetoric and writing (Clerke, 2010).

7.2.2.4 Design education. In a Western and possibly liberal feminist article that applies feminism on design, Sue Clegg and Wendy Mayfield restated many of Buckley's critiques of industrial design practice more than a decade later, this time applied to design education (1999). Clegg and Mayfield were critical of the longstanding associations between women and decorative arts and men and technology (1999). As they explain, these associations carry into design education where women tend to choose softer design fields like textiles and jewellery as opposed to harder fields like product and furniture design (Clegg & Mayfield, 1999). This happens despite ability where they believed women are equally competent and able to learn harder design skills (Clegg & Mayfield, 1999). They noted that the underrepresentation of women in more technical fields has been rather resistant to change despite efforts of feminism in design, policy changes and changes to education (Clegg & Mayfield, 1999). In response, the authors stressed the need to understand and address gendered technical competency: "As long as product design is associated with 'male' technologies, it seems unlikely women pioneers who enter the field will have much impact on how product design is shaped" (Clegg & Mayfield, 1999, p. 16). This project must take place at multiple levels in and out of design. Further, it should involve changes to design discourse and design history that avoid stereotypes and where women and discussions of gender are central and respected (Clegg & Mayfield, 1999).

In another Western and liberal feminist article that applies feminism on design, authors Sue Clegg, Wendy Mayfield and Deborah Trayhurn further noted that women working in design can feel extra pressure to prove their technical skills and a double judgment when they can't: "In not being able to do certain things, she would be [doubly] judged as a woman not being able to do things" (Clegg, Mayfield & Trayhurn, 1999, p. 50). In response, the authors proposed opening industrial design to a greater range of practices, which could help make industrial design appealing to a wider audience including men and women that do not identify with the field as is (Clegg, Mayfield & Trayhurn, 1999). They also suggested that design research and design education fight against these gender inequalities in industrial design (Clegg, Mayfield & Trayhurn, 1999).

From a general feminist perspective applied on design, Frances Bronet and Linda Layne suggested that a gender balance in design could be supported through design education (2010). This could involve empowering female students and teaching to feminine and masculine interests and values (Bronet & Layne, 2010). This could also involve incorporating feminism throughout the design curriculum and teaching students its value (Bronet & Layne, 2010). Finally, design education could aim to establish a model for work-life balance that respects students' multiple responsibilities (Bronet & Layne, 2010). This model could transfer to the professional world or, at least, not set a bad precedent (Bronet & Layne, 2010).

7.2.2.5 Professional practice. In a Western and likely cultural feminist text that applied a feminist lens on and in design, Nancy Perkins identified a shortage of female industrial designers and women in powerful positions associated with design like management and marketing (1999). She explained that the shortage of women in all these areas was of concern,

since design decisions are dictated by a range of professionals and not just by designers (Perkins, 1999). Her feminist perspective helped further problematize this issue. She explained: “When women are missing ... key criteria for what is comfortable, appropriate, and appealing for women may be overlooked” (Perkins, 1999, p. 120). In response, Perkins stressed that women should be active in designing products for female users, since their own experiences could inform products and new feminine visions “of what is aesthetically pleasing, of what is most comfortable and easy to use” (1999, p. 125).

In a Western article speaking about feminism in a general sense and applying a feminist lens on design, Javier Gimeno Martínez restated the critique that women are excluded from design practice and tend to be less visible (2007). In response, he suggested the value of affirmative action that would encourage and highlight women’s work in design; this could include “organizations created exclusively for female designers, shops where items were exclusively designed by women, special issues of magazines, e-mail lists about female designers, and design groups composed entirely of female designers” (Martínez, 2007, p. 19). As a more contemporary article, he also stressed the need for these initiatives to reach-out to more diverse women, which he noted has not always been the case (Martínez, 2007). Similarly, in a 2003 article stressing the value of contemporary feminisms to design and applying a feminist lens on design, Judy Attfield argued that the shortage of women and other social groups in design can be addressed by affirmative action.

7.2.2.6 Moving beyond Buckley. There are also several articles that extend Buckley’s original ideas more dramatically and, in some cases, even contradict Buckley’s original claims. These texts do not necessarily align with the broader themes introduced above or, in many cases,

take a more moderate approach toward their critiques of design. This is likely partially related to the feminist perspectives applied in each case, as well as positive changes to industrial design over time. Depending on the case, the author may or may not provide future-focused suggestions to industrial design. These works are presented below and examined in more detail in the discussion section.

Writing from a possibly liberal feminist perspective applied on design, Pinar Kaygan, a Turkish design researcher, reiterated many of Cheryl Buckley's arguments from her 1986 article (Kaygan, 2014). Kaygan explained that design fields are gendered and positioned hierarchically (2014). As an extension of this point, women are viewed as better suited to feminine fields and men are associated with masculine fields, which impacts the number of men and women that enter each field (Kaygan, 2014). Kaygan noted that industrial design is typically seen as masculine, but is more feminine compared to engineering (2014). Further, there is gender parity in industrial design in Turkey (Kaygan, 2014). Combined, this situation impacts design practice and, specifically, interdisciplinary collaborations between industrial designers and engineers (Kaygan, 2014). During these collaborations, design knowledge and expertise are less valid than engineering (Kagan, 2014). While Kaygan noted that women can be especially successful in feminine-coded industrial design, she adds that women working in industrial design can face perceived "double technological incompetence" compared to men in industrial design when collaborating with engineers (Kagan, 2014, p. 84). This extends Clegg, Mayfield and Trayhurn's earlier point that women working in design can feel extra pressure to prove their technical skills and a double judgment when they can't: "In not being able to do certain things, she would be [doubly] judged as a woman not being able to do things" (1999, p. 50). In this case, women working in industrial design and collaborating with engineers could

actually be seen to face triple technological incompetence by conducting masculine-coded technical activities in a masculine coded-field, while collaborating with professionals in an even more masculine and technological field. Further, in another article inspired by postmodern feminism applied on design, Pinar Kaygan explained that women take on certain strategies to negotiate the gendered workplace (2016). This can include blending in and adopting masculine behaviours or accepting feminine gender roles and perhaps acting like a mother, sister or daughter with colleagues (Kaygan, 2016). In response, Kaygan proposed that management overseeing interdisciplinary collaborations have a crucial role to moderate the hierarchy between industrial designers and engineers; "they must identify and challenge such power asymmetries that are constructed around dualistic associations in order to create a more egalitarian atmosphere" (Kagan, 2014, p. 86).

Kaygan's mention of gender parity in industrial design, as well as the idea that industrial design might be more feminine than previously thought are different from earlier perceptions and are reiterated in several other recent texts. In an opinion piece, Alice Rawsthorn talked about the historic exclusion of women from design, especially the more 'masculine' fields like product design (2014). She noted that the situation has changed over the years where there are now some prominent female designers and many female design students (Rawsthorn, 2014). However, she added that men are still more visible in the field and female designers often experience some kind of sexism in the design community (Rawsthorn, 2014). In response and from a relatively general Western feminist perspective applied on design, Rawsthorn noted that women have been especially successful in newer design fields where there isn't an established male leadership (2014). She also added that new design technologies and contexts of practice can empower female designers:

> The possibility of raising investment from crowd funding, publicizing work on social media and selling it online is enabling a new generation of designer-entrepreneurs to pursue their own objectives by operating independently. Empowering though this has been for men, it has proved even more liberating for women by allowing them to devise new ways of working, free from the constraints of old boys' networks. (Rawsthorn, 2014, para. 14)

Buckley had seen industrial design as masculine (1986). This was re-stated by Clegg, Mayfield, & Trayhurn who saw industrial design and its associations with technology, hands-on activities, hand tools and getting dirty in the workshop as masculine (Clegg, Mayfield, & Trayhurn 1999). However, writers have been increasingly seeing industrial design as gender balanced. For instance, Clegg, Mayfield, & Trayhurn stressed that the creativity associated with industrial design is a feminine trait (1999). Further, writing from a Western and possibly radical feminist perspective applied on design, Joan Rothschild suggested that the "industrial designer best epitomizes the joining of the aesthetic and the technical: She must make the vacuum cleaner pleasing and attractive enough for the consumer who, at the same time, must be convinced that it works well, and indeed better than the competition" (1998, p. 108).

Finally, more contemporary feminisms are more concerned with gender and masculinity. Several authors noted that the gendered perceptions of industrial design as more feminine can discourage men from entering the field (Clegg, Mayfield & Trayhurn, 1999; Kaygan, 2014). Further, writing from a Western and liberal feminist perspective applied on design, Michelle Lomberg suggested that critique toward gendered roles and assumptions in industrial design can disadvantage men in design and unfairly characterize the masculine-oriented design profession:

> Men are also caught up in this uninterrogated essentialism; constructed in opposition to the social concerned, nurturing, multitasking women, the essential man values individuality over community, instrumental work over relational work, singular focus over multitasking. This type of essentialist thinking paints an inaccurate picture of men designers and male-dominated design practice, which often have such altruistic

> concerns as worker safety and comfort, environmental issues, and universal accessibility as their focus. (Lomberg, 2003, p. 96)

7.2.2.7 Other topics. Next, there are other texts that address the design profession and practice levels that diverge from the major topics of gendered and hierarchal design practice seen in Buckley's work and its academic tradition. That said, their critiques still mirror many of the broader themes in the literature including power dynamics and the lack of recognition of women in design. In response, they explore the possibility of injecting feminist perspectives in industrial design and, specifically, in design education and professional communities. They also encourage the recognition, respect and mobilization of female designers.

Inspired by postmodern feminism applied on design, Pinar Kaygan noted that individual designers interested in women's needs and gender equality might not be able to affect large change, given larger power structures and design collaboration where managers would need to be on-board (Kaygan, 2016). Further, design education was already discussed in relation to the applications of Buckley's foundational text. However, design education comes-up frequently in the feminist literature in industrial design; in many cases, it's viewed as a means for positive change in design. Writing from a Western, postmodern and intersectional feminist perspective applied on and in design, Sharra Vostral and Deana McDonagh proposed that feminism should be incorporated throughout design education; this early introduction would shape the design student's future practice and make students more receptive to feminist perspectives (2010).

There are also several texts that centre on design professional communities. Writing from a Western and likely eco-feminist perspective applied on and in design, Wendy Brawer proclaimed: "Although women are often associated with and are active in environmental

issues and design, they have tended not to be called on as experts" (1999, p. 129). In response, Brawer encouraged collaboration between female design practitioners and recognition of women's knowledge in design and on environmental issues (1999). Also on the topic of community, designer Stephanie Sonya Ibbitson explained in an interview that industrial design practice is difficult and can make a person feel alone (Beeston, 2017). Inspired by a Western and radical feminist perspective applied on and in design, Ibbison proposed forming a women's professional network rooted in collaboration and support between female designers (Beeston, 2017). This would help support group members emotionally and technically and inspire their work (Beeston, 2017). Finally, from a general feminist perspective, Frances Bronet and Linda Layne proposed strategies to encourage feminist design practice; this includes showcasing examples of feminist design, identifying feminist design experts and mentors, incorporating feminist discussions at professional community events like conferences, identifying sponsors that could support feminist design, and establishing awards for feminist design (2010).

7.2.3 Design projects. The next level of the industrial design framework includes the design project, the structural unit of design practice (Vial, 2014), as well as its components: design practice, process and objects.

7.2.4 Design practice in the project. Design practice includes work outside the design project and work during a project (Dorst, 2009). While certain parts of the discussion on design practice in the previous section addressed work outside the project, other elements were applicable to practice during a project. Several writers suggested that female designers

incorporate their personal perspective in design projects, seeing this as a resolution to other issues in the field. Based on a Western and eco-feminist perspective, Amelia Amon proposed that women's perspectives could drive changes to industrial design's guiding principles and orientations (1999). Wendy Brawer, another eco-feminist writer, helped expand on this point by suggesting that women have unique design knowledge including concern for environmental issues (1999). Similarly, based on a Western and likely cultural feminist perspective applied on and in design, Perkins was concerned that the shortage of women would negatively impact design outputs, since "[w]hen women are missing ... key criteria for what is comfortable, appropriate, and appealing for women may be overlooked" (Perkins, 1999, p. 120). In response, Perkins stressed that women should be active in designing products for female users, since their own experiences could inform products and new feminine visions "of what is aesthetically pleasing, [and] of what is most comfortable and easy to use" (1999, p. 125).

The proposals that industrial design is masculine oriented are also applicable in this section. This includes challenges to the double or, potentially, triple incompetence women can face in industrial design practice (see Clegg, Mayfield & Trayhurn, 1999 and Kaygan, 2014) and Kaygan's critique that women can be driven to adopt certain behaviours in practice like blending in and adopting masculine behaviours or accepting feminine gender roles (Kaygan, 2016). As presented above, a resolution to these issues could include opening industrial design to a greater range of practices and processes, which could help make industrial design appealing to a wider audience including men and women that do not identify with the field as is (Clegg, Mayfield & Trayhurn, 1999).

Finally, from a Western and likely cultural feminist perspective, Nancy Perkins problematized the shortage of women in all decision-making roles during the design project

(1999). As before, she was concerned that this shortage would negatively impact design outputs and their appeal and relevance to women (Perkins, 1999).

7.2.5 Design processes. Design processes were briefly addressed in the texts presented above. For instance, Amon hinted that women's perspectives in design practice could encourage processes based on small-scale local production for niche markets and environmental protection and emphasize aesthetics (Amon, 1999). However, design processes are directly addressed in a range of other literature. In most cases, authors promote applying feminism in design projects and on design processes as a resolution to issues in the field, and characterise the features and advantages of such a perspective.

First, several authors stress that a feminist lens in design highlights the contextual issues surrounding design activities and outputs. Writing from a Western and radical feminist perspective applied on design, Joan Rothschild noted that feminism helps point out the broader social, economic and political contexts of design activities (1995). Similarly, from a general feminist perspective, Frances Bronet and Linda Layne argued that a feminist lens could inform understandings of the social angle of design (2010).

Other articles emphasize feminism's relationships with reflections and critique in design. Writing from a Western and liberal feminist perspective, Michelle Lomberg encouraged designers to be self-reflective and consider "the conditions that make the practice of design possible, on the contexts in which their products will exist and on the assumptions they may have about the user or client or Other" (2003, pp. 22-23). This process should also include a critical examination of whether current approaches to countering women's domination are appropriate and sufficient (Lomberg, 2003). In another example based on a

third wave feminist perspective applied on and in design, Sarah Elsie Baker stressed that "[s]peculation, creativity, and invention are essential for feminism in order that new more equitable futures can be brought into existence" (2017, p. 62). She encouraged designers to engage in speculative design, which breaks from the marketplace and encourages dialog and reflection among users (Baker, 2017).

Writing from a Western and radical feminist perspective, Joan Rothschild stressed that feminism helps encourage design concerned with user and community needs, especially pertaining to women and other social groups that have been left out (Rothschild, 1995; 1999b). It also guides the use of design activities that incorporate and respect users like user research, participatory methods (Rothschild, 1995) and inclusive design (1999b). Further, Rothschild was critical of the gendered and hierarchal positioning of creative fields (1995; 1998), as well as the separation between design fields, which she viewed as artificial given their interdependence and the frequent collaboration of practitioners (1998). In response, Rothschild explained that "feminist perspectives are geared to speak to this fragmentation" (1998, p. 101). They could encourage moving past these artificial separations and engaging in non-hierarchal interdisciplinary relationships and collaboration in practice (Rothschild, 1995; 1998; 1999b). Finally, Rothschild noted that a stronger link between fields and especially between industrial design and engineering would also benefit users; it would give greater value to design perspectives and their focus on user needs (1995).

Other authors also mirror these discussions on collaboration, suggesting that designers engage with a range of different stakeholders. Writing from a Western and liberal feminist perspective, Michelle Lomberg encouraged interdisciplinary collaborations with people from other fields like feminist scholars and social scientists, as well as drawing on theory and

literature from other fields to expand our understanding of design and its impact on the world (2003). These processes would help inform this critical reflection (Lomberg, 2003). In a general discussion on feminism applied as a lens on design, Boyer and Boswell-Penc see promise in co-design with women and openness to new ideas at whatever scale, including dramatically different concepts (2010). Finally, in a broad discussion of feminism, Linda Layne explains that involving feminist designers or users, "early and often" in the design project offers the best chances at developing an optimally feminist product (2010a, p. 24).

In addition to encouraging the application of certain existing design strategies, several authors propose modifications to these strategies to better align with feminist goals. Writing from a Brazilian and intersectional feminist perspective applied on design, Luiza Prado de O. Martins noted that critical and speculative design have been encouraged as processes to address feminist and social justice critiques of design through increased discussion and reflection (2014). However, she highlighted several issues with these approaches. Critical and speculative design are centred in the West, mostly limited to academic contexts without broader visibility, and mostly conducted by privileged groups of people (Martins, 2014). She also noted that critical and speculative design rarely address issues of gender or draw on relevant related theories (Martins, 2014). In response, Martins suggested developing feminist versions of these strategies (2014). She outlined her vision of feminist speculative design, which she sees as a sub-category of the larger approach that focuses on gender, as well as intersectional sources of oppression (Martins, 2014). She further stressed that feminist speculative design should be accessible to the public (Martins, 2014).

In another case based on a Western and third wave feminist perspective applied on and in design, Kristina Lindström and Åsa Ståhl proposed that feminist theory can inform

industrial design (2015). Specifically, the concept of figurations and situated knowledge can inform collaborative design theory and practice (Lindström & Ståhl, 2015). Finally, in a Western article exploring feminist epistemology and, specifically, Donna Haraway's situated knowledge applied on design, author Shana Agid stressed that designers operate subjectively and from their position in relation to other actors (2012). She explained that this positioning creates power dynamics and impacts the designer's perspective:

> The experiences that design students bring to school as people whose socio-economic, race, gender, sexual, national, embodied, etc. positions likely have produced different ways of seeing, different sets of assumptions, and, importantly, different access to the privilege of not-seeing the impact of these positions, will necessarily affect their relationship to the tasks required of them and their perceptions of the contexts in which they are asked, encouraged, or made to work. (Agid, 2012, p. 37)

This designer's perspective can then perpetuate certain assumptions based on their own position and world-view (Agid, 2012). In response, Agid suggested modifications to the dominant understanding of design thinking (2012). This would involve recognizing the broader contextual factors that could impact the range of design decisions, as well as encouraging designers to reflect on their own positioning and how it relates to their work (Agid, 2012). This could also involve encouraging critical thinking to identify how design practice perpetuates certain problems, and engaging in design subversion through a strategy like critical design (Agid, 2012). Last, Agid stressed that these new approaches should be taught and encouraged in design education (2012).

Finally, on another distinct topic, a Western and liberal feminist article noted that gendered design competence could be exacerbated by increasing computerization and technologization (Clegg, Mayfield & Trayhurn, 1999). On the other hand, the authors also noted that digital design processes were a recent phenomenon and may be open to new gender readings (Clegg, Mayfield & Trayhurn, 1999).

7.2.6 Design objects. Design objects are a particularly popular subject in the literature and are the focus of the section that follows. It was explained earlier that certain critiques and resolutions address multiple levels of the industrial design framework and a critique and its accompanying resolution can be located at different levels of the framework. This is especially the case for the discussion about design objects. Most of the texts on the subject also refer to design practice and processes and/or to the project of object reception.

7.2.6.1 Feminist technology. The first group of literature examined here discusses the idea of feminist technology and how to achieve it through design. Here, a feminist technology offers an implicit resolution to points of concern in industrial design. These discussions relate to the broad themes in the literature because feminist technology involves the application of a feminist perspective on industrial design, and specifically on the design object. Further, the development of a feminist technology is based on feminist reformulations of industrial design at other levels.

All of the authors in this section are contributors to the *Feminist Technology* anthology (2010) and discuss feminism generally and work from a Western perspective. This section begins with some theorization on the definition of a feminist technology. Deborah Johnson argued that feminist technology should be "good for women, gender equitable, sometimes favor women, and … always an improvement over prior gender inequitable social relations" (2010, p. 52). Frances Bronet and Linda Layne shared criteria for feminist technology developed by their design students based on a general review of feminism (2010). The students decided that the product should be ergonomic and, depending on the feminist

perspective, would fit women better than men or fit men and women equally; be usable by all women regardless of age and ability; be affordable based on the income gap between women and men; balance out the plethora of masculine technologies; build on the social world and relationships; have conscious engagement with gendered product language; and be based on co-design with women (Bronet & Layne, 2010). Finally, applying a feminist lens on design, Linda Layne explained that feminist technology should "enhance women's ability to develop, expand, and express their capacities" (2010a, p. 3). This wide definition could also include a continuum from minimally to highly feminist products (Layne, 2010a). For instance, a product doesn't necessarily need to empower women to be feminist, but an empowering product would be more feminist than others that only create small changes (Layne, 2010a). Layne also argues that the end and actual user experience should be used to judge a feminist product (2010a). Marketing and the designers' intentions, whether feminist or not, should not figure into this judgment (Layne, 2010a). As a caveat, Layne explained that there might not be a consensus on what product is feminist because of the diversity of feminism and its contexts of application, as well as its complexity where a designer might leave out certain feminist dimensions (2010a). She also notes that feminist technology needs to go hand in hand with larger feminist work at a social level (Layne, 2010a).

Beyond these definitions, many authors propose tactics in design practice and processes to encourage and enable the development of feminist technology. At the practice level, Linda Layne suggested promoting feminist design through foundations, grants and awards that could, in turn, encourage the development of feminist technologies (2010a). Further, Frances Bronet and Linda Layne suggested teaching feminism in design education, which could encourage students to develop feminist technologies in their future practice

(2010). Applying a feminist lens on design, Shirley Gorgenstein explained that it's difficult to design a feminist product, since its actual impact can be unclear from the outset (2010). However, she explains that designing from a feminist perspective offers the best chances to achieve a feminist product, given feminism's focus on women's experiences (Gorgenstein, 2010). Gorgenstien also suggested several strategies to develop feminist technologies (2010). These involve a rigorous and holistic adoption of feminist principles throughout the project: modifying design priorities to integrate a central concern for user needs; integrating feminism into design goals; and addressing a feminist problem through design (Gorgenstien, 2010). Projects should also address a range of feminist concerns and issues in different contexts; this could include designing a product for the household or for the workplace (Gorgenstien, 2010).

Finally, other authors suggest that feminist technology could be achieved through the redesign of existing products based on feminist principles. For instance, applying a feminist lens on design, Sharra Vostral noted that non-feminist technologies can become feminist through redesign based on feminist principles (2010). This would involve incorporating feminism throughout each stage of the project and the object's path from design to the marketplace. This also involves designing for the range of female users (Vostral, 2010). Kate Boyer and Maia Boswell-Penc also encouraged a critical evaluation and redesign of products from a feminist perspective and explain that this should happen hand-in-hand with broader social changes and changes to policy to support women's rights (2010).

On another, related subject, several authors stress the broader value of feminist technologies. Applying a feminist lens on design, Deborah Johnson proposed seeing design objects as a tool for change toward feminist goals (2010). Further, in a radical feminist text,

Suzette Worden and Jill Seddon noted that design often perpetuates social norms, but also has the potential to encourage new ideas and behaviours (1994).

The next group of texts address the relationships between design objects and sex, gender and sexuality, investigating the assumptions designers inject into product design and the alignment between the object and its user. While the literature above presented feminist technology as an implicit resolution to points of concern in industrial design, the literature below typically problematizes design objects and proposes resolutions rooted in other levels of the industrial design framework. The critiques in this section relate to power dynamics between designers and users and the harm and limitations designers and design objects can place on users. In turn, the resolutions involve feminist driven reformulations of industrial design at a range of levels and the injection of women into design, especially through participatory design approaches.

7.2.6.2 Design and women's bodies. Writing from a Western and postmodern and intersectional feminist perspective, Vostral and McDonagh were critical of products designed primarily for an able bodied male user, which ignores the needs of other users including women and makes them accommodate to objects and their surroundings (2010). In response, they suggested designing with women and diverse users in mind (Vostral & McDonagh, 2010). This critique and its resolutions were also reiterated by Mithula Naik, a postmodern feminist designer and design researcher originally from India, who applied a feminist lens on and in design (Interview in Kassun-Mutch, 2016).

7.2.6.3 Gender. The relationships between design objects and gender is another dominant theme throughout the literature. This section begins by presenting two articles that introduce the current situation, before diving-in to more complex and detailed discussions in the pages that follow. To begin, Rothschild, a radical feminist, noted that design objects are informed by gender assumptions (1998). Lena Hansson and Marcus Jahnke, Western and postmodern feminist writers that applied a feminist lens on and in design, agreed with this point, but also noted that this issue is under-recognized (2009). In their view, there is a lack of awareness to gender in design projects (Hansson & Jahnke, 2009). They proposed a relatively simple resolution to this issue; namely to recognize the relationships between gender and design objects and to consider these issues throughout design projects (Hansson & Jahnke, 2009). This resolution could be enabled by educating designers on feminism and the social issues it addresses (Bronet & Layne, 2010). Together, these changes to product design could help encourage larger social change (Hansson & Jahnke, 2009).

This relatively simple introduction is followed by a detailed discussion of the relationships between design objects and gender found in a Western and postmodern feminist article by Ehrnberger, Räsänen and Ilstedt (2012). The authors apply a feminist lens on and in design. To begin, the authors were critical of gendered product language where women's products "are characterized by soft, clean, organic shapes, and bright colours (preferably pink), and … decoration such as hearts, diamonds, or flowers" and men's products "are characterized by complex, angular shapes, and dark colours" and have a look that references machinery, performance and danger (Ehrnberger, Räsänen & Ilstedt, 2012, p. 88). They explained that gendered product language reinforces gender norms, roles and hierarchies (Ehrnberger, Räsänen & Ilstedt, 2012). The authors were also critical of several more subtle

situations. They explained that masculine products are the norm and feminine products are an exception (Ehrnberger, Räsänen & Ilstedt, 2012). For instance, there are cases of products that offer a feminine version (Ehrnberger, Räsänen & Ilstedt, 2012). However, this situation does not reverse where traditionally feminine products don't have a masculine version (Ehrnberger, Räsänen & Ilstedt, 2012). In these cases, the men's product has its own category; for instance, men's cosmetics are often called grooming products (Ehrnberger, Räsänen & Ilstedt, 2012). As another case, the authors noted that apparently unisex products often have a masculine aesthetic (Ehrnberger, Räsänen & Ilstedt, 2012).

In response, the authors discussed the pros and cons of possible resolutions to these issues. One approach is to design truly unisex products; however, they note that this approach could lead to neutral and bland objects (Ehrnberger, Räsänen & Ilstedt, 2012). Another option is designing gender bending products like pink hand tools or baby products for dads (Ehrnberger, Räsänen & Ilstedt, 2012). However, while these can help change behaviour by introducing new options, they may also accentuate gender differences and they are limited to both ends of the gender spectrum (Ehrnberger, Räsänen & Ilstedt, 2012). Instead, the authors noted that the ideal solution would be to design products that don't follow the gender dichotomy (Ehrnberger, Räsänen & Ilstedt, 2012). To this end, designers should critically examine and challenge their gender assumptions, as well as design norms and traditions (Ehrnberger, Räsänen & Ilstedt, 2012). Further, designers working outside mainstream professional practice could engage in parody or humour to highlight and destabilize gendered assumptions and provoke reactions and discussion (Ehrnberger, Räsänen & Ilstedt, 2012).

These discussions are also mirrored in other articles. Writing from a Western and liberal feminist perspective, Michelle Lomberg argued that objects are gendered and reinforce

gender (2003). In response, Lomberg saw potential in a less binary approach to product design (2003). Indeed, she suggested that new technology like cameras and cell phones provided an example of this approach, as they can blend elements of the feminine and masculine (Lomberg, 2003). Writing from a Western and postmodern and intersectional feminist perspective, Vostral and McDonagh were critical of product design that makes gendered assumptions and ignores women's diversity (2010). In response, the authors encouraged a broad, complex and diverse understanding of female users in design (Vostral & McDonagh, 2010). Writing from a western and radical or possibly socialist feminist perspective applied on design, Judy Wajcman (1991) proposed that "[r]ather than calling for a technology based on feminine values, we need to go beyond masculinity and femininity to construct a technology according to a completely different set of socially desirable values" (p.166). Similarly, as another example, Hansson and Jahnke, postmodern feminist writers, propose minimizing gendered products through various approaches like more neutral design, gender-bending design, and exploring new understandings of gender through humour and provocation in design (2009). Hansson and Jahnke also directly linked gendered products with design practice. They explained that the expectation to design gendered objects can restrict designers' creativity and may not align with their personal values (Hansson & Jahnke, 2009). However, they also note that designers engaging in more gender-fair product design should realize that their understanding of gender might not always align with users' experiences and needs (Hansson & Jahnke, 2009). As such, designers should work to understand user's needs and possibly involve users in the design process (Hansson & Jahnke, 2009).

Finally, Cheng Chuko and Li-Fang Chen, design researchers in Taiwan working from a liberal feminist perspective applied on design, showed that these Western discussions about

sexed and gendered products also apply to an Asian context (2016). They explained that gendered products reinforce gender norms and can be harmful to women (Chuko & Chen, 2016). For example, they compared foot binding to the high heel shoe, where both are painful and sexualize women (Chuko & Chen, 2016). They also reiterated Ehrnberger, Räsänen and Ilstedt's critique that masculine products are the norm and feminine products are an exception (Chuko & Chen, 2016). In response, they proposed designing products specific to men or women, while trying to avoid gendered stereotypes in the product's features or appearance (Chuko & Chen, 2016). They also suggested introducing students to gender sensitivity through design education (Chuko & Chen, 2016).

7.2.6.4 Sexuality. The relationships between design objects and sexuality came up several times in the paragraphs above including during Chuko and Chen's discussion of high heeled shoes and foot binding (2016). However, this is also the point of focus in the following Western and postcolonial book chapter that applied a feminist lens on design. In "Representations of women and race in the Lancastershire cotton trade," Mumby was critical of the export of cotton from Britain to India and China in the 19th century (1989). One major argument challenged the prints on the cotton and its advertising being sent to India, as this imagery depicted troubling scenes that sexualized women and that represented power dynamics between colonists and colonies (Mumby, 1989).

7.2.6.5 Economic system. Finally, the last discussion in this section addresses the relationships between design objects and the economic system. Several Western and socialist feminist writers are critical of industrial design's complacency in perpetuating economic systems that

harm and oppress women. Specifically, they challenge the assumptions and motivations behind certain design objects. These draw on many of the broader themes in the literature like the power dynamics between designers and users and the harm and limitations designers and design objects can place on users. Applying a feminist lens on design, Jane Graves was critical of women's domestic responsibilities and related domestic products like washing machines (1996). In her view, these kinds of products are based on a social and economic assumption that women's household labour is free (Graves, 1996). A centralized and commercialized approach to domestic labour would make more economic sense if each woman were paid for her work (Graves, 1996). Further, Judy Wajcman debated the benefits and limitations of technology in the workplace (1991). She admitted that technology like computers and other machines can benefit workers by replacing repetitive tasks with more creative job opportunities (Wajcman, 1991). However, Graves pointed out that technology can also replace workers, especially those with lower status (Graves, 1996). Graves was also critical of the economic pragmatism that drives the decision whether or not to introduce these technologies (1996). For instance, they aren't implemented in cases where low paid, typically female, workers offer a cheaper alternative (Graves, 1996).

7.2.7 Other projects. Design projects end with the establishment of a prototype (Boutinet, 2012). In this sense, the objects' future refinement and production and other activities like marketing, distribution and use would be part of different projects. These subsequent projects would align with Boutinet's broad definition of a project where a project is driven by an actor or a group of actors and involves a start-to-finish process of developing objectives and carrying out activities to achieve them (2012). These further projects may also include similar

structural components to design projects including the actor, process and object realms. These subsequent projects are the focus of the pages that follow where feminism's critiques and resolutions are organized in relation to the type of project and its actor, process and object sub-categories.

7.2.7.1 Projects of material extraction and production. In a review of feminist perspectives on technology, Judy Wajcman introduced a contemporary postcolonial feminist critique of the contexts surrounding design (2007). This article relates to the broad themes in the literature by challenging power dynamics and the harm industrial design can cause to women. In terms of the actor category, Wajcman noted that material extraction can negatively affect communities where it takes place: electronics like laptops "require the scarce material Coltan, the delivery of which feeds into military conflicts in Central Africa, and thus has very specific consequences for women" living there (2007, p. 295). She also noted that there is a power difference between those that produce products in factories and those that consume them (Wajcman, 2007).

7.2.7.2 Project of marketing. Several of the texts presented above mention marketing and its relationships with existing points of critique toward industrial design. In most cases, marketing is viewed as complicit in the issues with industrial design. Like with the broader themes, these critiques focus on the exclusion, harm or control of women. In a likely cultural feminist text, Nancy Perkins discussed marketing at the actor level (1999). She was concerned about a potential shortage of female decision-makers in these roles (Perkins, 1999), which could negatively affect design decisions and the way the product is presented to the public.

Ehrnberger, Räsänen and Ilstedt also discuss the marketing project and justify Perkins' concerns (2012). At the process level, marketing often reinforces the gendering of design objects (Ehrnberger, Räsänen & Ilstedt, 2012). Finally, related to the object category, Linda Layne noted that marketing interventions should not figure into the evaluation of whether or not a technology is feminist (2010a). This argument helps distinguish a feminist product from a product sold as feminist through a kind of 'feminist washing.' However, it also hints that marketing interventions that present a product in a non-feminist way shouldn't necessarily figure into its evaluation as a feminist or a non-feminist product.

7.2.7.3 Project of consumption. These texts draw on the broader themes found in the literature, but take different perspectives. One associates consumerism with issues of unequal power or control, while others suggest a feminist re-reading of consumption and the view of female consumers as active and empowered.

Just as socialist feminist authors Nicki Lisa Cole and Alison Dahl Crossley were critical of industrial design at the professional level, they are also critical of the associations between design and consumption (2009). They explained that the processes of consumption work against feminist goals (Cole & Crossley, 2009). In their view, consumption perpetuates capitalism and an individualistic society over a collective one and enables feminism to be co-opted and taken advantage of by designers and related professionals for their own gain (Cole & Crossley, 2009). The authors also argued that consumption reinforces less ideal third wave feminisms, which are sometimes associated with consumption and self-expression through designed objects (Cole & Crossley, 2009). That said, Cole and Crossley recognized that their view is not shared across the feminist community; they acknowledge that women's

consumption and consumer choices can be seen to provide independence and power, both feminist goals (2009). This counter point is the subject of several additional texts, which blend the actor, process and object categories in their discussions.

From a Western and radical feminist perspective, Penny Sparke noted that women's consumption can be seen as passive; however, it can also be understood as a gesture of independence: "[s]tereotypically 'women's tastes' still stand outside the 'true' cannon of aesthetic values in the dominant culture" (1995, p. 3), so women's consumption can take place "outside the value judgments imposed on it by masculine culture" (1995, p. 8). These themes are also present in Carolyn Cartier's discussion of Chinese feminism, which applies a feminist lens on design (2009). She explained the concept of market feminism, where women would return to the home and take on traditional and feminine roles including consumption in order to address over population and unemployment issues in China (Cartier, 2009). In this perspective, consumption is an important female activity that is taken seriously and given time and thought (Cartier, 2009). Cartier also notes that jewellery is a particularly popular purchase (2009). This is associated with a historical context where jewellery was a way for women to have money passed down to them, even though, as women, they would not be heirs to their family fortune (Cartier, 2009). Today, though more and more women purchase jewellery with their own money, it remains a valuable investment and symbol of wealth (Cartier, 2009). Although not explicit, Cartier's text shows that consumption can be a means to female agency, empowerment and independence from a financial point of view (2009).

Finally, the last two texts discussed here show that consumer choices can be a way to support feminist politics. In a broad discussion of feminism, Linda Layne stressed that consumers have the power and choice to support feminist technology through their consumer

choices and consumer roles in the family and workplace (2010a). Further, in an interview, the Western and likely radical feminist designer, Stephanie Sonya Ibbitson noted that she encouraged female designers by buying their work (Beeston, 2017).

7.2.7.4 Project of object reception. The first texts presented here blend the actor, process and object categories and critique domestic products from a feminist perspective. They associate products with issues of unequal power or control. Specifically, several Western and radical and/or socialist feminist writers critique supposedly labour saving technology like vacuums and washing machines (Graves, 1996; Schwartz Cowan, 1983; Wajcman, 1991; Worden & Seddon, 1994). Ruth Schwartz Cowan (1983) and Suzette Worden and Jill Seddon (1994) situated the establishment of these products in a historical period with increasing separation between women's and men's roles and the phasing-out of systems like domestic service; at this time, women became primarily responsible for the maintenance of their family home. While these products might be seen as liberating or labour saving for women, the authors critique them for many reasons. For instance, Jane Graves was critical of the washing machine, which she argued can be isolating to women, making them stay in the home instead of going out to the laundromat (Graves, 1996). It can also provide more domestic work by encouraging multitasking and creating higher expectations and anxiety about cleanliness (Graves, 1996). Further, she noted that the washing machine could be a way to silence women. It "eliminate[s] the perception of female labour but not the reality of their effort," since the user needs to collect the clothes, operate the machine and fold clothes (Graves, 1996, p. 35). As such, a husband might purchase the machine for his wife, who then wouldn't be able to complain about her household responsibilities (Graves, 1996). In response, the authors

proposed a range of possible solutions. This included a collective or commercialized approach to domestic work like communal cooking or laundry services (Schwartz Cowan, 1983; Wajcman, 1991) and a different division of household labour between women and men and lower expectations for household cleanliness (Schwartz Cowan, 1983). Wajcman (1991) also suggested that smart home technology could help decrease women's work in the home and engage men in the process.

In contrast to these bold critiques, the remainder of this section focuses on literature that links the project of object reception to user agency and power. This is similar to the proposed re-reading of consumption and the view of female consumers as active and empowered seen in the previous section. First, writing from a Western and postmodern and intersectional feminist perspective, Vostral and McDonagh challenged the vision of women as passive consumers (2010). In response, they suggested thinking of users as smart and engaged, possibly with insights to offer to design (Vostral & McDonagh, 2010). This point is taken-up in a range of other articles with their own themes and agendas.

Writing from a Western and cultural feminist perspective applied on design, Lee Wright challenged existing feminist critiques relating to gendered and sexualized products like the high heeled shoe (1989). She explained that stilettos are critiqued for sexualizing women, making it hard for them to move and for causing injuries like back problems (Wright, 1989). She noted that a typical response involves adopting masculine styles like jeans, flat shoes and baggy clothes (Wright, 1989). However, she noted that this resolution perpetuates masculinity and minimizes femininity (Wright, 1989). As such, she proposed another option; namely, a new reading or interpretation of feminine products like stiletto shoes "to redefine meaning rather than changing the form" (Wright, 1989, p. 7). In this sense, the stiletto shoe is

associated with women's lives outside the home and it emphasizes the female body in a positive way by building on the female form, enhancing women's sexuality in a powerful way and making women taller (Wright, 1989). Wright's support for femininity and its reinterpretation to assign it a higher value is typical of cultural feminism. However, her arguments provide a counter point to the typical critiques of gendered products.

In other cases, authors stress users' abilities to reinterpret potentially anti-feminist products in empowering ways. Ehrnberger, Räsänen and Ilstedt noted that users might interpret products in an unexpected way or renegotiate their meaning (2012). In a general discussion on feminism, Sharra Vostral noted that non-feminist technologies can become feminist through re-scripting (2010). Users can change the understanding of the product or the product itself through interventions and modifications (Vostral, 2010). Similarly, from a Western and contemporary feminist perspective, Sarah Elsie Baker noted that conventions surrounding consumption and gender can be addressed through subversion (2017). Baker valued beauty and glamour and suggests that failures at being glamorous like lipstick on your teeth and peeling nail polish could be a starting point to reclaim and re empower glamour and to make them a point of focus (2017). Baker also brought together the more positive view of gendered products and the understanding of users' abilities to reinterpret design objects seen in this section. To this end, she introduced the feminist debate surrounding beauty and glamour where products can be seen as restrictive, superficial, objectifying and even physically dangerous (Baker, 2017). However, her view was that glamour and beauty are empowering for many reasons. First, dressing-up can be a pleasurable, creative and aesthetic experience (Baker, 2017). Further, it enables a form of escapism where the user can look like a movie star or enjoy pampering themselves (Baker, 2017). Its also egalitarian: glamour doesn't

need to be expensive and, "[a]s opposed to natural beauty, glamour is an ideal that most people can share if so inclined" this includes people of different sexes and genders (Baker, 2017, p. 55). Finally, Baker noted that it helps construct identity, where a user can draw on and express features like femininity and sexuality (Baker, 2017).

The last example presented in this chapter relates to users and the project of object reception, but takes a different perspective.

7.2.7.5 Project of user-driven design. Design processes that involve user participation were discussed earlier in this chapter. However, Alice Rawsthorn provided a unique extension to this discussion centring on the actor and process categories (2014). Related to the broader themes in the literature, Rawsthorn's work supported a kind-of feminist re-reading and redefinition of industrial design processes and the injection of women into design as active, empowered and recognized actors. From a relatively general Western feminist perspective, Rawsthorn explained that new technologies like 3D printing empower users, allowing them to become designers and create products appropriate to them and, notably, to their gender identity (2014).

7.3 Discussion

As stressed at various points in this chapter, the problems feminist perspectives find with industrial design are systemic. Feminism identifies and challenges power and masculinity embedded in multiple aspects of industrial design. This power and masculinity can be defined literally or symbolically. At the professional level, feminism identifies and challenges industrial design's rooting in modernism and its associations with the marketplace. Depending

on the case and the feminist perspective, this identification and critique of masculinity at the professional level is also linked to capitalism and consumerism like with socialist feminism and the military and corporations in a case of eco-feminism.

