

THE ACCEPTANCE AND USAGE INTENTION OF MENSTRUAL UNDERWEAR

Elizabeth Phan

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APPROVED:

JiYoung Kim, Major Professor  
Hae Gam, Committee Member  
Bugao Xu, Chair of the Department of  
Merchandising and Digital Retailing  
Jana Hawley, Dean of the College of  
Merchandising, Hospitality and  
Tourism  
Victor Prybutok, Dean of the Toulouse  
Graduate School

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This research aims to study the consumer perception, acceptance and adoption of menstrual underwear as it provides a sustainable option to the current feminine hygiene management solutions widely used in the consumer market in the U.S. In addition to the functional and utilitarian aspect of the underwear, I further delve into studying the social psychological effect the usage of the underwear (i.e., hedonic) has on consumer adoption. A longitudinal, qualitative study employing a three-step approach was conducted. The findings suggest that participants have never heard of menstrual underwear and did not fully understand the phenomenon. Contradicting responses between subject's attitudes and behavior towards the environment were revealed although, menstrual underwear had a positive psychological effect on the participants. Overall, menstrual underwear was most accepted amongst participants in the study.

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## CHAPTER 1

### INTRODUCTION

#### 1.1 Overview

This chapter introduces the problem the current study seeks to address and how it adds to the current body of literature. The first section includes information on the process of menstruation, historical roots and theories behind menstrual stigma, and how this stigma effects women's development. Information about previous research is discussed and how the current study is significant and complements previous research is addressed. This chapter concludes with the study's purpose.

#### 1.2 Problem Statement

Menstruation, or having a period, is a natural biological process that prepares a females' body for reproduction (Rembeck et al., 2006; Chrisler et al, 2015). It is the transition from childhood to womanhood, playing a vital role in female health and development. Spanning over the course of three to seven days, it is the vaginal discharge of blood and other tissues from the lining of the uterus occurring once a month. A single female will endure more than 400 periods in her lifetime starting around 12 years of age before hitting menopause around 51 years (Thomas & Ellertson, 2000; Durkin, 2017).

Menstrual hygiene management (MHM) is the use of clean materials to absorb menstrual blood that can be changed privately, safely, hygienically, and as often as needed for the duration of the menstrual cycle (UNICEF & WHO, 2012). Commercially produced disposable pads and tampons have made managing periods easier but have contributed greatly to the global issue of menstrual waste. No journal articles or

statistics on the percentage of feminine product make up in landfills could be found but on average a woman may go through 12,000 to 14,000 disposable products generating 250 to 300 pounds of waste in her lifetime (Gibson, 2017; Wylie, 2017; Atkin, 2018). When improperly disposed, plastic and chemical makeup in disposable feminine hygiene products can disrupt our ecosystem (Mercola, 2013). Even if disposed in the trash properly, these non-biodegradable, plastic products end up in our landfills requiring about 500-800 years to decompose (Mehrotra, 2018). Plasticizing chemicals found in pads include polyethylene (PET), polypropylene (PP), propylene glycol (PEG) and bisphenol A (BPA) (Mercola, 2013), which contributes to the pollution of the ecosystem.

The lack of disposal management systems and menstruation education have led women to improperly dispose of feminine products. Embarrassment over having a period leads most women to think less about the environment. 97% of women expressed concern towards the environment in a U.S. study, however 85% admitted to ignoring the harmful environmental repercussions of improperly disposing sanitary products— flushing them down the toilet so others wouldn't see them in the trash. 38% of women would dispose their tampons in the toilet if at a partner's house or at work (Siebert, 2018). This reflects the stigma around menstruation hindering the progress of menstrual health education. One of the first menstrual product advertisements appearing in the 1920s represented menstruation as taboo that required discretion and secrecy. For decades, conventional products have relied on the same message ultimately shaming women and treating menstruation as a forbidden subject.