Much of the literature is critical of technology, which is seen as a symbol of power and masculinity. This relationship is at the heart of feminism's critiques of industrial design at multiple levels. Further, toward the more concrete levels of the industrial design framework involving individuals like designers or users, feminist perspectives identify and critique situations where an aspect of industrial design harms, excludes, disregards, disrespects or controls women and is concerned with power dynamics. Often, these major themes are combined in feminism's critiques of industrial design.

At the professional and practice levels, feminism stresses that industrial design is a technical field, based on technical skills and processes that, for instance, involve the use of computers and hand-tools. As a result, women don't have a clear place in the field and might not want to enter the field or might feel uncomfortable in their roles. This is a cyclical problem where these issues are perpetuated by a lack of women in industrial design. These issues are also present in and perpetuated through various projects and institutions in the design community. For instance, design scholarship, including design history, perpetuates these exclusions through their focus and methods and design education can perpetuate industrial design's technical and masculine associations through their focus and content.

These critiques are also applied to design objects and their development. Design objects are a form of technology and perpetuate the male and masculine norm. For instance, designers often create products with a 'typical' male user in-mind and based on masculine aesthetics. Design objects can also have power over their users and harm women by not

adequately considering their needs, by perpetuating unequal social dynamics, or by gendering or sexualizing women, outside their own terms. Further, socialist feminism is also critical of design objects that perpetuate and enable an economic system that controls or exploits women in the home or in the workplace.

Finally, feminist perspectives recognize that all of these issues are systemic and relate to broader social issues outside industrial design. Based on this understanding, feminism also identifies issues of sex and gender inequality in projects related to industrial design like marketing, material extraction and production. The problems can have similarities to the issues in industrial design, but are also specific to their individual context.

In contrast to the systemic problems in industrial design, feminism's responses tend to be more grassroots relying on the actions of individual design practitioners, design educators and users. Feminist perspectives support and drive redefinitions of any aspect of industrial design associated with power and masculinity based on women's perspectives and/or feminist perspectives. These women's perspectives are sometimes associated with feminine characteristics. While women, the feminine and feminism are different concepts, feminist perspectives are also often associated with feminine characteristics in the literature. As a baseline, these redefinitions ensure that industrial design does not harm or hinder women in any way, but would ideally go further to benefit women.

At the professional level, feminism proposes a re-alignment of industrial design toward postmodernism and social and sustainability concerns. Most feminisms seem to agree on this proposed change with the exception of socialist feminism, whose critiques of industrial design may be too fundamental to consider engaging with industrial design.

Many additional recommendations involve injecting women into industrial design as active, empowered, recognized and respected actors that work from their point of view as women and/or as feminists. This could help enable the redefinitions of industrial design.

In response to the issues at the professional and practice level, design scholarship including design history should focus on women in design and their interests and experiences, and apply feminist methods. Design education can counter industrial design's technical and masculine associations through changes to their focus and content like introducing more feminine content and teaching students about feminism. These changes to education have potential to make a large impact on industrial design by filtering through the design community and its activities. There are also many possible design community strategies that could support women in industrial design and their work like affirmative action, professional associations and competitions. Finally, in terms of practice outside and during the design project, women should embrace and work from their own perspective. Together, these initiatives could help establish a strong place for women in industrial design and help realign industrial design with women's and/or feminist perspectives.

Next, at the practice and process levels, women's and/or feminist perspectives have potential to balance-out industrial design's masculine and technical orientations by providing alternative lenses and guiding the use of specific design methods. An eco-feminist text saw the value and promise of women's perspectives, which could inform different models of production and emphasize environmental protection and aesthetics. In contrast, most other texts focused on feminist perspectives. These can draw on more feminine concerns, but also feminism's strengths in critique and reflection and interest in systems. Several articles stressed that a feminist lens would support more socially and contextually conscious design and

encourage the application of related known methods like user research, participatory design and inclusive design. Other texts explained that a feminist lens would support non-hierarchal interdisciplinary collaborations between industrial designers and professionals like engineers and social scientists. Several third-wave feminist articles proposed that a feminist lens could encourage critique, creativity and speculation through design that might develop dramatically different outputs. Finally, several writers note that a feminist lens can interrogate and improve existing design methods, including its own preferred processes in practice like co-design and critical design. These changes help counter industrial design's power and masculinity at the practice and process levels and can filter through industrial design to offer a range of benefits at other levels. Most notably, they can impact the development of design objects.

Many articles discuss changes to design objects that could address the power dynamic between designers and users and the harm that design activities and objects can inflict on users. They stress that designers should create products for women and base their designs on a thoughtful and respectful reflection on gender and user needs. A woman's and/ or feminist lens in practice and the associated processes discussed above could enable this design work. Further, many authors encourage designers to produce feminist technology, which conforms to and helps further feminist politics. Once again, a woman's and/ or feminist lens in practice and the associated processes could fulfil these goals.

While there are critiques of design objects, their purchase and their use based on their power and control over users especially coming from socialist feminism, most feminist perspectives have a positive view toward the projects of consumption and object reception. Indeed, most feminists argue that users can employ design objects and the process of consumption for personal empowerment and even to further feminist goals. They also stress

women's agency and power where users can interpret and employ design objects in their own ways. This change of perspective contributes to the positive redefinition and new understanding of industrial design, and the injection of women into industrial design as active, empowered, recognized and respected actors, this time taking the role of consumers and users.

Finally, feminism recognizes that there are issues throughout related projects like marketing, material extraction and production, but doesn't propose resolutions, at least in this industrial design literature. It's possible that feminism is understood as a collaborative project and network where individuals in each field are responsible for addressing the issues that surround them. Perhaps inequalities in a related field like marketing have been left for feminists in that field to address. Indeed, several authors in the industrial design literature noted that managers overseeing design work need to support women and feminist initiatives to enable their success, although they didn't provide strategies to engage with these managers. Even this closely related activity like design management might be out of the scope of these feminist initiatives in industrial design.

Moving on, feminism also engages with industrial design outside this critique and resolution dynamic. It acknowledges positive changes that have taken place in industrial design like the increasing number of female designers and the possibly increasingly feminine alignments of industrial design. It is also optimistic about progress and innovation in industrial design; it stresses that these new dimensions to industrial design haven't yet been integrated into problematic social structures and remain open to various readings and applications, including feminist ones. This is especially the case for new technology that might escape the traditional masculine and hierarchal model. For instance, 3D printing can provide power and

independence to designers and users that wish to design outside traditional professional and consumer structures.

These improvements could be a sign that feminism has made an impact in industrial design. Further, its optimism regarding certain innovations like new technology could be considered additional feminist resolutions and recommendations to industrial design. They are promising directions that feminist initiatives could take to redefine industrial design and move away from its rooting in power and masculinity.

7.3.1 Similarities and differences across the literature. As mentioned in the beginning of this chapter, there are strong similarities between the literature despite their different feminist perspectives, applications of feminism and contexts. This is demonstrated in the themes in the literature, discussed in the pages above. That said, there are certain differences within the literature, as follows.

7.3.1.1 Type of feminism. Beyond the core concepts shared by each feminist strand, different feminisms have different understandings of the concept of woman, the extent of the difference between women and men, the specific causes of inequality, and the changes that are needed to address inequality (Chambers, 2013; Goodwin, 2007).

Feminism supports and drives redefinitions of any aspect of industrial design associated with power and masculinity based on women's perspectives and/or feminist perspectives and promotes injecting women into industrial design as active, empowered, recognized and respected actors that work from their point of view as women and/or as feminists. Cultural feminism and eco-feminism stress the differences between women and men

and identify and valorise women's characteristics. They are the main feminist strands to promote redefining industrial design based on women's perspectives and to encourage and characterize women's points of view in industrial design. The other strands focus primarily on feminist perspectives and points of view, although these are also often associated with feminine characteristics and have similarities to cultural and eco-feminist proposals.

Next, radical feminism is known to encourage especially foundational changes to address inequality. It follows that it is the main feminist perspective to address industrial design at the abstract and deep-rooted professional level. Further, one of the most obvious differences in the literature is their varying points of focus on different causes of inequality: eco-feminism has a relatively strong emphasis on the environment, socialist feminism is concerned with the economic world, third wave and intersectional feminisms are concerned with the needs of women and other disadvantaged populations, postmodern and third wave feminisms may have a more positive view of masculinity, and postcolonial feminism has the greatest interest in global power dynamics.

7.3.1.2 Application of feminism. The application of feminism as a lens on or in industrial design doesn't appear to greatly impact the critiques and proposals. As previously noted, literature with both types of applications align with the larger trends. Work that applies a feminist lens in design appears at most levels of the industrial design framework. That said, there is a larger proportion of feminist lenses in design, compared to feminist lenses on design, at the design project and object reception levels. This is likely due to the topics naturally encountered in design activities and in work that applies a feminist lens in design.

Although it might be possible to identify other differences based on the application of feminism, this wouldn't be appropriate for several reasons. To begin, literature that applies feminism as a lens in design, also applies it as a lens on design, since authors describe and contextualize their design practice. Similarly, writers that apply a feminist lens on design may draw on practical experience, given that many design researchers have an on-going design practice. As such, there aren't pure distinctions between the different applications of feminism. Further, writing about a feminist lens in design aligns with current research trends toward, for instance, project-grounded research. Differences in the work with a feminist lens in design could be attributed to time period, rather than the application of feminism. For instance, many of the articles with a feminist lens in design address gender and the design object, a distinctly contemporary concern.

7.3.1.3 Place and time. Now on the topic of context, feminisms coming from different places seem to have relatively similar arguments to those seen in the Western literature, although they might draw on different examples or have different points of focus. For instance, Chuko and Chen showed that Western discussions about sexed and gendered products also apply to Taiwan (2016). That said, this observation about the similarities to feminisms from different places could be based on limits to this research project like the primary focus on English and French literature or the emphasis on industrial design rather than related activities like craft.

Finally, there are differences between the literature coming from different time periods. The works tend to apply the dominant feminist strands of their time, which impacts their perspective and approach to industrial design. There is also an evolution in the literature

where the newer work expands on earlier feminist texts, as well as reacting to changes in industrial design itself.

The differences between the literature based on their feminist perspective and context is valuable by providing a range of different perspectives toward industrial design, which enables a rich and complex understanding of feminism's critiques and proposals toward industrial design. However, distinguishing between these different perspectives also enables a choice of which critiques and proposals to prioritize. Some may be more relevant than others in specific situations or based on time and place.

7.3.1.3 Relationship to topics seen throughout feminist design history. Chapter 4 included a history of feminism and feminist perspectives related to design. I explored topics like domesticity, beauty, technology and DIY, which are seen within this history. These same topics appear in feminist work in industrial design and the literature has varying relationships to them, as noted in Chapter 4. For instance, technology was central to many of the feminist critiques of industrial design, where industrial design is seen as a form of technology that embodies masculine values. However, some literature also sees industrial design as flexible and possible to reframe. As another example, some literature is critical of beauty norms for controlling women, while other work sees beauty and fashion as potentially empowering.

As discussed in Chapter 4, these variations often relate to the feminist perspective and context of the work. For instance, the more positive view of industrial design as technology and, indeed, discussions of user-driven design (DIY) are mostly seen in recent work.

7.3.2 Contextualizing the results. I mentioned in Chapter 6 that this literature analysis had several limitations including its narrow focus on industrial design, which might miss-out on transferable insights from other design fields. While I didn't conduct a formal exploration of the feminist literature in the range of other design fields, I did review approximately 300 texts on the broad topics of women and design, as part of my doctoral learning journey (Wisker et al. 2010). Most of the literature was strikingly similar to the work in industrial design. The exceptions were cases where the literature addressed a topic specific to its field; for instance, feminist writing on advertising might address the representation of women, while feminist writing on architecture and urban planning could reference the organization of space. That said, certain ideas explored in the literature, even if similar to the work in industrial design, could supplement the feminist work in industrial design by providing a different perspective or an elaboration on a topic of mutual concern. The following are several transferable insights based on this larger literature exploration.

The first example is based on the writing of Leslie Kanes Weisman, a prominent feminist theorist in architecture. Her work can help explain the rooting of the relationships between industrial design and technology and power and masculinity. She explained: "Boys are raised in our society to be spatially dominant … Girls are raised … to expect and accept spatial limitations" (1994, p. 24). These cultural and social conditions transfer to professional design practice where masculine approaches and male designers dominate (Kanes Weisman, 1994). While the feminist literature in industrial design discusses the systemic nature of sex and gender inequalities and power and masculinity in industrial design and technology, it doesn't thoroughly explain the transfer of these larger social issues to industrial design. Leslie Kanes Weisman's writing helps bridge this conceptual gap.

The next examples build on feminism's critiques and proposals toward design processes, and the emphasis on designer positioning. In industrial design, Michelle Lomberg encouraged designers to be self-reflective and consider "the conditions that make the practice of design possible, on the contexts in which their products will exist and on the assumptions they may have about the user or client or Other" (2003, pp. 22-23). There is a relatively lively debate in digital design fields about self-reflective design strategies that could respond to Lomberg's call to action. Doris Allhutter proposed a method to help designers avoid injecting their own stereotypes into the project, which can be applied in the design process of games or websites (2012). This process is called mind scripting where each member of a design team responds to prompt questions and shares their responses with the team (Allhutter, 2012). The group then discusses the responses collectively to highlight assumptions, and similarities and differences in their beliefs (Allhutter, 2012). While this method could be applied to general social topics, it can also be applied when discussing specific questions pertaining to the design project.

Also in industrial design, several authors proposed modifications to design methods to better align with feminist goals. In most cases, their proposals addressed feminism's preferred design processes like critical design and aimed to make them even better. Several feminist writers in architecture engaged in similar processes, this time enhancing human centred design and co-design. Their insights and modifications to these common design processes are likely transferable to industrial design. In "Designing Collective Access: A Feminist Disability Theory of Universal Design" Hamraie proposed modifications to universal design like conducting a feminist analysis of the concept of access in universal architecture (2013). Next, several authors propose modifications to co-design processes to further empower users. This

could include teaching user participants about design so they are knowledgeable when they go into a collaborative design project and ensuring that they are able to express themselves in the collaborative environment (Bradshaw, 1984/2000). Further, Katie Lloyd Thomas critiqued the use of architectural drawings like orthographic drawings, especially during collaborations with non-designers. She explained that architectural drawings are rigid and omit and oppress important information such as the broader cultural contexts of the building and are inaccessible to other stakeholders in the project like community participants (2001). Instead, she proposes that drawing could be a collaborative process together with users or that users could be presented with more emotive or unfinished drawings (Thomas, 2001). She also proposes other forms of drawing that include colour, different types of lines or even sound and movement (Thomas, 2001).

However, in contrast to the arguments in this section that most of the feminist literature in other design fields was similar to industrial design, there is an exception in a recent article by Sarah Fox, a doctoral student in human computer interaction. She explained that feminism can inform the design workplace and used the example of feminist hackerspaces, which uphold feminist principles in their admission policies, collaborative environments and projects (Fox, Ulgado, & Rosner, 2015).

7.4 Conclusion and Preliminary Response to Objectives 1 and 2

This literature analysis provides a preliminary response to first objectives: 1) to identify the content of feminism's critiques and proposals toward industrial design when it's applied as a lens on design and 2) to identify the content of feminism's implicit critiques and proposals toward industrial design when it's applied as a lens in design.

The results show the similarities between feminism's critiques and proposals toward industrial design, regardless of whether feminism is applied as a lens on or in industrial design. However, the objectives require separating the results based on feminism's application to industrial design. Each example from the literature applies a feminist lens on design given the broader reflection required to write a paper. As such, all the results contribute directly to Objective 1. However, certain papers identified in this chapter also apply a feminist lens in design. The critiques and proposals from these works contribute to Objective 2.

That said, the critiques and proposals specific to feminist lenses in design are limited given the rarity of this type of writing. This is where the co-design projects contribute, as they apply feminist lenses in design.

The participatory project-grounded research is presented in Chapters 8 and 9. This is followed by a synthesis of the literature analysis and participatory project-grounded research data in Chapter 10, which provides a direct and concise response to Objectives 1 and 2.

Chapter 8. Participatory Project-Grounded Research Data

8.1 The Women's Center for Creative Work

The WCCW is located in a small building in an artist compound in a residential Los Angeles neighbourhood. The building includes a large workspace, a library, private offices and a kitchen. There are many notice boards throughout the centre advertising activities and providing functional information. This includes a poster with the centre's core values that include:

- Self-determination, respect and care for oneself and others
- A radically expansive understanding of feminism, what is a woman and what is female experience
- Advocacy for feminism as an active and evolving practice
- A radically expansive understanding of creative practice

In addition to serving as a community workspace, the centre hosts many events such as theatre productions, printmaking workshops, yoga, and discussion groups.

The co-design projects took place at various locations around the WCCW. Most of the design meetings were held in the centre's library, which is a closed space that members can book to use. This was a superb location, since it provided private space where the co-design team could spread out and make noise without worrying about disturbing other members. It was also an inspiring space, since it was filled with feminist books of all kinds, which participants sometimes referred to. In addition to the library, some of the prototyping activities also took place in different areas around the WCCW. This includes one particularly messy project that took place in the garden and parking lot outside the centre. The following are

photos of the WCCW including the common workroom, the calendar and noticeboard, and the library (see Figures 8.1, 8.2 and 8.3).

Figure 8.1. WCCW common workroom.

Figure 8.2. WCCW calendar and notice board.

Figure 8.3. WCCW library.

8.2 Project with Betsy and Samara

This first co-design project took place over about five weeks with two participants: Betsy and Samara. The following is a brief biography of each participant and an introduction to their experiences of feminism, as discussed during the group interview.

8.2.1 Betsy. Betsy is a graphic designer that has worked on print publications, flyers, digital applications, branding, as well as design research. She is interested in collaborative processes in and out of design, which is what drew her to this project. Betsy wasn't previously a member of the WCCW, but is on their mailing list and has attended some of their events. Betsy explained that it's hard to define feminism in a general sense because it's so diverse and such a broad topic. Though, she suggested that it's generally centred on female concerns like reproductive rights. Betsy doesn't necessarily align herself with a feminist strand, but to her, feminism is about women's independence as well as their equality, equal opportunities and freedom from discrimination. She intentionally maintains a general stance on feminism, avoiding bringing in too many peripheral topics, since she feels that feminism is complex enough on its own. In terms of the gender question, Betsy disassociates feminism and womanhood from femininity and supports a more flexible understanding of gender. She particularly supports services like Planned Parenthood and policies like equal pay and maternity leave. To her, feminism is a lens that guides the way she interacts and lives in the world and helps her sense what is feminist and what is not. Specifically, it helps her avoid internalized sexism and guides her social relationships where she avoids gendered expectations. Feminism also impacts her graphic design work by encouraging an analytic way of thinking and the search for unexpected solutions.

8.2.2 Samara. Samara, the second participant, is a PhD student in performance studies from New York City. She was in Los Angeles for 6 months while she finished her dissertation. She is also a member of a feminist punk band. Samara became engaged with the WCCW when she arrived in Los Angeles, hoping that it would inspire her creativity. She was interested in

participating in this study because of the overlap with her own doctoral research that explores feminist performances and their relationship to space. For a general definition, Samara explained that feminism comes into any kind of political or social conversation through sexual difference first where it supports equality and resists patriarchy. However, it is also more complex than this and must take other issues like race or class into consideration. She also noted that being feminist involves a process of continual learning and self-transformation, but without the goal of mastery where one person is expected to know everything. At a personal level, feminism involves having a collective rather than an individualist perspective. Individual feminists should learn from the collective and apply this knowledge to their own lives. Samara doesn't align herself with a feminist strand and her own understanding of feminism continues to develop and evolve. However, like Betsy, she maintains a broad and flexible perspective on womanhood. Feminism has helped her in her own life by supporting self-interrogation. For instance, it highlighted her internalized sexism that diminishes her self-confidence. Further, its emphasis on the collective has helped her find other people with similar experiences. Based on these experiences, Samara explained that she is working on being vulnerable, which means not trying to be perfect or an authority in her activities, and being herself and expressing herself. It also impacts her interactions with others where she is respectful of their boundaries and ideas.

Neither participant was aware of the specific feminism held at the WCCW. This might be because it supports all kinds of feminisms, as noted on the poster. I sent the participants this analysis for their review shortly after the group interview, though neither participant commented on the analysis.

8.2.3 Journaling. Each participant including me wrote about the group discussion in their personal journals.[7] The consensus was that each group member held a different conception of feminism, but that this difference would be enriching to the project. Further, Betsy noted that bridging feminism and design makes talking about feminism easier. This is because feminism is usually quite abstract, but it becomes more concrete in a project like this.

While the basic structure for each co-design project was introduced in the previous chapter, this section focuses on the specific details of the co-design project with Betsy and Samara. The activities are organized chronologically and in terms of the activities that took place in each design meeting.

8.2.4 Design meeting 1. The project began by exploring problematic and utopian situations from a feminist perspective. As a prompt, I posted keywords and descriptions of feminism drawn from the group interview. For instance, this included the positions that feminism is guided by equality, collectivity and respect; supports equal opportunities, self-transformation and owning vulnerability; and rejects sexism, authority and discrimination. The group brainstormed problematic situations based on these principles and arrived at an extensive list. This included the following assertions: feminist concerns are pervasive in the workplace, social interactions and personal relationships; women's voices might be less valued than men's and there is a feminine way of being that isn't acceptable in all situations; and women can struggle to get what they want.

[7] Research participants did not always keep a journal. Betsy and Samara each missed an occasional entry, and participants in the other projects didn't keep journals at all. In this chapter, I always mention the participants' journals when there was an entry. No mention of a participants' entry means there wasn't one that week.

Next, each participant including me represented an ideal feminist future inspired by these same feminist principles through collage and presented their collage to the group. The collages represented a range of themes surrounding voice (e.g. having a voice and using it), self-expression, the importance of positive experiences and wellbeing, social reinventions (e.g. establishing new value systems) and the physical world (e.g. needing personal space). The hope behind this activity was that placing the problematic situations and utopian images in tension could help arrive at a design idea. This analysis took place through a group discussion, as well as my own independent work between meetings. The major conclusion of this process was that the problems were mostly social and the ideal situations revolved around the individual. Aligned with this reasoning, Samara proposed that changes at an individual level could help resolve the social problems.

8.2.4.1 Journaling. After this meeting, I wrote primarily about the group dynamic in my journal. I expressed surprise at needing to take such a strong leadership role throughout the project in terms of the discussion, analysis and design elements. I left many opportunities for participation, but felt that the participants didn't grasp them. This worked against how I imagined a co-design and feminist project would operate. However, I also noted having higher expectations of rigour than the participants and that taking on many of the responsibilities allowed me to ensure that the project planning and analysis were done thoroughly. I also noted that the feminism in the collages was implicit rather than explicit; they represented feminist areas of interest, but didn't directly refer to women and women-specific concerns. Betsy also wrote about the group dynamic in her journal. In particular, she was concerned that she was

dominating or driving the conversation. She was also interested in Samara's contributions to the project. Betsy felt that Samara had a unique point of view as a non-designer.

8.2.5 Design meeting 2. In the second design meeting, the analysis of the differences between the problematic current situation and the ideal future situation triggered a long brainstorming session of design ideas that operated at an individual level and supported the individual. The brainstorming process was aided by a series of prompts where I provided a list of potential users (e.g. seniors, a career person, a housewife, a homeless person, the participants themselves). In total, the group arrived at 55 design ideas. Many of the proposals revolved around a home office, aligning with the previous utopian ideas of self-expression and personal space. Betsy and Samara especially enjoyed these ideas and decided to take the design project in this direction. At first, they proposed combining them together into a desk with lots of features. However, Betsy was concerned that the idea was too complicated. I agreed and said that it sounded more like a feminist workspace product line. The group loved the idea and ran with it.

The group collectively determined their favourite design ideas from among the 55 options that fit this workspace theme. They were a work-mat, a desk, an intention display to post hopes and goals, a junk-drawer to hide away distractions and burdens like paperwork, a notebook and an activity prompt that might, for instance, inspire creative writing. The group's favourite idea among this list was the work mat that could be rolled-out to demarcate a workspace anywhere. Near the end of the meeting, the group discussed some logistical issues. Betsy suggested that the group take more time for individual reflection, which I incorporated in subsequent meetings. Further, Samara explained that she would be missing 1 week of the

project because of a trip. In response, Betsy stressed that the project should not continue without her and, instead, the group would pause the project during her absence. Finally, Betsy and Samara were interested in constructing a professional prototype of the chosen product. Both noted that their male partners could help with the construction, as both were handy and Samara's husband was a carpenter.

8.2.5.1 Journaling. After the meeting, I wrote more about my positioning during the encounter. While I took on a leadership role throughout the project, I also held back during the brainstorming session. I was afraid that I would bias the project by proposing solutions aligned with a certain kind of feminism or sustainable design solution. I also noted that it was a good thing I didn't intervene too much in the brainstorming, as the designs took a specific and surprising direction. The design ideas represented feminist principles, but were not explicitly feminist or particularly radical or different in relation to feminism or design. Further, the design ideas didn't represent feminism's emphasis on diversity discussed in the group interview. Indeed, Betsy noted that certain prompts like one referring to a homeless user were depressing. For her part, Betsy wrote about her feelings toward design objects in a general sense. She enjoyed the pleasure gained from products that feel good, that improve experiences and make mundane or unpleasant activities more enjoyable. She gave the example of yoga equipment. She also explained that products that help change behaviour (e.g. eating better, being independent) should acknowledge that these activities are difficult. Such products should also create a space to honour and enable these activities. Finally, Samara wrote about enjoying the project and especially the group dynamic where she felt comfortable, respected and safe. She noted that she lost that feeling once the meeting was over. As she explained,

when she was talking about the project with her husband, he asked a lot of questions, which derailed her confidence.

8.2.6 Design meeting 3. At the beginning of this meeting, I proposed that each group member develop two design ideas independently for part of the block of time. I suggested that each member develop the work mat idea, the group favourite, and another design of their choosing. This activity took place through drawing and modelling.

8.2.6.1 Work mat. Beginning with the work mat, Samara worked in a combination of 2-D and 3-D. She explored the size (where it is big and possibly customizable); the shape (where it has rounded corners, which are more humane and a rounded shape that hugs you); and features (these could include a to-do list, break ideas, a motivational quote, an activity timer and a surface you could write on). Betsy also worked in 2-D and 3-D. She was especially interested in the material and stressed that this was an important choice. She proposed that the product could be silicone with rounded corners and grooves for hands. This would provide an aesthetic that is tangible, rich, pleasant and tactile. Last, I worked in 2D and explored the ways that the mat could fold up and be stored away.

8.2.6.2 Individual choices. In terms of the individual choices, Betsy explored the intention display. Her idea was to create a light box with a slot in front. The user could slide coloured glass into the slot, which would deflect the light. This is both a beautiful object and a symbolic one where different colours of glass could mean something different to the user. Samara designed the junk-drawer where she liked the idea of being able to slide objects off the desk

directly into it. I also explored the junk drawer concept. My idea was to create a stomach that hangs on the wall. The user could fill the stomach with junk as if it was eating it. The group especially enjoyed the stomach idea and explored it collectively. They proposed that it could be stretchy and expand with its contents. It could also be anatomical, resembling a woman's torso or even a pregnant belly.

The following are quick drawings that synthesize each of the design ideas that I developed to share with the participants (Figures 8.4-8.7). I created the drawings, but in many cases also incorporated Betsy and Samara's original sketches.

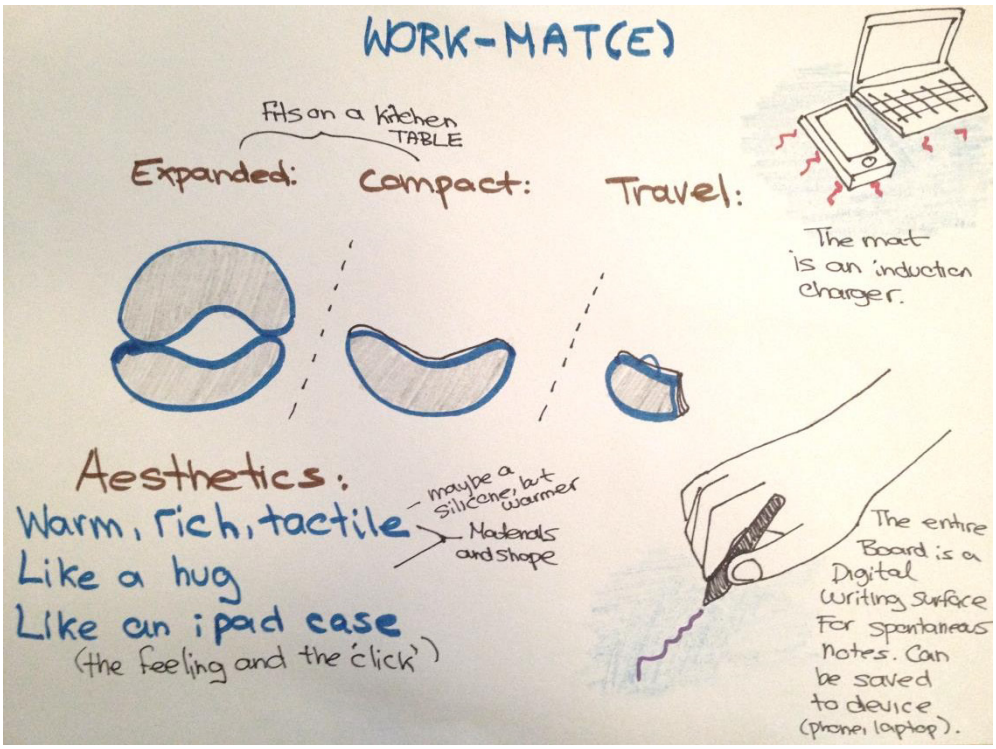

Figure 8.4. Work mat design. Drawing by Isabel.

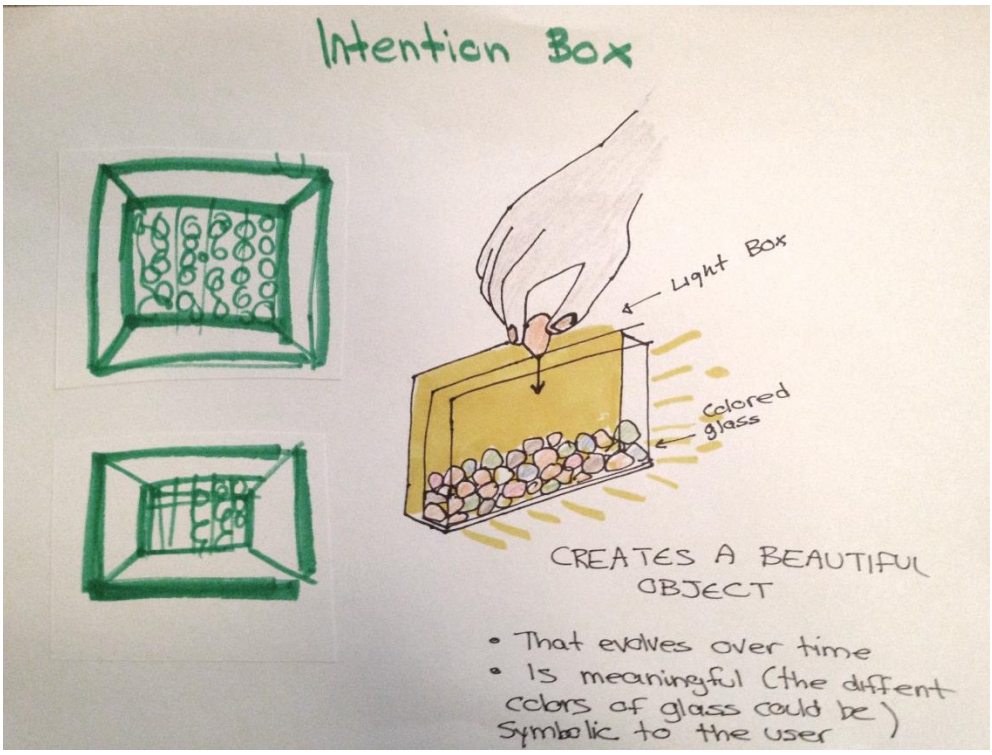

Figure 8.5. Betsy's intention display box. Drawing by Isabel with Betsy's sketches (left).

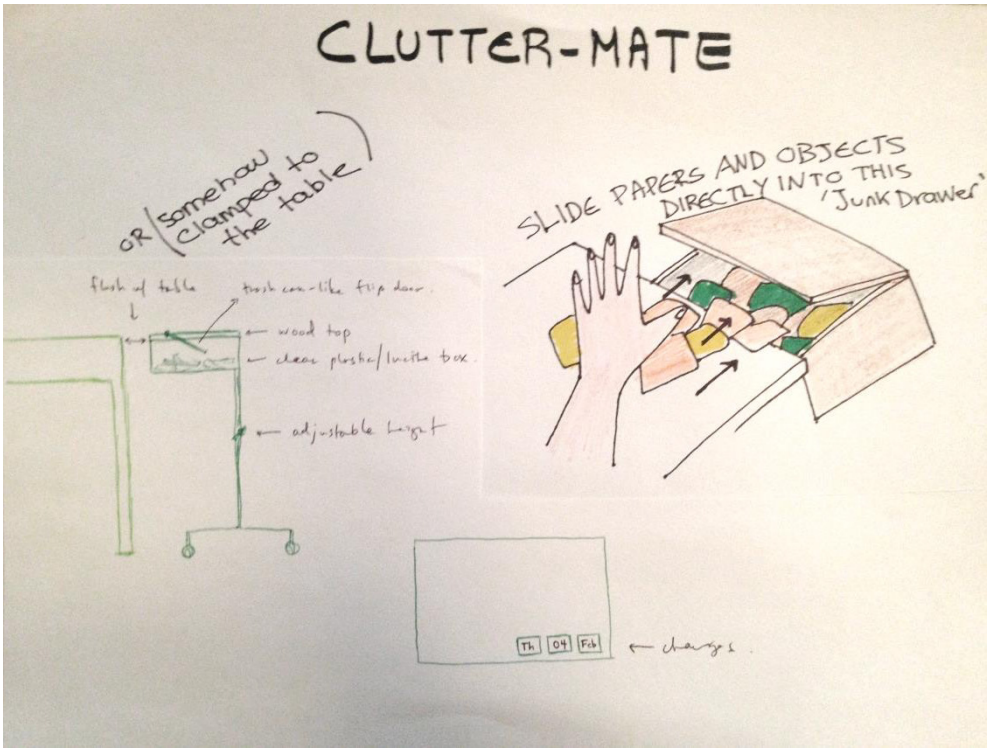

Figure 8.6. Samara's junk drawer design. Drawing by Isabel with Samara's sketches (left).

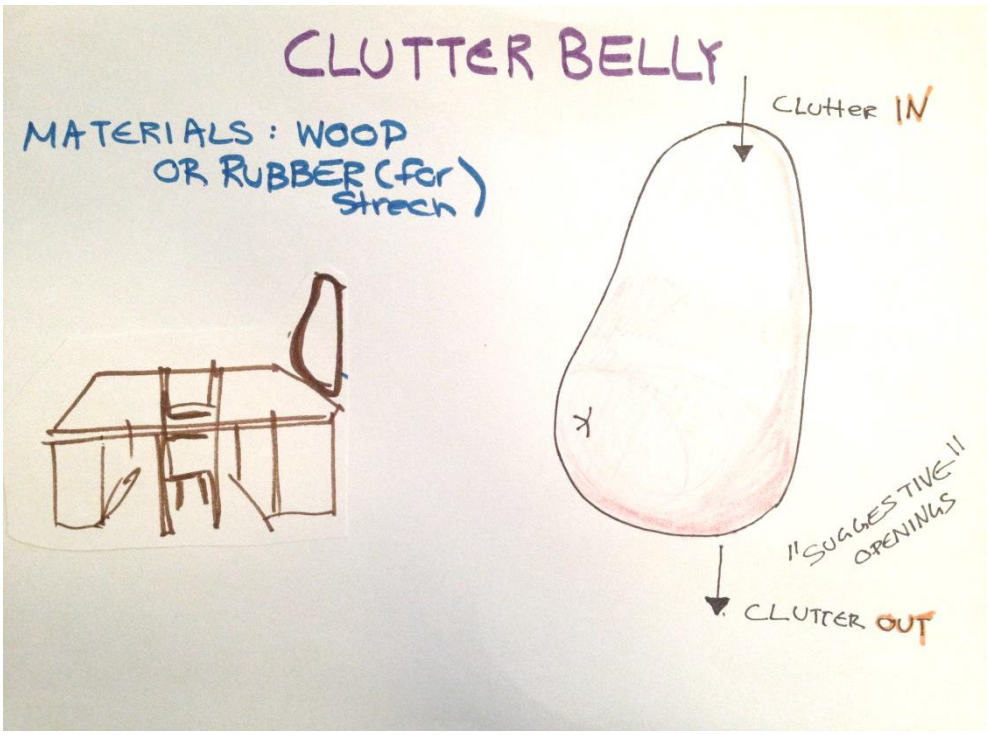

Figure 8.7. Isabel's clutter belly design. Drawing by Isabel.

At the end of the meeting, the group revisited the idea of developing a polished prototype of the product. This was still the plan, but Betsy and Samara were concerned with the symbolism of enlisting their male partners for help. They proposed finding a female craftsperson at the WCCW to build the prototype.

8.2.6.3 Journaling. After the meeting, I wrote about my design contributions and, in particular, the clutter belly idea. I chose to develop the junk drawer idea as my individual project, since the design had already been reasonably well developed through group discussions. Given this context, I figured that my contribution would bring less of my own subjectivity to the project. However, the stomach idea ended up being quite personal and unique; it brought my design interests and aesthetic to the project. That said, Betsy and

Samara did contribute to the design by proposing that it could be an anatomical and female figure. I also wrote about the ways feminism seemed to be showing up in the project: through symbolism (i.e. regarding the body and the meaning of products), the emphasis on certain aesthetic features (i.e. the feeling of objects), and the independence of the design team (i.e. avoiding men's help). I noted that these issues were surprising to me, as I have relatively little interest in symbolism and the feeling of products and wouldn't mind asking for help in the construction.

8.2.7 Design meeting 4. At this point, Betsy announced that she would need to be away for 1 week. This added to the week that Samara would be away, making a 2-week break. This added additional pressure to the project and encouraged the group to quickly narrow down the design ideas to one favourite. After a brief discussion, Betsy and Samara chose the clutter belly design because they enjoyed its anatomical references and its uniqueness. The group then developed the idea through a series of discussions and modelling (see Figures 8.8 and 8.9).

There was also a lot of discussion on the colour of the product. Betsy argued that it should be flesh tone to reference a human torso and believed that another colour such as green would take away from the product. However, choosing a skin tone was a difficult process because of its potential reference to specific population groups. The group didn't want to leave-out certain populations. Indeed, Betsy even referred to this as the hardest part of the project. Finally, Samara went to the bookshelf and pulled out a book (Figure 8.10). She proposed using the same colour as its cover: medium-tone mauve. Betsy and Samara agreed on this colour since it was representative of many skin colours and its pink elements were a nice feminine reference.

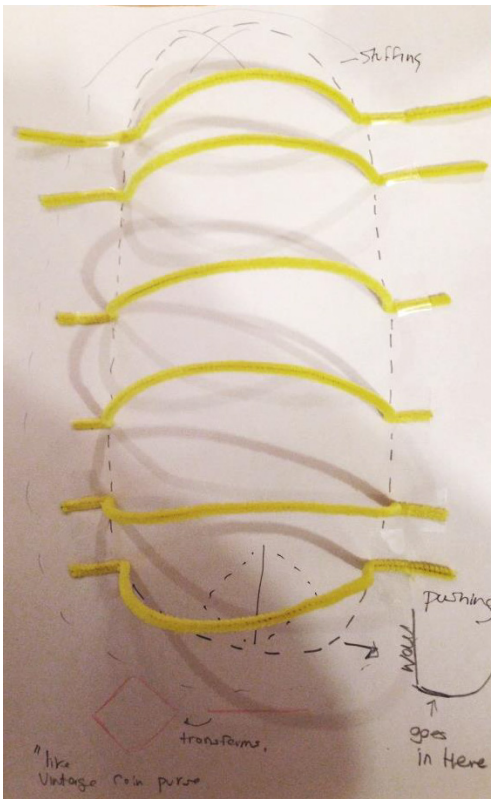

Figure 8.8. Samara's exploration of form and the opening at the bottom and top.

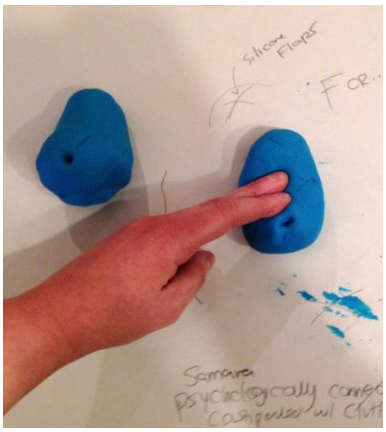

Figure 8.9. Isabel experimenting with the shape and interactivity of the design.

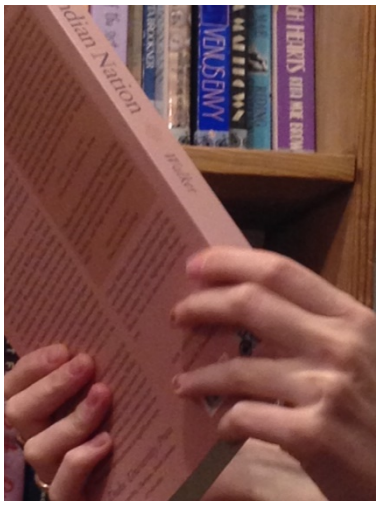

Figure 8.10. Samara holding the book for the colour reference.