These issues have received both increased scrutiny and awareness towards the



environmental, economic and social impact of menstruation. In recent years, several startup brands have united to change the misconception of periods. They are producing innovative, sustainable alternatives for girls and women to handle the reality of their periods. Alternatives include menstrual cups, reusable pads and menstrual underwear which are all contributors to the disruption of America's \$5.9 billion disposable feminine hygiene industry (Atkin, 2018).

The most stylish of emerging, reusable products are menstrual underwear, or period-proof underwear, a standalone absorbent or “complimentary to tampons, menstrual cups or pads” (VanLeeuwen & Torondel, 2018). This alternative is meant to resemble female underwear with a built-in pad. It comprises of a multilayer design with various brands incorporating different fabrics—the most commonly used textiles including microfiber polyester, nylon, lycra and organic cotton. The fibers work to provide stain and leak resistance, trap odor and safely assist in menstrual management (Eveleth, 2016). Depending on the brand and style, absorbency levels vary between ½ tampons up to 4 tampons worth of menstrual fluid (VanLeeuwen & Torondel, 2018; Andersson, 2019). With increased consumer interest toward the menstrual underwear, the industry is growing. The global menstrual underwear market was 79 million US\$ in 2018 and is expected to reach 580 million US\$ by the end of 2025. Due to emergence of several key players across the globe, the menstrual underwear market is highly fragmented. Some of the leading brands include THINX Inc., Clovia, Knixwear, Lunapads International, and Modibodi.

While the industry sees growth in consumer acceptance, hence increased sales, their impact is still minimal compared to the sales made by conventional disposable

feminine hygiene products. With several products on the market for management and different techniques in using them, the essence behind confusion is the lack of education and communication between women. Americans hold cultural norms in very high regard and particularly wouldn't challenge any related to hygiene (Phipps, 2012). With only two main options available in mostly all grocery and drug store shelves, women are ill-informed of any other menstrual alternatives.

### 1.3 Significance of the Study

First, this study adds to the current menstrual hygiene literature by focusing on the acceptance and potential usage of menstrual underwear. While there are well-established studies on other alternative menstrual product such as menstrual cups, there are limited knowledge on the menstrual underwear. For example, Phipps (2012) found that the conceptualization of menstrual cups is different in active users than that of the current mainstream. Active menstrual cup users are better informed and cautious of the environment leading them to use reusable products over disposable products (Phipps, 2012). Distrust in commercially manufactured products and the suspicions of unnamed chemicals likely lead to the use of the cup. Feminist communities both offline and online promoting awareness and support for the cup likely lead women to use it.

Second, while there is a growing popularity for menstrual underwear in Western industrialized countries, there is a lack of empirical evidence examining the acceptance and potential usage of the product in the U.S. (VanLeeuwen & Torondel, 2018). Previous literature has mainly studied disposable products on menstrual hygiene management in developing countries and low-income areas. For example, VanLeeuwen and Torondel (2018) studied the hypothetical acceptability and potential utility of

reusable menstrual underwear among a female refugee population currently living in Ritsona, Greece. They found that these women shared a preference for baby diapers on heavy flow days and had a strong dislike for cloth as an absorbent due to its linked perception of negative health outcomes and discomfort. No other literature has mentioned a preference for baby diapers as a management product. The perceived acceptability rate for menstrual underwear was high, but the compatibility of the product was questionable in certain environments. Hennegan and colleagues (2016) studied young girl's menstrual management in rural Uganda and found that compared to girls that utilized improvised methods of management such as new or old cloth, those that were provided reusable pads were more confident in absorbency levels. However, those with reusable pads participated less in physical activities. While reusable pads were highly favored, there was no difference found in the actual soiling of clothing and missing activities due to menstruation.

Further, prior studies on female hygiene management provided limited implication in its research design as they did not allow the participants to fully experience the product. In a qualitative study with Middle Eastern women living in a refugee setting, participants were shown a single sample of a menstrual underwear to identify the potential acceptability of the product (VanLeeuwen & Torondel, 2018). As they did not have an opportunity to experience the product during their period, the study has limitation in eliciting the true psychological and physiological responses from the participants.