I then asked a series of questions to Betsy and Samara about the product (e.g. its users, its construction) in an attempt to push the design further. After a brief discussion, Samara and Betsy proposed that the product should be geared toward a young, creative person and used in

their home office. In order to emphasize the anatomical aspects of the design, it would be based on a mould of a woman's torso and, specifically a moderately pregnant belly. Further, the product would be made from flexible silicone, so that it could expand with its contents and be pushed-on to release its contents. Instead of hiring a male craftsperson to build the final prototype, I would take the lead in this process with some help from the participants.

I then proposed discussing the product with other WCCW members, since they fit the target user group. The design team spoke with three members working at the centre that day. Two members enjoyed the design, but one was concerned with the negative symbolism of putting 'junk' in a pregnant belly. Based on this negative comment, the group immediately returned to the symbolism of a stomach eating and digesting and to model a non-pregnant torso.

I volunteered to be the model for the product and proposed that the participants mould my torso using plaster bandages. I would then cast the product from silicone using the plaster mould. Betsy and Samara wanted to mould a large belly, so they told me to eat a large meal before and drink lots of water throughout the process.

8.2.7.1 Journaling. After the meeting, I wrote about my surprise at how the stomach design idea transformed. It started out as a silly concept without a direct and clear relationship with feminism. However, through collaboration the stomach became a mold of a real torso, of a woman's torso and even of a pregnant belly. I also wrote about the group's dynamic and independence. While it was not appropriate to hire a male craftsperson to help with the prototyping, Betsy and Samara encouraged me (a woman) to take the lead. In turn, Betsy wrote about enjoying the design process especially the discussions, exploration, play and

brainstorming. She wished that these activities took place in her own design workplace and that she could find other designers like me to collaborate with. She also noted that the clutter belly was her favourite design because it provided an opportunity for play and discovery. The other ideas seemed too normative and easy or, at the other extreme, unfeasible within the context of this project. Finally, Samara wrote about wanting a product that would provide opportunities for group collaboration and exploration. She also explained that she was enjoying the collaborative experience. She felt that she was less bold and confident than the other group members, but she didn't feel bad about it. This was because the design team was a group of women and she didn't attribute the different personalities to gender differences.

8.2.8 Design meeting 5. Betsy and Samara met me at the WCCW and moulded my torso using plaster bandages (see Figure 8.11).

Figure 8.11. Samara molding my torso. Photo taken by Betsy.

8.2.8.1 Journaling. After this process, I noted my surprise that the participants were concerned about making a mess with the plaster. This kind of concern seemed anchored in femininity and not necessarily contemporary feminism. In turn, Betsy wrote about enjoying the design experience. It was a fun and easy project with lots of laughter, sharing and talking. She wished this type of collaboration was more common in design and noted that this feminist design project would inspire her future design work. Betsy also analysed the aspects of the project that enabled the positive collaborative experience; this included the small group size, the commonality between participants (i.e. gender, creativity, age) and the finite goals of the project. She further noted that the initial discussion on feminism was a ground-breaking exercise that helped expose participants' vulnerabilities and encouraged everyone to open-up.

8.2.9 Prototyping. I conducted the remaining stages of the prototyping on my own while the participants were away. This process was inspired by my design knowledge and previous work in sculpture. I filled the mould of the torso with liquid plaster to create a cast of my belly (Figures 8.12). Next, I built-onto the plaster cast with clay to create the form of the product. I then created a second mould of the larger shape (Figures 8.13 and 8.14). This second mould was the basis for slush casting where I poured liquid silicone into the mould and rotated it for about 1 hour until it dried.

In total, I slush casted two versions of the product to try to get the ideal colour and texture (Figures 8.15 and 8.16). The first was dark brown and too different from the colour determined by the group. The colour of the second version was closer to the chosen mid-tone mauve. However, it had a bubbled and rough texture, partly due to wear on the plaster mould. While I improved the product each time, I decided to stop after the second prototype, as the second version represented the group's vision and the silicone for a third version would be pricey. Together, the construction of the two prototypes cost about $500.

Figure 8.12. Plaster cast of my torso.

Figure 8.13. Building-up the torso with clay to create a rounded shape.

Figure 8.14. Mould of the full shape.

Figure 8.15. Slush cast mould and the final product (version 1).

Figure 8.16. Final product (version 2).

8.2.10 Design meeting 6. The group met one final time once the prototype was finished and Betsy and Samara returned from their trips. The goal was to examine and analyse the prototype (see Figure 8.17). The participants both thought that the prototype represented the group's vision for the product with the exception of its colour and surface texture issues. Looking at the prototype in-person inspired further design discussions. Betsy noted that getting items out of the object would be a challenge and something would need to be addressed in any future iterations. She also noted that getting objects out of the bottom of the product might be too suggestive.

Figure 8.17. Samara (left) and Betsy (right) examining the final product (version 2).

I then asked how well the end product aligned with Samara's and Betsy's goals starting-out. Samara initially wanted a polished product that dealt with an interesting problem. She thought that the product aligned well with those goals: it encourages having a good workspace and making the space fun and enjoyable. Betsy wanted a product that was weird and expressed femininity. When reminded of these early goals, she said that this product 'nailed it.' That said, the group decided that the product didn't respond to the prompt for the initial brainstorming session to support changes to the individual regarding, for instance, independence, self-determination and choice. It did, however, offer a positive contribution in relation to the body. Namely, it offered a joyful and refreshing representation of a real female body.

In terms of feminism, the group decided that the product was subliminally feminist by inserting a positive representation of the female body in an everyday environment. It also

represented some of the feelings associated with an ideal feminist future identified early in the project like enjoyment, happiness and living in the moment. Betsy further added that insights from the product were less striking than the group's interactions, which were distinctly feminist. In addition, this was as it should be, as the design experience had been her priority throughout the project. The feminist aspects in the design processes and collaboration included the open-endedness of the project where the experience was emphasized over the end product; the supportive and collaborative environment where no one stole the show; and the light-heartedness and informality of the project and the environment at the WCCW. Each of these factors encouraged participants to contribute fully and creatively to the project.

I also asked how the group would take this design further in an ideal world. The participants determined that they would host a Kickstarter event to fund the further development and production of this prototype, manufacture it in China, and sell it through a place like the MOMA Design Store. It would need to be manufactured with proper machinery given the challenges of doing it by hand. At this point, I mentioned some ethical concerns related to the product and this manufacturing process like the sustainability of materials and certain labour practices. These were issues the participants hadn't thought about, but they vigorously stressed would be important moving forward. Samara noted that all-around responsibility is a key foundation of feminism. That said, Betsy and Samara didn't want to take the project further. Samara explained that she was more interested in the collaborative experience and the relationships that the group developed than the end product. Betsy noted that she didn't have the experience or resources to do so.

8.2.10.1 Journaling. I wrote about the breadth and limits of feminism after this final design meeting. I was struck that the participants wanted a responsible product even though they didn't bring up social, environmental and financial considerations themselves. I theorized that it could be because they didn't have industrial design experience or training and, as such, might not think about these issues. Further, the situation could be related to the breadth of feminism. Feminism might be so complex on its own that sub-issues and peripheral issues aren't immediately obvious, but are important once they are recognized.

8.3 Project with Sabina and Amanda

The second co-design project was the single-day workshop held with Sabina and Amanda. The following is a biographical introduction to both participants, as well as an overview of their feminisms drawn from the group discussion.

8.3.1 Sabina. Sabina is an urban planner for Los Angeles County. She was introduced to the WCCW through a personal contact and has participated in several activities at the centre including a yoga class. Sabina explained that, in general, feminism is a way to address oppression based on gender. To her, feminism is about respect and not objectifying or dehumanizing people based on identity and physical characteristics. Her personal understanding of feminism has close relationships to other movements like antiracism and is related to queer politics, namely the ability for women to forge their own identity.

8.3.2 Amanda. Amanda, the second participant, is also an urban planner for Los Angeles County. She was invited to participate in the co-design project by Sabina, her colleague. This

workshop was her first experience at the WCCW. She explained that feminism supports equal opportunity and the ability for women to be themselves. In terms of her personal experience of feminism, she agrees with Sabina that feminism is about respect and not objectifying or dehumanizing people based on identity and physical characteristics. She also added that feminism is about justice on a daily basis; it supports women's self-expression and freedom from unequal treatment because of who they are. Feminism comes across in her daily interactions as respect where Amanda is mindful of and tries to put aside pre-conceived notions about roles. In this way, she treats everyone with the same respect, whether they are conforming to stereotypical gender roles or not. Amanda noted that she doesn't align herself with a particular feminist strand.

Like in the first project, neither participant was aware of the specific feminism held at the WCCW. As this project took place all at once during a full-day workshop, I took notes on the participants' feminism on a large sheet of paper as they spoke. This was a reference point for the group throughout the project. However, I also conducted a full analysis of the group interview after the workshop. I sent the summary and analysis to both participants for their review and comments several days later.

8.3.3 Feminist problems and utopias. The next activity following the interview was to identify problematic and utopian situations from a feminist perspective. Sabina and Amanda listed problems revolving around women's safety in urban areas, which they stressed were high priority and basic issues that need to be addressed before all else. These included physical threats to women when walking around the city or in transportation like taxis, Uber cars or

public transit. The participants also noted norms and standards relating to women's appearance, weight and dress, which they felt were particularly pronounced in Los Angeles.

In relation to the collages, Amanda's vision of an ideal feminist future was based on topics like economic and physical security, health, happiness, family, and work. Sabina's collage used cars as a symbol of freedom and safety. She also explained that her collage represented freedom of access, an informed perspective, and not being vulnerable. Finally, I tried to base my collage on previous discussions with Amanda and Sabina and represented topics like beauty, joy, power, identity, community, love and friendship.

In terms of the analysis of the tension between the problematic and utopian situations, the group concluded that the problems tended to revolve around limits and risks toward the body in relation to appearance and safety. In turn, the utopia was an empowering and supportive environment with free movement of the body without anything holding it back. As such, the group decided to search for design solutions to help achieve an empowering and supportive environment for the body in relation to safety or appearance.

8.3.4 Brainstorming. The group brainstormed about thirty design ideas in response to this need, and then narrowed them down to several favourites. Sabina and Amanda were especially interested in an easily implementable and grass roots design. Amanda further noted that something with beauty and joy is not essential, but would be a bonus. The designs from the brainstorming session that aligned with these specific criteria included an urban way-finding or lighting system, street furniture, a chatty bus-line where users would be encouraged to talk to each other, and a community watch system.

8.3.5 Design development. At this point, each participant including me chose one design from this list to develop in greater detail. Sabina explored a form of DIY community signage that would advertise features like safe walking paths, water fountains and public seating. Amanda proposed enhancing existing systems like a bike-sharing network with features like better lighting, seating and maps to make them more usable. Last, I proposed identifying particular safe or scenic routes through communities with a string of lights hung above the street.

Amanda and Sabina especially liked the idea of community signage since it was grass roots and would be easy to implement. The group developed this idea further through a series of discussions. The initial conclusion was that the signage could be available online as a series of templates that users could print out and place around their neighbourhoods. The signs would be symbol-based to ensure children or people that don't speak English could read them. They would also fulfil multiple purposes like safety and discovery to enhance the daily life of residents and visitors to the neighbourhood. However, Sabina and Amanda were concerned that the signage wouldn't make a large difference to the urban experience, and that it was a Band-Aid solution making up for a shortage of official signage. As such, the idea of community signage transformed into a system of neighbourhood ambassadors; namely, pairs of community members that would give directions, record problems, help in emergency situations, and offer their own expertise (e.g. restaurant recommendations). In terms of its execution, Sabina and Amanda noted that the neighbourhood ambassadors could be organized through a centralized system with a paid administrator. It could also be put into place in cooperation with existing community groups.

8.3.6 Analysis. Though Sabina and Amanda were pleased with the design at the end of the session, the group had several lingering concerns that were not completely addressed. Amanda was concerned about the ambassadors' own safety where they might be the subject of an attack if they were too identifiable and easy to find. Further, a grass roots system like this would likely rely on volunteers, but Sabina was concerned about their exploitation if they were volunteers and that a system relying on volunteer labour would restrict who could participate. In terms of feminism, the group decided that the design output supports freedom and safety, important elements of feminism. However, the potential exploitation of workers and risks to their safety were distinctly anti-feminist. Feminism was also apparent in the design collaboration where there was a safe and encouraging group dynamic. The setting at WCCW further prompted the feminism in the project, where the participants mentioned being inspired by the mission statement on the front door. Last, Sabina and Amanda noted that feminism offered a valuable lens on urban planning that helped them filter out anti-feminist conventions and elements.

8.3.7 Journaling. Sabina and Amanda didn't participate in the journaling activity. As such, this section relies on my reflections alone. In my journal, I wondered about the participants' points of inspiration in this project. The community-centred aspect of the design could be linked to feminism or Sabina and Amanda's roles as urban planners. As such, I questioned which perspective these elements came from and whether they came from both. I also wrote about a disagreement I had with the participants. While Sabina and Amanda were concerned with the safety and exploitation of workers involved in the design proposal, I didn't think this was a problem. Volunteer labour is quite common and Los Angeles didn't seem that

dangerous to me. However, upon reflection, I realized that the participants' concerns were based on their feminist perspectives and represented a different way of thinking about labour than I was accustomed to.

8.4 Project with Ana, Wale, Ashley and Rocio

The third collaborative project differed significantly from the first two. It was initiated by Wale, a contact at the WCCW that mentioned to me that she knew a group of people who needed design assistance. Wale is involved in the Q Youth Foundation community group, a local LGBTQIA+[1] organization for young people. Q Youth was participating in a design project with the University of California Los Angeles Social Enterprise Academy. Each year the Social Enterprise Academy pairs non-profit community groups with students taking an undergraduate business course. The goal of the partnership and the course is to help community groups develop a product that can sustain them financially, similar to the Girl Guides and their cookies. The products are then presented to a jury that funds the top ideas. Q Youth was keen to develop a successful product and to win the competition, but felt they needed more design assistance than the business students could provide and a collaborator that would understand and be responsive to their organization and their unique needs. As such, Wale put me in contact with Ana, the executive director of Q Youth.

To initiate the collaboration, I met with Wale and Ana for one day. We spoke about the logistics of the collaborative project for several hours before joining other members of Q Youth at a social event. The conclusion of this meeting was that Ana and other Q Youth members would participate in my co-design project and would bring the design ideas and

[1] LGBTQIA+ refers to lesbian, gay, bisexual, transgender, queer, intersex, asexual and more.

outcomes back to the Social Enterprise Academy for their review. However, there were several conditions of this collaboration. This co-design project would follow a specific and condensed time-line to integrate with the Social Enterprise Academy schedule. Further, Ana would be the primary contact and collaborator in the project.

8.4.1 Journaling. Ana, Wale, Ashley and Rocio didn't participate in the journaling activity. As such, these entries are based on my reflections alone. I took many notes after these initial conversations with Ana and Q Youth. I noted that the group saw my feminist design project as particularly responsive and understanding of their needs. This was a positive reflection on the promise of a feminist-driven design project. I further explored the group dynamic where there was a meeting period before confirming the collaboration and where Ana was the primary contact and collaborator in the project. I hypothesized that this dynamic was developed in the best interests of Q Youth to protect the community and to make sure my intentions were honourable and aligned with theirs.

8.4.2 Design meeting 1. The initial discussion on feminism took place one-on-one between Ana and I. Ana explained that feminism in general emphasizes fairness and balance in society for women. While Ana doesn't like labels including the label of feminism, feminism is a part of Ana's life. It is inspired by Ana's mother, who had unconventional ideas pertaining to marriage and religion that inspired Ana's life and way of thinking. Ana's views also align with Latina and Chicana feminism and especially their queer orientations. One example is the move toward gender fluidity in the Spanish language that replaces the feminine 'a' with 'x'. These perspectives influence Ana's life including an importance on inclusivity, diversity, culture,

honesty and sincerity. Ana isn't a member of the WCCW and, as such, wasn't aware of the feminism at the centre.

The description of the co-design project pauses briefly here to introduce queer Latina and Chicana feminisms, since they weren't included in the overview in Chapter 4. Queer Latina feminism appears to be referred to as Latinx feminism. It's an intersectional perspective that sits at the boundaries of Latin American feminisms, Indigenous feminisms and queer theory (García, 2017) and seems to combine thinking from each of these areas. Broadly speaking, Latin American feminisms address the impact of race and language and women's experiences, and Indigenous feminisms address Indigenous women's issues and draw on traditional knowledge (Moi, 2014). The queer lens explores the changeability and "multi-dimensionality of human experience," which it sees as a "patchwork of multiple identities and situational subjectivities" (Epstein, 2005, p. 68). It challenges binaries in sex, gender and sexuality (Valocchi 2005). In turn, Chicana feminism can be broadly understood as an intersectional feminism that supports the needs of Mexican-American women and deals with issues including race, language and patriarchy (García, 1997). "Queer Aztlán: The re-formation of Chicano tribe" is a relatively well-known Chicana feminist text by Cherríe Moraga, which appears in her 1993 publication. Moraga argues for an inclusive Chicano community: 'In a "queer" Aztlán [homeland], there would be no freaks, no "others" to point one's finger at' (1993, p. 235)

Now returning to the project with Ana, I sent the summary on feminism to Ana for review. However, the condensed time frame of this project meant that the first meeting included additional activities inspired by this discussion. Like the project with Sabina and Amanda, I took notes on feminism as Ana was speaking. These notes were a jumping-off

point for the other activities. After this initial discussion, Ana and I explored current problems from a feminist perspective. Ana noted three major points: 1) misunderstandings about queerness where a person needs to constantly come out and educate others, a tiring but essential process; 2) privilege and lack of privilege, an especially pronounced dynamic for a queer person of colour; and 3) self-inflicting problems like a lack of confidence where a person might not realize their potential and abilities.

Ana explored the idea of a feminist utopia through collage. Ana spent a long time developing a detailed collage that represented inclusion and diversity, and a healthy and worry-free community. Inspired by the collage, Ana explained that community members should contribute equally to achieve this future scenario by getting involved in grassroots initiatives and contributing to positive action and change. As before, I tried to base my collage on previous conversations with Ana and represented ideas of inclusion and culture. However, I realized that Ana's feminism and experiences were quite different from mine and my collage could easily bias the discussion. As such, I made the collage so Ana didn't feel unconformable, but skimmed over my collage in our discussion.

Next, Ana and I talked about the potential bridges between the problem and utopia. Ana saw internal activism as the solution. Internal activism involves empowering ones-self; namely, developing self-expression, a feeling of safety, and the confidence to stand up against injustice. An empowered individual can then become a visionary and a community leader that can make significant social changes. Ana and I then brainstormed design ideas that could support internal activism, arriving at about 15 ideas. We then narrowed down the ideas based on Q Youth's needs for a revenue-generating idea, a product to promote the organization and a product that is meaningful. Based on these criteria, our favourite ideas were an interactive

notebook that could include goals, quotes and resources; an empowering symbol that could be posted around the city or used as a brand for merchandise; a martial arts training program; and an app or product that boosts a user's confidence through praise.

8.4.2.1 Journaling. After this meeting, I reflected on my processes as a co-design facilitator. Ana complimented my work at several times, stressing that I had a good ability to break down systems, investigate deep questions, and the reasons behind situations. I wondered whether these skills should be attributed to my design experience, my interest in feminism, or both.

8.4.3 Design meeting 2. At this point, Ana organized a larger meeting with me and other Q Youth members: Ashley, Rocio and Wale. This took place at Ana's home. Ana's goal was to tell the other members about the design ideas and see if they had other suggestions. The group talked about the symbol idea, Ana's favourite, for about 1 hour. Ana's idea was that the symbol could bring together the community and show people they aren't alone. It could be posted around the city on stickers and printed on t-shirts. After this, the discussion moved to other ideas proposed by different members of the group, but none got the full support of everyone present.

Ana and Wale then initiated a second brainstorming session with the prompts: "what would you actually purchase?" and "what does Los Angeles need?" While the group came up with dozens of ideas, one clear favourite emerged. It was a subscription gift basket that would include a range of items like event tickets, t-shirts and scented candles. The group liked this idea since it drew on their area of strength: their networks. Specifically, they could include event tickets or products produced and sold by their existing community contacts.

8.4.3.1 Journaling. After this meeting, I wrote about my position throughout the event. I decided to give up my role as leader and took a back seat in respect for Ana's position in the group and the setting at Ana's home. I also wrote about my surprise that many of the design suggestions during the group brainstorming session were feminine (i.e. the scented candles). This was unexpected in the context of a queer community group.

8.4.4 Between design meetings. Ana met with the Social Enterprise Academy students armed with the various ideas that had emerged during the collaborative project to this point. Together, they decided to move forward with the symbol idea and the gift box idea. The symbol would become Q Youth's brand. Specifically, the symbol would be the word "/KWIR/", which sounds like "queer" when said aloud. In their view, associating with the brand would make users activists. The brand would be promoted by Q Youth and through an online Q Youth platform. The symbol would be affixed to a range of items like stickers and t-shirts that Q Youth would sell. Further, Q Youth would operate through the brand to prepare and sell the gift baskets.

8.4.5 Design meeting 3. After this meeting and discussion with the UCLA students, Ana met with me to finalize the design idea. I asked Ana a series of leading questions about the products (e.g. about the consumers, logistics, and production). In response, Ana concluded that users could be anyone in the queer community or that supports the queer community, and especially those with disposable income. The gift baskets would include two major types of products: community support resources like brochures and fun products made by LGBTQIA+

friendly companies. Further, the development and shipping of the boxes would be an opportunity to create employment for Q Youth members, especially those that have a difficult time finding work because of their queer identity and/or a disability. Ana stressed that the employees would be paid well and treated well so they are happy and want to be there.

In terms of the specific contents of the boxes, I proposed allowing users to choose what goes in their box. My rationale was that consumers might not all want the same thing, especially since Ana hoped to reach a large audience. Ana liked this idea since it represented diversity and inclusion, major Q Youth principles. Further, inspired by Ana's mention of individuals with disabilities, I asked whether the box's contents would be accessible. Ana noted that accessible products would be important and that Q Youth would be willing to take any extra effort to make them available.

The meeting ended with an analysis of the project. Ana felt the brand and gift basket idea supported Q Youth's goals since it promised to generate income, draw attention to the organization, and build community. Further, it supported internal activism through its very presence, which would bolster users' sense of community and belonging. In terms of feminism, the ideas support inclusivity and diversity, and fairness and equality by helping provide good employment. While the products don't align with Chicana or Latina feminism, Ana noted that they create their own queer culture. Ana also stressed that the collaborative process was feminist. This is seen in how grounded, organic and responsive the project was. It was easy to follow and understand and respected Q Youth's unique needs and reflection process. This was in contrast to Ana's experience with the UCLA students, whose design process was more rigid, inaccessible and non-responsive to Q Youth's specific experiences and needs.

8.4.5.1 Journaling. After this final meeting, I wrote about Ana's interest in accessible products. I saw this as a parallel situation to Betsy and Samara's interest in socially, environmentally and financially sustainable design. In both cases, the participants were adamant to include these features in the project, but only after I mentioned them. Like before, I theorized that this could be based on two reasons. As non-designers, the participants may not think about these issues. Alternatively, they might be sub-issues of feminism that don't immediately come to mind, but are still highly important.

Following this overview of the three co-design projects, the next chapter includes an analysis of the projects and a direct response to Objective 2.

Chapter 9. Participatory Project-Grounded Research Results

This chapter includes a response to Objective 2 - identify the content of feminism's implicit critiques and proposals toward industrial design when it's applied as a lens in design - based on analysis of the participatory project-grounded research data. The results of each co-design project are explored separately and one at a time. This is followed by a synthesis of the results at the end of the chapter.

As mentioned in Chapter 6, the framework to identify feminism in each project was based on the participants' own definitions identified during the group interview. Ideologies are embodied in people and adherents apply them in their lives where they inform their engagement and interactions in the social and political worlds (Freeden, 2003; Goodwin, 2007; Van Dijk, 1998). I also previously mentioned that contemporary feminism is very broad and open to different views, theories and ways of practicing feminism (Krolokke & Scott Sorensen, 2006). Drawing on the participants' own understanding and definitions of feminism acknowledged this diversity, was respectful to their thinking and helped ensure the analysis was aligned with their feminisms.

Generally speaking, while the participatory project-grounded research presented many broad intersections between feminism and industrial design, most of these intersections addressed the project level of the industrial design framework including practice in the project, processes and objects. Further, feminism primarily guided industrial design activities and provided few explicit critiques. As such, most of the results from the fieldwork are feminist proposals to industrial design, insights into certain areas of priority and ideal approaches. That

said, these proposals could be extended and analysed to provide implicit critiques to certain aspects of industrial design, which takes place in the synthesis section of this chapter.

9.1 Project with Betsy and Samara

In the collaboration with Betsy and Samara, the participants brought a feminist perspective united by the support of equality, respect, a balance of collectivity and independence, reflection, self-expression and openness. While neither participant associated with a particular strand of feminism, both of their perspectives had links with liberal feminism and postmodern feminism. Betsy's approach had links with liberal feminism through her emphasis on rights and opportunities in the public world. She also held a relatively postmodern understanding of gender by disassociating feminism and womanhood from femininity. In turn, Samara had similar attitudes toward gender, but focused more on the lives of individual women than their experiences and rights in the public world.

9.1.1 Practice in the project and process. To begin, many of feminism's intersections with industrial design sit between the practice and process levels and address the group dynamic and collaboration. Collaboration was naturally central in the design project given the research goals and the participatory project-grounded research. However, I addressed this collaboration in a unique way based on the feminist methodology and methods in this research project: I aimed for an equal and non-hierarchal collaborative experience within the design team. Further, I was troubled throughout the project that I needed to take on a leadership position and was responsible for the prototyping phase. I was afraid that I was controlling and dominating the collaborative process.

These intentions and concerns, combined with discussions with Betsy and Samara help highlight feminism's first recommendation to industrial design based on analysis of this co-design project. Betsy and Samara stressed on numerous occasions that they enjoyed the group dynamic and collaboration and that it was clearly feminist. It seems that, unlike me, they weren't troubled by my leadership role, which leads to the following conclusion. Feminism supports a respectful and relatively equal collaborative process, but also a dynamic where each group member draws on their individual strengths. This provides a balance between feminism's emphasis on equality and the collective with its other focus on independence and self-expression. In this sense, it was appropriate for me to take on a leadership position in this collaborative process given my design expertise.

Additional discussions with Betsy and Samara on this topic help further define the ideal characteristics of this collaborative, yet independent group dynamic. The collaboration should involve a respect and interest in other group members' perspectives including those that might be different, and should always involve all group members when decisions take place. For instance, Betsy expressed a real interest in learning what Samara had to say as a non-designer and stressed the project should pause during her absence. This collaboration was further enabled by the group's characteristics including the small size and similarities across group members as young and creative women. Other factors included the atmosphere emphasizing discussion and casual and joyful work and the creative and feminist environment at the WCCW. Betsy also stressed the importance of the projects' structure involving a balance between open-endedness and finite goals, and noted that the work I put into organizing the activities enabled her and Samara to relax, focus on other priorities and enjoy the collaborative design experience. Together these characteristics helped each group member

engage confidently and creatively in the project and provided a sense of community within the group.

In terms of the independence, I was able to take a leadership role and provide structure to the project based on my design experience. Further, each team member brought their own knowledge and interests to the table. That said, this dynamic is delicate and could be easily broken. This could happen if one group member took too much of a lead or, inversely, if one member was singled out and put on the spot, especially regarding a question they couldn't answer. Also, symbolism appears to be deeply important in feminism. As such, team members' roles can't perpetuate gender norms; a male designer taking the lead in the project wouldn't be feminist.

Individual reflection is another component of this independence. For instance, Betsy suggested including more time for individual reflection during the design processes and stressed the value of having time between design meetings to think about the project.

My self-interrogation about my role in the design project informs an additional possible feminist recommendation to industrial design at the practice and process levels: namely, to engage in self-reflection. My self-reflection and concern about my role in the design team likely supported the feminist nature of the collaboration. While I took on a leadership role, I continually re-evaluated my position in the team and held back at various points to enable Betsy and Samara to take the lead. Indeed, Betsy applied a similar self-reflective process in the project where she moderated her power and was conscious of moments where she took the lead. This kind of self-reflection could be key to maintaining the balance between collaboration and independence in group-work. This kind of self-reflective

approach could be applied in industrial design and would be especially valuable in collaborative projects.

Now, the discussion changes focus slightly to address design thinking. The collaborative processes that involved identifying problems and an ideal future and then looking at the tension between them were inspired by problem setting. The participants didn't challenge this basic structure, but did introduce some feminist-informed approaches within it. Samara's feminism is based on a dynamic between the individual and collective: people learn from the collective, apply this knowledge in their lives and these individual initiatives can help create larger social changes. This broader structure helped explain the problems and solutions identified in this design process and the approach taken by the design team. Just like feminism more broadly, the problems identified in the design collaboration were at the social level and the proposed responses were located at the individual level. This provides a recommendation to industrial design to focus on needs in the social world, consider society's collective and individual levels, and provide design solutions that operate at an individual or grass roots level.

Also at the design thinking level, Betsy explained that feminism encouraged an analytic way of thinking and the search for unexpected design solutions. These comments were based on experience from her graphic design practice, but also transferred to her approach in this collaborative design project. Once again, this design thinking approach could be applied in industrial design to add another dimension to current strategies.

9.1.2 Process. While this was not my intention in planning the co-design projects, Betsy mentioned that the initial group interview on feminism was a successful ice-breaker for the

collaboration; it aligned with feminism's emphasis on collectivity, confidence, self-expression and openness by encouraging each group member to break down their inhibitions and open-up. For instance, this encouraged Betsy to show her vulnerabilities to the other team members, which meant she shared more design ideas than she normally would and didn't worry about their imperfections. This kind of ice-breaking activity could be easily applied in other industrial design projects.

As my leadership role in the structure of the project indicates, the participants' feminism didn't really engage with the design processes. That said, they seemed to enjoy the structure, which could be an insight in itself. Many of the processes in the project could already have similarities to feminism. For instance, problem setting is a systemic and complex approach to design thinking and co-design and its associated processes engaged the research participants in a respectful and equal way in the project. This relationship between the processes and feminism could be a sign that certain aspects of industrial design are already aligned with feminism. However, it could also be a sign of a feminist bias in my own design work. Though, regardless of the cause, feminism's apparent approval of these design processes shows that methods like problem setting, brainstorming, collage and user research should continue in industrial design.

The exception to the comments above are the prototyping processes. I was happy to hear that Betsy and Samara's male partners were skilled in building and was eager to involve them in the prototyping process. However, Betsy and Samara were troubled by the symbolism of enlisting their help, which could signal patriarchy or dependence. This provides a critique and proposal to industrial design. Namely, designers should be aware of power dynamics and patriarchy in their collaborations. Instead Betsy and Samara suggested enlisting the help of a

female builder and were happy when I volunteered to build the prototypes, which provides a response to the aforementioned critique. Namely, it's acceptable to ask for external help as long as it doesn't perpetuate gendered power dynamics and patriarchy and, ideally, the choice of an expert should break stereotypes and norms.

As another example, when Betsy and Samara helped create the cast for the design product, I was surprised at their concern about making a mess. This could be perceived as a feminine reaction and it is a reluctance to engage in a more masculine-coded, messy hands-on activity. This reaffirms the point that postmodern feminisms that disassociate womanhood from femininity don't reject femininity. Women and postmodern feminists like Betsy and Samara likely still have and value many feminine traits. As a critique and proposal to industrial design, it prompts the recognition that many design activities are technical and masculine-coded. This doesn't necessarily mean that these processes should be replaced, but, instead, it encourages designers to be aware of potential discomforts when working in design and to be tolerant, helpful and encouraging to those around them.

9.1.3 Design object. Just as feminism didn't really engage with the design processes, the same is true for the design object. It didn't offer a foundational critique of design products and propose a dramatic alternative like a system innovation, defined by authors like Bhamra, Hernandez and Mawle (2013). Instead, it informed the design of relatively traditional kinds of objects: namely, various home-office products. This could be interpreted as feminism's approval of industrial design and its typical emphasis on physical, mass-produced objects. However, feminism's critiques and proposals toward industrial design can be seen in the

goals, meaning and characteristics applied to the design objects developed during the collaboration.

The features of the design object to empower the individual user with the eventual goal to effect broader social change were mentioned above and can be understood as a characteristic of a feminist-informed design object. These social goals could inform industrial design by encouraging a grander purpose in design work and the injection of additional meaning in design objects. That said, I prompted the participants to respond to a feminist concern based on a feminist vision of the future through design. As such, this meaning, implicit in the design object could also be attributed to my contributions and to the project structure.

However, there are other areas where feminism has stronger and clearer intersections with the design object. Specifically, Betsy and Samara took a more complex and holistic approach to defining the design object than I am used to. These multiple dimensions of the design and their design approaches in each case help highlight potential holes in industrial design and areas where designers can further engage with and empower users.

Betsy and Samara saw the problem and need at a physical and emotional level and addressed it through the product's physical characteristics, symbolism and aesthetic including its feeling and look. This is in contrast to my primary focus on a more concrete need and the product's physical characteristics. If I was working alone, I would have likely eventually addressed these other dimensions, but they wouldn't be my primary concern and I wouldn't address them so rigorously. While I'm not necessarily representative of other industrial designers, it's likely that other designers would do the same. As such, feminism seems to offer

an implicit critique of industrial design's narrow focus and could teach design to consider and operate at these additional, more complex levels.

Betsy and Samara also injected additional meaning in the object that did not necessarily directly address the design problem and needs, but that reflected feminism's emphasis on people and empowerment, change and optimism, and supported its broader goals. The objects were joyful and honoured women and women's experiences, which are feelings that could transfer to and support their users. This shows that design objects can hold multiple layers of meaning and encourages designers to inject more complexity in products, especially positive undertones relating to happiness, pleasure and empowerment.

At a more concrete level, feminism appeared to encourage unique objects and open-ended objects. This emphasis could relate to feminism's movement away from problematic traditions and interest in imagining new futures, as well as its support for the individual. While these characteristics are already present in many products, feminism highlights their value and role in innovation and change in design and society. It could encourage industrial designers to inject these characteristics in their product design.

Feminism also engaged with aesthetics and symbolism more strongly and directly than is typical in industrial design. The aesthetics represented joy and beauty and promoted sensory engagement. Betsy sought a beautiful, rich, and tactile object with a pleasant feel. The object should also have a strong and comfortable relationship with the user's body; this could involve using a soft and tactile material like silicone, rounded shapes and shapes formed to the human body. Samara also suggested creating a 'humane' object that engages with the user's body through sounds, rounded corners or even a hug. These features relate to feminism's social focus and emphasis on people's physical and emotional needs. While aesthetics are important

in industrial design, these specific points of emphasis are more unusual and would likely be addressed less rigorously. These intersections between feminism and industrial design highlight a potential gap in product design and suggest a way for design objects to engage with users and reach them at a deeper emotional level.

Next, feminism encouraged a product that is symbolic with a positive message and with a meaning that the user can co-create. Like aesthetics, this symbolism helps design objects engage with users emotionally and supports feminism's emphasis on people's physical and emotional needs. Further, the awareness toward positive and negative symbolism aligns with feminism's more general social critiques and goals. Once again, symbolism provides a strategy that can be applied by industrial designers in the development of design objects; it highlights a potential gap in product design and a way for design objects to engage with and support users and reach them at an emotional level.

Finally, another area where feminism informs industrial design relates to the representation of people in a design object. It encourages the representation, honour and celebration of human bodies and, especially, women's bodies. It also ensures that these representations are respectful of human diversity, aren't sexualized and show natural body shapes, especially pregnant or fat bodies. This focus likely draws on feminism's emphasis on people, women, equality and respect. This involves a two-part critique and suggestion to industrial design, which can be illustrated through the transforming vision of my clutter-belly design concept.

My initial concept for the junk drawer was a stomach that would swallow the contents. This kind of playful concept is typical of my design work and was not intentionally or explicitly feminist. That said, Betsy and Samara transformed the idea into a woman's torso or

a pregnant stomach, based on an actual model. They used the opportunity to introduce a positive representation of a woman's body into the surroundings and material culture. In addition, they identified issues with the design at several points that could be potentially disrespectful to the female body. This included the symbolism of a pregnant belly as a junk drawer and the suggestiveness of the bottom slit on the product. I did not identify these issues. This difference of opinion shows feminism's awareness of and concern for disrespectful and sexualized representations of the female body and its recommendation to eliminate any such case. As such, feminism critiques the separation between the design and human worlds and situations where design objects are disrespectful of the female body. In response, it encourages design objects to represent, respect and celebrate human bodies and female bodies.

Next, the discussion on the colour of the clutter belly also addressed the human body. It drew on feminism's emphasis on people, equality and the contemporary focus on intersectionality. While I would have eventually considered the colour of the object, Betsy and Samara brought up the issue before I had begun to think about it. They also placed huge weight on the issue. For instance, Betsy noted that it was the hardest part of the project. They eventually decided to choose a human colour, a feminine colour and a colour that represented many skin tones. Once again, this situation shows that feminism critiques the separation between the design and human worlds and situations where design objects could be disrespectful or limiting to their users. In response, it encourages design objects to represent, respect and celebrate human bodies and human diversity.

9.1.4 Other projects. While feminism mostly intersected with the design project, it also addressed the projects of production and consumption. At a process level, Betsy and Samara

proposed that the production would be funded by Kickstarter and take place in a country like China using machine and mass production. Further, at the consumer level, the products would be sold through a boutique like the Moma Design Store. This has similarities and differences to design norms. In one sense, feminism seems to support a different model of professional practice based on independence, where we would kickstart the idea rather than seeking partnerships or selling the idea. Further, the sales at a boutique sidestep larger corporations and sellers, though it's unclear whether this is based on feminism's independence, hints of socialist feminism or, on the other hand, the nature of the design object or the participant's unfamiliarity with industrial design. In contrast, Betsy and Samara's proposal to manufacture the products abroad disregards certain potential feminist concerns like ethical labour and the environmental costs of manufacturing and shipping. That said, Betsy and Samara stressed the critical importance of these issues when I pointed it out to them.

This situation leads to several points of reflection about feminism's intersections with industrial design. First, this data isn't clear or reliable enough to draw conclusions about feminism's critiques and recommendations to industrial design. The challenges or, in contrast, the support for certain norms could relate to feminism, but they could also relate to the participant's unfamiliarity with design, its models of production and distribution and their advantages and challenges. That said, feminism's apparent support for socially and environmentally problematic scenarios and then change of opinion does provide some possible insights. First, it could be true that feminism supports all around responsibility like Samara said and the participants just weren't familiar enough with certain ethical issues in industrial design to identify and challenge them. Though, on the other hand, this situation might

highlight certain limits to the feminist lens. This suggestion is based on the case above, but also discussions I had with participants throughout the project.

During the group interview, Samara explained that feminism comes into any kind of political or social conversation through sexual difference first. She also explained that it's not reasonable to expect anyone to master feminism. As such, feminism might place a higher value and emphasis on women and social concerns over other dimensions, despite its interest in all around responsibility. This could also involve an emphasis on certain women's and social issues over others. Further, feminism's complexity could mean that certain social issues and secondary concerns in the environmental and economic worlds can be forgotten. This is illustrated in the situation above, but also the brainstorming session. I provided participants with prompts listing a range of potential users including themselves, but also particularly disadvantaged populations like homeless women. Despite the potential to address a problem facing these especially disadvantaged populations, we focused on users like ourselves.

Relating back to feminist critiques and proposals to industrial design, these insights show that feminism is particularly focused on women's needs and the social world, despite its interest in broader issues. A single feminist perspective wouldn't be able to provide an encompassing critique and recommendation to industrial design. Instead, feminist lenses should be combined, where each feminist perspective could bring something different. Further, feminism is sympathetic to issues beyond the social world and could provide critiques and proposals on this topic, but it wouldn't place as much emphasis on these issues as a more targeted approach.

9.1.5 Broader insights. As explained in the pages above, Betsy and Samara particularly enjoyed the collaborative process. They also mentioned on several occasions that the end product had less importance. I initially attributed this focus to their roles in the design project and motivations for taking part in this research project. However, it is also likely that feminism's focus on women and community values collaboration and human interactions over professional goals and material objects. This offers a critique to industrial design by challenging its points of emphasis and recommending a change of focus from design goals to design processes.

9.2 Project with Amanda and Sabina

The feminism in this group supported equal opportunities, justice, freedom and self-determination for women, and sought to help avoid situations where anyone is objectified or dehumanized. The participants were especially interested in intersectional feminist perspectives, as well as flexible identities and gender roles. Based on this, Amanda and Sabina's feminisms seem anchored in relatively general third wave priorities and concerns.

Like the project with Betsy and Samara, feminism didn't dramatically change the conduct of the design activity. It simply modified its priority areas and certain features. These points of intersection and interaction pertain to a range of realms including practice, process and the design object.

9.2.1 Practice in the project and process. I facilitated the activities in a similar way to the first project where I encouraged equal participation from participants and engaged in continual self-reflection about my role in the team. Amanda and Sabina praised this group dynamic and

stressed that it represented feminism. It made them feel safe and empowered and, in my view, relates to feminism's human focus and emphasis on equality. They also noted that the small group size helped them feel especially comfortable and the setting at a feminist workspace was inspiring and empowering. These two additional factors helped enhance the positive group dynamic.

These insights can inform collaboration in industrial design by showing the importance of the collaborative environment and providing recommendations to enhance collaboration like equality, self-reflective processes, group size and the working environment. Further, Amanda and Sabina's enthusiasm with the WCCW provides additional insights on working environments. It shows the importance and impact of a working environment on a design project and could help identify the characteristics of an inspiring and empowering environment. For instance, the participants noted that the WCCW mission statement helped set the tone for the environment.

Again, like the project with Betsy and Samara, these participants seemed to enjoy the design processes and didn't provide any critiques or recommendations. This could be a sign that the methods applied in this project may already align with feminism and should continue in industrial design.

Next, in terms of design thinking, I didn't particularly examine the feminist problems and utopias identified during the collaborative design thinking process with Betsy and Samara, since they didn't have a direct implication for industrial design and the project goals. However, the problems, utopias and design ideas examined in this project with Amanda and Sabina provide some direct insights to industrial design, perhaps because the discussions in this project were more heavily rooted in design. The participants identified issues with beauty

standards and urban safety, issues with direct links to the built environment and material culture.

These points of focus surprised me. Although I know these issues exist, they are not problems I typically think about and are not front-and-centre in my mind. This disjuncture could inform industrial design. It shows that feminism can highlight problems that designers themselves may not be aware of and points to the value of applying a feminist perspective and co-design with feminists in design thinking and product development.

The project with Betsy and Samara also helped highlight feminism's points of focus and processes where it identifies problems at a social level and responds to them at an individual level, hoping that the individual can help effect broader social change. This dynamic was also present in the project with Amanda and Sabina. They identified social problems surrounding safety. The design solution was based at a grass roots and individual level that involved community-members creating their own signage or being ambassadors and safety patrollers. Finally, the design solution would offer broader social benefits by enhancing public safety and creating a stronger sense of community. This approach to identifying and responding to problems could inform industrial design by guiding how industrial design understands problems in the social world and responds to these issues through design initiatives.

9.2.2 Object. In contrast to the other levels of the industrial design framework, there was a rich interplay between feminism and the design object in this project that provides a range of insights to industrial design. First, I mentioned during the discussion of the project with Betsy and Samara that the participants injected multiple layers of meaning in the design: the objects

responded to a design problem, but also projected joy and a respect for women. I also described my realization that feminism can place a higher value and emphasis on certain issues over others. The project with Amanda and Sabina reinforced each of these points. The participants responded to safety issues through the design object, which they stressed were especially critical. However, they also hoped that the object would project beauty and joy, a lower-level, but still important focus.

Like before, these insights inform industrial design by showing the limits of a feminist lens, where a single feminist perspective doesn't identify and respond to every issue at once. In this case, this limit was intentional by addressing more critical issues first. However, it also shows that design objects can hold multiple layers of meaning and encourages designers to inject more complexity in products, especially positive undertones relating to beauty and joy.

It was mentioned above that Amanda and Sabina sought a grass-roots design idea. This preference is the focus of the paragraphs that follow. Specifically, this section focuses on the characteristics of a grass roots response. This type of approach was unusual to me and went against my instincts to create and distribute a product or collaborate with larger institutions, which are likely shared by most designers. This disjuncture is an area where feminism can inform industrial design. Engaging at the grassroots level supports feminism's emphasis on equality, community and self-determination; it shows a new context for design activities and the implementation of design objects that breaks down power dynamics in industrial design and can help design and design objects better support society and their users.

Amanda and Sabina wanted a design object that was easily implementable. During the individual design work, I developed a concept similar to the pink balls in Montreal's Gay Village neighbourhood, which I thought was feasible and relatively simple. However, it would

require collaboration with the city, which the participants thought was too difficult. This critique stresses the simplicity required in the design solutions; engaging with authorities at any level could be too difficult.

That said, the grass-roots solutions must offer a significant change and address the roots of a problem. This point came to light in the critiques of Amanda's idea to supplement existing signage. The participants decided the design wouldn't make a large difference and was only a Band-Aid solution. Since feminism doesn't encourage engaging with institutions and authorities, the power of a grass-roots solution can come from existing community resources like knowledge, facilities and community networks, aligning with feminism's emphasis on self-determination. Further, grass-roots solutions can be also highly organized. For instance, the participants suggested hiring an administrator.

Moving on, the design proposals had several additional characteristics. They were all relatively open-ended and user driven, which is likely related to feminism's emphasis on self-determination and freedom. Further, they respected users' diversity in accordance with Amanda and Sabina's intersectional feminist perspectives. For instance, Sabina proposed creating signage with symbols so people that don't read or don't speak English could understand. Each of these points offers an implicit critique to industrial design, as well as potential strategies to respect and empower users.

Like Betsy and Samara, Amanda and Sabina also injected people into the design solution. As mentioned above, the design ideas drew on people to execute them and were based on community resources. However, the participants also seemed to prefer design ideas involving actual people over a static object. Various team members proposed design ideas like a park bench or an app throughout the collaboration, but these were quickly vetoed and

replaced. This preference shows feminism's central interest in human beings. It seems to critique the separation between people and technology and could inform industrial design by encouraging design solutions that break down that barrier.

Last, one of the major discussions within this project related to the people involved in executing the design solution. I imagined that the community ambassadors would be volunteers. However, this was a point of contention with the participants. They believed that volunteer labour was exploitative and might limit who could participate, where people on a low income would need to focus their attention on paid employment. They were also concerned that the volunteers wouldn't be safe and could be attacked while doing their jobs. These concerns are directly related to feminism's emphasis on justice, safety, respect and class, in the case of this intersectional perspective. These concerns were surprising to me and could inform industrial design by challenging its conceptions of labour. It brings attention to people involved in all phases of a product's lifecycle beyond the designer and user, and stresses that these people should be well paid and safe.

9.2.3 Caveat. This project with Amanda and Sabina was difficult to analyse and the results above should be used with caution. As mentioned throughout this research project, people bring their own subjectivity to the design project like feminism, but also their other interests, expertise, values, etc. Both participants were new to Los Angeles and were urban planners working for the city. I suspect that these factors influenced the design project in fundamental ways, which makes it difficult to tell whether certain points of emphasis are based on feminism or these factors. It's possible that part of their concern for safety was based on unease in a new city, the design solution emphasising community and based on a service

instead of an object could be based on their work as urban planners, and their disinterest working with institutions like the city could be based on their professional experiences. As such, the results in this section won't be given as much weight in the broader research analysis, especially on these three issues, and the results of this co-design project will be checked against the other outcomes from the literature exploration and the other co-design projects.

9.3 Project with Ana, Wale, Ashley and Rocio

The feminism applied in this project is quite broad. It supported fairness and balance in society for women, and equality and diversity in a general sense, extending to issues like identity and culture. It stressed the need for individuals to find and be proud of their own path. It also emphasized the need for respect and protection of all populations. Ana's feminism was related to Latina and Chicana feminism and especially their queer orientations. Like the other co-design projects, feminism didn't dramatically change the conduct of the design activity. It simply modified its priority areas and certain features. These points of intersection and interaction pertain to a range of realms including practice, process and the design object, as well as the projects of production and use.

9.3.1 Design practice in the project and processes. Feminism's emphasis on respect, fairness and protection informed the design practice and, specifically, the relationship between the collaborators and I. Ana made sure this relationship was safe, empowering and non-exploitive of Ana, Wale, Ashley and Rocio . This was enabled and reinforced by a variety of strategies. The first was the vetting process, where I met with Ana and various members of Q

Youth for many hours and in a range of social situations before they accepted to collaborate. They were likely verifying my intentions and beliefs. The second strategy was using Ana as the primary contact and collaborator that would relay information back to Q Youth. Next, the group ensured give and take in our collaborative relationship. The co-design project benefited my research, but helped Q Youth in the competition. The project also took place on their terms. Finally, Ana's choice to host most of the design meetings at Ana's home further reinforced this power dynamic and protection. This situation offers an implicit critique of collaboration in design, which may not advantage participants as much as designers. Further, it provides a range of feminist-informed strategies to support fairer and more respectful collaborative dynamics.

Also on the subject of the co-design practice and processes, this project provided some critiques and proposals relating to their facilitation. Ana critiqued the business students' approach, which was rigid, inaccessible and non-responsive to Q Youth's needs. In contrast, Ana complimented my work: I was responsive to their needs and had the ability to break down systems, ask deep questions and explore the reasons behind things. In Ana's view, this was feminist because it was a grounded, organic, responsive and respectful process. Certainly, the business students' design processes were not representative of designers' collaborative processes. However, Ana's critiques could be applied to co-design processes as a warning. On the flip side, it's difficult to tell which of the positive aspects of my co-design processes were based on my skills as a designer, co-design norms and methods and/or feminism. However, once again, Ana's comments could be interpreted as a feminist preference for complex, systemic and organic design thinking and responsive and respectful co-design processes.

As during the other projects, I engaged in self-reflection throughout this co-design project. This likely enabled the responsive and respectful aspects of the collaboration. For instance, it guided moments when I could take the lead in the project, and other times when I should sit back and listen like during the second group meeting at Ana's home. This provides a feminist recommendation to industrial design; namely, for designers to engage in self-reflection throughout collaborative design projects.

Despite the different roles in the co-design project including Ana's leadership position and my role as a designer and facilitator, the group dynamic remained relatively equal. For instance, Ana checked back regularly with Q Youth and we only moved forward with a design idea if every group member agreed. This aligns with feminism's emphasis on equality and balance, but also the situation in the other co-design projects where collaboration was based on equality, but also the special skills and perspectives of each participant. It could inform industrial design and especially co-design processes by distinguishing between equality and sameness: each participant is equal, but brings their individuality to the team.

At the collaborative design thinking level, the design problem and solution revolved around the potential of individual activism to enable personal and social empowerment. Like the two previous co-design projects, this project emphasized feminism's dual focus on the individual and the collective and their dynamic where problems are located at the social level and the individual is the means for change. This focus and dynamic relates to feminism's broader human and social emphasis. Like the other projects, this approach to identifying and responding to problems could inform industrial design by guiding how industrial design understands problems in the social world and responds to these issues through design initiatives.

Finally, like with the other co-design projects, Ana, Wale, Ashley and Rocio seemed to enjoy the design processes and didn't provide any critiques or recommendations. This could be a sign that the methods applied in this project may already align with feminism and should continue in industrial design.

9.3.2 Object. This project provided many feminist insights on the design object, especially recommendations to align objects with feminism. Many of these insights mirror proposals found in the previous two co-design projects. For instance, the gift basket design responded to multiple levels of needs. This includes the clearly feminist goal to support and empower the individual and community. However, it also responds to the need for pleasure and happiness, which are implicitly rather than explicitly feminist. These dual points of focus are seen in the gift baskets' contents that include community resources and fun products. This situation informs industrial design: it shows that design objects can hold multiple layers of meaning and encourages designers to inject more complexity in products, especially positive undertones relating to fun and happiness.

Further, Ana preferred an inclusive design and one that provided users with choices and options. Ana also wanted an object that emphasized local contexts. This aligns with feminism's focus on independence, diversity, inclusion and culture and these preferences are exemplified in the gift basket contents. For instance, the gift baskets would include a range of objects including products made by local companies, and users could choose which objects they receive. These points of emphasis inform industrial design by highlighting areas of priority that should be addressed and incorporated in product design.

Next, while this project was guided by a queer feminism, it did not necessarily dismiss the feminine or aim for gender neutrality in products. As an example, scented candles, a highly feminine product, were a recurring design idea throughout the project. Instead, Q Youth appreciated the emotional value of this kind of product and elevated it to a position of respect. Like the project with Betsy and Samara, this situation hints that feminisms that disassociate womanhood from femininity don't reject femininity. Even queer feminism can still have and value many feminine traits. As a critique and proposal to industrial design, it prompts the recognition that design objects don't need to be devoid of gender, but they can be gendered provided it's done thoughtfully and respectfully.

9.3.3 Other projects. Although the gift basket design idea supported individual activism, it also had strong links to community, the actor dimension, during the production and use projects. First, the projects with Betsy, Samara, Amanda and Sabina drew on existing resources. The collaboration was based on the team members' skills and expertise and, in the case of the project with Amanda and Sabina, the design proposal drew on existing community resources. Similarly, the gift basket idea drew on Q Youth's strengths and resources; namely, their contacts and networks. On a related topic, the gift baskets would be filled by goods created by members or allies of the broader LGBTQIA+ community. Further, the gift baskets would empower individuals, enabling them to engage in community action and change. Finally, while the gift baskets would be sent to individual users, the /KWIR/ brand would create a community. These various links to community align with feminism's broad human and social focus and its apparent emphasis on grass-roots initiatives that empower the

community and rely on their expertise. This could inform industrial design by refocusing its levels of intervention and its goals.

Discussions surrounding labour, the actor dimension, were central throughout the project with Amanda and Sabina and were also present in this project. Ana wanted to create jobs through the production of the gift baskets and stressed that these jobs should be well paid and provide work to vulnerable populations, aligning with feminism's emphasis on fairness, inclusivity and diversity. The design concept also tied to the supply chain. The gift baskets would be filled with products from Queer friendly companies; these priorities align with feminism's emphasis on community, inclusivity and, possibly, culture. Like in the project with Amanda and Sabina, these concerns were surprising to me. I would likely have considered labour and the production of the design object during the project, but not so rigorously and they wouldn't have been central concerns. These different priorities informed by a feminist perspective could inform industrial design by challenging its conceptions of labour. Feminism brings attention to people involved in all phases of a product's lifecycle beyond the designer and user, and stresses that these people should be well paid and safe. The project with Ana could also encourage designers to be mindful of the specific people involved in the product's life cycle; namely, to provide good employment opportunities to members of the local community, vulnerable people and people supporting positive causes and values.

9.3.4 General insight. This section ends with a general insight on feminism's focus and scope in relation to industrial design. Specifically, Ana's interest in an accessible product was similar to Betsy and Samara's interest in a sustainable product. Recall that Betsy and Samara wanted an all-around sustainable product, but only after I mentioned it. Similarly, Ana stressed

that the gift baskets should include accessible products, aligned with the feminist principles of equality, respect and protection, but only after I asked. It could be true that feminism supports all around responsibility like Samara said and Ana just wasn't familiar enough with industrial design to identify and challenge issues of accessibility. However, this situation could also be an example of feminism's levels of priority. Feminism might place a higher value and emphasis on certain issues, despite its interest in all around responsibility. Relating to industrial design, a single feminist perspective wouldn't be able to provide an entirely encompassing critique and recommendation. Instead, feminist lenses would need to be combined, where each feminist perspective could bring something different. Further, feminism is sympathetic to a range of issues and could provide critiques and proposals on many topics, but it wouldn't place as much emphasis on peripheral issues like disability as a more targeted approach.

That said, unlike Betsy and Samara's peripheral interest in the environment, Ana wasn't particularly concerned with environmental issues. For instance, I suggested that the gift baskets could be packaged in reusable boxes, an idea that Ana didn't latch onto. This example shows not only feminism's focus and scope, but also its limits. Environmental issues may be peripheral in some feminisms, and not addressed in others. In terms of industrial design, this observation shows that a feminist lens may not provide critiques and proposals relating to all dimensions of sustainability.

9.4 Summary

I mentioned in the beginning of this chapter that the intersections between feminism and industrial design in the fieldwork data pertained mainly to the design project. Further,

feminism primarily guided industrial design activities and provided few explicit critiques. In this sense, most of the results from the participatory project-grounded research are feminist proposals to industrial design, insights into certain areas of priority and ideal approaches. This contrasts with the broad results from the literature analysis that directly addressed the intersections between feminism and industrial design at many levels including the epistemological and included both critiques and proposals. However, despite its more targeted focus, the participatory project-grounded research data has certain advantages over the literature analysis data, where the strengths of one help make-up for the weaknesses of the other. The fieldwork results represent real-life and contemporary feminism, address the real-life intersections between feminism and industrial design and provide in-depth data based on examples, rather than theory.

The pages above have highlighted a range of feminist critiques and proposals to industrial design based on feminist lenses in design. This conclusion section doesn't repeat these findings, but, instead, provides an additional level of analysis. It identifies common critiques and proposals across the co-design projects, as well as differences attributed to the context and the feminism applied in each project.

9.4.1 Common critiques and proposals. As mentioned at various points in this paper, feminism's core concepts are that sex and gender are significant factors in the social and political worlds, sex and gender are at the heart of social hierarchies and inequalities, and female sex and feminine gender are disadvantaged meaning that women are dominated (Chambers, 2013; Freeden, 1996). In response, feminism aims to eliminate the problems and inequalities that negatively affect women. When applied to industrial design at the concrete

level, feminism would be critical of issues like the inequality, injustice and oppression of women and provide responses to these situations. It would interrogate the relationships between sex, gender and design, seen, for example, in women's roles in the field, how designers develop products for female users and how design can perpetuate gender roles. Further, it could encourage an emphasis on women's and human experiences, as well as designer positioning throughout the project.

These generalizations are confirmed by the participatory project-grounded research data. The feminism in each co-design project was attentive to women's situations and needs at each level of the industrial design framework that the co-design projects directly addressed. This includes the female members of the design team, those producing the design object and the object's users. Issues like the inequality, injustice and oppression of women did not always take an obvious or basic form, but were identified in situations like disregard, disrespect and vulnerability. Feminism then responded to these issues through a range of strategies that sought to eliminate these problems and support women through factors like respect, empowerment, freedom and independence. Regardless of the feminist strand applied in each co-design project, the strategies tended to encourage critical reflection, innovation and a human focus in design and aligned their recommendations with traditionally feminine traits like understanding, compassion (Bem, 1974) and abstract feminine characteristics like process, dialogue and the whole (Wilshire, 1989). That said, feminism did not always critique industrial design. Instead, it sometimes pointed to existing aspects of industrial design that already aligned with its goals.

The following are the common critiques and proposals identified in the fieldwork data. First, while most of the intersections between feminism and industrial design pertained to the

design project, there was one consistent intersection external to the project; namely, the working environment, which falls in the practice external to the project category. Each co-design project stressed the significance of the working environment and the value of an empowering environment on the project where it could support and/or inspire the team members. That said, the characteristics of such an empowering environment might change from case to case. For instance the WCCW was empowering to participants in the first two projects and hosting the project at Ana's home was preferred in the third project. This provides an implicit critique of situations with a lack of attention to the working environment and its characteristics and a feminist-informed recommendation to industrial design: specifically, to pay attention to the working environment and to choose a space that would be empowering to team members.

At the practice in the project and process levels, the feminist perspective applied in each collaboration appeared to support the design activities I chose and facilitated. This includes the collaboration, the co-design tools and techniques inspired by Sanders and Stappers, design thinking based on problem setting, and the more traditional design methods like brainstorming and prototyping. Specifically, the participants enjoyed the equality and respect within the design team, my responsiveness as the designer and facilitator, the complexity and open-endedness of the design thinking, and the structure and productivity of the design methods. This provides an implicit critique of design activities that don't align with these criteria such as a hierarchal and patriarchal group dynamic and rigid and linear design thinking. It also encourages industrial designers to continue to engage with the activities applied in this project.

That said, feminism also provides some recommendations to enhance the design activities applied in this project. Most notably, feminism can inform group dynamics in co-design projects. While it supported an equal and respectful collaborative group dynamic, feminism also encouraged each group member to apply their individual perspective and expertise. The reflection on power dynamics must also extend to the broader social and historical situations that each group member is rooted in, and counter these power dynamics in the group interactions. In the project with Betsy and Samara this involved working with a female builder. In contrast, in the project with Ana, Wale, Ashley and Rocio this involved protecting themselves from my privilege as a white and apparently cisgendered researcher. Finally, feminism encourages each group member to engage in continual self-reflection about their role and position in the team.

In relation to the design object, feminism encourages products that support and empower the individual, believing that changes at an individual level can transfer to the broader social world. Further, feminism supports the individual's needs at multiple levels including concrete and emotional needs, as well as secondary needs like those pertaining to pleasure, fun and happiness. This offers an implicit critique of one-dimensional design objects geared to a broad and vaguely defined user group. As a recommendation, it encourages designers to pay attention to and support individual users, focusing on their personal needs at many levels. Design objects should also be complex, operating at many levels and holding a range of meanings including a support for pleasure, fun and happiness.

As an extension of this focus on the social world and the individual, two of the projects encouraged a grass-roots and community-oriented design solution that would be implemented by the local community and draw on their existing strengths and expertise and support the

local community and respond to their specific needs. This doesn't necessarily critique industrial design, but it introduces a different professional model that operates in a different context and at a different level and scale.

Feminism also appeared to support a user-driven and open-ended design object. These areas of priority offer an implicit critique against limited and patriarchal design objects that leave little space for user creativity and could encourage industrial designers to apply user-driven and open-ended characteristics in their creations.

Finally, feminism also engages with labour in the project of production. The feminist perspective in each co-design project was attentive to the people involved in producing the design object, although the focus varied from case to case. Though, two of the projects aimed to create good jobs through the production and execution of the design solution. This offers an implicit critique of industrial design that ignores production and labour issues. It also encourages industrial designers to critically reflect on these issues and not only avoid harmful practices, but actually support best practices in labour through the planning and production of their design objects.

Many elements of these projects aligned with topics often seen at the intersections of feminism and design. This was especially the case for contemporary topics like beauty, technology and DIY, where the projects generally aligned with current feminist attitudes toward these topics. For instance, while Amanda and Sabina were critical of beauty standards, many participants also sought beautiful products and those associated with personal care. Technology can be defined in different ways, for example, focusing on electronics or product design as technology. In keeping with many contemporary feminist attitudes, the participants seemed to have a positive view toward technology. They saw the promise of design as a

technology and weren't opposed to electronic technologies, although they didn't figure heavily into the projects. Finally, the frequent emphasis on grass roots design responses could be seen to align with underlying ideas in DIY, especially the idea of working outside large structures and institutions to effect change (Chidgey, 2014). That said, the projects didn't align with the full range of discussions related to these topics (e.g. a critique of Eurocentric beauty standards or differential access to technology). This is likely due to the focus and depth of the projects and the feminist perspectives represented within the groups.

9.4.2 Differences between the critiques and proposals. In contrast to these similarities, there were also some differences in the intersections between feminism and industrial design from case to case. Some of these differences could be attributed to the focus of each project or its level of development. For instance, the project with Betsy and Samara provided the most insights since it was the longest running project and the only project where the participants took part in the journaling exercise. Betsy's view that the initial group interview was an icebreaker that kick-started and facilitated the collaborative process might have been shared by other participants. However, it was not mentioned in the other projects. That said, other differences can be directly linked to the feminist perspective applied in each project.

Context is also an important factor when analysing feminism since the same feminist strand may take different forms in different time periods and places. Each project had the same basic context since they all took place around the same time and in Los Angeles. As such, the differences between the projects can be mostly attributed to the different feminist perspectives or other contextual issues external to feminism like the participant's backgrounds, interests, professional experiences or needs.

Beyond the core concepts shared by each feminist strand, different feminisms have different understandings of the concept of woman, the extent of the difference between women and men, the specific causes of inequality, and the changes that are needed to address inequality (Chambers, 2013; Goodwin, 2007). These differences are at the heart of the differences in the intersections between feminism and industrial design from case to case and the variations in feminism's critiques and proposals.

To begin, the different feminist perspectives informed the definition of the women that the feminist perspective was attentive to in the design collaboration, production and object use phases. The least postmodern and intersectional feminist perspective was present in the project with Betsy and Samara. Accordingly, this group focused on the needs of relatively non-diverse, female and feminine women. Amanda and Sabina held a significantly postmodern and intersectional feminist perspective and were concerned with the needs of diverse women in terms of gender, class, culture and language, as well as the needs of people generally. Finally, drawing on a queer Latina feminist perspective, Ana and Q Youth focused on the needs of queer and Latina women and queer and Latin/a people that don't identify as women or men. This emphasizes feminism's diverse intersections with industrial design that can vary from case to case. However, it can also encourage industrial design to critically examine and respond to its relationships with women and oppressed groups of people broadly defined, which is a process that has just begun to take place.

It was mentioned above that most of the feminist proposals drew on traditionally feminine traits. However, this was the strongest and most literal in the design object created during the collaboration with Betsy and Samara. The object's physical characteristics (e.g. colour) and aesthetic (e.g. warm and tactile) were distinctly feminine. Further, the object also

represented the female body. These especially pronounced female and feminine reference points could be based on the group's less postmodern perspective. These differences across the co-design projects stress that industrial design should better engage with the feminine and female at each level of the framework, and that the strengths of these relationships can vary from case to case. Perhaps diverse relationships with the female and feminine could respond to the variety of feminist perspectives.

Feminism's varying levels of radicality may also be apparent in the co-design projects, especially relating to the extent that the design solution resembled a typical industrial design object and was based on a traditional model of production. Betsy and Samara's feminism had certain similarities to liberal feminism, known to be a moderate perspective. Accordingly, they developed a relatively traditional type of design object and suggested producing it through a relatively typical model of production. In contrast, the other co-design projects were based on intersectional/postmodern and queer Latina feminism, which are likely more radical. It follows that their design solutions and models of production break from industrial design norms. Both groups proposed grassroots solutions with local applications. However, these different relationships between feminism and industrial design based on feminism's level of radicality would need to be confirmed through further research. This is especially because the untraditional design solutions in the second and third projects could also be attributed to Amanda and Sabina's professional background and Q Youth's needs. At this point, these insights don't provide a clear critique or recommendation to industrial design, but they could encourage industrial design to open up to and explore different professional models and kinds of outputs.

Finally, the fieldwork data also highlighted feminism's varying focus and scope. Beyond the basic concern for issues like inequality, injustice and oppression, each feminist perspective also put forward related concepts and points of focus like respect or protection. These additional concepts, their levels of emphasis and their levels of priority varied from case to case. Further, beyond these primary points of focus, feminism can also address related issues in the broader social world and even touch-on topics like the economy and environment, as mentioned earlier in this paper. However, feminism's scope differed between the co-design groups. In one case, it appeared to address this broader responsibility, but, in another, it focused on the social world and especially specific issues within it. This situation demonstrates the strengths and limits of a feminist perspective in industrial design. Specifically, its critiques and recommendations may not be entirely encompassing and respond to the range of issues that feminism could theoretically address. As such, industrial design may need to draw on a variety of feminist perspectives or combine feminism with other lenses to optimally identify and respond to social, economic and environmental issues.

9.5 Limits

I mentioned earlier that I was unsure whether some of Amanda and Sabina's ideas could be attributed to their feminist perspectives or to other experiences like being new to the city or working as urban planners. This issue was especially pronounced in that project, but came up throughout the participatory project-grounded research. It's hard to identify the inspiration for certain decisions and choices can likely be attributed to a range of factors. Further, the participants' definitions of feminism were very broad, often referencing big concepts and topics like openness, self-expression, self-determination, respect, identity and culture. As such,

critiques and proposals that I've attributed to feminism could also be related to a range of other factors and these broad concepts. Thus, the research results in this chapter should be used with caution. Further, I bring the results for Objectives 1 and 2 together in the next chapter. There, I rely more heavily on the literature analysis results, which are based on a narrower definition of feminism and include a more targeted discussion on the relationships between feminism and industrial design.

9.6 Conclusion

The discussion in this chapter responded to Objective 2. This adds to the results already presented in Chapter 7, which responded to Objectives 1 and 2. Although the responses to Objectives 1 and 2 have already been explored in detail, the results are discussed together in the chapter that follows.

Chapter 10. Overview of the Results for Objectives 1 and 2

Detailed results for Objectives 1 and 2 were presented in the previous chapters. This chapter does not repeat these results, but, instead, provides a meta-analysis and a more accessible overview of research results. It discusses the relationships between the results from the literature analysis and the participatory project-grounded research and their responses to Objectives 1 and 2. This chapter also summarizes feminism's critiques and proposals toward industrial design through visual representations.

10.1 Relationships Between the Literature Analysis and Participatory Project-Grounded Research Results

It was mentioned in the Methodology Chapter that the results from the literature analysis and the participatory project-grounded research could not be uncritically combined given methodological differences between the strategies. They also don't provide a singular response to the research question. However, each explored feminist critiques and proposals toward industrial design, and the research strategies complement each other by providing different perspectives.

As suggested earlier, the strengths of one strategy help compensate for the limits of the other. For instance, the intersections between feminism and industrial design in the fieldwork data pertained mainly to the design project. Further, feminism primarily guided industrial design activities and provided few explicit critiques. In this sense, most of the results from the fieldwork are feminist proposals for industrial design, insights into certain areas of priority and ideal approaches. This contrasts with the broad results from the literature analysis that directly

addressed the intersections between feminism and industrial design at many levels including the epistemological and included both critiques and proposals. However, despite its more targeted focus, the participatory project-grounded research data has certain advantages over the literature exploration data. Namely, the fieldwork results represent real-life and contemporary feminism, address the real-life intersections between feminism and industrial design and provide in-depth data based on examples, rather than theory.

Given this complementarity between the results from the research strategies, it seems appropriate to cautiously search for broader trends and similarities across the results.

To begin, all of the results from the literature analysis respond to Objective 1 – to identify the content of feminism's critiques and proposals toward industrial design when it's applied as a lens on design. Similarly, all of the results from the fieldwork respond to Objective 2 – to identify the content of feminism's implicit critiques and proposals toward industrial design when it's applied as a lens in design. That said, certain works from the literature analysis are examples of a feminist lens in design and can also respond to Objective 2.

There are certain trends in the results for Objective 2. In both the literature analysis and the fieldwork, the feminist lenses in design tended to focus their critiques and proposals at the design project and object reception levels. This makes sense, considering the topics naturally encountered in design activities and in work that applies a feminist lens in design.

However, there aren't many other characteristics that link the results for Objective 2 and distinguish them from the results for Objective 1. This follows because feminism's operations tie back to its core concepts and the broader movement, as noted in the theoretical framework and reiterated at several points. As such, there wouldn't be significant differences

in feminism's critiques and proposals toward industrial design linked solely to feminism's application on or in industrial design. It also wouldn't be appropriate to look for these differences, as they wouldn't necessarily be representative. Instead, differences could be more strongly linked to factors like time period and feminist perspective. For instance, in both the literature analysis and the participatory project-grounded research, examples of a feminist lens applied in design are relatively recent and apply to relatively contemporary feminisms.

At this point in the research project, it might normally be appropriate to bring together the results for Objective 2 and summarize the results for Objectives 1 and 2 separately. However, the context described above shows that this approach isn't particularly relevant. As such, the remainder of this chapter focuses on a synthesis and meta-analysis of feminism's critiques and proposals toward industrial design irrespective of the application of feminism on or in industrial design.

Looking at the results together also helps moderate some of the limits of the participatory project-grounded research discussed toward the end of the last chapter. I am able to look for trends across the data, rather than relying too heavily on the results from this phase of the project. During this synthesis, I also focus more strongly on the literature analysis results.

10.2 Summary of Feminist Critiques and Proposals Toward Industrial Design

This section looks for broader trends across the data and studies critiques and proposals that came up several times or align closely with other arguments.

Collectively, the research results confirmed the hypotheses in the theoretical framework about feminism's implications for industrial design. They also expand on these initial hypotheses, as demonstrated in Chapters 7 and 9 and in the discussion that follows.

Looking at the critiques and proposals as a whole, it appears that the problems feminist perspectives find with industrial design are systemic; they are based on common and consistent issues that simply materialize differently in different contexts. These systemic problems include: the presence of power and masculinity, unequal power dynamics between people and negative situations facing women. Feminism identifies incarnations of these problems at the range of levels in the industrial design framework.

In turn, feminist perspectives respond to these issues through proposals at the multiple levels of the industrial design framework. That said, feminist perspectives appear to prefer grass-roots proposals relying on actor interventions that typically draw on women's perspectives and/or feminist perspectives. These actors could include designers, users or other individuals involved in a stage of the design project or subsequent projects.

These broader trends across feminist critiques and proposals toward industrial design are illustrated in Figures 10.1 and 10.2. The figures show the system and context behind feminist critiques of and proposals for industrial design respectively. The letters A-L on the figures refer to specific critiques and proposals at various levels of the industrial design framework that align with the broader trends mentioned above. Table VI, which appears after the figures, includes a list of these critiques and proposals organized based on this lettering system. Letters A-L in the table refer to specific points on the figures.

However, despite these broader trends, feminism's diversity and context specificity means that there are differences across the results and caveats to the generalizations above.

First, most of the feminist proposals involve drawing on women's perspectives and/or feminist perspectives. That said, cultural feminism, eco-feminism and, generally, less postmodern feminisms tend to characterize a women's perspective, something that other feminisms don't typically do. It was noted in Chapters 7 and 9 that these women's and feminist perspectives often have links with the feminine. That said, the links between women's perspectives and feminist perspectives and the feminine were especially pronounced in cultural, eco- and less postmodern feminisms.

Similarly, different feminist perspectives also informed the definition of women, the point of focus of many feminist critiques and proposals of industrial design. As an example, intersectional feminisms were concerned with the needs of diverse women working in design or using design products, whereas cultural feminisms focused on relatively non-diverse, female and feminine designers and users.

Beyond the basic concern for issues like inequality, injustice and oppression, different feminist perspectives understood the causes of these issues in different ways and some put forward additional points of focus. These additional concepts, their levels of emphasis and their levels of priority varied from case to case. For instance, eco-feminism has a relatively strong emphasis on the environment, socialist feminism is concerned with the economic world and third wave and intersectional feminisms are concerned with the needs of women and other disadvantaged populations.

Varying levels of radicality were also present in the data and impacted the depth of interrogation and the extent that the proposals were similar to the status quo. More radical feminisms tended to interrogate industrial design at more abstract and deep-rooted levels and likely inspired more extensive and different proposals.

Feminisms coming from different places seemed to have relatively similar arguments, although they might draw on different examples or have different points of focus. That said, there are differences between the feminist interventions in industrial design coming from different time periods. The work tended to apply the dominant feminist strands of their time, which impacted their perspective and approach to industrial design. There was also an evolution in thinking where the newer work expanded on earlier feminist work and reacted to changes to industrial design over time.

Certain of these differences are represented in the figures and table that follow. However, others should simply be kept in mind. Take, for example, the proposal to inject women into industrial design as active, empowered, recognized and respected actors that work from their point of view as women and/or as feminists in Table VI. The definition of women; the characterisation of a women's point of view or a feminist point of view; and the preference for women to work from their point of view as women or as feminists would vary depending on the feminist perspective.

Regardless of these caveats and precisions, I recognize that this synthesis of research results can be seen to decontextualize the results and skims over the links and contradictions between arguments and perspectives. However, there are often links between feminist arguments at certain levels, despite their incredible diversity. In my view, identifying some of these commonalities, especially with respect to their relationships with industrial design, can help communicate feminism's potential contributions. This is especially valuable when drawing on feminist insights for industrial design theory and practice or reaching out to the broader industrial design community. I mentioned bell hooks' call to make feminist thought

accessible to a range of audiences through **"[**m**]**ass-based feminist education for critical consciousness" in Chapter 5 (2015, p. 113). Related to this point, hooks (2015) also said:

> Most feminist thinkers/theorists do their work in the elite setting of the university. For the most part we do not write children's books, teach in grade schools, or sustain a powerful lobby which has a constructive impact on what is taught in the public school. I began to write books for children precisely because I wanted to be a part of a feminist movement making feminist thought available to everyone. (p.13)

The summary that follows is my attempt to help make feminist thought on industrial design more accessible and communicate its valuable contributions.

In terms of **critiques**, feminist perspectives identified systemic problems in industrial design based on certain common and consistent issues. These appear at the multiple levels of the industrial design framework, but can materialize differently at different levels and in different contexts.

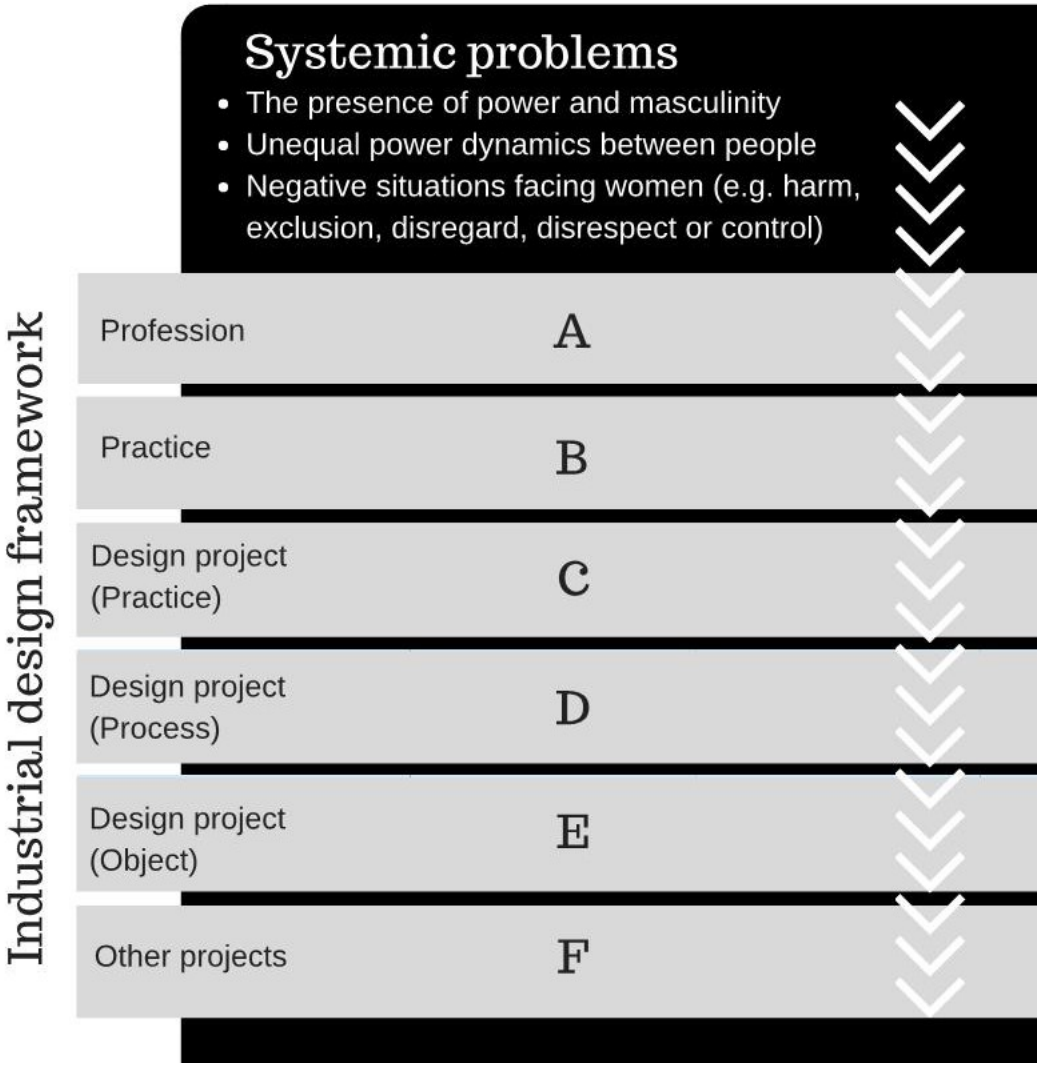

Figure 10.1. System and context behind feminist critiques of industrial design.

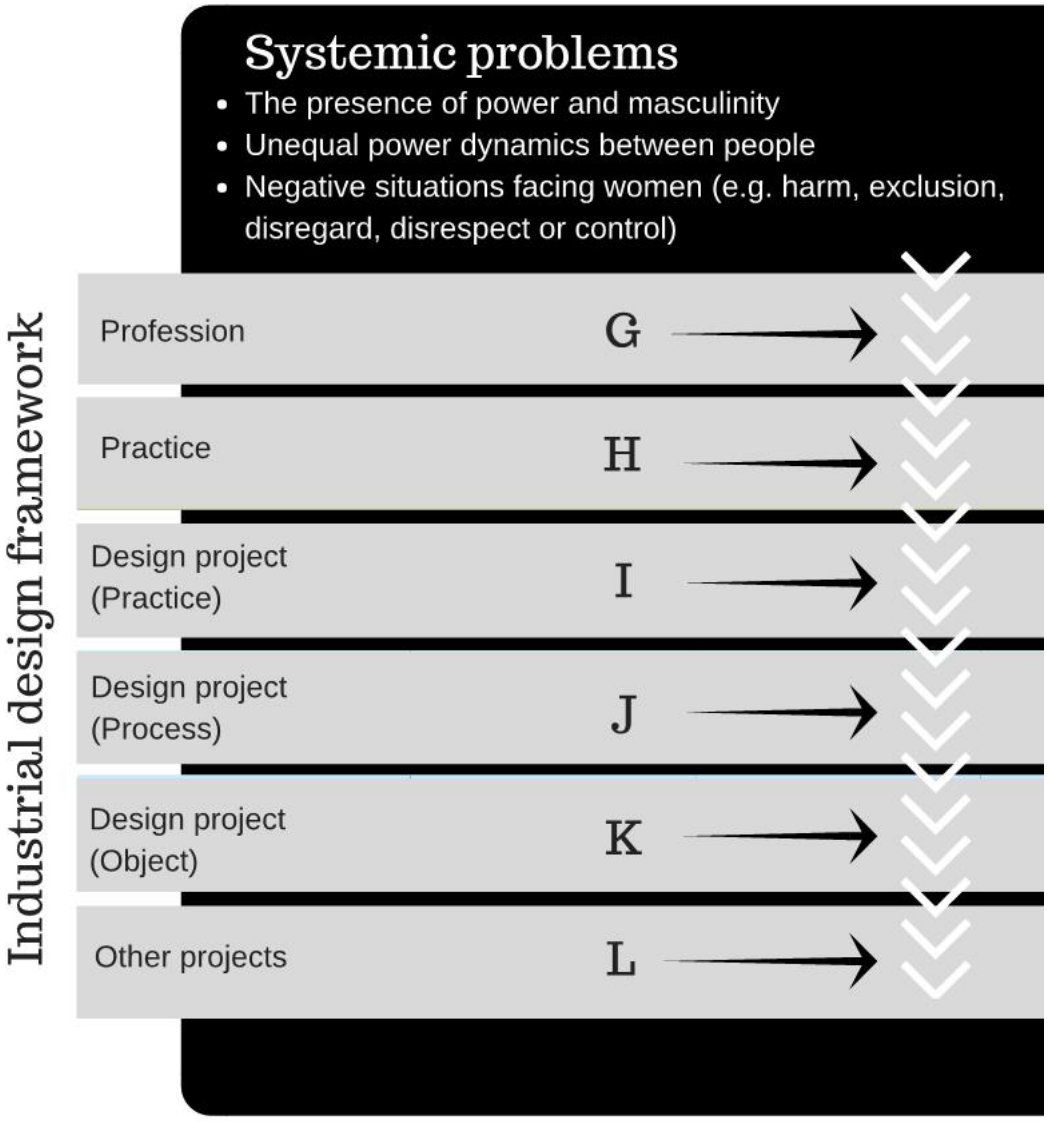

Figure 10.2. System and context behind feminist proposals for industrial design.