Lastly, this study raises awareness on the impact of disposable feminine hygiene products and how reusable underwear can help reduce cost and waste. Other studies

among the topic of menstruation in social sciences include the use of disposable products, improving access to hygienic menstrual absorbents, tax exemption on feminine hygiene products, disposal infrastructure, etc. (Sinha & Paul, 2018).

In general, menstruation is a taboo subject receiving little attention. It is important and significant to discuss the impact of menstrual underwear by addressing the gap between reusable hygiene products and urbanized U.S. society. While still gaining traction on the market, there is much opportunity for growth. This study may contribute new research and findings to the topics of menstruation, menstrual hygiene management and sustainability. The research may provide marketers an increased understanding of consumer' risk and motivation perceptions which can then be used to devise risk-reducing strategies and trust-building mechanisms to encourage purchase intention for menstrual underwear.

#### 1.4 Purpose of the Study

This research aims to study the consumer perception, acceptance and adoption of menstrual underwear as it provides a sustainable option to the current feminine hygiene management solutions widely used in the consumer market in the U.S. In addition to the functional and utilitarian aspect of the underwear, researchers further delve into studying the social psychological effect the usage of the underwear (i.e., hedonic) will have on consumer adoption. More specifically, this study will answer the following questions by conducting a longitudinal study on the usage of the menstrual underwear.

1. What are the perceived benefits that will lead to acceptance and adoption of the menstrual underwear?

2. What are the perceived risks that will act as a barrier for acceptance and adoption?
3. Will psychological and hedonic aspects of the usage enhance the acceptance and adoption?

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Overview

This chapter builds the foundation of current research. The next section includes information on alternatives to disposable feminine hygiene products and concerns with our current practice. Previous studies on cloth diapers, adult diapers and women empowerment are reviewed. In the following section, motivation theory is discussed, and the chapter concludes with the proposition developments.

#### 2.2 Literature Review

##### 2.2.1 Studies on Alternatives to Disposable Feminine Hygiene Products

There are limited studies on menstrual hygiene management, especially on menstrual underwear. A study conducted by VanLeeuwen and Torondel (2018) was the only research found that was on menstrual underwear. They conducted a qualitative study based on Middle Eastern women living in a refugee setting. Participants engaged in discussion for the study were only shown a sample of a menstrual underwear to identify the potential acceptability of the product. The authors found that these women appreciated the concept and design of the product but still had doubts regarding absorbency, capacity, and convenience of use. Most women preferred and were accustomed to disposable sanitary pads as absorbents and have used baby diapers exclusively or in conjunction with pads. Quantity was a concern for several participants because menstruation is a continuous process averaging at 7 days per cycle. Very few participants expressed concern about hygiene and the cleaning process of reusable underwear.

While not specific to menstrual underwear, there are several studies that focused on general menstrual management. Hennegan and colleagues (2016) addressed the deficit in girl's menstrual management in rural Uganda. Participants were girls that utilized improvised methods of management such as new or old cloth and those that were provided reusable pads. The authors found that girls wearing reusable pads were more confident in absorbency levels yet participated less in physical sports, working in the field, fetching water, and cooking. It was concluded that while reusable pads were highly favorable, there was no change in the actual soiling of clothing and missing activities due to menstruation did not differ.

While there is an extremely limited amount of research on menstrual underwear, there are several related studies, such as, with menstrual cups. Menstrual cups are another alternative to sustainable hygiene management. The first modern design was invented in 1937 and was made from latex rubber. Through innovation, the 21<sup>st</sup> model of menstrual cups were designed from medical grade silicone and trademarked as a sustainable and reusable feminine hygiene product (Beksinska et al., 2015). In their study on menstrual cups, Beksinska and others (2015) assessed the acceptability and performance of the menstrual cup in South Africa. In comparison to tampons and disposable sanitary pads, they found the menstrual cup was rated better by comfort, quality, blood collection, appearance and preference. The women reported an overall positive experience with a high intent to continue using the product. Menstrual cups were also associated with environmental benefits in the study stating that it would lead to cost savings in reduction of waste and damage to water systems. Kakani and Bhatt (2017) also assessed the adaptability and effectiveness of the menstrual cup to

inexperienced users in India. Out of 150 participants, a little over 90% of women found the cup easy to use by their third cycle. 135 to 142 women grew more comfortable in removing their cups in the third cycle. Overall, the study found that women preferred the cup to their usual method of sanitary protection in comfort, dryness/irritation, odor, length of wear, and interference with various activities. Danish company, Ruby Cup, believed menstrual cups would solve the issue in Kenya where girls have sold their bodies for sex to be able to afford menstrual hygiene products. Cups are a promising solution because they are designed to be used up to 12 hours with a total lifespan of 10 years (Sundqvist, 2015). Thus, it is a cleaner, healthier and cost-effective alternative for women with limited accesses to pads and tampons.

Further, few studies on adult incontinence underwear revealed a related research result on perceived risks and potential benefits. Getliffe et al., (2007) reported high levels of anxiety associated with the perceived risks of poor performance and lack of discretion on absorbent products for individuals with incontinence. Interviewees of the study demonstrated real and potential emotional distress on the topic of urine smells and being in close proximity of other people. They expressed words such as 'mortified', 'embarrassed', and 'ashamed' when describing feelings and fears (Getliffe et al., 2007).

In several trade publications that focused on the negative impact of disposable feminine hygiene products, menstrual underwear was compared to reusable cloth diapers without the bulk (Hsieh, 2018). In correspondence to the increased awareness on health and environmental issues, the popularity of reusable diapers is growing ("The Green Renewal," 2009; Meseldzija et al., 2013). Although 95% of U.S. families use disposable diapers, production and popularity of reusable diapers have increased ("The



Green Renewal,” 2009; Alpert, 2017). In addition, concern for their impact on solid waste disposal costs and landfill inventories have led some policymakers to recommend the use of cloth diapers (Lehrburger, Mullen, & Jones, 1991). Approximately 30 billion disposable diapers end up in landfills around North America each year (Schwarcz, 2017). This includes estimates of both infant diapers and adult incontinence products. Diapers consist of polypropylene plastics made from petroleum, a non-renewable resource, that will not biodegrade under landfill conditions. When improperly disposed, raw fecal matter and urine can leech into the groundwater surrounding landfills while cloth diapers can be washed down the toilet to go through sewage treatment facilities. Cloth diapers are reusable diapers made of natural made materials and have become a popular alternative due to its positive effect on reducing waste footprint, money savings and harsh chemical avoidance to babies’ sensitive skin. There are several diverse options for cloth diapers including prefolds, fitted, pocket, hybrid, all-in-ones and all-in-twos cloth diapers. These styles may contain materials such as bamboo, cotton, hemp and wool. In a study conducted on form fitted cloth diapers, Stone & Brackelsberg (1997) found that mothers believed “using cloth diapers is a small thing that we can do to help the environment” and felt good about their contribution to the environment. Other mothers believed there should be a tax deduction for families that use cloth diapers.

## 2.2.2 Concerns with Current Practice

### 2.2.2.1 Environmental Impact

During menstruation, a single woman may go through 12,000 to 14,000 disposable products generating 250 to 300 pounds of waste in her lifetime (Gibson, 2017; Wylie, 2017; Atkin, 2018). Mostly made of synthetic materials containing