Table VI: *Summary of the Feminist Critiques and Proposals toward Industrial Design*

Critique	Proposal
A: Profession	**G: Profession**
• Industrial design's rooting in modernism • Industrial design's rooting in the marketplace (this critique can be more or less extreme depending on the feminism applied) **Specific to eco-feminism** • Industrial design's relationships with the military and corporations	• Realignment of industrial design toward postmodernism • Realignment of industrial design toward social and sustainability concerns
B: Practice	**H: Practice**
• The power and masculinity present in industrial design does not leave a clear place for female design professionals and can make female designers feel uncomfortable in their roles • This also applies to other projects and institutions in the design community like design scholarship and design	• Inject women into industrial design as active, empowered, recognized and respected actors that work from their point of view as women and/or as feminists • Support these women through affirmative action and targeted professional associations and competitions

education	• Design scholarship including design history should focus on women in design and their interests and experiences, and apply feminist methods • Change the focus and content of design education to include more feminine and feminist content
C: Project (practice)	**I: Project (practice)**
• The power and masculinity present in industrial design does not leave a clear place for female design professionals and can make female designers feel uncomfortable in their roles	• Inject women into industrial design as active, empowered, recognized and respected actors that work from their point of view as women and/or as feminists • Work outside traditional professional and consumer structures • Engage in self-reflective, non-hierarchal interdisciplinary collaborative work
D: Project (process)	**J: Project (process)**
• Rigid and linear design thinking • Hierarchal and patriarchal group	• Apply design thinking based on problem setting

dynamics in collaboration • Reliance on technology like computers and hand-tools	• Apply methods like user research, co-design and participatory design, inclusive design and critical design • Interrogate and modify existing design methods based on feminist perspectives • Co-design should involve an equal and respectful collaborative group dynamic where each group member applies their individual perspective and expertise • Engage in self-reflection about power and position throughout co-design projects • Embrace new technologies like 3D printing and define their meaning based on feminist perspectives • Pay attention to the working environment and choose a space that would be empowering to the design team
E: Project (object)	**K: Project (object)**

• Design objects created for a 'typical' male user and based on masculine aesthetics • Design objects geared to a broad and vaguely defined user group • Design objects that ignore female users and their needs • Design objects that perpetuate unequal social dynamics • Design objects that gender or sexualize women outside their own terms • One dimensional design objects • Design objects that limit users' creativity **Specific to socialist feminism** • Design objects that perpetuate and enable an economic system that controls or exploits women	• Create products for female users and base these designs on a thoughtful and respectful reflection on gender and user needs • Pay attention to and support individual users, focusing on their personal needs at many levels • Produce feminist technology, which conforms to and helps further feminist politics • Create complex objects that operate at many levels and hold a range of meanings including a support for pleasure, fun and happiness • Create user-driven and open-ended design objects • Create grass-roots and community-oriented design objects that can be implemented by the local community, draw on their existing strengths and expertise and support the local community and respond to their

	specific needs
F: Other projects	**L: Other projects**
• These systemic issues and broader feminist concerns are present in the range of other projects like marketing • Unfair labour in projects like manufacturing or sales	• Feminism in industrial design doesn't address issues in other projects like marketing, leaving an opening for initiatives in other fields • Support best practices in labour • Create good jobs through the production and execution of the design solution • Acknowledge and embrace women's agency and power where users can interpret and employ design objects in their own ways • Support user-driven design and design processes like 3D printing

10.3 Relationships Between Research Results and the Theoretical Frameworks on Feminism

These results tie back to the initial theoretical frameworks discussing feminism and feminist perspectives in industrial design. They relate directly to feminist concepts and theories on power, sex, gender, gender roles, experience and situated knowledge. Feminism also intersects with design in ways proposed in the theoretical framework. Namely, it:

- Highlights universal and masculine knowledge and encourages the incorporation of multiple perspectives in knowledge construction including women's perspectives
- Highlights and addresses situations involving the inequality, injustice and oppression of women
- Interrogates relationships between sex, gender and design, including design's role as a technology of gender
- Encourages a greater focus on women's and human experiences and the people involved in design
- Encourages user involvement in design, and
- Encourages designers to position themselves and deeply consider this positioning throughout their work.

However, the research results also push this framework further. They show the systemic nature of issues facing design, as well as feminist approaches to addressing these issues; namely, grass-roots interventions. The research results also add additional detail to each point in the theoretical framework. For example, they illustrate how design can operate as a technology of gender (e.g. through its theories, working environments and conceptions of female users) and how design can be reframed. They also expand on the relationships between design and women's and human experiences, showing, for instance, the many people involved in design, how user needs can be better addressed and how design teams can be structured. Finally, the results also introduce new dimensions to the framework. This includes important discussions on sexuality and aesthetics at the intersections of feminism and industrial design.

Similarly, the research results addressed many of the broad topics often explored in feminist work on design: the gendered nature of space, domesticity, beauty, technology, DIY

and craft. The results often aligned with broader approaches to these topics related to time period and feminist perspective (e.g. the more positive view of technology in contemporary feminism) and could contribute to these broader discussions. For instance, they could help add additional nuance to the discussion on technology and help position craft in relation to other creation activities and professional fields. Looking beyond these specific topics, the research results also point-out additional topics for exploration such as feminist working groups, working environments and design objects.

Following this extensive discussion of the results for Objectives 1 and 2 in the past few chapters, the chapter that follows explores the research results in relation to Objectives 3 and 4.

Chapter 11. Results for Objectives 3 and 4

The chapter that follows addresses Objectives 3 and 4, which examine the relationships between feminist interventions in industrial design and design for sustainability. Objective 3 aims to understand the relationships between feminism's interactions with and contributions to industrial design and design for sustainability processes and goals and Objective 4 aims to identify the unique insights feminism's interactions with and contributions to industrial design can provide to design for sustainability theories and practices.

There is no new data collection at this stage. Instead, the response to Objectives 3 and 4 is based on further analysis of the results from the literature analysis and co-design projects. This process involves examining how and to what extent feminism's critiques of industrial design and its proposals for change contribute to sustainability goals. This is based on a comparison between feminism's critiques and proposals and a sustainable development framework (see Appendix 1).

This analysis is the focus of the first section in this chapter. This is followed by a discussion about how feminism's support for sustainable development goals translates to the support for design for sustainability goals and, finally, a direct response to Objectives 3 and 4.

11.1 Relationships between Feminist Critiques and Proposals and Sustainable Development Goals

This section compares feminist critiques and proposals toward industrial design, summarized in Figures 10.1 and 10.2 and Table VI in the previous chapter, with the sustainability framework presented in the LCSDSN report (2015). The critiques and proposals are analysed

with respect to their level of support for the sustainable development goals in the report. The indicators for each goal enable this evaluation.

In some cases, the analysis also draws on more specific critiques and proposals mentioned in Chapters 7 and 8. This happens when certain critiques or proposals have an especially unique and striking relationship with sustainability. There is a note in the text when the review moves beyond the data summarized in Chapter 10.

11.1.1 Critiques and proposals dealing with employment and labour. To begin, feminism's emphasis on employment and labour in relation to design professionals and other people involved in the design project and subsequent projects support a range of sustainable development goals in relation to social and financial concerns. This relationship is illustrated in Figure 11.1.

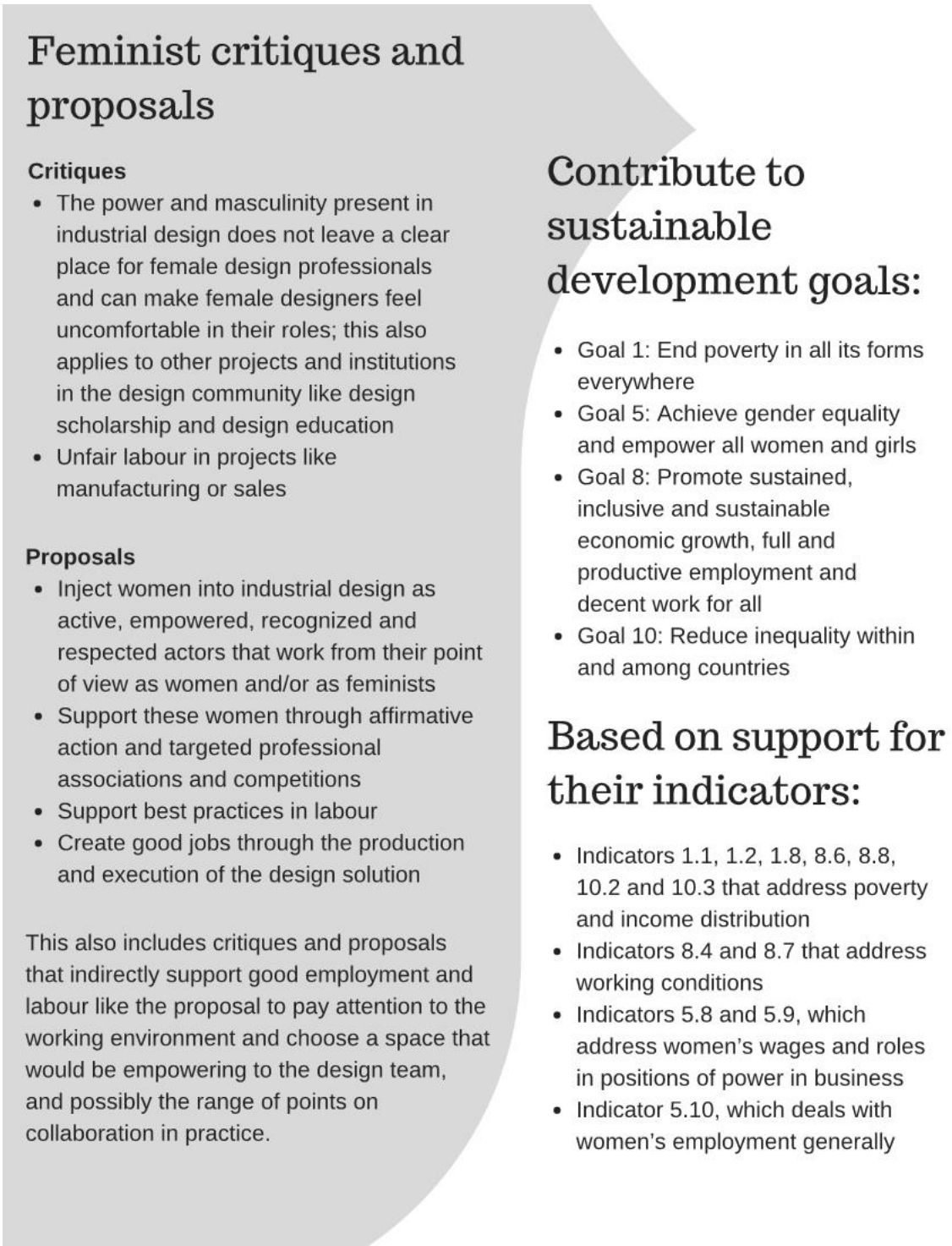

Figure 11.1. Relationships between feminist critiques and proposals on employment and labour, and sustainable development goals aligned with social and financial concerns.

In each case, these feminist-informed critiques and proposals contribute to the sustainable development goals based on their support for some of their indicators. Thus, these feminist critiques and proposals could have a large impact if broadly applied in industrial design. Though, there would need to be similar initiatives and changes in other fields and areas of concern to completely fulfil their objectives. Further, each sustainable development goal has other indicators not addressed by the feminist interventions in industrial design. In most cases, these additional indicators are outside the reach of industrial design and relate to areas like law, medicine and politics.

11.1.2 Critiques and proposals dealing with employment, labour and users. Feminist interventions in industrial design also respond to a specific dimension of sustainable development goal 17: strengthen the means of implementation and revitalize the global partnership for sustainable development. This goal includes a broad range of indicators, with many outside the scope of industrial design. The exception is indicator 17.6 evaluative wellbeing and positive mood affect, which has the goal to satisfy the measurements in a framework. The LCSDSN report notes that this indicator addresses "an individual's overall satisfaction with life" (2015, p. 208). There are a variety of frameworks to measure wellbeing and mood that, most notably, include the Cantril Self-Anchoring Striving Scale and an evaluation of daily mood (LCSDSN, 2015). The Cantril Scale asks participants to rank their life satisfaction from 1-10 (LCSDSN, 2015).

The feminist-informed critiques and proposals pertaining to employment and labour described in the section above would likely contribute to fulfilling this indicator. Specifically, the working conditions and experiences of design professionals and other people involved in

the design project and subsequent projects would likely figure into their life satisfaction and mood.

Further, the range of critiques and proposals that address users and the relationships between design processes, the design object and users would also contribute to this indicator and its objectives. Recognition of areas where design and design objects harm or restrict users and proposals to these issues would likely enhance users' life experiences and mood. The relationship between these feminist critiques and proposals and sustainable development Goal 17 are illustrated in Figure 11.2.

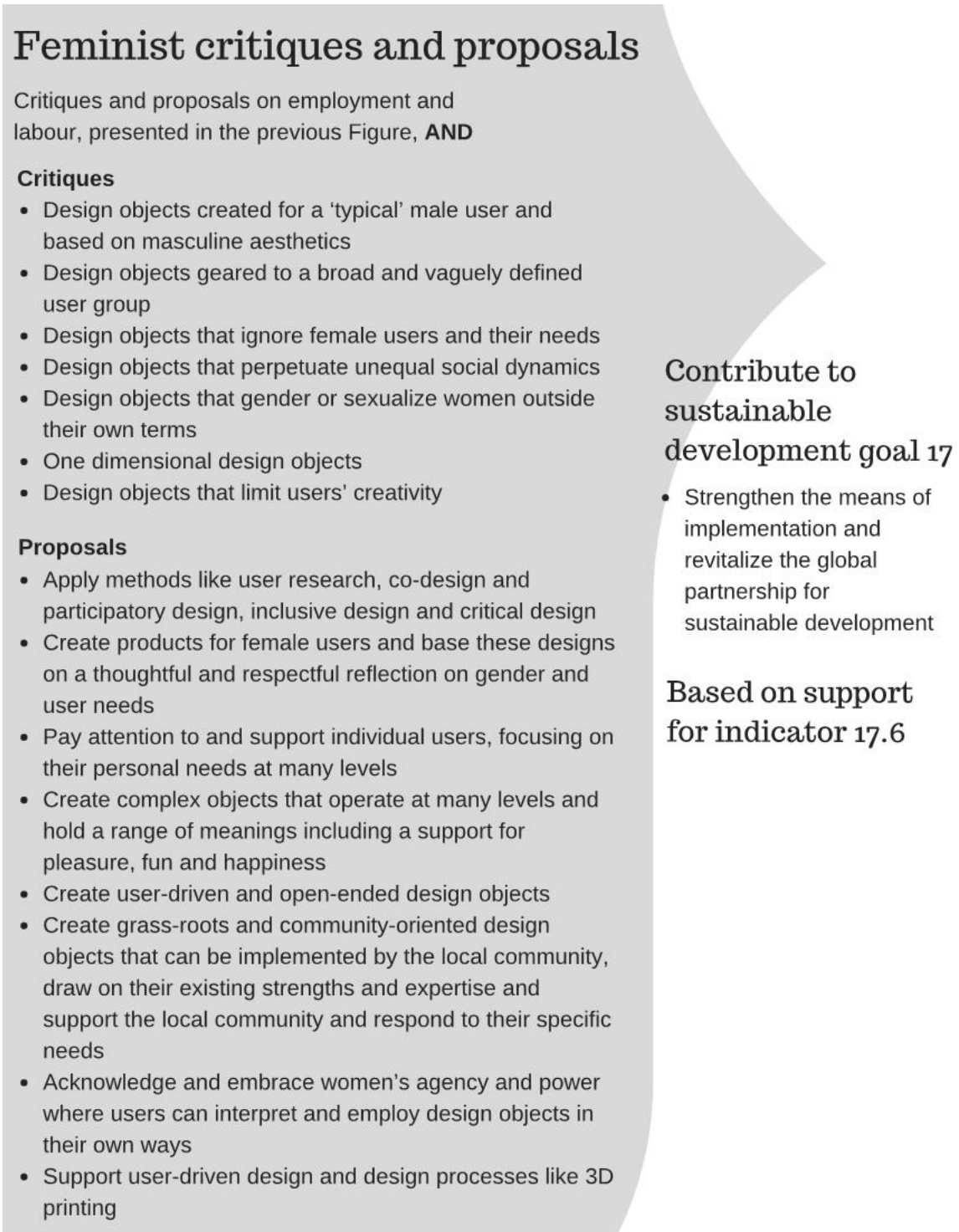

Figure 11.2. Relationships between feminist critiques and proposals on employment, labour and users, and a sustainable development focus on life satisfaction.

These feminist-informed critiques and proposals that contribute to fulfilling indicator 17.6 would have a large impact if broadly applied in industrial design. Though, there would need to be similar initiatives and changes in other fields and areas of life to optimally enhance wellbeing and mood.

11.1.3 Critiques and proposals dealing with realignments at the professional level. The relationships between the feminist interventions in industrial design and sustainable development described in the sections above were relatively concrete and direct. In contrast, this section and the sections that follow focus on the relationships at a more theoretical and indirect level.

To begin, feminism encourages a realignment of industrial design at the professional level. This includes critiques of industrial design's rooting in the marketplace and its proposal to realign industrial design toward social and sustainability concerns. Such a change at the professional level would filter through the industrial design framework and is likely already represented in the range of feminist critiques and proposals at each level. In this sense, these professional changes are related to and possibly help drive feminism's relationships with sustainable development described in the sections above; namely, its impact on social and financial goals tied to employment and labour and its support of wellbeing based on changes to employment and user experience.

That said, these professional changes would also impact how designers work, a factor not yet addressed in this discussion. It could encourage designers to make further changes to industrial design at the various levels of the framework. For instance, this could include developing new processes and new criteria for design objects. This could also impact the kind

of projects they take on and the design objects they create where designers guided by a social and sustainability focus could address the range of sustainable development goals including issues like water management and sanitation (goal 6) or even marine resources (goal 14) through their projects and design objects. In this sense, a realignment of industrial design at this professional level could theoretically help support each sustainable development goal. The relationship between these feminist critiques and proposals and sustainable development is illustrated in Figure 11.3.

This feminist informed realignment at the professional level would have a large impact if thoroughly and broadly applied in industrial design. Though, there would need to be similar initiatives and changes in other fields and areas to optimally enhance sustainable development.

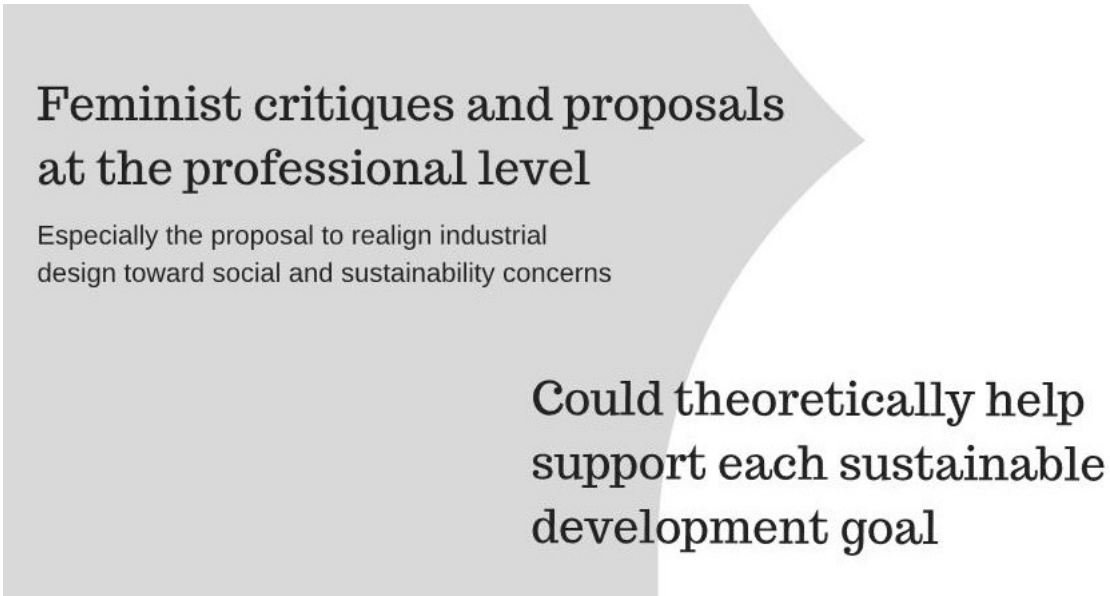

Figure 11.3. Relationships between feminist critiques and proposals at the professional level, and the range of sustainable development goals.

11.1.4 Proposals encouraging designers to work from their point of view as women and/or as feminists. This section also centres on the relationships between feminist informed changes to the way designers work and sustainable development. Feminism encourages designers/female designers to work from their point of view as women and/or as feminists. Beginning with the proposal to work from a feminist perspective, the theoretical framework in Chapters 3 and 4 described the potential relationships between feminism and sustainability, which are mostly supported by the research results (this relationship will be explored in detail later in this chapter). Designers working from a feminist perspective would likely support sustainable development goals in a similar way to designers working from a social and sustainability focus described earlier. Specifically, a feminist lens could encourage designers to make changes to industrial design at the various levels of the framework and could also impact the kind of projects they take on and the design objects they create. In this sense, a feminist lens in design could theoretically help support each sustainable development goal. This relationship is illustrated in Figure 11.4.

The application of a feminist lens in design would have a large impact if thoroughly and broadly applied. Though, it would need to be accompanied by other initiatives in other fields and areas to optimally address sustainable development.

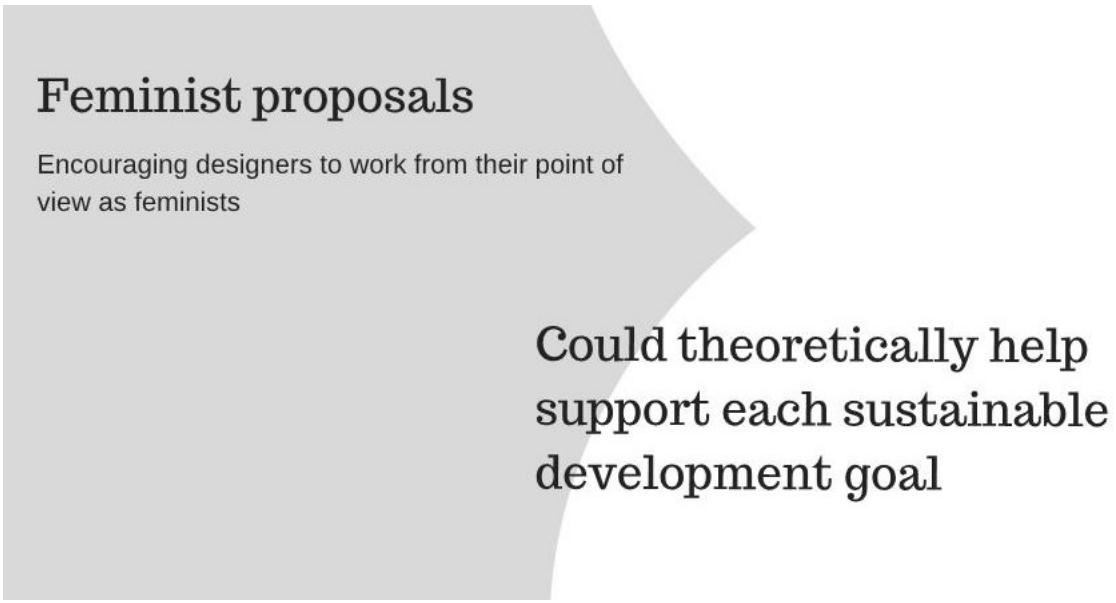

Figure 11.4. Relationship between the feminist proposal for designers to work from their point of view as feminists, and the range of sustainable development goals.

Next, the feminist recommendation that female designers work from their point of view as women could impact sustainable development in several ways. This specific relationship would depend on an individual's point of view and would be contested within feminism itself. First, most feminisms would agree that female designers may be especially able to design good products for female users because of a shared experience at some level. In this sense, a women's perspective in design could align with indicator 17.6 on wellbeing and mood by producing good products for female users. Further, this women's perspective could also guide the kind of projects designers take on and the objects they create. This could contribute to the range of sustainable development goals and indicators that address women's issues.

The application of such a women's perspective in design would have a large impact if it were broadly applied. Though, it would need to be accompanied by other initiatives in other fields and areas to optimally address sustainable development.

In contrast, certain feminisms, especially cultural feminisms would characterise a women's perspective and associate it with the feminine. In turn, the feminine has links to sustainability. Its emphasis on issues including community, complexity, collaboration and care has links to society and a general responsibility. As such, working from a women's and a feminine perspective would likely support sustainable development goals in a similar way to designers working from a social and sustainability focus and a feminist perspective described above. Specifically, a responsible and caring feminine perspective could encourage designers to make changes to industrial design at the various levels of the framework and could also impact the kind of projects they take on and the design objects they create. In this sense, a feminist lens in design could theoretically help support each sustainable development goal.

The application of a women's and a feminine lens in design would have a large impact if thoroughly and broadly applied. Though, it would need to be accompanied by other initiatives in other fields and areas to optimally address sustainable development.

These various relationships between the proposal for female designers to work from their point of view as women and sustainable development goals are represented in Figure 11.5.

Figure 11.5. Relationship between the feminist proposal for female designers to work from their point of view as women, and a variety of sustainable development goals.

11.1.5 Eco-feminist critiques and proposals. Specific feminist perspectives also have different relationships with sustainable development. The most obvious example is eco-feminism. It was mentioned only once in the summary table, but it offers a range of critiques and recommendations described in Chapter 7. Eco-feminism is critical of industrial design's relationships with the military and corporations. It argues that industrial design should be re-aligned with human needs and environmental protection, a proposal also seen in the feminist work in industrial design more broadly. It also encourages female designers to inject their perspectives in their practice, a process that could drive more socially and environmentally conscious design.

Eco-feminism's particular emphasis on environmental consciousness in industrial design could respond especially directly to environmentally focused sustainable development goals. This could happen through eco-feminist informed changes within industrial design and an eco-feminist focus in industrial design projects. Namely, eco-feminist proposals at the professional level could filter through the various levels of industrial design and address sustainable development goals by minimizing environmental strain and degradation caused by design manufacturing and the use of design artefacts. Further, its intersections with industrial design at the project level could potentially address the range of sustainable development goals with environmental dimensions through targeted product and service design. These relationships between eco-feminist critiques and proposals and environmentally oriented sustainable development goals are illustrated in Figure 11.6.

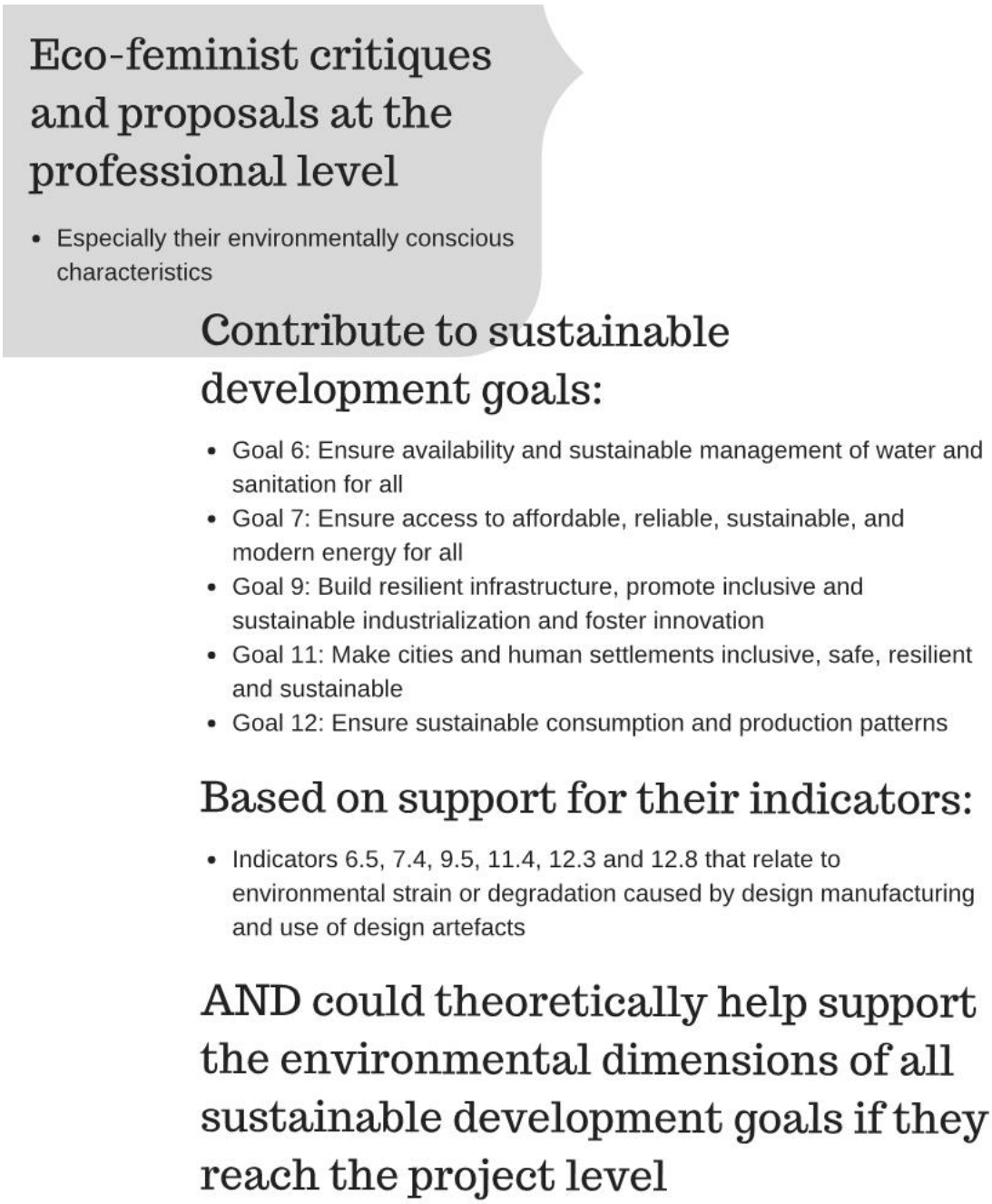

Figure 11.6. Relationships between eco-feminist critiques and proposals, and environmentally oriented sustainable development goals.

These eco-feminist-informed critiques and proposals would have a large impact on sustainability if broadly applied in industrial design. Though, there would need to be similar initiatives and changes in other fields and areas of concern to completely fulfil their objectives.

11.1.6 Potential exceptions. Combined, this analysis showed that the vast majority of feminism's critiques and proposals toward industrial design listed in the summary table support sustainable development in some way. This is likely also the case for the range of feminist critiques and proposals toward industrial design discussed in Chapters 7 and 8. Certain critiques and proposals in the summary table were not mentioned in the sections above because they represent a more complex or less obvious relationship to sustainability. However, they are not necessarily exceptions to the relationships between feminism's critiques and proposals and sustainable development, as will be discussed in this section.

The first example is the feminist critique of technology like computers and hand tools, which could potentially hinder sustainability initiatives that rely on these technologies. Take, for example, goal 14: conserve and sustainably use the oceans, seas and marine resources for sustainable development. This initiative surely involves the use of monitoring technologies and computers. However, the resolution to this feminist critique involves actions like redefining the meaning of technology or introducing new, more empowering technologies to industrial design. These recommendations generally support indicator 17.6: evaluative wellbeing and positive mood affect. Further, they don't involve eliminating technologies and wouldn't hinder other sustainability initiatives.

The next case is more complex. A feminist-informed recommendation to address industrial design's rooting in the marketplace was to work outside traditional professional and consumer structures. This would change the very foundations of industrial design and its position in the current economic system. Industrial design has always been a strategy for economic development, which was seen to provide a competitive advantage to companies (Er, 1997). As an example, the Indian government was interested in design's role in their industrialization process and economy (Fathers, 2012). As part of this process, they consulted with Ray and Charles Eames in 1958 who proposed establishing a design education program (Fathers, 2012). The government did just that in the 1960s with the establishment of the National Institute of Design (Fathers, 2012). Similarly, in the 1970's the United Nations held a conference to explore how design could be employed in development; a major conclusion was to establish design training throughout the developing world (Fathers, 2012). Although the development program has been replaced by sustainable development over time, sustainable development remains founded on the development model of the 1950s and 1960s. Changing the structure of industrial design and moving away from its traditional professional and consumer structures could have a negative economic impact and hinder sustainable development goals 1, 8, 9 and 10.

- Goal 1: End poverty in all its forms everywhere
- Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
- Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- Goal 10: Reduce inequality within and among countries

That said, the feminist recommendation for industrial design to move away from traditional professional and consumer structures has similarities to the concept of post-development. A brief introduction to post-development follows, before returning to its implications for the feminist recommendation to industrial design and its relationship with sustainability.

To begin, a range of feminist and postcolonial literature has interrogated the structures behind development. They explain that the concept of development is based in the European/Western knowledge system. In *Is Science Multicultural? Postcolonialisms, Feminisms, and Epistemologies*, Sandra Harding explained that the European/Western knowledge system is directed by three major cultural elements as follows: 1) it relies on Christian laws of nature that emphasise authority and absolutism, and hold that statistical regularities can describe nature; 2) it views itself as universal and superior, which drove its colonial history; and 3) it aims to maximize value neutrality, which is itself a European cultural value (1998). Based on these ideals, European knowledge systems dominate, devalue and seek to replace other local knowledge (Harding, 1998). To this end, they employ tactics like authority and management; control over access to knowledge and benefits from knowledge; and non-recognition of alternative perspectives (Harding, 1998).

Being based in this knowledge system, development can be seen as inherently ethnocentric and paternalistic (Escobar, 1995). It has identified "archaic superstitions and relations" in the Third World (Escobar, 1995, p. 39) and created "'abnormalities' (such as the 'illiterate', the 'underdeveloped', the 'malnourished', 'small farmers', or 'landless peasants'), which it would later treat and reform" (p. 41). This harmed the independence and culture of the Third World (Escobar, 1995).

The literature also traces the history of development and explains that the development programme began much earlier than is typically recognized. Specifically, development can be traced back to the colonial period (Craggs, 2014). European countries developed their colonies to serve their interests (Craggs, 2014). For instance, they aimed for improved infrastructure for trade and settlement, greater economic output and improved health of colonists abroad (Craggs, 2014). There was a move toward a humanitarian form of development in the late nineteenth and early twentieth centuries (Craggs, 2014). This helped to affirm and support colonialism, and, later, to help the colonies' transitions to independence (Craggs, 2014). This humanitarian form of development continued after the Second World War and is the development program we know today. Given the structures behind development and its problematic history, this new form of development is considered to be a second colonial occupation, as it pushed 'underdeveloped' countries toward the developed ideal (Craggs, 2014).

This feminist and postcolonial thinking sees sustainable development as a valuable initiative (Braidotti, 1994), but also argues that it's problematic because it's based on the concept of development. As such, the idea of post-development emerged in the 1990s (Ahorro, 2008) and continues today. Post-development contributors reject the concept of development because of its flaws and attempt to develop alternatives (Ahorro, 2008). One example rooted in a feminist perspective is Development Alternatives with Women for a New Era (hereafter referred to as DAWN; DAWN, n.d.a). Their website proposes a new vision of development "founded on social solidarity and economic, political, ecological, social and personal justice; where poverty and violence are eradicated; where human rights in their fullest and most

expansive sense are the foundations of laws, public policies, and private actions" (DAWN, n.d.b, para.1).

Thus, the feminist recommendation for industrial design to move away from traditional professional and consumer structures breaks from the current economic model and the model at the heart of sustainable development. This proposal, combined with feminism's preference for a social and sustainable re-imagination of industrial design, would likely guide a more responsible structure for industrial design. This critique and proposal aligns with post development and, indeed, DAWN's interest in economic justice.

With the arguments toward development and sustainable development in mind, post-development could be understood as a more sustainable form of sustainable development. In this sense, these fundamental changes to the professional and consumer structures of industrial design aren't unsustainable, but could actually be optimally sustainable, going beyond the current conception of sustainability.

11.1.6 Discussion. The sections above demonstrate that each element of feminism's critiques and proposals toward industrial design address sustainability in some way. That said, feminism's critiques and proposals toward industrial design support certain aspects of sustainable development in different ways and to different extents. Feminism strongly and directly supports social and financial sustainable development issues addressing employment and labour and the social issue of wellbeing. Yet, beyond these central points of focus, feminism's relationships with sustainable development can vary and may be less strong and direct. First, feminism would strongly and directly support environmental issues and goals, but mainly if an eco-feminist perspective were applied. As another example, feminism could

address the range of sustainable development goals by guiding the focus of industrial design projects and creating targeted products and services. Yet, this would depend on the designer's initiative, and the specific points of focus would be unpredictable and vary from case to case.

Finally, feminism's proposal to realign industrial design toward social and sustainability concerns at a professional level could help support each sustainable development goal. These professional changes would impact each level of the industrial design framework and would require changes to the way designers work. As mentioned above, this realignment of industrial design could help support each sustainable development goal through changes within industrial design and by guiding the focus of industrial design projects. Yet, analysis of the co-design projects showed that a single feminist perspective isn't entirely encompassing. Each lens has certain points of emphasis, addresses issues according to varying levels of priority and can forget about issues lower down on its order of priorities. In this sense, the broad statement that feminist interventions could help support each sustainable development goal through changes within industrial design and by guiding the focus of industrial design projects is theoretically accurate, but would require the combined efforts of multiple feminist lenses.

It's mentioned in Appendix 1 that the LCSDSN report distinguishes between indicators that are generally applicable and a range of complimentary national indicators. These complimentary indicators can be applied optionally, depending on needs and context. Similarly, the LCSDSN report categorized the sustainable development indicators according to topics of special concern where certain categories like industrialization, science, technology and innovation, sustainable cities and human settlements and sustainable production and consumption have particular relevance to industrial design. I flagged many of the indicators in

these categories as well as several others that were particularly relevant to industrial design in the table in Appendix 1 (Table VII). Although all goals and indicators were considered in the analysis, certain ought to be given greater weight and importance. This includes the general indicators, unless the complimentary national indicators appeared to have particular relevance to industrial design. This also includes the indicators dealing with topics of special concern with particular relevance to industrial design. While industrial design should ideally address the range of sustainable development goals and indicators, it's especially critical for industrial design to address elements directly related to its activities and position in the larger social context.

That said, there isn't really a relationship between feminism's critiques and proposals toward industrial design and the highlighted sustainable development indicators. Feminism's critiques and proposals align with many general indicators, but also a fair number of complimentary indicators. Further, I flagged some of the indicators that relate to feminism's critiques and proposals toward industrial design as having special relevance to industrial design. However, this was also not the case for many of the indicators discussed in the previous pages.

This situation shows that feminism is a distinct initiative, different from sustainable development. It has its own goals and points of focus, as similar as they may be to sustainable development. That said, feminism could be understood as a sub-initiative within the broader sustainable development programme. It could also be applied consciously as a tool for sustainable development. For instance, feminism has the potential to intersect with sustainable development as a whole. This wouldn't happen on its own, but it could happen given structure

and goals. Feminism's specific critiques and proposals could also be applied to help move toward greater sustainability.

11.2 Translating Feminism's Support for Sustainable Development Goals toward Support for Design for Sustainability Goals

The close relationship between sustainable development and design for sustainability was mentioned at several points in this text. For instance, design for sustainability was defined as a field comprising a range of discussions, principles and strategies (Walker & Giard, 2013) applied in "design practice, education and research that, in one way or another, [contribute] to sustainable development" (Vezzoli et al., 2014, p. 2). Given these close interrelationships, the relationships between feminism's critiques and proposals and sustainable development goals apply directly to design for sustainability. Namely, critiques and proposals that contribute to sustainable development goals would also contribute to design for sustainability goals. With this relationship in mind, the sections that follow respond directly to Objectives 3 and 4.

11.3 Results for Objective 3

This section responds to Objective 3 by outlining relationships between feminism's interactions with and contributions to industrial design and design for sustainability processes and goals. It references proposals in the theoretical framework, and explores how this research supports or contradicts them.

In Chapter 3, beyond the basic claim that feminist scholars' concern for women's conditions has overlaps with design for social sustainability, I argued that feminist interventions in industrial design could have parallels with design for sustainability as a whole.

They could contribute to design for sustainability goals as a whole and feminism's processes could be considered relatively encompassing design for sustainability processes. I also suggested that feminist work in industrial design could provide an especially encompassing response to sustainability based on its focus on complexity, systems and scale, women, the social and economic worlds, the range of sustainability dimensions and the breadth and depth of issues in design. In this sense, feminism's interactions with industrial design could be considered relatively encompassing, unique and valuable design for sustainability processes.