chemicals, toxins and plastics, between 12 and 20 billion disposable products end up in landfills annually taking up to 100 years to decompose (Borowski, 2011; Gibson, 2017). These products include sanitary pads, tampons and panty liners. While sanitary pads, are the most preferred product in menstrual management for U.S. women (Potdar, 2016), it is one of the most non-environmentally friendly products, with many containing plastics in the equivalence of four supermarket bags. Of the many layers in pads, products can be laced with “odor neutralizers, artificial fragrances” and pesticide residue from cotton production (Mercola, 2013; Kounang, 2015). Similarly, tampons come individually wrapped in plastic applicators that do not biodegrade for at least a decade. Further, one of the main issues with tampon usage is improper disposal procedures. Commonly, tampons are flushed down toilets which can lead to plumbing problems like flooded homes and gardens. When tampons aren’t filtered out by waste treatment plants they can end up in rivers, coastal waters, inside wildlife and seep into our water systems (Borowski, 2011; Atkin, 2018). However, Borowski (2011) finds that most women are unaware of the environmental issues associated with menstruation products such as waste generated. With over 50% of the population represented by females, the current stigma on menstruation makes it challenging to install safe disposal methods.

#### 2.2.2.2 Impact on Health

Several case studies stated that little attention is given to possible chemical exposure with feminine hygiene products. It was found by the National Toxicology Program and the State of California Environmental Protection Agency that in commercial products, there is evidence of dangerous chemicals including styrene, chloromethane, chloroethane, chloroform, and acetone (Bae et al., 2018). Because

these products are considered medical devices, the Food and Drug Administration does not require full disclosure of ingredients (Mercola, 2013; Fetters, 2015; Kounang, 2015; Jones, 2016; Rabin, 2017). A suggested list of ingredients would typically say “may” contain cotton, rayon and polyester materials (Mercola, 2013; Kounang, 2015; Rabin, 2017).

Cotton in feminine hygiene products has been an ongoing issue for women’s health. A bleaching process would take place for the product to achieve an ultra-white “clean” look. Although considered “chlorine free,” these products, especially tampons, generate dioxin as a byproduct (Bae et al., 2018). The Environmental Protection Agency (EPA) states that no safe levels of dioxin exposure exist as it is said to be carcinogenic and have been linked to “abnormal tissue growth in the abdomen and reproductive organs, hormonal and endocrine system disruption” and many more health risks (Borowski, 2011; Mercola, 2013). An interviewee from a study carried out by Borowski (2011) believes the cancer of her cervix was potentially caused by the repetitive exposure and absorption of chemicals from tampon use resulting in “painful and irregular periods, soreness, cramping, and other gynecological issues.”

Toxic shock syndrome (TSS) is a potentially fatal infection caused by bacterial toxins with symptoms that include fever, low blood pressure, skin rashes, liver and kidney failure (Borowski, 2011). This disease is heavily associated with tampon usage. The first scandal of Toxic Shock Syndrome appeared in the 1980s when 91% of all cases were related to menstruation. 38 women died using super-absorbent tampons (Borowski, 2011; Fetters, 2015; Kounang 2015; Jones, 2016). Toxic shock syndrome is prevalent in tampons with added synthetic materials that included

carboxymethylcellulose (CMC), polyacrylate rayon and polyester - ingredients that increased absorption. CMC and polyester in tampons dry out women's vaginas which can cause small cuts during removal (Fetters, 2015). These cuts become infected by toxin-producing bacteria, *Staphylococcus aureus*. A case study by McDermott and Sheridan (2015) reports that although female sanitary products have undergone intensive change in design and material makeup, TSS may still occur. Using highly absorbent tampons for more than eight hours increases the risk of TSS (Borowski, 2011; Kounang, 2015; Jones, 2016).

#### 2.2.2.3 Financial Impact

The cost of managing periods can be expensive for women. When breaking down all the possibilities for proper hygiene management, a single woman could be spending on menstrual management products, birth control, additional clothing or bed sheets from accidents and pills for pain relief. In totality, she may spend between \$1,000 to over \$15,000 in her lifetime (Kane, 2017). A contributing factor to the total cost of a period is sales tax. Considered "tampon tax," this term refers to sales, value-added tax, and similar taxes imposed on menstrual hygiene products (Bennett, 2017; Crawford & Spivack, 2017). This tax has costed American women approximately \$3.1 billion each year, with only nine states exempting feminine hygiene products from sales tax (Bennett, 2017).