This investigation has shown that these suggestions are fairly accurate, with certain exceptions. To begin, feminist critiques and proposals appearing at the lower levels of the industrial design framework (i.e. project levels) have stronger and more direct relationships with social and economic sustainability, compared to environmental sustainability. In this sense, these lower-level critiques and proposals don't present as encompassing a response to design for sustainability as suggested. Yet, they could still be considered processes to inform design for social and economic sustainability and they contribute to design for social and economic sustainability goals.

Lower-level critiques and proposals relating to employment, labour and users align with design for social sustainability through a shared focus on issues like usability, needs, health, safety, quality of life and diversity. They also help work toward "collective and social ends, rather than predominantly commercial objectives" (Armstrong et al., 2015, p. 15) and contribute to a good society that "ensures that everyone has access to the goods and services needed for a decent existence" (Bruinsma, 2016, p. 38). For example, they encourage the creation of good jobs and products that respond to women's needs.

The critiques and proposals align with most of the principles of socially responsible design from the Utrecht Manifesto (Bruinsma, 2016). Namely:

- Engage with society: engage users as partners in the design process and listen to what they have to say
- Design socially: consider social situations and contexts when designing
- Act sustainably: work sustainably, in terms of social and environmental sustainability
- Be critical: design from a critical and socially-engaged position
- Be persistently radical: Think radically and reimagine social situations
- Take responsibility together: seek out and engage in collaborative work

In terms of design for economic sustainability, the critiques and proposals on employment and labour support the principle of accountability. They also highlight ways to support economic sustainability through design decisions. This includes critiques about women's roles in design and unfair labour, as well as suggestions to help women enter and succeed in the field, support best practices in labour and create good jobs.

That said, these critiques and proposals don't support design for social and economic sustainability as a whole. They don't align with every aspect of these dimensions through limits in scope and different points of focus. For instance, the critiques and proposals relate only partially with other principles of socially responsible design from the Utrecht Manifesto (Bruinsma, 2016). For the principle to connect ethics and aesthetics, some feminist critiques and proposals encourage the development of aesthetically pleasing products (e.g. Betsy and Samara's emphasis on a tactile product), but not necessarily products that encourage ethical behaviour. In terms of the principle to be supportive and modest, the feminist critiques and proposals contribute to social initiatives, but don't tell designers not to seek recognition for

their work. The principle of transparency is mostly addressed through the promotion of co-design and self-reflection, although this link isn't direct or explicit. Finally, the feminist critiques and proposals don't address commitment, where designers are encouraged to create products that users would want to keep for a long time. However, feminist perspectives in industrial design encourage complex and thoughtful products geared to user needs, which could have enduring appeal.[8]

Moving on to the higher-level feminist critiques and proposals at the profession and practice levels, feminism recommends a realignment of industrial design from rooting in the marketplace toward a focus on social and sustainability concerns. Further, it encourages designers to work from their perspectives as feminists and/or as women. This could drive further, future relationships with design for sustainability. Namely, these reorientations and perspectives could encourage designers to make changes to industrial design at the various levels of the framework, and could inform the kind of projects they take on and the design objects they create. In this way, these recommendations to realign industrial design and for designers to work from their perspectives as feminists and/or as women could encourage future critiques and recommendations relating to industrial design. Thus, these critiques and proposals are processes for design for sustainability as a whole, and their insights could inform the range of design for sustainability goals.

These critiques and proposals could drive a transition to a more sustainable economic model and could more thoroughly support a good society through, for example, design

[8] Design for social sustainability is different from social design and socially responsible design, as discussed in Chapter 3. As such, this discussion shows that feminism's critiques and proposals align with social design and socially responsible design, rather than design for social sustainability. However, the broader discussion of the LCSDSN framework in this chapter helps anchor these conclusions within social sustainability.

projects that address specific design for social sustainability issues. They also have the strongest links to design for environmental sustainability: the critiques and proposals encourage a focus on sustainability concerns broadly defined, and suggest that designers work from their feminist perspectives, which could include eco-feminism. These are much stronger relationships with sustainability than are seen in the lower-level critiques and proposals, and have a link to design for environmental sustainability that isn't really seen elsewhere.

That said, the recommendation for designers to work from their perspectives as feminists could have a limited impact on design for sustainability. As described above, a single feminist perspective isn't entirely encompassing. Each lens has certain points of emphasis, addresses issues according to varying levels of priority and can forget about issues lower down on its order of priorities. Working from a feminist perspective could encourage designers to make further changes to industrial design at the various levels of the framework and inform the kind of projects they take on and the design objects they create. However, feminisms' potential future critiques and proposals to industrial design might only inform design for sustainability in certain ways and contribute to certain design for sustainability goals. For instance, a designer working from a post-colonial feminist perspective might focus on production networks, a specific social and economic concern.

Moving on, the theoretical framework also discussed feminism's especially unique and strong relationships with design for sustainability. These suggestions appear to be accurate, more so than the suggestions about the relationships between feminist critiques and proposals and design for sustainability dimensions. In this sense, feminist work in industrial design does provide an especially encompassing response to sustainability, and its interactions with

industrial design could be considered relatively encompassing, unique and valuable design for sustainability processes.

First, it was explained in Chapter 3 that design and design for sustainability work recognizes complexity and systems, but can overlook scale. In contrast, feminism is highly attentive to complexity and systems, as well as scale: feminist work often focuses on grounded and context-specific experiences. This is the case for the feminist critiques and proposals identified in this research project. Feminist perspectives in industrial design recognize the complex and systemic issues present throughout society and in design, and recommend action at many levels. Further, in terms of scale, many of the critiques are based on specific issues related to human experiences and the proposals typically rely on grass-roots interventions, addressing topics like working environments and user needs.

It was also explained that design for sustainability does not typically focus on women's concerns and the social dimension is relatively underdeveloped. In contrast, these are feminism's most obvious points of focus. Indeed, the research results have shown that feminist work in industrial design focuses heavily on women's experiences. It also aligns quite strongly with design for social sustainability, as discussed earlier.

Existing design for social sustainability work includes broader strategies like design for the other 90%, design for need and inclusive design, as well as various principles and methods. The following are several examples. First, authors suggest applying participatory design to better understand user needs and develop appropriate and useful products (Melles, de Vere & Misic, 2011). Others propose engaging in interdisciplinary exchanges to better understand and address social issues (Caruso & Frankel, 2010). Many authors also encourage designers to consider the focus and contexts of their work. This could include working within

institutions and helping to develop services (Morelli, 2007) for healthcare providers, education institutions or governments (Cooper, 2005). Designers could also help address social concerns like crime (Cooper, 2005) and the needs of diverse groups of people like seniors or people with disabilities, or aim to change user behaviour for the better (Tromp, Hekkert & Verbeek, 2011) and empower users (Cipolla & Bartholo, 2014).

Feminism's contributions to design for social sustainability overlap with some of these existing proposals. For instance, it also encourages interdisciplinary work and participatory methods. Yet, a feminist perspective and its critiques and proposals address a range of other issues, especially those surrounding women's needs. This could include, for instance, an interest in how objects gender or sexualize their users or how participatory design is carried out. As another example, a feminist perspective would inform data collection in social life cycle analysis (Benoît et al., 2010), as suggested earlier. It would encourage an enhanced focus on women's experiences and participatory approaches.

Moving on, the theoretical framework also suggested that feminist work in industrial design could inform the relatively underdeveloped dimension of design for economic sustainability. Namely, it would align with most contemporary theorizing on design for economic sustainability and contribute new theory to further develop the domain. Indeed, as discussed earlier in this section, feminism's critiques and proposals relating to industrial design align with and contribute to design for economic sustainability. They support a move to a new economic model, as well as more transparency and accountability in the field. They also introduce new points of focus, such as the suggestion to create good jobs tied to product development and sales. However, this research didn't focus specifically on feminist economics

or draw explicitly on its theories. A more targeted focus could have highlighted additional critiques and proposals even more deeply tied to economic sustainability.

Finally, the theoretical framework also explained that design for sustainability approaches can have a relatively narrow focus, often centring on a single sustainability dimension and specific aspects of industrial design rather than theories and practices as a whole. I suggested that feminism's particularly strong grasp of complexity and systems could help it address sustainability concerns more holistically, through a single lens, and at a deeper level than is often seen. As suggested, the research results have shown that feminism addresses multiple sustainability dimensions. Even when ignoring the proposal to realign industrial design toward sustainability concerns or for designers to work from a feminist perspective, feminism's critiques and proposals still typically address the dual dimensions of social and economic sustainability. In addition, the feminist lens addresses multiple levels of industrial design. There are critiques and proposals at each level, and many touch on multiple levels at once.

Despite certain exceptions, this discussion has shown that feminist interventions in industrial design have strong parallels with design for sustainability and provide an especially encompassing response to sustainability. This relationship is especially strong when multiple critiques and proposals are taken into account and if the feminist lens inspires changes at the professional and practice levels. The feminist strand is also significant, as suggested in the theoretical framework. I noted that certain feminisms could offer especially promising contributions to design for sustainability. This included intersectional feminisms, radical feminisms and eco-feminism. As predicted, intersectional feminisms were concerned with women's needs and the needs of other populations, which could help address a greater range

of socially sustainable issues. More radical feminisms addressed industrial design at the abstract and deep-rooted professional level. Aligned with the prediction, feminism's critiques and proposals at these levels had the broadest and most extensive relationships with design for sustainability. Finally, eco-feminism had the most direct relationships with the environmental dimension of design for sustainability. In each case, the feminist critiques and proposals of industrial design aligned with these strands could be considered especially promising processes for design for sustainability and would contribute relatively powerfully toward design for sustainability goals.

This discussion has shown many strong relationships between feminism's interactions with and contributions to industrial design and design for sustainability processes and goals. Yet, the feminist critiques and proposals don't align perfectly with design for sustainability, they focus on certain sustainability dimensions and certain issues over others. Similar to the conclusion in the discussion on the relationship between feminism and sustainable development, this misalignment hints that feminism is a distinct initiative from design for sustainability. When applied to design, feminism has its own goals and points of focus, as similar as they may be to design for sustainability. That said, feminism in design could be seen as a sub-initiative within the broader design for sustainability field, and could be applied consciously as a tool for design for sustainability. It could be especially valuable given its particular focus on complexity, systems and scale, women, the social and economic worlds, the range of sustainability dimensions and the breadth and depth of issues in design.

11.4 Results for Objective 4

At the most basic level, these relationships between feminist work in industrial design and design for sustainability inform sustainability theories and practices by illustrating the value and contributions of a feminist lens. Feminism could be seen as a new framework to contribute to design for sustainability. For instance, working from a feminist perspective could help designers make fairly socially and economically sustainable decisions and design with strong attention to scale. As suggested earlier in this chapter, combining multiple feminist lenses would result in an even stronger and more direct relationship with design for sustainability.

Looking at feminism's critiques and proposals toward industrial design could also provide further insights. They highlight social and economic issues in the field that may not be otherwise acknowledged, and guide responses that go further than some other design for sustainability work. This could inform design for sustainability theory and practices by articulating issues in the field and guiding responses. For instance, feminism's critiques and proposals illustrate how to support women in a range of design arenas (i.e. practice, education and scholarship), how to support team members in design collaborations, and how to socially and economically support the people involved in product development and sales. Further, each feminist critique and proposal toward industrial design relates to design for sustainability in some way, as indicated throughout this chapter. These insights could be added to existing design for sustainability frameworks and guidelines.

This dissertation focused primarily on feminism's contributions to industrial design at a relatively concrete level. Yet, the theoretical framework also explored the potential relationships between feminist work in industrial design and design for sustainability at

epistemological levels. While beyond the intended scope of this chapter, this section ends with a discussion on feminism's contributions to sustainability at this epistemological level.

Chapter 3 presented arguments by authors including Stuart Walker (2006) and John Ehrenfeld (2013) that unsustainability is deeply entrenched in industrial design and optimal sustainability can only be achieved through holistic changes. It was proposed that feminism's recommendation to open industrial design knowledge to the incorporation of new perspectives could be the first step toward profound and holistic changes to industrial design for sustainability. This hypothesis appears to be accurate, but the research results also hint that feminism can contribute even more directly to these holistic changes.

Earlier in this chapter, feminism's extensive and radical critiques and recommendations to industrial design were linked to post development, a more sustainable reformulation of sustainable development. A similar process may also take place here where feminism's extensive and radical critiques and recommendations to industrial design could be the means for these profound and holistic changes to industrial design for sustainability.

Related to their arguments, Walker and Ehrenfeld each proposed changes to industrial design and described its more sustainable alternative. To begin, Walker suggested a variety of changes to industrial design that address the profession, design thinking, and the design object (2006). In his view, the profession should be understood in terms of its end goal to design objects/material culture and should be de-professionalized and become more open-ended (Walker, 2006). Design thinking should be experimental and focus on possibilities instead of solving problems (Walker, 2006). Finally, products should be appropriate to their context and part of a holistic picture (Walker, 2006). In turn, Ehrenfeld was critical of design's rooting in modernism and its associated characteristics like objectivity, rationality and hierarchy, as well

as design's reliance on technology (2008). Instead, Ehrenfeld proposed a move into a different paradigm (2008) and stressed that design should recognize complexity and respect the world around us (2013).

Feminism's especially radical critique of industrial design's rooting in the marketplace and its recommendation to work outside traditional professional and consumer structures aligns with Walker and Ehrenfeld's arguments, especially Walker's proposal for de-professionalization (2006). Further, many of feminism's other critiques and proposals would support their vision of change. This includes the feminist critique of industrial design's rooting in modernism and the recommendation to realign industrial design toward postmodernism; the critique of industrial design's reliance on technology like computers and hand-tools; and the recommendation to apply design thinking based on problem setting.

Thus, feminism's interactions with and contributions to industrial design further contribute to design for sustainability by providing the means for holistic changes for sustainability. Applying a feminist lens on or in industrial design or drawing on its range of critiques and proposals could lead to a new, more sustainable model of industrial design.

11.5 Conclusion

This chapter drew on the research results to position the relationships between feminism's interactions with and contributions to industrial design and design for sustainability processes and goals, and to identify the unique insights they provide to design for sustainability theories and practices. It showed that feminist work in industrial design has extensive relationships with design for sustainability, especially its social and economic dimensions. It also provides a particularly encompassing response to sustainability based on its focus on scale, women, the

social and economic worlds, the range of sustainability dimensions and the breadth and depth of issues in design. Further, feminist work in industrial design could be the means for holistic changes to industrial design for sustainability. As a result, feminist work in design could be understood as a sub-initiative within the broader design for sustainability field and could be applied consciously as a tool for design for sustainability. Feminism could be seen as a framework to contribute to design for sustainability and its critiques and proposals toward industrial design could inform design for sustainability theory and practices by articulating issues in the field and guiding responses.

Having now responded to each objective, the next chapter is the research conclusion. It reviews the research project and explores its contributions.

Chapter 12. Conclusion

12.1 Research Outcomes and Contributions

The research question at the heart of this project was: how does feminism inform industrial design and design for sustainability theories and practices? The objectives were to 1) identify the content of feminism's critiques and proposals toward industrial design when it's applied as a lens on design; 2) identify the content of feminism's implicit critiques and proposals toward industrial design when it's applied as a lens in design; 3) understand the relationships between feminism's interactions with and contributions to industrial design and design for sustainability processes and goals; and 4) identify the unique insights feminism's interactions with and contributions to industrial design can provide to design for sustainability theories and practices. I employed feminist and critical constructivist frameworks and the research was based on an extensive literature analysis of existing feminist work in industrial design, as well as the conduct and analysis of three feminist-driven design projects.

In accordance with the objectives, this study identified a range of feminist informed critiques and proposals toward industrial design. It also positioned feminist work in industrial design in relation to design for sustainability and identified the unique insights feminism's interactions with and contributions to industrial design can provide to design for sustainability theories and practices.

At the broadest level, this research highlights issues in industrial design like restrictions on knowledge that can limit the place and acceptance for alternative thinking, or the presumed and ideal neutrality of designers. It adds to the growing body of work that

challenges these assumptions and the research results provide an example of the advantages of a more open field.

This project also shows the value and contributions of a feminist perspective in design. Broadly speaking, feminism operates as a sort-of filter. It highlights aspects of industrial design that are problematic in relation to women's needs and the range of feminism's other concerns, and proposes resolutions to these issues aligned with its social justice focus. These critiques and proposals can help industrial design have a more positive impact and work toward its sustainable goals.

Looking more directly at the specific research results, I responded to Objectives 1 and 2 separately and then brought their results together in Chapter 10, given the complementarity of the research methods and results. As a whole, the feminist critiques and proposals aligned with the initial theoretical framework on the intersections of feminism and industrial design. As suggested, feminist work in industrial design highlights universal and masculine knowledge and encourages the incorporation of multiple perspectives in knowledge construction including women's perspectives; highlights and addresses situations involving the inequality, injustice and oppression of women; interrogates relationships between sex, gender and design; encourages a greater focus on women's and human experiences and the people involved in design; encourages user involvement in design; and encourages designers to position themselves and deeply consider this positioning throughout their work. The research results also add additional detail to each point in this framework and help expand it.

Despite differences between feminist perspectives, the results broadly show that feminist lenses identify systemic problems in industrial design such as the presence of power and masculinity, unequal power dynamics between people and negative situations facing

women. Feminism also helps identify incarnations of these problems at the range of levels in the industrial design framework. This includes, for example, unequal power within design teams, the masculine leaning of certain design processes and the relationship between design objects and female users. In turn, feminist perspectives respond to these issues through proposals at the multiple levels of the industrial design framework. There appears to be a preference for grass-roots proposals relying on actor interventions that draw on women's perspectives and/or feminist perspectives. These actors could include designers, users or other individuals involved in the design project or subsequent projects.

The specific critiques and proposals aligned with many of the broad topics often explored in feminist work on design like beauty, technology and DIY. As expected, their approach to these topics varied depending on context and feminist perspective. Once again, the insights from this research project could help contribute to these larger bodies of work, adding additional detail to these discussions and even introducing new topics for exploration.

Next, in response to Objective 3, I noted that feminism is a distinct initiative from sustainability, with its own goals and points of focus. However, there are still strong links between feminism's interactions with and contributions to industrial design and design for sustainability. As such, feminism in design could be seen as a sub-initiative within the broader design for sustainability field. While a feminist lens in design could theoretically address the range of sustainability dimensions, it has particularly strong links with design for social and economic sustainability. For instance, many of its critiques and proposals align with social frameworks. Some also support a move to a new economic model, as well as more accountability in the field. Further, its interactions with industrial design could be considered relatively encompassing, unique and valuable design for sustainability processes that provide

an especially encompassing response to sustainability, based on feminism's focus on complexity, systems and scale, women, the social and economic worlds, the range of sustainability dimensions and the breadth and depth of issues in design. The feminist lens and its critiques and proposals help highlight issues in the field that might not otherwise be acknowledged, and guide more extensive responses than some other design for sustainability work.

Finally, in response to Objective 4, these relationships could inform design for sustainability by illustrating the value and contributions of a feminist lens, which could be employed consciously as a tool for design for sustainability. Specific critiques and proposals could also inform design for sustainability theory and practices by articulating issues in the field and guiding responses. These critiques and proposals could be added to existing design for sustainability frameworks and strategies. For instance, the critiques and proposals show how to socially and economically support women and the range of people involved in product development and sales, and how to form a relatively equal and non-hierarchal design team. These insights could add to strategies like social life cycle analysis or participatory design.

Feminism's contributions to industrial design at an epistemological level could also inform design for sustainability theories and practices. Working from a feminist lens or drawing on feminist critiques and proposals could inform a new, more sustainable model of industrial design based on, for instance, de-professionalization, realignment toward postmodernism and design thinking based on problem setting.

Together, these research outcomes provide many contributions to a range of audiences and arenas. Beginning with the feminist design community and broader feminist cause, this research helps refine the understanding of feminism's interactions with and contributions to

industrial design and demonstrates the value of a feminist perspective. This contributes to the body of feminist work in industrial design, helps legitimize this perspective and could encourage future feminist work in the field. For instance, feminist designers could be inspired to more directly apply their feminist perspectives in their work and feminist-driven design work could become more visible. More broadly, feminist-informed changes to industrial design and a stronger body of feminist work in the field could contribute to the broader feminist initiative and its goals. This research could also add to feminist theory. For example, feminist literature on materiality acknowledges a shortage of feminist interrogations on the material and a lack of depth in these investigations (Irni, 2013). This research project could contribute to theory in this area.

This study could also inform non-feminist designers or those unfamiliar with feminism. The results could help educate these designers about the value and contributions of a feminist perspective. The list of feminism's critiques and proposals could enable them to apply feminist insights in their work. Both scenarios - where a designer applies a feminist lens in their work or draws on feminism's critiques and proposals - could help lead to broad changes in industrial design and its role in the world.

These implications for non-feminist designers and those unfamiliar with feminism are particularly important contributions and align with bell hooks' call for a feminist education (2015). As suggested, these research results might encourage them to make changes in their work. However, at the very least, this discussion could encourage these designers to be more open and receptive to feminist perspectives in the field.

Next, the research outcomes could also apply directly to industrial design and design for sustainability theory and practice, adding to existing thinking, strategies and frameworks.

The critiques and proposals touch-on many dimensions of industrial design and could highlight areas of concern and provide new ideas; this is certainly the case for design for sustainability, as described in Chapter 11. However, many of the critiques and proposals also addressed specific topics like design history, critical design and co-design. Their suggestions could also help develop theory and practices in these areas.

Finally, from a personal perspective, this research and its results contribute to my goals behind this research project. They help inform a new, more open and more socially conscious form of industrial design, which better aligns with my vision of the field and my approaches to professional practice.

Despite these general contributions, the research results could impact industrial design at various levels. For instance, they could guide a significant reformulation of industrial design if feminism were broadly applied as a lens, all of feminism's critiques and proposals were applied, and more radical feminisms were employed. On the other hand, it could have a more moderate impact if feminism were rarely applied as a lens, feminism's critiques and proposals were applied selectively, and less radical feminisms were employed. Either direction could be appropriate.

That said, it's important to be careful if picking-and-choosing feminisms and feminist insights for design. This could include, for example, seeking the insights of a specific feminist perspective that comes from a different time period or context. It might not be relevant today or in a different context. Further, it would be possible to apply certain feminist insights and reject others because they don't align with one's preconceptions. In this situation, I believe that designers and design researchers should be self-reflective and consider why they've had this reaction.

There is also another caveat to applying these research results, which pertains especially to this selective application of feminism's insights. In their postmodern and intersectional feminist text, Vostral and McDonagh introduced the possibility of feminism being taken advantage of in design (2010). This could involve employing feminist insights for monetary gain or in a way that's anti-feminist (Vostral & McDonagh, 2010). This point emphasizes that the research results should be employed with care. They should be applied in situations aligned with feminist or social and sustainability goals, and not to simply benefit a designer and their practice.

Despite these various contributions, this project has many limits, which are explored in the section that follows.

12.2 Limits

The critical constructivist framework stresses that research outcomes should be understood as a single perspective, specific to the context of the research project, which could be added to or challenged in the future. This is the case here. This project demonstrates how feminism can inform industrial design and design for sustainability theories and practices. However, its response is partial. Feminism is incredibly complex and it isn't possible to represent its diversity and its range of potential intersections with design in a single project. My personal position also limits the project. For instance, there is a Western bias in this project that guides my research approach and understanding of feminism, industrial design and, likely, design for sustainability. It also comes through in my primary focus on English and French literature and my choice to hold the co-design projects in Canada or the USA.

This dissertation is also limited by many contextual factors and decisions throughout the project. This includes the reliance on only about 50 texts in the literature analysis and three co-design projects, as well as the decision to focus on feminism as an ideology and the attention toward its critiques and proposals, instead of other potential points of focus.

Beyond the limits that contribute to the partial perspective in this project, there are also limits that may have impacted the internal validity (Bryman, Teevan & Bell, 2009). In terms of my literature analysis, my review was surely not complete, my search criteria eliminated many potentially relevant readings, and I added certain texts that didn't fit the narrow search criteria, but not others. Additional search terms could have helped identify relevant texts. This includes terms like gender, femininity and masculinity, discussed earlier. Other related search terms like sex, sexism, experience or situated knowledge could have also informed this research by identifying texts focused around these related concepts and theories. Analysis of these additional texts could have added more depth and nuance to the project and to the understanding of feminism. As explained in Chapter 6, I didn't use these broader search terms given the risks of including writing that doesn't explicitly engage with feminism. However, future research should add to this literature analysis by including additional texts, especially those associated with broader search terms.

In terms of the co-design projects, although I tried to follow-the-lead of the participants' feminism, my feminist perspective likely infiltrated the project. As such, the insights from the project aren't purely representative of the participants' feminism. Further, I may not be representative of other industrial designers and, indeed, my design work may be already more feminist than I realize. In this context, my discussion on the intersections of feminism and industrial design might not be representative of industrial design more

generally. I was also heavily implicated throughout the design projects and analysis, and may have made mistakes that could have been identified in a more collaborative research project.

However, these limits to the co-design projects were moderated by several factors. I remained self-reflective throughout the project, which helped me spot and respond to issues. The research participants were also involved in the project analysis, which provided a range of other perspectives. Finally, the literature analysis also highlighted feminism's critiques and proposals toward industrial design. Its results and the advantages of this other strategy ensured the research conclusions were not solely based on the co-design projects.

On another topic, situations where a feminist lens was applied in design in the literature and during the co-design projects required significant interpretation. This often involved identifying an implicit critique and a proposal anchored in a design decision. My interpretations may not have been completely accurate in these situations. Further, these critiques and proposals could be based on many other factors in addition to feminism, such as other ideologies or experiences. However, the collaborative analysis after the co-design projects likely helped avoid some misinterpretations. Further, the large quantity of results and their synthesis helped identify broader trends and relied less on individual results.

In terms of Objectives 3 and 4, I applied the LCSDSN framework, which is not directly linked to design. My analysis also drew on a fairly cursory discussion of design for sustainability, as well as my personal understanding of the field. The resulting analysis and outcomes were not as deep or detailed as they could have been. However, they provide a broad introduction to feminism's contributions to design for sustainability, which align with my research goals. The relationships between feminism and design for sustainability could be explored in additional detail in future projects.

Finally, in terms of external validity, the research results are not necessarily generalizable (Bryman, Teevan & Bell, 2009). This is especially the case for the participatory project-grounded research, which was based on a small number of co-design projects (Bryman, Teevan & Bell, 2009). The results may be specific to their research context (Archer, 1995), described throughout Chapters 8 and 9. That said, the detailed description of context could enable the transfer of insights to similar cases (Schwandt, 2007).

12.3 Future research

Given the partial perspective and limits of this project, future research must continue to explore the relationships between feminism, industrial design and design for sustainability. There are also many promising research directions. This could include exploring the contributions of more specific feminist theories for industrial design, further investigating how feminism can inform targeted design processes like human-centred design and drawing, or exploring design with respect to feminist discussions on topics like beauty, technology or DIY. Future investigations could also take a broader approach. The relevance of Rendell's framework from architecture (2011) and Bardzell's framework from HCI (2010), as well as parallels between my literature analysis and the broader literature review, illustrate the similarities between feminism's relationships with design and industrial design. Future projects could draw on these relationships, referring to research in other design fields or conducting a broader design analysis.

In future projects, it would also be valuable to engage more directly with other complimentary lenses. This could include a gender lens as discussed earlier, in addition to other related perspectives like queer or LGBT perspectives. While directly including these

additional lenses was outside the scope of this project, each could bring valuable and unique perspectives to design. For instance, a queer lens could introduce a challenging deconstructive perspective to design and an LGBT perspective could explore issues of sexuality, not really addressed here.

That said, there were openings to these additional lenses in this project. This includes gender, which was discussed throughout the dissertation. In addition, despite somewhat different points of focus, queer and LGBT perspectives have strong overlaps with feminism and can be incorporated in feminist thinking (e.g. lesbian feminism, intersectional feminism, queer feminism and third wave feminism). The openness of the literature analysis and participatory project-grounded research enabled the incorporation of these feminisms and theories, which was the case in the co-design project rooted in queer Latina and Chicana feminism.

Finally, the relationships between feminism and design for sustainability are also especially rich. It would be valuable to continue to explore how feminism can inform design for sustainability processes or a more sustainable form of design for sustainability.

Research questions that align with these future research directions could include:

- How can situated knowledge be addressed when designing for a global marketplace?
- How can feminist discussions on power re-define the relationships between designer, maker and user?
- How could a queer disruption inspire design creativity?
- What are designer and user experiences of a more feminine design practice?

- How can feminist design interventions in different design fields (e.g. architecture, interior design, industrial design) come together in a single environment? What is their impact on human experience in the space?
- How can feminist economics inform design for economic sustainability?
- How can feminist and postcolonial critiques of development inform a re-imagination of design for sustainability?

I have already begun to share my research results with design and design research communities. For instance, I have presented my work at design conferences and in a design journal. I will continue to present and build on my work in the coming years through conversations with feminist and non-feminist designers and design researchers. I will also extend my research in some of the directions mentioned earlier. For instance, I have already written a paper on how queer understandings of sex and gender can inform design research and product design (Prochner, 2014).

References

Agid, S. (2012). Worldmaking: Working through theory/practice in design. *Design and Culture, 4*(1), 27-54.

Aguinaga, M., Lang, M., Mokrani, D., & Santillana, A. (2013). Critiques and alternatives to development: A feminist perspective. In M. Lang & D. Mokrani (Eds.), *Beyond development: Alternative visions from Latin America* (pp. 41-59). Quito, Equator: Rosa Luxemburg.

Ahmed, S. (2014, May 26). Feminist critique. *Feminist Killjoys*. Retrieved from https://feministkilljoys.com/2014/05/26/feminist-critique/

Ahmed, S. (2017). *Living a feminist life*. Durham, NC: Duke University Press.

Ahorro, J. (2008). *The waves of post-development theory and a consideration of the Philippines.* Retrieved from http://www. cpsa-acsp. ca/papers-2008/Ahorro.pdf

Alaimo, S., & Hekman, S. (2008). Introduction: Emerging models of materiality in feminist theory. In S. Alaimo & S. Hekman (Eds.), *Material feminisms* (pp. 12-37). Bloomington, IN: Indiana University Press.

Allen, A. (1998). Rethinking power. *Hypatia, 13*(1), 21-40.

Allen, A. (2016). Feminist perspectives on power. *Stanford Encyclopedia of Philosophy*. Retrieved from https://plato.stanford.edu/entries/feminist-power/

Allen, M. (2017). *The sage encyclopedia of communication research methods* (Vols. 1-4). Thousand Oaks, CA: Sage.

Allhutter, D. (2012). Mind scripting: A method for deconstructive design. *Science, Technology and Human Values, 37*(6), 684-707.

Amon, A. (1999). The domestication of space-age technologies. In J. Rothschild (Ed.), *Design and feminism: Re-visioning spaces, places, and everyday things* (pp. 125-129). New Brunswick, NJ: Rutgers University Press.

Anderson, E. (2015). Feminist epistemology and philosophy of science. *Stanford Encyclopedia of Philosophy*. Retrieved from https://plato.stanford.edu/entries/feminism-epistemology/#standpoint

Archer, B. (1981). A view of the nature of the design research. In R. Jacques & J. A. Powell (Eds.), *Design: Science: Method* (pp. 30-47). Guilford, UK: IPC Business Press Ltd.

Archer, B. (1995). The nature of research. *Co-Design Journal, 2*(11), 6-13.

Armstrong, L., Bailey, J., Julier, G., & Kimbell, L. (2014). *Social design futures: HEI research and the AHRC.* Retrieved from http://eprints.brighton.ac.uk/13364/1/Social-Design-Report.pdf

Association des designers industriels du Québec. (2010). *Domaine du design industriel*. Retrieved from https://adiq.qc.ca/domaine-du-design-industriel/

Association of Canadian Industrial Designers. (2006). *Industrial design*. Retrieved from http://www.designcanada.org/what-is-ID.html

Attfield, J. (1989). Introduction. In J. Attfield & P. Kirkham (Eds.), *A view from the interior: Feminism, women and design* (pp. 1-3). London: The Women's Press.

Attfield, J. (2003). What does history have to do with it? Feminism and design history. *Journal of Design History, 16*(1), 77-87.

Attfield, J., & Kirkham, P. (Eds.). (1989). *A View from the interior: Feminism, women and design.* London: The Women's Press.

Baker, S. (2006). *Sustainable development.* London: Routledge.

Baker, S. E. (2017). A glamorous feminism by design*?. Cultural Studies, 31*(1), 47-69.

Bakker, I. (1999). Development policies. In J. Peterson & M. Lewis (Eds.), *The Elgar companion to feminist economics* (pp. 83-95). Cheltenham, UK: Edward Elgar Publishing.

Bardzell, S. (2010). Feminist HCI: Taking stock and outlining an agenda for design. In *Proceedings of the SIGCHI conference on human factors in computing systems* (pp. 1301-1310). New York: Association for Computing Machinery.

Barker, D.K., & Kuiper, E. (2003). Introduction: Sketching the contours of a feminist philosophy of economics. In D.K. Barker & E. Kuiper (Eds.), *Toward a feminist philosophy of economics* (pp. 1-18). London: Rutledge.

Baydar, G. (2005). Figures of wo/man in contemporary architectural discourse. In H. Heynen & G. Baydar (Eds.), *Negotiating domesticity: Spatial productions of gender in modern architecture* (pp. 30-47). London: Routledge.

Beeston, L. (2017, January 21). Sonya Lee Atelier has form, function and feminism in the bag. *Toronto Star*. Retrieved from https://www.thestar.com

Bem, S. L. (1974). The measurement of psychological androgyny. *Journal of Consulting and Clinical Psychology, 42*(2), 155-163.

Benoît, C., Norris, G. A., Valdivia, S., Ciroth, A., Moberg, A., Bos, U., Prakash, S., Ugaya, C., & Beck, T. (2010). The guidelines for social life cycle assessment of products: Just in time!. *International Journal of Life Cycle Analysis, 15*, 156-163.

Benson, E. (2011). *Designing a sustainable design studio*. Paper presented at the 2011 Denver Cumulus Conference, Denver, USA. Retrieved from https://www.academia.edu/35674270/Designing_a_Sustainable_Design_Studio

Best, S. (1995). Sexualizing space. In E. Grosz & E. Probyn (Eds.), *Sexy bodies: The strange carnalities of feminism* (pp. 181-194). London: Routledge.

Bhamra, T., & Lofthouse, V. (2007). *Design for sustainability: A practical approach.* Aldershot, UK: Gower.

Bhamra, T., Hernandez, R., & Mawle, R. (2013). Sustainability: Methods and practices. In S. Walker & J. Giard (Eds.), *The handbook of design for sustainability* (pp. 106-120). London: Bloomsbury.

Boehnert, J. (2014). Design vs. the design industry. *Design Philosophy Papers, 12* (2), 119-136.

Boserup, E. (1970). *Women's role in economic development*. New York: St. Martin's Press.

Boslaugh, S. (2010). Secondary data source. In N. J. Salkind (Ed.), *Encyclopedia of research design* (pp. 1331-1331). Thousand Oaks, CA: Sage.

Boutinet, J.-P. (2012). *Anthropologie du projet* (2 ed.). Paris: PUF.

Boyer, K., & Boswell-Penc, M. (2010). Breast pumps: A feminist technology, or (yet) "more work for mother." In L. L. Layne, S. L. Vostral & K. Boyer (Eds.), *Feminist technology* (pp. 119-135). Urbana, IL: University of Illinois Press.

Bradshaw, F. (2000). Working with women. In J. Rendell, B. Penner, & I. Borden (Eds.), *Gender, space architecture: An interdisciplinary introduction* (pp. 282-294). London: Routledge (Original work published 1984).

Braidotti, R., Charkiewicz, E., Häusler, S., & Wieringa, S. (1994). *Women, the environment and sustainable development: Towards a theoretical synthesis*. London: Zed Books.

Brawer, W. (1999). Sustainability and the city. In J. Rothschild (Ed.), *Design and feminism: Re-visioning spaces, places, and everyday things* (pp. 129-134). New Brunswick, NJ: Rutgers University Press.

Brinton Lykes, M., & Crosby, A. (2014). Feminist practice of action and community research. In S.N. Hesse-Biber (Ed.), *Feminist research practice – A primer* (pp. 145-181). Los Angeles: Sage.

Bronet, F., & Layne, L. L. (2010). Teaching feminist technology design. In L. L. Layne, S. L. Vostral & K. Boyer (Eds.), *Feminist technology* (pp. 179-196). Urbana, IL: University of Illinois Press.

Bruinsma, M. (2016). Introduction to the Utrecht Manifesto. *Design Issues, 32*(2), 37-42.

Bryman, A., Teevan, J. J., & Bell, E. (2009). *Social research methods* (2nd Canadian ed.). New York: Oxford.

Buchmüller, S. (2012). How can feminism contribute to design?: A framework for a feminist design research and practice. In P. Israsena, J. Tangsantikul & D. Durling (Eds.), *Proceedings of Design Research Society Conference 2012* (pp. 172-185). Bangkok: Chulalongkorn University.

Buckley, C. (1986). Made in patriarchy: Toward a feminist analysis of women and design. *Design Issues, 3*(2), 3-14.

Buckley, C. (1999). Made in patriarchy: Theories of women and design- a reworking. In J. Rothschild (Ed.), *Design and feminism: Re-visioning spaces, places, and everyday things* (pp. 109-119). New Brunswick, NJ: Rutgers University Press.

Byrne, D. (2017). *How does the literature review differ from doing desk research?*. Retrieved from the Sage Research Methods Project Planner: http://methods.sagepub.com/project-planner/reviewing-the-literature

Cahill, A. (2003). Feminist pleasure and feminine beautification. *Hypatia, 18*(4), 42-64.

Cartier, C. (2009). Production/consumption and the Chinese city/region: Cultural political economy and the feminist diamond ring. *Urban Geography, 30*(4), 368-390.

Caruso, C. & Frankel, L. (2010, July). *Everyday people: Enabling user experience in socially responsible design*. Paper presented at DRS2010. Retrieved from http://www.drs2010.umontreal.ca/proceedings.php

Chamber, C. (2013). Feminism. In M. Freeden, L. Sargent & M. Stears (Eds.), *The Oxford handbook of political ideologies* (pp. 562-582). Oxford, UK: Oxford University Press.

Chapman, J., & Grant, N. (2007). Introduction. In J. Chapman & N. Grant (Eds.), *Designers, visionaries + other stories: A collection of sustainable design essays* (pp. 2-15). London, UK: Earthscan.

Charles, N. (2015). Feminist politics: From activism to representation. In V. Robinson & D. Richardson (Eds.), *Introducing gender and women's studies* (4 ed., pp. 40-57). London: Palmgrave.

Chidgey, R. (2014). Developing communities of resistance? Maker pedagogies, do-it-yourself feminism, and DIY citizenship. In M. Ratto & M. Boler (Eds.), *DIY citizenship: Critical making and social media* (pp. 101-114). Cambridge, MA: MIT Press.

Chow, R. (2010). What should be done with the different versions of research through design. In C. Mareis, G. Joost & K. Kimpel (Eds.), *Entwerfen. wissen. produzieren. designforschung im anwendungskontext* (pp. 145-158). Bielefeld, DE: Transcript Verlag.

Chowdhry, G. (1995). Engendering development? Women in Development (WID) international development regimes. In M. H. Marchand & J. L. Parpart (Eds.), *Feminism/ postmodernism/ development* (pp. 26-41). London: Routledge.

Chuko, C., & Chen, L.-F. (2016). Gender consciousness and design- the influence of values on design behavior. *Bulletin of Japanese Society for the Science of Design, 63*(1), 57-66.

Cipolla, C., & Bartholo, R. (2014). Empathy or inclusion: A dialogical approach to socially responsible design. *International Journal of Design, 8*(2), 87-100.

Clegg, S., & Mayfield, W. (1999). How women's place in design is still defined by gender. *Design Issues, 15*(3), 3-16.

Clegg, S., Mayfield, W., & Trayhurn, D. (1999). Disciplinary discourses: A case study of information technology and design courses. *Gender and Education, 11*(1), 43-55.

Clerke, T. (2010). Gender and discipline: Publication practices in design. *Journal of Writing in Creative Practice, 3*(1), 63-78.

Cole, N. L., & Dahl Crossley, A. (2009). On feminism in the age of consumption. *Consumers, Commodities & Consumption, 11*(1), 1-5.

Connelly, M. P., Murray Li, T., MacDonald, M., & Parpart, J. L. (2000). Feminism and development: Theoretical perspectives. In J. L. Parpart, M. P. Connelly & V. E. Barriteau (Eds.), *Theoretical perspectives on gender and development* (pp. 51-160). Ottawa: International Development Research Centre.

Cooper, R. (2005). Ethics and altruism: What constitutes socially responsible design?. *Design Management Review*, *16*(3), 10-18.

Craggs, R. (2014). Development in a global-historical perspective. In V. Desai & R. Potter (Eds.), *The companion to development studies* (3 ed., pp. 5-9). London: Routledge.

Craig, M. L. (2006). Race, beauty and the tangled knot of guilty pleasure. *Feminist Theory, 7*(2), 159–77.

Dalsgaard, P., & Halskov, K. (2012). *Reflective design documentation*. Paper presented at Designing Interactive Systems Conference 2012, Newcastle. Retrieved from

http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.473.2655&rep=rep1&type=pdf

Dankelman, I. (2012). Women advocating for sustainable livelihoods and gender equality on the global stage. In W. Harcourt (Ed.), *Women reclaiming sustainable livelihoods: Spaces lost, spaces gained* (pp. 21-41). London: Palmgrave Macmillan.

Davis, K. (2000a). Beauty (the feminine beauty system). In L. Code (Ed.), *Encylopedia of feminist theories* (pp. 38-39). London: Routledge.

Davis, K. (2000b). Beauvoir, Simone de (1908-86). In L. Code (Ed.), *Encyclopedia of feminist theories* (pp. 39-40). London: Routledge.

DAWN. (n.d.a). *History.* Retrieved from http://www.dawnnet.org/feminist-resources/about/history

DAWN. (n.d.b). *Vision.* Retrieved from http://www.dawnnet.org/feminist-resources/about/vision

De Lauretis, T. (1987). *Technologies of gender: Essays on theory, film, and fiction*. Bloomington, IN: Indiana University Press.

Denzin, N., & Lincoln, Y. (2013). Introduction: The discipline and practice of qualitative research. In N. Denzin & Y. Lincoln (Eds.), *Strategies for qualitative inquiry* (4 ed., pp. 1-42). Thousand Oaks, CA: Sage.

Dicker, R., & Piepmeir, A. (2016). Introduction. In R. Dicker & A. Piepmeier (Eds.), *Catching a wave: Reclaiming feminism for the 21st century* (pp. 3-18). Lebanon, NH: Northeastern University Press.

Dorst, K. (2009). *Layers of design: Understanding design practice*. Paper presented at International Association of Societies of Design Research 2009 Conference, Seoul. Retrieved from https://opus.lib.uts.edu.au/handle/10453/11246

Double Union. (2014). *Blog*. Retrieved from http://doubleunion.tumblr.com

Dunne, A., & Raby, F. (2001). *Design noir: The secret life of electronic objects*. Basel, CH: August/Birkhäuser.

Ehrenfeld, J. (2008). *Sustainability by design: A subversive strategy for transforming our consumer culture*. New Haven, CT: Yale University Press.

Ehrenfeld, J. (2013). The roots of unsustainability. In S. Walker & J. Giard (Eds.), *The handbook of design for sustainability* (pp. 15-26). London: Bloomsbury.

Ehrnberger, K., Räsänen, M., & Ilstedt, S. (2012). Visualising gender norms in design: Meet the mega hurricane mixer and the drill dolphia. *International Journal of Design, 6*(3), 85-98.

Eichler, M., & Lavigne, M. (2015). Women's movement. In *The Canadian encyclopedia* online. Retrieved from www.thecanadianencyclopedia.ca/en/article/womens-movement

Epstein, S. (2005). A queer encounter. In T.L. Steele (Ed.), *Sex, self and society: The social context of sexuality* (pp. 68-73). Belmont, CA: Thompson Wadsworth.

Er, H. A. (1997). Development patterns of industrial design in the Third World: A conceptual model for newly industrialized countries. *Journal of Design History, 10*(3), 293- 307.

Er, Ö., & Kaya, Ç. (2008). Problems or opportunities?: Overcoming the mental barrier for socially responsible design in Turkey. *The Design Journal, 11*(2), 159-181.

Escobar, A. (1995). *Encountering development: The making and unmaking of the Third World*. Princeton, NJ: Princeton University Press.

FAT. (2018). *Our work*. Retrieved from http://www.fat-net.org

Fathers, J. (2012). *The appropriate role for design training in a developing context* (Unpublished doctoral dissertation). Cardiff University, Cardiff.

Findeli, A. (2004). *La recherche-projet: Une méthode pour la recherche en design.* Paper presented at the Swiss Design Network, Basel. Retrieved from http://projekt.unimes.fr/files/2014/04/Findeli.2005.Recherche-projet.pdf

Findeli, A. (2010). Searching for design research questions: Some conceptual clarifications. In R. Chow, W. Jonas & G. Joost (Eds.), *Questions, hypotheses and conjectures: Discussions on projects by early stage and senior design researchers* (pp. 286-303). New York: iUniverse.

Findeli, A. (2015). La recherche-projet en design et la question de la question de recherche: Essai de clarification coneptuelle. *Sciences du Design, 1*(1), 45-57.

Findeli, A., & Coste, A. (2007). De la recherche-création à la recherche-projet: Un cadre théorique et méthodologique pour la recherche architecturale. *Lieux Communs, 10*, 139-161.

Findeli, A., Brouillet, D., Martin, S., Moineau, C., & Tarrago, R. (2008). Research through design and transdisciplinarity: A tentative contribution to the methodology of design research. In B. Minder (Ed.), *Focused-current design research projects and methods* (pp. 67-94). Bern, CH: University of Bern.

Flick, U. (2007). *Qualitative research kit: Managing quality in qualitative research* London: Sage.

Fox, S., Ulgado, R., & Rosner, D. (2015). Hacking culture, not devices: Access and recognition in feminist hackerspaces. In D. Cosley, A. Forte, L. Ciolfi & D. McDonald (Eds.), *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing* (pp. 56-68). New York: ACM.

Frayling, C. (1993). Research in art and design. *Royal College of Art Research Papers, 1*(1), 1-5.

Freddi, M. (2007). Ideology and ethics in the discourse of designs: A corpus study. In G. Garzone & S. Sarangi (Eds.), *Discourse ideology and specialized communication* (pp. 335- 354). Bern, CH: Peter Lang.

Freeden, M. (1996). *Ideologies and political theory: A conceptual approach*. Oxford, UK: Oxford University Press.

Freeden, M. (2003). *Ideology: A very short introduction*. Oxford: Oxford University Press.

Freeden, M. (2013). The morphological analysis of ideology. In M. Freeden, L. Tower Sargent & M. Stears (Eds.), *The Oxford handbook of political ideologies* (pp. 115-137). Oxford, UK: Oxford University Press.

Frisch I.-S. (2010). *Design and Development* (Unpublished masters thesis). University of Vienna, Vienna.

Gajjala, R. (2003). South Asian digital diasporas and cyberfeminist webs: Negotiating globalization, nation, gender and information technology design. *Contemporary South Asia, 12*(1), 41-56.

Gamble, S. (2006). Postfeminism. In S. Gamble (Ed.), *The Routledge companion to feminism and postfeminism* (pp. 36-45). London: Routledge.

Gannon, S., & Davies, B. (2007). Postmodern, poststructural and critical theories. In S. Hesse-Biber (Ed.), *Handbook for feminist research: Theory and praxis* (pp. 71-106). Thousand Oaks, CA: Sage.

García, A. M. (1997). Introduction. In A. M. García (Ed.), *Chicana feminist thought: The basic historical writings* (pp. 1-20). New York: Routledge.

García, R. R. (2017, October 6). Imagining utopias: Toward Latinx feminist thought [Blog post]. Retrieved from https://csw.ucla.edu/2017/10/06/imagining-utopias-toward-latinx-feminist-thought/

Gentile, F. (2008). Gender and international development. In A. Lind & S. Brzuzy (Eds.), *Battleground: Women, gender and sexuality* (Vol. 1, pp. 218-225). Westport, CT: Greenwood Press.

Gillis, S., & Hollows, J. (2008). Introduction. In S. Gillis & J. Hollows (Eds.), *Feminism, domesticity and popular culture* (pp. 1-14). New York: Routledge.

Goodwin, B. (2007). *Using political ideas*. Chichester, UK: John Wiley & Sons.

Gorgenstein, S. (2010). What we now know about feminist technologies. In L. L. Layne, S. L. Vostral & K. Boyer (Eds.), *Feminist technology* (pp. 203-214). Urbana, IL: University of Illinois Press.

Grant, J. (2000). Experience. In L. Code (Ed.), *Encylopedia of feminist theories* (pp. 188-189). London: Routledge.

Grant, J. (2016). Experience. In L. Disch and M. Hawkesworth (Eds.), *The Oxford handbook of feminist theory* (pp. 227-246). Oxford, UK: Oxford University Press.

Graves, J. (1996). The washing machine: 'Mother is not herself today.' In P. Kirkham (Ed.), *The gendered object* (pp. 30-42). Manchester, UK: Manchester University Press.

Grosz, E. (1995). *Space, time, and perversion: Essays on the politics of bodies*. Sydney: Allen and Unwin.

Hall, H. (2015, November 24). 100 women 2015: Is make-up a feminist issue?. *BBC News*. Retrieved from https://www.bbc.co.uk/news/world-34903614

Hamraie, A. (2013). Designing collective access: A feminist disability theory of universal design. *Disability Studies Quarterly, 33*(4). Retrieved from http://www.dsq-sds.org/article/view/3871/3411

Hanne, A. (2015). *Feminist economics*. Published by www.lulu.com.

Hansson, L., & Jahnke, H. (2009). *Gender bending through design- an account of a student project on gender*. Paper presented at Nordes 2009- Engaging Artefacts, Oslo, Norway. Paper retrieved from http://www.nordes.org/opj/index.php/n13/issue/view/9

Harasim, L., Hiltz, S. R., Teles, L., & Turoff, M. (1997). *Learning networks*. Cambridge, MA: MIT Press.

Haraway, D. (1988). Situated knowledges: The science question in feminism and the privilege of partial perspective. *Feminist studies, 14*(3), 575-599.

Harding, S. (1998). *Is science multicultural?.* Bloomington, IN: Indiana University Press.

Hayden, D. (2005). What would a nonsexist city be like?: Speculations on housing, urban design, and human work. In S. S. Fainstein & L. J. Servon (Eds.), *Gender and planning: A reader* (pp. 47-67). New Brunswick, NJ: Rutgers University Press.

Hedrén, J. 2009. Shaping sustainability: Is there unreleased potential in utopian thought?. *Futures, 41*(4), 220-225.

Hemmert, F. (2013). *Encountering the digital: Representation and experiential embodiment in tangible user interfaces* (Unpublished doctoral dissertation). Universität der Künste, Berlin.

Henwood, A. (2007). *Political ideologies: An introduction* (4 ed.). New York: Palmgrave Macmillan.

Hesse-Biber, S. (2007). Feminist research: Exploring the interconnections of epistemology, methodology and method. In S. Hesse-Biber (Ed.), *Handbook for feminist research: Theory and praxis* (pp. 1-26). Thousand Oaks, CA: Sage.

Hesse-Biber, S. (2012). Feminist research: Exploring, interrogating, and transforming the interconnections of epistemology, methodology, and method. In S. Hesse-Biber (Ed.), *Handbook for feminist research: Theory and praxis* (2 ed., pp. 1-26). Thousand Oaks, CA: Sage.

Hesse-Biber, S. (2014). A re-invitation to feminist research. In S.N. Hesse-Biber (Ed.), *Feminist research practice – A primer* (pp. 1-13). Los Angeles: Sage.

Heynen, H., & Baydar, G. (Eds.). (2005). *Negotiating domesticity: Spatial productions of gender in modern architecture*. London: Routledge.

Hill Collins, P. (1990). *Black feminist thought: Knowledge, consciousness, and the politics of empowerment*. Boston: Unwin Hyman.

Hill, E. (2015). Feminism is over, the battle is won. Time to move on. *The Spectator*. Retrieved from https://www.spectator.co.uk/2015/10/the-decline-of-feminism/

Hines, S. (2015). Feminist theories. In V. Robinson and D. Richardson (Eds.), *Introducing gender and women's studies* (4 ed., pp. 23-39). London: Palmgrave.

hooks, b. (2000). *Feminist theory from margin to center* (2 ed.). London: Pluto Press.

hooks, b. (2015). *Feminism is for everybody: Passionate politics*. New York: Routledge.

International Council of Societies of Industrial Design. (n.d.). *Definition of design*. Retrieved from http://www.icsid.org/about/about/articles31.htm

Irni, S. (2013). The politics of materiality: Affective encounters in a transdisciplinary debate. *European Journal of Women's Studies, 20*(4), 347-360.

Jackel, S. (2013). Women's suffrage. In *The Canadian encyclopedia* online. Retrieved from http://www.thecanadianencyclopedia.ca/en/article/womens-suffrage

James (2000). hooks, bell (b.1952). In L. Code (Ed.), *Encyclopedia of feminist theories* (pp. 255-256). London: Routledge.

Johnson, D. G. (2010). Sorting out the question of feminist technology. In L. L. Layne, S. L. Vostral & K. Boyer (Eds.), *Feminist technology* (pp. 36-54). Urbana, IL: University of Illinois Press.

Kanes Weisman, L. (1994). *Discrimination by design: A feminist critique of the man-made environment*. Urbana, IL: University of Illinois Press.

Kassun-Mutch, P. (2016, May 13). Meet Mithula Naik: feminist designer, latent entrepreneur. [Web log post]. Retrieved from https://www.liisbeth.com/2016/05/13/meet-mithula-naik-feminist-designer-latent-entrepreneur/

Kaygan, P. (2014). 'Arty' verus 'real' work: Gendered relations between industrial designers and engineers in interdisciplinary work settings. *The Design Journal, 17*(1), 73-90.

Kaygan, P. (2016). Gender, technology and designer's work: A feminist review. *Design and Culture, 8*(2), 235-252.

Keitsch, M. (2012). Sustainable design: A brief appraisal of its main concepts. *Sustainable Development, 20*, 180-188.

Keitsch, M.M. (2015). Sustainable design: Concepts, methods and practices. In M. Redclift & D. Springett (Eds.), *Routledge International Handbook of Sustainable Development* (pp. 164-178). London: Routledge.

Kempson, M. (2015). My version of feminism: Subjectivity, DIY and the feminist zine. *Social Movement Studies, 14*(4), 459-472.

Kennedy, M. I. (1981). Seven hypotheses on female and male principles in architecture. *HERESIES: A Feminist Publication on Art and Politics, 3*(3), 12-13.

Kesselman, A. (1991). The 'freedom suit': Feminism and dress reform in the United States, 1848-1875. *Gender and Society, 5*(4), 495-510.

Kincheloe, J. L. (2005). *Critical constructivism*. New York: Peter Lang.

Kirkham, P. (1989). 'If you have no sons': Furniture making in Britain. In J. Attfield & P. Kirkham (Eds.), *A view from the interior: Feminism, women and design* (pp. 109-127). London: The Women's Press.

Kirkham, P. (2002). *Women designers in the USA, 1900-2000: Diversity and difference*. New Haven, CT: Yale University Press.

Kleinsmann, M. S. (2006). *Understanding collaborative design* (Unpublished doctoral dissertation). TU Delft, Delft.

Krolokke, C., & Scott Sorensen, A. (2006). *Gender communication theories and analyses: From silence to performance.* Thousand Oaks, CA: Sage.

Lawson, B., & Dorst, K. (2009). *Design expertise*. New York: Routledge.

Layne, L. L. (2010a). Introduction. In L. L. Layne, S. L. Vostral & K. Boyer (Eds.), *Feminist technology* (pp. 1-35). Urbana, IL: University of Illinois Press.

Layne, L. L. (2010b). Why the home pregnancy test isn't the feminist technology it's cracked up to be and how to make it better. In L. L. Layne, S. L. Vostral & K. Boyer (Eds.), *Feminist technology* (pp. 89-118). Urbana, IL: University of Illinois Press.

Layne, L., Vostral, S. L., & Boyer, K. (Eds.). (2010). *Feminist technology.* Urbana, IL: University of Illinois Press.

Leach, M. (2007). Earth mother myths and other ecofeminist fables: How a strategic notion rose and fell. *Development and Change, 38*(1), 67-85.

Leadership Council of the Sustainable Development Solutions Network. (2015). *Indicators and a monitoring framework for the sustainable development goals: Launching a data revolution for the sustainable development goals.* Retrieved from the Sustainable Development Solutions Network website: http://unsdsn.org/wp-content/uploads/2015/05/FINAL-SDSN-Indicator-Report-WEB.pdf

Lewis-Beck, M. S., Bryman, A., & Futing Liao, T. (2004). *The SAGE encyclopedia of social science research methods*. Thousand Oaks, CA: Sage

Liljestrom, A. (2010). Interviews with groups. In K. Roulston (Ed.), *Reflective interviewing: A guide to theory and practice* (pp. 33-51). London: SAGE.

Lincoln, Y., Lynham, S., & Guba, E. (2011). Paradigmatic controversies, contradictions, and emerging confluences, revisisted. In N. Denzin, & Y. Lincoln (Eds.), *The SAGE handbook of qualitative research* (4 ed., pp. 97-128). Los Angeles: Sage.

Lindner, E. (2014). 16 celebs who aren't afraid to call themselves feminists. *MTV News*. Retrieved from http://www.mtv.com/news/1822259/celebritiy-feminists-pharrell/

Lindström, K., & Ståhl, A. (2015). Figurations of spatiality and temporality in participatory design and after - networks, meshworks and patchworking. *CoDesign, 11*(3-4), 222-235.

Littig, B. (2013). *Feminist perspectives on environment and society.* London: Routledge.

Lockyer, J. P. (2007). *Sustainability and utopianism: An ethnography of cultural critique in contemporary international communities* (Unpublished doctoral dissertation). University of Georgia, Athens.

Lomberg, M. (2003). *Interdisciplinary interventions in feminist industrial design scholarship* (Unpublished master's thesis). University of Calgary, Calgary.

Lopes, A. (2006). Participatory action research. In V. Jupp (Ed.), The SAGE dictionary of social research methods(pp. 217-218). London: Sage.

Lupton, E. (1993). *Mechanical brides: Women and machines from home to office.* New York: Cooper-Hewitt, National Museum of Design and Smithsonian Institution.

Madge, P. (1993). Design, ecology, technology: A historiographical review. *Journal of Design History, 6*(3), 149-166.

Madge, P. (1997). Ecological design: A new critique. *Design Issues, 13*(2), 44-54.

Manzini, E., & Jégou, F. (2003). *Sustainable everyday: Scenarios of urban life*. Milan: Edizioni Ambiente.

Marchbank, J., & Letherby, G. (Eds.). (2007). *Introduction to gender: Social science perspectives*. Harlow, UK: Pearson Longman.

Marecek, J. (2000). Third-wave feminism. In L. Code (Ed.), *Encyclopedia of feminist theories* (pp. 473-474). London: Routledge.

Margolin, V. (1998). Design for a sustainable world. *Design Issues, 14*(2), 83-92.

Margolin, V. (2002). *The politics of the artificial: Essays on design and design studies*. Chicago: The University of Chicago Press.

Margolin, V. (2003). Revisioning design practice: Hot debate. *Design Philosophy Papers, 1*(6), 353-356.

Martins, L. P. D. O. (2014). Privilege and oppression: Towards a feminist speculative design. In Y.-K. Lim, K. Niedderer, J. Redström, E. Stolterman & A. Valtonen (Eds.),

Proceedings of DRS 2014: Design's big debates, (pp. 980-990). Retrieved from http://www.drs2014.org/en/publications/

Martínez, J. G. (2007). Women only: Design events restricted to female designers during the 1990s. *Design Issues, 23*(2), 17-30.

McCall, L. (2005). The complexity of intersectionality. *Signs: Journal of women in culture and society, 30*(3), 1771-1800.

McCann, C.R., & Kim, S.-K. (Eds.). (2010). *Feminist theory reader: Local and global perspectives* (2 ed.). New York: Routledge.

McDonough, W., & Braungart, M. (2002). *Cradle to cradle: Remaking the way we make things*. New York: North Point Press.

McMahon, M., & Bhamra, T. (2015). Social sustainability in design: Moving the discussions forward. *The Design Journal, 18*(3), 367-391.

McPherson, K. (2000). First-wave/second-wave feminism. In L. Code (Ed.), *Encyclopedia of feminist theories* (pp. 208-210). London: Routledge.

Melles, G., de Vere, I., & Misic, V. (2011). Socially responsible design: Thinking beyond the triple bottom line to socially responsive and sustainable product design. *CoDesign*, *7*(3-4), 143-154.

Mellor, M. (1997). *Feminism & ecology*. New York: New York University Press.

Mensah, M. N. (2005). Une troisième vague féministe au Québec?. In M. N. Mensah (Ed.), *Dialogues: Sur la troisième vague féministe* (pp. 8-24). Montreal: Les Éditions du remue-ménage.

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*. San Francisco: Jossey-Bass.

Mills, A. D., Durepos, G, & Wiebe, E. (2010). *Encyclopedia of case study research*. Thousand Oaks, CA: Sage.

Moi, T. (1999). *What is a woman?.* Oxford: Oxford University Press.

Moraga, C. (1993). *The last generation: Prose and poetry*. Boston: South End Press.

Morelli, N. (2007). Social innovation and new industrial contexts: Can designers "industrialize" socially responsible solutions. *Design Issues, 23*(4), 3-21.

Mumby, Z. (1989). Representations of women and race in the Lancastershire cotton trade. In J. Attfield & P. Kirkham (Eds.), *A view from the interior: Feminism, women and design* (pp. 20-28). London: The Women's Press.

Naples, N. A. (2005). Confronting the future, learning from the past: Feminist praxis in the twenty-first century. In J. Reger (Ed.), *Different wavelengths: Studies of the contemporary women's movemen*t (pp. 215-235). New York: Routledge.

Nash, K. (2000). Equality and difference. In L. Code (Ed.), *Encyclopedia of feminist theories* (pp. 174-176). London: Routledge.

Nickolai, C. A. (2013). Decently dressed: Women's fashion and dress reform in the nineteenth century United States. In S. M. Spencer-Wood (Ed.), *Historical and Archaeological Perspectives on Gender* (pp. 215-229). New York: Springer.

Obama, B. (2016). Glamour exclusive: President Barack Obama says, "this is what a feminist looks like." *Glamour*. Retrieved from https://www.glamour.com/story/glamour-exclusive-president-barack-obama-says-this-is-what-a-feminist-looks-like

Office of the Prime Minister. (n.d.). *Justin Trudeau*. Retrieved from https://pm.gc.ca/eng/prime-minister-justin-trudeau

Olsen, W. (2012). *Data collection: Key debates and methods in social research*. London: Sage.

Orr, C. (1997). Charting the currents of the third wave. *Hypatia, 12*(3), 29-45.

Owen, M. K. (2000). Gender. In L. Code (Ed.), *Encylopedia of feminist theories* (pp. 220-223). London: Routledge.

Pain, R. (2004). Social geography: Participatory research. *Progress in Human Geography, 28*(5), 652-663.

Papanek, V. (1973). *Design for the real world*. New York: Bantam Books. (Original work published in 1971)

Paris Design Summit. (2018). *Paris Design Summit 20-22.02.2019*. Retrieved from https://www.designsummit.paris/

Parpart, J. L., & Marchand, M. H. (1995). Exploding the cannon: An introduction/ conclusion. In M. H. Marchand & J. L. Parpart (Eds.), *Feminism/ postmodernism/ development* (pp. 1-22). London: Routledge.

Partington, A. (1989). The designer housewife in the 1950s. In J. Attfield & P. Kirkham (Eds.), *A view from the interior: Feminism, women and design* (pp. 206-214). London: The Women's Press.

Pedgley, O. (2007). Capturing and analysing own design activity. *Design studies, 28*(5), 463-483.

Percival, V., & Maclean, T. (2017, April 14). There's an important role for men in women's equality. *The Globe and Mail*. Retrieved from https://www.theglobeandmail.com/opinion/men-have-a-role-in-womens-equality/article34254478/

Perkins, N. (1999). Women designers: making differences. In J. Rothschild (Ed.), *Design and feminism: Re-visioning spaces, places, and everyday things* (pp. 120-125). New Brunswick, NJ: Rutgers University Press.

Perry Undem. (2015, March). *Topline results from a survey*. Retrieved from https://cdn2.vox-cdn.com/uploads/chorus_asset/file/3570070/Vox_Poll_Toplines__2_.0.pdf

Petit, V., & Guillaume, B. (2018). Scales of design: Ecodesign and the anthropocene. In P. Vermaas & S. Vial (Eds.), *Advancements in the philosophy of design* (pp. 473-494). Cham, SW: Springer.

Postrel, S., (2002) Islands of shared knowledge: Specialization and mutual understanding in problem solving teams. *Organization Science, 13*(3), 303-320.

Prentice, S. L. (2000). Gender roles. In L. Code (Ed.), *Encylopedia of feminist theories* (p. 223). London: Routledge.

Prochner, I. (2014). *Incorporating queer understandings of sex and gender in design research and practice*. Paper presented at the 2014 Design Research Society Conference. Umeå University, Umeå, Sweden. Retrieved from http://www.drs2014.org/media/648147/0216-file1.pdf

Pussyhat Project. (2018). *Our story*. Retrieved from https://www.pussyhatproject.com/our-story/

Rahman, M. & Witz, A. (2003). The elusive quality of the material in feminist thought. *Feminist Theory, 4*(3), 243-261.

Raizman, D. (2010). *History of modern design: Graphics and products since the industrial revolution* (2 ed.). London: Laurence King.

Rawsthorn, A. (2014, December 16). By design: Is the design world still a boy's club? [Web log post]. Retrieved from https://frieze.com/article/design-7

Reger, J. (2015, October 26). Feminism, first, second, and third waves. *The Blackwell Encyclopedia of Sociology*. Retrieved from https://onlinelibrary.wiley.com/doi/10.1002/9781405165518.wbeosf036.pub2

Rendell, J. (2011). Critical spatial practices: Setting out a feminist approach to some modes and what matters in architecture. In L. A. Brown (Ed.), *Feminist practices: Interdisciplinary approaches to women in architecture* (pp. 17-56). Farnham, UK: Ashgate.

Rhode, D. (2016). Appearance as a feminist issue. *SMU Law Review, 69*, 697-710.

Rich, J. (2014). *Modern feminist philosophy* (2 ed.). Penrith, CA: Humanities Ebooks.

Ricoeur, P. (1986). *Lectures on ideology and utopia*. New York: Columbia University Press.

Rist, G. (2014). *The history of development: From western origins to global faith* (4 ed., P. Camiller, Trans). London: Zed Books.

Roberts, M. (1991). *Living in a man-made world: Gender assumptions in modern housing design*. London: Routledge.

Rothschild, J. (1995). 'Designing technology' to meet human needs: Feminist visions in practice. *Icon, 1,* 99-105.

Rothschild, J. (1998). Designed environments and women's studies: A wake-up call. *NWSA Journal, 10*(2), 100-116.

Rothschild, J. (1999a). Afterword. In J. Rothschild (Ed.), *Design and feminism: re-visioning spaces, places, and everyday things* (pp. 175-181). New Brunswick, NJ: Rutgers University Press.

Rothschild, J. (1999b). Introduction: re-visioning design agendas. In J. Rothschild (Ed.), *Design and feminism: Re-visioning spaces, places, and everyday things* (pp. 1-6). New Brunswick, NJ: Rutgers University Press.

Rothschild, J. (Ed.). (1999c). *Design and feminism: Re-visioning spaces, places, and everyday things*. New Brunswick, NJ: Rutgers University Press.

Rothschild, J., & Rosner, V. (1999). Feminism and design: A review essay. In J. Rothschild (Ed.), *Design and feminism: Re-visioning spaces, places, and everyday things* (pp. 7-34). New Brunswick, NJ: Rutgers University Press.

Ryan, B. (1992). *Feminism and the women's movement: Dynamics of change in social movement, ideology and activism*. New York: Routledge.

Sachs, J. (2015). *The age of sustainable development*. New York: Columbia University Press.

Sanders, B.- N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *CoDesign, 4*(1), 5-18.

Sanders, B.- N., & Stappers, P. J. (2012). *Convivial toolbox: Generative research for the front end of design*. Amsterdam: BIS.

Sanders, E. B. N., & Stappers, P. J. (2014). Probes, toolkits and prototypes: Three approaches to making in codesigning. *CoDesign, 10*(1), 5-14.

Sargent, L.T. (2013). Ideology and utopia. In M. Freeden, L. T. Sargent & M. Stears (Eds.), *The Oxford handbook of political ideologies* (pp. 439-451). Oxford, UK: Oxford University Press.

Schön, D. (1983). *The reflective practitioner: How practitioners think in action.* New York: Basic Books.

Schwandt, T.A. (2007). *The SAGE dictionary of qualitative inquiry*. Thousand Oaks, CA: Sage.

Schwartz Cowan, R. (1983). *More work for mother: The ironies of household technology from the open hearth to the microwave*. New York: Basic Books.

Service Canada. (2013). *Industrial designers.* Retrieved from http://www.servicecanada.gc.ca/eng/qc/job_futures/statistics/2252.shtml

Shapiro Sanders, L. (2007). 'Feminists love a utopia': Collaboration, conflict and the futures of feminism. In S. Gillis, G. Howie & R. Munford (Eds.), *Third wave feminism: A critical exploration* (2 ed., pp. 3-15). New York: Palmgrave Macmillan.

Shedroff, N. (2009). *Design is the problem: The future of design must be sustainable*. Brooklyn, NY: Rosenfled Media.

Skjerven, A. (2016). *Design research for sustainability: Historical origins and development.* Paper presented at DRS 2016, Design Research Society 50th Anniversary Conference, Brighton. Retrieved from http://www.drs2016.org/180/

Smulders, F., Lousberg, L., & Dorst. K. (2008). Towards different communication in collaborative design. *International Journal of Managing Projects in Business, 1*(3), 352-367.

Snyder, R. (2008). What is third-wave feminism? A new directions essay. *Signs, 34*(1), 175-196.

Sohng, S. S. L. (1996). Participatory research and community organizing. *The Journal of Sociology and Social Welfare, 23*(4), 77-97.

Spangenberg, J., Fuad-Luke, A., & Blincoe, K. (2010). Design for sustainability (DfS): The interface of sustainable production and consumption. *Journal of Cleaner Production, 18*(15), 1485-1493.

Sparke, P. (1995). *As long as it's pink*. London: Pandora.

Sparke, P. (2013). *An introduction to design and* culture*: 1900 to present* (3rd Ed.). London: Routledge.

Spivak, G. C. (1988). Can the subaltern speak?. In C. Nelson & L. Grossberg (Eds.), *Marxism and the interpretation of culture* (pp. 271-313). Chicago: University of Illinois Press.

Stappers, P. J. (2007). Doing design as a part of doing research. In R. Michel (Ed.), *Design research now* (pp. 81-98). Basel, CH: Birkhäuser.

Starr, C. (2000). Third wave feminism. In L. Code (Ed.), *Encyclopedia of feminist theories* (p. 474). London: Routledge.

Steen, M. (2013). Co-design as a process of joint inquiry and imagination. *Design Issues, 29*(2), 16-28.

Steen, M., Arendsen, J., Cremers, A., De Jong, A., De Jong, J., & De Koning, N. (2013). Using interactive model simulations in co-design: An experiment in urban design. *CoDesign, 9*(1), 2-16.

Steen, M., Manschot, M., & De Koning, N. (2011). Benefits of co-design in service design projects. *International Journal of Design, 5*(2), 53-60.

Steves, A., & Silver, R. (2018). Sustainable design for scale. In R. B. Egenhoefer (Ed.), *Routledge handbook of sustainable design* (pp. 55-72). London: Routledge.

Stewart, D. W., Shamdasani, P. N. & Rook, D. W. (2007). *Applied social research methods: Focus groups*. Thousand Oaks, CA: Sage.

Sunder Rajan, R., & Park, Y.-M. (2008). Postcolonial feminism/postcolonialism and feminism. In H. Schwarz & S. Ray (Eds.), *A companion to postcolonial studies* (pp. 53-71). Victoria, Australia: Blackwell Publishing.

Tally, R. T. (2013) *Utopia in the age of globalization: Space, representation and the world-system*. New York: Palmgrave Macmillan.

Taylor, V., Whittier, N., & Pelak, F. (2004). The women's movement: Persistence through transformation. In L. Richardson, V. Taylor & N. Whittier (Eds.), *Feminist frontiers* (6 ed., pp. 515-536). New York: McGraw Hill.

Thomas, K. L. (2001). Lines in practice: Thinking architectural representation through feminist critiques of geometry. *Geography Research Forum, 21*, 57-76.

Thornham, S. (2001). Postmodernism and feminism (or: repairing our own cars). In S. Sim (Ed.), *The Routledge companion to postmodernism* (pp. 41-52). London: Routledge.

Tison, M. (2011, May 21). Designers industrielles: Rares, précieuses et recherchées. *La Presse.* Retrieved from http://affaires.lapresse.ca/economie/quebec/201105/20/01-4401576-designers-industrielles-rares-precieuses-et-recherchees.php

Tong, R. (2014). *Feminist thought: A more comprehensive introduction* (4 ed.). Philadelphia, PA: Westview Press.

Toupin, S. (2014). Feminist hackerspaces: The synthesis of feminist and hacker cultures. *The Journal of Peer Production, 5*. Retrieved at http://peerproduction.net/issues/issue-5-shared-machine-shops/peer-reviewed-articles/feminist-hackerspaces-the-synthesis-of-feminist-and-hacker-cultures/

Tromp, N., Hekkert, P., & Verbeek, P.-P. (2011). Design for socially responsible behaviour: A classification of influence based on intended user experience. *Design Issues, 27*(3), 3-19.

Ulgado, R. R., & Fox, S. (2014). *Critical design in feminist hackerspaces*. Retrieved from https://openlab.ncl.ac.uk/socially-engaged-art/files/2014/03/Critical-Design-in-Feminist-Hackerspaces.pdf

United Nations Department of Economic and Social Affairs. (2013). Partnering for innovative solutions for sustainable development. *Newsletter, 17*(5). Retrieved from https://www.un.org/development/desa/newsletter/dialogue/2013/05/7096.html

United Nations General Assembly. (2015, October 21). *Transforming our world: The 2030 agenda for sustainable development*. Retrieved from https://sustainabledevelopment.un.org/post2015/transformingourworld

Valocchi, S. (2005). Not yet queer enough: The lessons of queer theory for the sociology of gender and sexuality. *Gender and Society, 19*(6): 750-770.

Van Dijk, T. A. (1998). *Ideology: A multidisciplinary approach*. London: Sage.

Verbeek, P. P. (2008). Morality in design: Design ethics and the morality of technological artifacts. In P. Kroes, P. E. Vermaas, A. Light & S. A. Moore (Eds.), *Philosophy and design: From engineering to architecture* (pp. 91-103). Dordrecht, NL: Springer.

Vestbro, D.U., & Horelli, L. (2012). Design for gender equality: The history of co-housing ideas and realities. *Built Environment, 38*(2), 315-335.

Vezzoli, C., & Manzini, E. (2008). *Design for environmental sustainability*. London: Springer.

Vezzoli, C., Kohtala, C., Srinivasan, A., Diehl, JC., Fusakul, S.M., Xin, L., & Sateesh, D. (2014). *Product-service system design for sustainability*. Sheffield, UK: Greenleaf Publishing.

Vial, S. (2014). De la spécificité du projet en design: Une démonstration. *Communication & Organisation, 2*, 17-32.

Vickers, J. (2014). *Design for sustainability: A framework for product/service design and its application to an electronic weighing system for earthmoving equipment* (Unpublished doctoral dissertation). University of Auckland, Auckland.

Vostral, S. L. (2010). Tampons. In L. L. Layne, S. L. Vostral & K. Boyer (Eds.), *Feminist technology* (pp. 136-153). Urbana, IL: University of Illinois Press.

Vostral, S., & McDonagh, D. (2010). How to add feminist approaches into design courses. *Design Principles and Practices: An International Journal, 4*(4), 113-128.

Waas, T., Hugé, J., Verbruggen, A., & Wright, T. (2011). Sustainable development: A bird's eye view. *Sustainability, 3*(10), 1637-1661.

Wajcman, J. (1991). *Feminism confronts technology*. University Park, PA: Pennsylvania State University Press.

Wajcman, J. (2007). From women and technology to gendered technoscience. *Information, Communication and Society, 10*(3), 287-298.

Wajcman, J. (2010). Feminist theories of technology. *Cambridge Journal of Economics, 34*(1), 143-152.

Walby, S. (2011). *The future of feminism*. Cambridge, UK: Polity.

Walker, S. (2006). *Sustainable by design: Explorations in theory and practice*. London: Earthscan.

Walker, S., & Giard, J. (2013). General introduction: Design for sustainability- a reflection. In S. Walker & J. Giard (Eds.), *The handbook of design for sustainability* (pp. 1-10). London: Bloomsbury.

Warhol, R. R., Warhol-Down, R., & Herndl, D. P. (Eds.). (1997). *Feminisms: An anthology of literary theory and criticism*. New Brunswick, NJ: Rutgers University Press.

Weinthal, L. (2011). Interior-scapes. In L. A. Brown (Ed.), *Feminist practices: Interdisciplinary approaches to women in architecture* (pp. 139-154). Surrey, UK: Ashgate.

Whiteley, N. (1998). *Design for society*. London: Reaktion Books.

Willis, A.-M. (2013). Design, politics and change. *Design Philosophy Papers, 11*(1), 1-6.

Wills, D. (2000). Friedan, Betty (b. 1921). In L. Code (Ed.), *Encyclopedia of feminist theories* (p. 215). London: Routledge.

Wilshire, D. (1989). The uses of myth, image and the female body in re-visioning knowledge. In A. M. Jagger & S. R. Bordo (Eds.), *Gender/body/knowledge: Feminist reconstructions of being and knowing* (pp. 92-114). New Brunswick, NJ: Rutgers University Press.

Wingrove, E. (2016). Materialisms. In L. Disch & M. Hawkesworth (Eds.), *The Oxford handbook of feminist theory* (pp. 454-471). Oxford, UK: Oxford University Press.

Wisker, G., C. Morris, M. Cheng, R. Masika, M. Warnes, V. Trafford, G. Robinson, & J. Lilly. (2010). *Doctoral learning journeys*. Draft report for Higher Education Academy, National Teaching Fellowship Scheme Project 2007-2010. University of Brighton and Anglia Ruskin University.

Worden, S., & Seddon, J. (1994). Women designers in Britain in the 1920s and 1930s: Defining the professional and redefining design. In T. Eberhart & C. Wächter (Eds.), *Proceedings of the 2nd Feminist Research Conference: feminist perspectives on technology, work and ecology* (pp. 363-370). Graz, AUT.

Worden,S., & Seddon, J. (1995).Women designers in Britain in the 1920s and 1930s: Defining the professional and redefining design. *Journal of Design History, 8*(3), 177-193.

Wright, L. (1989). Objectifying gender: The stiletto heel. In J. Attfield and P. Kirkham (Eds.), *A view from the interior: feminism, women and design* (pp. 7-19). London: The Women's Press.

Wulan, R. R. (2017). The myth of white skin: A postcolonial review of cosmetics ads in Indonesia. *SHS Web of Conferences, 33*. Retrieved from https://www.shs-conferences.org/articles/shsconf/pdf/2017/01/shsconf_icome2017_00048.pdf

Wyatt, S. (2008). Feminism, technology and the information society: Learning from the past, imagining the future. *Information, Community & Society, 11*(1), 111-130.

Wylie, A. (2012). The feminist question in science: What does it mean to 'do social science as a feminist?'. In S. Hesse-Biber (Ed.), *Handbook of feminist research: Theory and praxis* (2 ed., pp. 544-557). Thousand Oaks, CA: Sage.

YouGov. (2013, May 1). *Has "feminist" become a dirty word?*. Retrieved from https://today.yougov.com/news/2013/05/01/has-feminist-become-dirty-word/

Young, I. M. (1981). Beyond the unhappy marriage: A critique of the dual systems theory. In L. Sargent (Ed.), *Women and revolution* (pp. 43-69). Boston: South End Press.

Zaccaï, E. (2002). *Le Développment Durable—Dynamique et Constitution d'un Projet*. Brussels: Peter Lang.

Zein-Elabdin, E. (2003). The difficulty of a feminist economics. In D. K. Barker & E. Kuiper (Eds.), *Toward a feminist philosophy of economics* (pp. 321-338). London: Routledge.

Appendix 1: Sustainable Development Goals and Indicators

This appendix lists the sustainable development goals and indicators from *Transforming our World: The 2030 Agenda for Sustainable Development* (United Nations General Assembly, 2015) and the publication, "Indicators and a monitoring framework for the sustainable development goals: Launching a data revolution for the sustainable development goals" (LCSDSN, 2015). These make up the analytic framework for design for sustainability, as described in Chapter 6. However, before presenting these goals and indicators, the discussion pauses to introduce several specific details.

First, it's notable that the LCSDSN report distinguishes between indicators that are generally applicable and a range of complimentary national indicators. These complimentary indicators can be applied optionally, depending on needs and context. This distinction between general and optional national indicators is highlighted in the table of sustainable development goals and indicators (Table VII). Similarly, the LCSDSN report categorized the sustainable development indicators according to topics of special concern where certain categories like industrialization, science, technology and innovation, sustainable cities and human settlements and sustainable production and consumption have particular relevance to industrial design. I also flagged many of the indicators in these categories as well as several others that were particularly relevant to industrial design in the table.

The table that follows is a copy of the table of suggested sustainable development indicators in the LCSDSN report (2015, pp. 29-38). However, it differs at several points from the original. I added notes about the indicators of special relevance for industrial design and simplified certain sections that were beyond the scope of this research. Last, I added goals

associated with each indicator. The original table in the report noted indicators, but not how they can be applied and interpreted. This version of the table added the idea of goals to understand how data can be interpreted as good or bad in relation to it. These goals are based on a review of the report in its entirety. When the goals were explicitly stated in the report, they are listed simply as 'goals' in the table. In other cases, they were less clear and required a combination of close reading and common sense to define. In these situations, the goals are listed as 'presumed goals' in the table. That said, certain goals were unclear even after reviewing the report in detail. These are indicated as 'goals unclear' in the table.

Table VII: *Sustainable Development Goals and Indicators*

Sustainable Development Goal 1: End poverty in all its forms everywhere	
	Indicators 1.1 Proportion of population living on less than $1.25 per day; Presumed goal: zero or low proportion 1.2 Proportion of population living below national poverty line; Presumed goal: zero or low proportion 1.3 The Multidimensional Poverty Index is a further source of poverty indicators which move beyond income to include things like education and health; Presumed goal: no or minimal poverty according to the index 1.4 Percentage of eligible population covered by national social protection; Presumed goal: all or high percentage 1.5 Percentage of women, men, Indigenous peoples, and local communities with secure rights to land, property, and natural resources; Presumed goal: all or high

	percentage 1.6 Losses from natural disasters, by climate and non-climate-related events measured by financial costs and mortality; Presumed goal: none or minimal losses □ Special relevance to industrial design: designed infrastructure and products could help achieve this goal 1.7 Total fertility rate; Presumed goal: lower fertility, since it represents women's power and access to contraception **Complimentary National Indicators:** 1.8 The Poverty Gap Ratio, which measures the relative poverty of a population in relation to the $1.25 marker; Presumed goal: no or minimal poverty 1.9 Percentage of population using banking services; Presumed goal: all or high percentage 1.10. Equal access to inheritance: Presumed goal: equal access 1.11 Investments in disaster reduction; Presumed goal: high investments
Sustainable Development Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	
	Indicators 2.1 Proportion of population below minimum level of dietary energy consumption; Presumed goal: none or low proportion 2.2 Percentage of women of reproductive age with anaemia; Presumed goal: none or low proportion 2.3 Prevalence of stunting and wasting in children under 5 years of age; Presumed

	goal: none or low prevalence 2.4 Percentage of infants under 6 months who are exclusively breast fed; Presumed goal: all or high percentage 2.5 Percentage of women, 15-49 years of age, who consume at least 5 out of 10 food groups; Presumed goal: all or high percentage 2.6 Crop yield; Presumed goal: high or highest yield 2.7 Experts that can support farmers through, for instance, special training; Goal: high or highest number of experts 2.8 Nitrogen use efficiency in food systems: Goal: balance between nitrogen added to soil through fertilisers and nitrogen drawn from soil by crops 2.9 A further indicator about water use in farming is proposed here, but is vague **Complimentary National Indicators:** 2.10 Percentage of population with vitamin and mineral deficiencies; Presumed goal: none or low percentage 2.12 Proportion of infants who receive a minimum acceptable diet; Presumed goal: all or high proportion 2.13 Percentage children born with low birth weight; Presumed goal: none or low percentage 2.14 Growth rate of crops; Presumed goal: high or highest growth rate 2.15 Livestock yield; Presumed goal: high or highest yield 2.16 Phosphorus use efficiency in farming; Goal: balanced use 2.17 Share of calories from non-staple crops; Presumed goal: calories from a range of sources beyond staple crops

	2.18 Percentage of total daily energy intake from protein in adults; *Goal: unclear* 2.19 Availability of food drying, storage and processing facilities; Presumed goal: high or highest availability - Special relevance to industrial design: designed infrastructure and products could help achieve this goal 2.20 Plant diversity in agriculture: *Goal: unclear* 2.21 Access to crop irrigation: Presumed goal: high or highest access - Special relevance to industrial design: designed infrastructure and products could help achieve this goal 2.22 Agricultural resilience to natural factors based on access to crop insurance; Presumed goal: high use of crop insurance 2.23 Expenditure on research and development for agriculture and rural development; Presumed goal: high or highest expenditure - Special relevance to industrial design: this could refer to financial investments in design work 2.24 Food price volatility; Presumed goal: no or low volatility
Sustainable Development Goal 3: Ensure healthy lives and promote well-being for all at all ages	
	Indicators 3.1 Infant and child mortality; Presumed goal: no or low mortality 3.2 Percent of children receiving full immunization; Presumed goal: all or high percentage

3.3 HIV incidence, treatment rate, and mortality; Presumed goal: no or low incidence and mortality and high or highest treatment rate

3.4 Incidence, prevalence, and death rates associated with TB; Presumed goal: no or low rates

3.5 Incidence and death rates associated with malaria; Presumed goal: no or low rates

3.6 Probability of dying between the ages of 30 and 70 from cardiovascular disease, cancer, diabetes, chronic respiratory disease, or suicide; Presumed goal: no or low probability

3.7 Percent of population overweight and obese; Presumed goal: no or low percentage

3.8 Road traffic deaths per 100,000 population; Presumed goal: no or low deaths

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal

3.9 Access to health care; Presumed goal: full or high access

3.10 Percentage of population without effective financial protection for health care; Presumed goal: none or low percentage

3.11 Proportion of persons with a severe mental disorder receiving treatment; Presumed goal: all or high proportion

3.12 Contraceptive prevalence rate; Presumed goal: high or highest prevalence

3.13 Use of tobacco products; Presumed goal: no or low use

Complementary National Indicators:

3.14 Percentage of births attended by health personnel; Presumed goal: all or high

	percentage 3.15 Access to medical care during pregnancy; Presumed goal: all or high access 3.16 Access to care after pregnancy; Presumed goal: all or high access 3.17 Percentage of pregnant women taking vitamin and mineral supplements; Presumed goal: all or high percentage 3.18 Incidence of diarrheal disease in young children; Presumed goal: no or low incidence 3.19 Percentage of 1 year-old children immunized against measles; Presumed goal: all or high percentage 3.20 Percent HIV+ pregnant women receiving treatment; Presumed goal: all or high percentage 3.21 Condom use; Presumed goal: high or highest use 3.22 Percentage of tuberculosis cases detected and cured; Presumed goal: all or high percentage 3.23 Percentage of children under 5 with fever who are treated with appropriate anti-malarial drugs; Presumed goal: high or highest percentage 3.24 Percentage of people in malaria-endemic areas sleeping under insecticide-treated bed nets; Presumed goal: all or high percentage 3.25 Percentage of confirmed malaria cases that receive first-line antimalarial therapy; Presumed goal: all or high percentage 3.26 Percentage of suspected malaria cases that receive a parasitological test; Presumed goal: all or high percentage 3.27 Percentage of pregnant women receiving preventative treatment for malaria;

	Presumed goal: all or high percentage 3.28 Tropical Disease cure rate; Presumed goal: high or highest rate 3.29 Incidence and death rates associated with hepatitis; Presumed goal: no or low rates 3.30 Percentage of women with cervical cancer screening; Presumed goal: all or high rate 3.31 Percentage of adults with hypertension diagnosed & receiving treatment; Presumed goal: all or high rate 3.32 Harmful use of alcohol; Presumed goal: no or low rate 3.33 Healthy life expectancy at birth; Presumed goal: long or longest life expectancy 3.34 Waiting time for elective surgery; Presumed goal: short or shortest wait time 3.35 Prevalence of insufficient physical activity; Presumed goal: no or low prevalence 3.36 Fraction of calories from saturated fat and added sugar; Presumed goal: healthy proportion 3.37 Salt Intake; Presumed goal: healthy amount 3.38 Prevalence of persons consuming less than five servings of fruit and vegetables per day; Presumed goal: no or low prevalence 3.39 Percentage change in per capita red meat consumption; goal: lower consumption in areas with overconsumption 3.40 Prevalence of diabetes, hypertension, cardiovascular disease, and chronic respiratory disease; Presumed goal: low or lowest prevalence

3.41 Mortality from indoor air pollution; Presumed goal: no or low mortality

3.42 Percentage of appropriate health facilities; Presumed goal: high or highest percentage

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal

3.43 Percentage of population with access to affordable essential drugs and commodities; Presumed goal: high or highest percentage

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal

3.44 Percentage of new health care facilities built in compliance with building codes and standards; Presumed goal: all or high percentage

- Special relevance to industrial design: design training and regulations could help achieve this goal

3.45 Expenditures on research and development for health; Presumed goal: high expenditures

- Special relevance to industrial design: this could refer to financial investments in design work

3.46 Ratio of health professionals to population; Presumed goal: high ratio

3.47 Percentage of adults with discriminatory attitudes towards people living with HIV; Presumed goal: none or low percentage

3.48 Stillbirth rate; Presumed goal: low or lowest rate

Sustainable Development Goal 4: Ensure inclusive and equitable quality education and

promote life-long learning opportunities for all

Indicators

4.1 Percentage of young children receiving pre-primary education; Presumed goal: all or high percentage

4.2 Early Child Development Index; Goal satisfying development measurements in this index

4.3 Primary completion rates for children; Presumed goal: all or high completion

4.4 Percentage of children who master foundational literacy and math skills by the end of primary school; Presumed goal: all or high percentage

4.5 Secondary school completion rate; Presumed goal: all or high rate

4.6 Percentage of children who achieve proficiency in appropriate literacy and mathematics skills by the end of lower secondary schooling cycle; Presumed goal: all or high percentage

4.7 Tertiary education enrolment rates; Presumed goal: high or highest rates

- Special relevance to industrial design: this refers to interest in and access to career training, which could include design training

4.8 Percentage of children who acquire skills and values needed for global citizenship and sustainable development; Presumed goal: all or high percentage

4.9 Percentage of children under 5 experiencing responsive, stimulating parenting in safe environments; Presumed goal: all or high percentage

4.10 Number of children out of school; Presumed goal: none or low percentage

4.11 Percentage of adolescents with access to school-to-work program; Presumed

goal: all or high percentage

- Special relevance to industrial design: this refers to access to career training, which could include design training

4.12 Literacy rate of 15-24 year-olds; Presumed goal: all or high rate

4.13 Percentage of young adults with access to a learning program; Presumed goal: all or high percentage

- Special relevance to industrial design: this refers to career training, which could include design training

4.14 Availability of appropriate education facilities; Presumed goal: high or highest availability

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal, and this goal could also refer to the availability of design education programs

4.15 Pupil to computer ratio in primary and secondary education; Presumed goal: high or highest ratio

4.16 Scholarships for students from developing countries; *Goal: unclear*

- Special relevance to industrial design: this could refer to access to design education

4.17 Supply of qualified teachers; Presumed goal: high or highest supply

4.18 Presence of legal frameworks that guarantee the right to education for all children for early childhood basic education, and that guarantee a minimum age of entry to employment not below the years of basic education; Presumed goal: full or high presence

Sustainable Development Goal 5: Achieve gender equality and empower all women and girls
Indicators 5.1 Prevalence of girls and women 15-49 who have experienced physical or sexual violence; Presumed goal: none or low prevalence 5.2 Percentage of referred cases of sexual and gender-based violence against women and children that are investigated and sentenced; Presumed goal: all or high percentage 5.3 Percentage of women aged 20-24 who were married or in a union by age 18; Presumed goal: low or lowest percentage 5.4 Percentage of girls and women aged 15-49 years who have undergone FGM/C; Presumed goal: none or low percentage 5.5 Average number of hours spent on paid and unpaid work combined, by sex; Presumed goal: equal number of hours for every sex 5.6 Percentage of seats held by women and minorities in national parliament and/or elected office according; Presumed goal: percentage equal to their proportion of the population 5.7 Demand for family planning; Presumed goal: high or highest demand **Complementary National Indicators:** 5.8 Gender gap in wages, by sector of economic activity; Presumed goal: no or low gap □ Special relevance to industrial design: this refers to working wages that

could include wages in design, related fields and its support fields

5.9 Share of women on corporate boards of national / multi-national corporations; Presumed goal: equal share

- Special relevance to industrial design: this refers to workplace equality, that could include design, related fields and its support fields

5.10 Percentage of women without incomes of their own; Presumed goal: low or lowest percentage

5.11 Adolescent birth rate; Presumed goal: low or lowest rate

5.12 Percentage of young people receiving sexuality education; Presumed goal: all or high percentage

Sustainable Development Goal 6: Ensure availability and sustainable management of water and sanitation for all

Indicators

6.1 Percentage of population using safely managed water services; Presumed goal: all or high percentage

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal

6.2 Percentage of population using safe sanitation services; Presumed goal: all or high percentage

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal

6.3 Percentage of wastewater flows treated and reused; Presumed goal: all or high

percentage

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal, and this goal could also refer to water use in manufacturing

6.4 Integrated Water Resource Management; Presumed goal: satisfy the requirements of this approach

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal, and this goal could also refer to water use in manufacturing

6.5 Proportion of total water resources used; Presumed goal: maintaining a non-harmful proportion

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal, and this goal could also refer to water use in manufacturing

Complementary National Indicators:

6.6 Percentage of population practicing open defecation; Presumed goal: none or low percentage

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal

6.7 Percentage of population with basic hand washing facilities with soap and water at home; Presumed goal: all or high percentage

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal

6.8 Proportion of the population connected to collective sewers or with on-site storage of all domestic wastewaters; Presumed goal: all or high proportion

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal

6.9 Percentage of pupils enrolled in primary schools and secondary schools providing basic drinking water, adequate sanitation, and adequate hygiene services; Presumed goal: all or high percentage

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal

6.10 Percentage of beneficiaries using hospitals, health centers and clinics providing basic drinking water, adequate sanitation, and adequate hygiene; Presumed goal: all or high percentage

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal

6.11 Proportion of the flows of treated municipal wastewater that are directly and safely reused; Presumed goal: high or highest proportion

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal, and this goal could also refer to water use in manufacturing

6.12 Transboundary river-shed management; Presumed goal: appropriate management for environmental needs

6.13 International cooperation and capacity building in water and sanitation-related activities; *Goal: unclear*

	▯ Special relevance to industrial design: this could refer to design learning and collaboration 6.14 Participation of local communities for improving water and sanitation management; *Goal: unclear* ▯ Special relevance to industrial design: this could refer to design collaborations
Sustainable Development Goal 7: Ensure access to affordable, reliable, sustainable, and modern energy for all	
	Indicators 7.1 Share of the population using modern cooking solutions; Presumed goal: high or highest share ▯ Special relevance to industrial design: designed infrastructure and products could help achieve this goal 7.2 Share of the population using reliable electricity; Presumed goal: high or highest share ▯ Special relevance to industrial design: designed infrastructure and products could help achieve this goal 7.3 Implicit incentives for low-carbon energy in the electricity sector; Presumed goal: high or highest number of incentives 7.4 Rate of primary energy intensity improvement; Presumed goal: lower energy consumption ▯ Special relevance to industrial design: designed infrastructure and products

could help achieve this goal, and this goal could also refer manufacturing practices

Complementary National Indicators:

7.5 Primary energy by type; *Goal: unclear*

- Special relevance to industrial design: design products and manufacturing practices rely on energy

7.6 Fossil fuel subsidies; *Goal: unclear*

- Special relevance to industrial design: this could refer to incentives for manufacturing and the purchase and use of certain products

7.7 Share of energy from renewables; Presumed goal: all or high share

Sustainable Development Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Indicators

8.1 Gross national income per capita; Presumed goal: high income per capita

8.2 System of Environmental-Economic Accounting; Presumed goal: application of this system and the satisfaction of principles

- Special relevance to industrial design: this framework could apply to the range of design activities

8.3 Youth employment rate; Presumed goal: high or highest rate

- Special relevance to industrial design: this could refer to availability of work in design, related fields and its support fields

8.4 Ratification and implementation of fundamental International Labor

Organization labour standards and compliance in law and practice; Presumed goal: full or high ratification and implementation

- Special relevance to industrial design: this refers to workplace conditions, that could include conditions in design, related fields and its support fields

Complementary National Indicators:

8.5 Growth rate of GDP per person employed; Presumed goal: high or highest rate

8.6 Proportion of population earning below working poverty rate measured at $2 per capita per day; Presumed goal: no or low proportion

- Special relevance to industrial design: this refers to working wages, that could include wages in design, related fields and its support fields

8.7 Decent work; Presumed goal: full or high compliance with working standards

- Special relevance to industrial design: this refers to working conditions, that could include conditions in design, related fields and its support fields

8.8 Household income; Presumed goal: high or highest income

- Special relevance to industrial design: this refers to working wages, that could include wages in design, related fields and its support fields

8.9 Employment to population ratio; Presumed goal: high or highest ratio

8.10 Share of informal employment in total employment; Presumed goal: low or lowest share

8.11 Percentage of own-account and contributing family workers in total employment; *Goal: unclear*

8.12 Percentage of young people not in education, employment or training; Presumed goal: low or lowest percentage

Special relevance to industrial design: this could refer to availability of training and work in design, related fields and its support fields 8.13 Implementation of the 10 Year Framework of Programs on Sustainable Consumption and Production; Presumed goal: implementation and satisfaction of the framework Special relevance to industrial design: this framework directly pertains to design and its implementation could be an element in design regulation and planning
Sustainable Development Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
Indicators 9.1 Access to all-weather roads; Presumed goal: high or highest access Special relevance to industrial design: designed infrastructure and products could help achieve this goal 9.2 Mobile broadband subscriptions per 100 inhabitants; Presumed goal: high or highest subscriptions Special relevance to industrial design: designed infrastructure and products could help achieve this goal 9.3 Information and Communication Infrastructure Index; Presumed goal: satisfaction of the index, which will pertain to the quality of infrastructure Special relevance to industrial design: designed infrastructure and products could help achieve this goal

	9.4 Manufacturing value added as percent of GDP; Presumed goal: high or highest percentage • Special relevance to industrial design: encouraging design and manufacturing work could help achieve this goal 9.5 Total energy and industry-related green house gas emissions by gas and sector; Presumed goal: low or lowest emissions • Special relevance to industrial design: this relates to manufacturing practices 9.6 Personnel in research and development; Presumed goal: high or highest numbers • Special relevance to industrial design: this could refer to availability of work in design, related fields and its support fields **Complementary National Indicators:** 9.7 Percentage of households with Internet; Presumed goal: high or highest percentage • Special relevance to industrial design: designed infrastructure and products could help achieve this goal 9.8 Employment in industry; *Goal: unclear* • Special relevance to industrial design: this could refer to availability of work in design, related fields and its support fields
Sustainable Development Goal 10: Reduce inequality within and among countries	
	Indicators

10.1 Inequality at top end of income distribution; Presumed goal: greater income distribution

10.2 Percentage of households with incomes below 50% of median income; Presumed goal: low or lowest percentage

Complementary National Indicators:

10.3 Gini Coefficient; Presumed goal: satisfaction of the coefficient, which measures equality of income distribution

- Special relevance to industrial design: this refers to working wages and equality that could include work in design, related fields and its support fields

10.4 Economic mobility between generations; Presumed goal: high or highest potential for mobility

- Special relevance to industrial design: this could relate to access to employment in or related to design and its working wages

10.5 Human Mobility Governance Index; Presumed goal: satisfaction of the index, which tracks the conditions of migrants

10.6 Net Official Development Assistance to Least Developed Countries; Goal: High financial commitments to aid by high-income countries, ranging from 0.15%-0.2% of their Gross National Incomes

10.7 Indicator on share of Least Developed Countries representatives on boards of International Monetary Fund; *Goal: unclear*

10.8 Remittance transfer costs; Goal: reduce remittance costs by 5%

Sustainable Development Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable
Indicators 11. Percentage of urban population living in slums or informal settlements; Presumed goal: none or low percentage - Special relevance to industrial design: designed infrastructure and products could help achieve this goal 11.2 Percentage of people within 0.5km of frequent public transit; Presumed goal: high or highest percentage - Special relevance to industrial design: designed infrastructure and products could help achieve this goal 11.3 Ratio of land consumption rate to population growth rate; Presumed goal: efficient land use - Special relevance to industrial design: designed infrastructure and products could help achieve this goal 11.4 Mean urban air pollution; Goal: low pollution aligned with World Health Organization maximums - Special relevance to industrial design: design and manufacturing choices impact air pollution 11.5 Area of public and green space as a proportion of total city space; Goal: at least 45% - Special relevance to industrial design: designed infrastructure and products

could help achieve this goal

11.6 Percentage of urban solid waste regularly collected and well managed; Presumed goal: all or large percentage

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal

Complementary National Indicators:

11.7 Number of street intersections per square kilometre; *Goal: unclear*

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal

11.8 Existence and implementation of a national urban and human settlements policy framework; Presumed goal: existence and implementation

- Special relevance to industrial design: design training and regulations could help achieve this goal

11.9 Percentage of large cities that are implementing risk reduction and resilience strategies related to disasters and climate concerns informed by accepted international frameworks; Presumed goal: all or high percentage

- Special relevance to industrial design: this could relate to design planning and collaborations

11.10 Presence of urban building codes stipulating either the use of local materials and/or new energy efficient technologies or with incentives for the same; Presumed goal: all or high presence

- Special relevance to industrial design: design training and regulations could help achieve this goal

	11.11 City biodiversity index; Presumed goal: satisfaction of the measurements in this index, which evaluates biodiversity and environmental health in cities • Special relevance to industrial design: design and manufacturing choices can impact urban conditions 11.12 Percentage of consumption of food and raw materials within urban areas that are produced and delivered in/from rural areas within the country; Presumed goal: high or highest percentage • Special relevance to industrial design: this could relate to design planning and manufacturing practices
Sustainable Development Goal 12: Ensure sustainable consumption and production patterns	
	Indicators 12.1 Disclosure of Natural Resource Rights Holdings; Presumed goal: full or high disclosure 12.2 Global Food Loss Index; Presumed goal: satisfaction of the measures in this index, which aims to reduce food loss throughout its life cycle • Special relevance to industrial design: designed infrastructure and products could help achieve this goal 12.3 Consumption of ozone-depleting substances; Presumed goal: no or low consumption • Special relevance to industrial design: design and manufacturing choices can impact the level of consumption

12.4 Aerosol optical depth; Presumed goal: no or low aerosols in atmosphere

- Special relevance to industrial design: design and manufacturing choices can impact air pollution

12.5 Share of companies valued at more than $1 billion that make their social and environmental relationships public; Presumed goal: all or high proportion

- Special relevance to industrial design: this can relate to the transparency of large design companies

Complementary National Indicators:

12.6 Strategic environmental and social impact assessments required; *Goal: unclear*

- Special relevance to industrial design: design training and regulations could help achieve this goal

12.7 Legislative framework dealing with natural resources; Presumed goal: presence and enforcement of such frameworks

12.8 Chemical pollution; Presumed goal: no or low pollution

- Special relevance to industrial design: design and manufacturing choices can impact pollution

12.9 CO2 intensity of the building sector and of new buildings; Presumed goal: low or lowest intensity

- Special relevance to industrial design: design and manufacturing choices can impact pollution

12.10 Policies for sustainable tourism; *Goal: unclear*

12.11 Sustainable public procurement processes; *Goal: unclear*

Sustainable Development Goal 13: Take urgent action to combat climate change and its impacts
Indicators 13.1 Availability and implementation of a transparent and detailed deep decarbonization strategy; Presumed goal: availability and implementation - Special relevance to industrial design: design planning and regulations could help achieve this goal 13.2 CO2 intensity of new power generation capacity installed, and of new cars and trucks; Presumed goal: no or low intensity - Special relevance to industrial design: design choices can directly impact this goal 13.3 Net greenhouse gas emissions in the Agriculture, Forest and other Land Use sector; Presumed goal: no or low emissions 13.4 Official climate financing from developed countries; Presumed goal: financing according to pledges **Complementary National Indicators:** 13.5 Climate Change Action Index; Presumed goal: satisfaction of measures in this index that deals with preparedness for climate change consequences - Special relevance to industrial design: designed infrastructure and products could help prepare for climate change consequences 13.6 GHG emissions intensity of areas under forest management; Presumed goal: no or low emissions

Sustainable Development Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Indicators 14.1 Share of coastal and marine areas that are protected; Goal: minimum of 10% 14.2 Percentage of fish tonnage landed within Maximum Sustainable Yield; Presumed goal: all or high percentage **Complementary National Indicators:** 14.3 Eutrophication of major estuaries; Presumed goal: no or low eutrophication 14.4 Ocean acidity; Presumed goal: natural and healthy acidity levels 14.5 Spatial planning strategies for coastal and marine areas; Presumed goal: implementation of such strategies □ Special relevance to industrial design: design planning could help achieve this goal 14.6 Area of coral reef ecosystems and percentage live cover; *Goal: unclear* 14.7 Proportion of fish stocks within safe biological limits; Presumed goal: all or high proportion 14.8 Percentage of fisheries with a sustainable certification; Presumed goal: all or high percentage 14.9 Flags on fishing vessels; Presumed goal: all or high proportion 14.10 This indicator dealing with fisheries monitoring is unclear 14.11 Use of destructive fishing techniques; Presumed goal: no or low use 14.12 Access to marine resources for small-scale artisanal fishers: *Goal: unclear*

Special relevance to industrial design: designed infrastructure and products could help achieve this goal 14.13 This indicator dealing with marine technology is unclear 14.14 Area of mangrove deforestation; Presumed goal: none or low area Special relevance to industrial design: manufacturing practices could impact this goal
Sustainable Development Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Indicators 15.1 Annual change in forest area and land under cultivation; Presumed goal: none or minimal loss of area for each 15.2 Area of forest under sustainable forest management; Presumed goal: all or high percentage of forest 15.3 Annual change in degraded or desertified arable land; Goal: end land degradation and desertification by 2030 15.4 Red List Index; Presumed goal: satisfy the measures in this index, which deals with species extinction 15.5 Protected areas overlay with biodiversity; Presumed goal: Goal: biodiverse protected areas that represent the range of environmental diversity **Complementary National Indicators:** 15.6 Improved tenure security and governance of forests; Presumed goal: complete

	or high improvement 15.7 Conservation of mountain ecosystems; Presumed goal: full or high conservation 15.8 Vitality Index of Traditional Environmental Knowledge; Presumed goal: satisfaction of the measures in this index, which deals with local and Indigenous knowledge 15.9 This indicator on genetic resources is unclear 15.10 Abundance of invasive alien species; Presumed goal: low or lowest number 15.11 Financial resources for biodiversity and ecosystems: *Goal: unclear* Special relevance to industrial design: this could refer to financial investments in sustainable design work 15.12 Financial resources for sustainable forest management: *Goal: unclear* 15.13 Global support to combat poaching and trafficking of protected species: *Goal: unclear* 15.14 Living Planet Index: Presumed goal: satisfy the measures in this index, which evaluates plant diversity
Sustainable Development Goal 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	
	Indicators 16.1 Violent injuries and deaths per 100,000 population; Presumed goal: none or low injuries and deaths

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal

16.2 Number of refugees: Presumed goal: no or few situations creating refugees and therefore, minimal refugees

16.3 Proportion of legal persons and arrangements for which beneficial ownership information is publicly available; Presumed goal: all or high proportion

16.4 Revenues, expenditures, and financing of all central governments are legally available and publicly available; Presumed goal: high or highest transparency

16.5 Percentage of children under age 5 whose birth is registered with a civil authority; Presumed goal: all or high percentage

16.6 Existence and implementation of a national law and/or constitutional guarantee on the right to information: Presumed goal: existence and implementation

16.7 Perception of public sector corruption; Presumed goal: no or low perception

Complementary National Indicators:

16.8 Percentage people report feeling safe walking alone at night in the city or area where they live; Presumed goal: all or high percentage

- Special relevance to industrial design: designed infrastructure and products could help achieve this goal

16.9 Compliance with recommendations from the Universal Periodic Review and UN Treaties; Presumed goal: complete or high compliance

16.10 Frequency of payment of salaries within security forces; Presumed goal: high or highest frequency

	16.11 Percentage of people and businesses that paid a bribe to a public official, or were asked for a bribe by a public official; Presumed goal: none or low percentage 16.12 Percentage of total detainees who have been held in detention for more than 12 months while awaiting sentencing or a final disposition of their case; Presumed goal: none or low percentage 16.13 Illicit financial flows; Presumed goal: no or low financial flows 16.14 International cooperation in preventing violence and combating terrorism and crime; Presumed goal: high or highest cooperation 16.15 Representation of women among mediators, negotiators and technical experts in formal peace negotiations; Presumed goal: equal representation 16.16 Number of journalists and associated media personnel that are physically attacked, unlawfully detained or killed; Presumed goal: none or low number
Sustainable Development Goal 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development	
	Indicators 17.1 Domestic revenues allocated to sustainable development; Goal: at least 15-20% of Gross National Income 17.2 Official development assistance and net private grants; Goal: payment of specified levels of financial assistance 17.3 Private net flows for sustainable development; Presumed goal: high or highest flows 17.4 Annual report by Bank for International Settlements, International accounting

Standards Board, International Financial Reporting Standards, International Monetary Fund World Intellectual Property Organization, and World Trade Organization; Presumed goal: presence of annual reports

17.5 Share of sustainable development goal indicators that are reported annually; Presumed goal: full or high share

17.6 Evaluative Wellbeing and Positive Mood Affect; Presumed goal: satisfying the measurements in established frameworks

- Special relevance to industrial design: Design products and a positive working experience in a design related field could help elevate wellbeing and mood

Complementary National Indicators:

17.7 Total Official Support for Development; *Goal: unclear*

17.8 Country Programmable Aid; *Goal: unclear*

17.9 Debt sustainability; Presumed goal: sustainable levels of debt

17.10 Expenditure on research and development; Presumed goal: high or highest expenditure

17.11 Technology sharing and diffusion; *Goal: unclear*

- Special relevance to industrial design: this could refer to design learning and collaboration

17.12 Creation of / subscription to the Technology Bank and Science, Technology and Innovation Capacity Building Mechanism; Presumed goal: creation of and subscription to the mechanism

- Special relevance to industrial design: this could refer to design learning

	and collaboration 17.13 Average tariffs imposed by developed countries on agricultural products and textiles and clothing from developing countries; Presumed goal: reduced or eliminated tariffs 17.14 Value of least developed countries' exports as a percentage of global exports; *Goal: unclear* 17.15 Investment promotion regimes for least developed countries; *Goal: unclear* 17.16 Percent of official development assistance, net private grants, and official climate finance channelled through priority pooled multilateral financing mechanisms; Presumed goal: high or highest percentage

Note. This table outlines sustainable development goals and their respective indicators. It is adapted from the table of suggested sustainable development indicators in "Indicators and a monitoring framework for the sustainable development goals: Launching a data revolution for the SDGs" (LCSDSN, 2015, pp. 29- 38).

Appendix 2: Texts Included in the Literature Analysis

The following is a list of the texts included in the literature analysis:

Agid, S. (2012). Worldmaking: working through theory/practice in design. *Design and Culture, 4*(1), 27-54.

Amon, A. (1999). The domestication of space-age technologies. In J. Rothschild (Ed.), *Design and feminism: re-visioning spaces, places, and everyday things* (pp. 125-129). New Brunswick, NJ: Rutgers University Press.

Attfield, J. (1989). Introduction. In J. Attfield & P. Kirkham (Eds.), *A view from the interior: feminism, women and design* (pp. 1-3). London, UK: The Women's Press.

Attfield, J. (2003). What does history have to do with it? Feminism and design history. *Journal of Design History, 16*(1), 77-87.

Baker, S. E. (2017). A glamorous feminism by design*? Cultural Studies, 31*(1), 47-69.

Beeston, L. (2017, January 21). Sonya Lee Atelier has form, function and feminism in the bag. *The Toronto Star*. Retrieved from https://www.thestar.com

Boyer, K., & Boswell-Penc, M. (2010). Breast pumps: a feminist technology, or (yet) "more work for mother." In L. L. Layne, S. L. Vostral & K. Boyer (Eds.), *Feminist technology* (pp. 119-135). Urbana, IL: University of Illinois Press.

Brawer, W. (1999). Sustainability and the city. In J. Rothschild (Ed.), *Design and feminism: Re-visioning spaces, places, and everyday things* (pp. 129-134). New Brunswick, NJ: Rutgers University Press.

Bronet, F., & Layne, L. L. (2010). Teaching feminist technology design. In L. L. Layne, S. L. Vostral & K. Boyer (Eds.), *Feminist technology* (pp. 179-196). Urbana, IL: University of Illinois Press.

Buckley, C. (1986). Made in patriarchy: Toward a feminist analysis of women and design. *Design Issues, 3*(2), 3-14.

Buckley, C. (1989). Pottery women: A comparative study of Susan Vera Cooper and Millicent Jane Taplin. In J. Attfield and P. Kirkham (Eds.), *A view from the interior: feminism, women and design* (pp. 71-89). London: The Women's Press.

Buckley, C. (1999). Made in patriarchy: Theories of women and design-a reworking. In J. Rothschild (Ed.), *Design and feminism: re-visioning spaces, places, and everyday things* (pp. 109-118). New Brunswick, NJ: Rutgers University Press.

Cartier, C. (2009). Production/consumption and the Chinese city/region: Cultural political economy and the feminist diamond ring. *Urban Geography, 30*(4), 368-390.

Chuko, C., & Chen, L.-F. (2016). Gender consciousness and design- the influence of values on design behavior. *Bulletin of Japanese Society for the Science of Design, 63*(1), 57-66.

Clegg, S., & Mayfield, W. (1999). How women's place in design is still defined by gender. *Design Issues, 15*(3), 3-16.

Clegg, S., Mayfield, W., & Trayhurn, D. (1999). Disciplinary discourses: A case study of information technology and design courses. *Gender and Education, 11*(1), 43-55.

Clerke, T. (2010). Gender and discipline: Publication practices in design. *Journal of Writing in Creative Practice, 3*(1), 63-78.

Cockburn, C. & Ormrod, S. (1993). *Gender and technology in the making*. London: Sage.

Cole, N. L., & Dahl Crossley, A. (2009). On feminism in the age of consumption. *Consumers, Commodities & Consumption, 11*(1), 1-5.

Ehrnberger, K., Räsänen, M., & Ilstedt, S. (2012). Visualizing gender norms in design: Meet the mega hurricane mixer and the drill dolphia. *International Journal of Design, 6*(3), 85-98.

Gorgenstein, S. (2010). What we now know about feminist technologies. In L. L. Layne, S. L. Vostral & K. Boyer (Eds.), *Feminist technology* (pp. 203-214). Urbana, IL: University of Illinois Press.

Gorman, C.R. (2001). Reshaping and rethinking: Recent feminist scholarship on design and designers. *Design Issues, 17*(4), 72-89.

Graves, J. (1996). The washing machine: 'Mother is not herself today.' In P. Kirkham (Ed.), *The gendered object* (pp. 30-42). Manchester, UK: Manchester University Press.

Hansson, L., & Jahnke, H. (2009). Gender bending through design- an account of a student project on gender. Paper presented at Nordes 2009- Engaging Artifacts, Oslo, Norway. Paper retrieved from http://www.nordes.org/opj/index.php/n13/issue/view/9

Johnson, D. G. (2010). Sorting out the question of feminist technology. In L. L. Layne, S. L. Vostral & K. Boyer (Eds.), *Feminist technology* (pp. 36-54). Urbana, IL: University of Illinois Press.

Kassun-Mutch, P. (2016, May 13). Meet Mithula Naik: feminist designer, latent entrepreneur. [Web log post]. Retrieved from https://www.liisbeth.com/2016/05/13/meet-mithula-naik-feminist-designer-latent-entrepreneur/

Kaygan, P. (2014). 'Arty' versus 'real' work: Gendered relations between industrial designers and engineers in interdisciplinary work settings. *The Design Journal, 17*(1), 73-90.

Kaygan, P. (2016). Gender, technology and designer's work: A feminist review. *Design and Culture, 8*(2), 235-252.

Kirkham, P. (1989). If you have no sons: Furniture making in Britain. In J. Attfield and P. Kirkham (Eds.), *A view from the interior: feminism, women and design* (pp. 109-130). London: The Women's Press.

Kirkham, P., & Attfield, J. (1996). Introduction. In P. Kirkham (Ed.), *The gendered object* (pp. 1-11). Manchester, UK: Manchester University Press.

Layne, L. L. (2010a). Introduction. In L. L. Layne, S. L. Vostral & K. Boyer (Eds.), *Feminist technology* (pp. 1-35). Urbana, IL: University of Illinois Press.

Layne, L. L. (2010b). Why the home pregnancy test isn't the feminist technology it's cracked up to be and how to make it better. In L. L. Layne, S. L. Vostral & K. Boyer (Eds.), *Feminist technology* (pp. 89-118). Urbana, IL: University of Illinois Press.

Lindström, K., & Ståhl, A. (2015). Figurations of spatiality and temporality in participatory design and after - networks, meshworks and patchworking. *CoDesign, 11*(3-4), 222-235.

Lomberg, M. (2003). *Interdisciplinary interventions in feminist industrial design scholarship* (Master's thesis). University of Calgary, Calgary.

Martins, L. P. D. O. (2014). Privilege and oppression: Towards a feminist speculative design. In Y.-K. Lim, K. Niedderer, J. Redström, E. Stolterman & A. Valtonen, A. (Eds.), *Proceedings of DRS 2014: Design's big debates*, (pp. 980-990).

Martínez, J. G. (2007). Women only: Design events restricted to female designers during the 1990s. *Design Issues, 23*(2), 17-30.

Mumby, Z. (1989). Representations of women and race in the Lancashire cotton trade. In J. Attfield and P. Kirkham (Eds.), *A view from the interior: Feminism, women and design* (pp. 20-28). London: The Women's Press.

Nieusma, D. (2004). Alternative design scholarship: Working toward appropriate design. *Design Issues, 20*(3), 13-24.

Perkins, N. (1999). Women designers: Making differences. In J. Rothschild (Ed.), *Design and feminism: Re-visioning spaces, places, and everyday things* (pp. 120-125). New Brunswick, NJ: Rutgers University Press.

Rawsthorn, A. (2014, December 16). By design: Is the design world still a boy's club? [Web log post]. Retrieved from https://frieze.com/article/design-7

Rossi, C. (2009). Furniture, feminism and the feminine: Women designers in Post-War Italy, 1945 to 1970. *Journal of Design History, 22*(3), 243-257.

Rothschild, J. (1995). 'Designing technology' to meet human needs: Feminist visions in practice. *Icon, 1,* 99-105

Rothschild, J. (1998). Designed environments and women's studies: A wake-up call. *NWSA Journal, 10*(2), 100-116.

Rothschild, J. (1999a). Afterword. In J. Rothschild (Ed.), *Design and feminism: Re-visioning spaces, places, and everyday things* (pp. 175-181). New Brunswick, NJ: Rutgers University Press.

Rothschild, J. (1999b). Introduction: Re-visioning design agendas. In J. Rothschild (Ed.), *Design and feminism: Re-visioning spaces, places, and everyday things* (pp. 1-6). New Brunswick, NJ: Rutgers University Press.

Schwartz Cowan, R. (1983). *More work for mother: The ironies of household technology from the open hearth to the microwave.* New York: Basic Books.

Sparke, P. (1995). *As long as it's pink: The sexual politics of taste*. London: Pandora.

Vostral, S. L. (2010). Tampons. In L. L. Layne, S. L. Vostral & K. Boyer (Eds.), *Feminist technology* (pp. 136-153). Urbana, IL: University of Illinois Press.

Vostral, S., & McDonagh, D. (2010). How to add feminist approaches into design courses. *Design Principles and Practices: An International Journal, 4*(4), 113-128.

Wajcman, J. (1991). *Feminism confronts technology*. University Park, PA: Pennsylvania State University Press.

Wajcman, J. (2007). From women and technology to gendered technoscience. *Information, Communication and Society, 10*(3), 287-298.

Wilner, S. J. S., & Dinnin Huff, A. (2017). Objects of desire: The role of product design in revising contested cultural meanings. *Journal of Marketing Management, 33*(3-4), 244-271.

Worden, S., & Seddon, J. (1994). Women designers in Britain in the 1920s and 1930s: Defining the professional and redefining design. In T. Eberhart & C. Wächter (Eds.), *Proceedings of the 2nd European Feminist Research Conference: Feminist perspectives on technology, work and ecology* (pp. 363-370).

Worden, S., & Seddon, J. (1995).Women designers in Britain in the 1920s and 1930s: Defining the professional and redefining design. *Journal of Design History, 8*(3), 177-193.

Wright, L. (1989). Objectifying gender: The stiletto heel. In J. Attfield and P. Kirkham (Eds.), *A view from the interior: Feminism, women and design* (pp. 7-19). London, UK: The Women's Press.

Appendix 3: Group Interview Questions

Each interview began with several introductory prompts to break the ice and get to know each other.

- Tell me about yourself, like your interests and your work
- Tell me about your affiliations with the WCCW like when and why you joined
- Tell me about your work here at the WCCW

The next questions and prompts dealt with feminism generally to establish a common ground and identify participants' understandings of feminism and its meaning.

- Broadly, what is feminism?
- Describe the major principles it upholds[9]

The next questions addressed the specific feminism at the WCCW to understand whether the centre was aligned with a feminist perspective.

- Beyond this broad definition, how does feminism manifest at the WCCW?
- Does the feminism at the WCCW align with a strand of feminism?
- What feminist attitudes does the WCCW hold? An attitude is a judgment of something, either in a positive or negative way.[10]

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[9] The prompt relating to principles was meant to encourage discussion of concepts like patriarchy or equality, often referenced in definitions of feminism, and/or feminism's core concepts.

[10] Mention of attitudes in the final two groups of questions was based on theory on ideology. Van Dijk emphasizes that an ideology's core concepts, which he calls ideological beliefs are general and abstract (1998). These are translated into a series of attitudes when applied to concrete situations (Van Dijk, 1998). These attitudes pertain to a 'group schema' of adherents to the ideology: who they are (i.e. their characteristics), what they believe and want (i.e. the problems and solutions they identify), what they do, their social relationships with other groups (i.e. their allies and enemies), and their existing and desired resources (i.e. material

- How are these attitudes expressed in actions at the WCCW?

The last questions and prompts dealt with participants' personal experiences of feminism to understand whether they associated with a specific feminist perspective.

- What is your personal understanding of feminism?
- Describe how your personal understanding relates to feminism in the WCCW as a whole.
- Do you adhere to a strand of feminism? Which one or ones? If not, why?
- What feminist attitudes do you hold?
- How do you express your feminist attitudes in your actions?
- How do you express your feminist attitudes in your work at the WCCW?

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resources like money or employment and symbolic resources like power; Van Dijk, 1998). I thought that a discussion of attitudes would be more concrete and accessible to participants than a discussion of theory and core concepts, and I hoped that these attitudes would help situate the participants' feminist perspectives.