#### 2.2.3 Movement on Empowering Women

While all females go through the menses, menstruation is still a topic shied away from. For several countries, cultures and religious beliefs, they still vilify menstruation spreading the same message; menstruation is embarrassing and should remain hidden

with oneself. In Western cultures, this may only affect females in a way that makes them feel shameful for sharing menstrual pains with male counterparts, whereas for girls in developing countries such as Africa and India, the implications are often more critical (Sundqvist, 2015). A study carried out by Clue, a menstrual health app with the help of The International Women's Health Coalition discovered over 5,000 slang words in reference to the term "period" such as "time of the month," "female troubles," "Aunt Flo," and "on the rag" (Clue, 2016; Litman, 2018). Although some euphemisms are funny and entertaining to use, this can reinforce the idea that a period is something to be ashamed of and hidden from others. From a content analysis of advertisements in Australian magazines, Raftos et al. (1998) concluded that a powerful message was being sent to readers that leaking menstrual blood taints a women's femininity, because, through the proper choice of products, women should have kept the evidence of her menses out of sight. For American women, menstruation is thought of as an inconvenience and to overcome that feeling is to practice discrete management with menstrual products. This conception of menstruation isn't one just harbored by these women but one that is manipulated by the American media, marketing and advertising industry in order to sell menstrual products. Advertisements for menstrual products frequently emphasize the unpleasantness and inconvenience of menstruation and how their products can free women of it (Phipps, 2012).

While euphemisms and marketing advertisements are not as harmful, it is an indicator towards a larger issue. Negative perception on menstruation provide young girls and women with an unbalanced foundation for proper menstrual hygiene management (MHM). Driven by the lack of health education and knowledge, this has

contributed to the stagnation for women's development and empowerment (Litman, 2018). In low- and middle-income countries, access to sanitary products such as pads, tampons, or menstrual cups is limited. Often girls' resort to old rags, animal skins, leaves and padding underwear with soil to absorb their menstrual flow. Sanitation infrastructure— including waste disposal mechanisms, water, sanitation, hygiene (WASH) facilities and private toilets— are rarely available and sustainable. Western women that cannot afford menstrual products may use old cloths, diapers, tissues and toilet paper from public bathrooms. In a study on the impact of shame and stigma, adolescent girls expressed emotive language such as “afraid, embarrassed and insecurity” when faced with the fear of leaking. The anticipation of encountering negative reactions and discrimination after a menstrual leak leads girls to actively change their behavior; for example, avoiding white clothing or abstaining from certain activities such as swimming (Tingle & Vora, 2018).

Although there has been mild activism for breaking stigma and taboo in the past, it wasn't until 2015, considered “The Year of the Period” by the National Public Radio and Cosmopolitan, that menstruation became an important public discussion (Gharib, 2015; Jones, 2016). Poet, Rupi Kaur, wanted to normalize a women's period by posting an image of herself fully clothed with blood stain on her pants and sheets. What sparked public controversy is Instagram's “accidental” removal of the image twice (Jones, 2016). On the night before her big race, runner Kiran Gandhi received her period. After months of training not on her period, she believed a tampon would be uncomfortable while running leading her to free-bleed during the 2015 London. Much buzz was drawn after the GOP debate when Donald Trump made inappropriate comments about FOX's news

reporter, Megyn Kelly calling out the “blood coming out of her eyes, blood coming out of her wherever.” While it is unknown if the remark was a direct insult on periods, many women took it to social media with the hashtag #PeriodsAreNotAnInsult to address his unnecessary comments. The movements were so inspiring that women used their periods for protest.

Two years later, on January 21, 2017, The Women’s March, a women-led movement that addressed women’s and human rights issues took place “to create transformative social change” (Bynum, 2017; Dao, 2018; “Our Mission”, 2018). One of the most significant issues women fought for was to gain menstrual equity and eliminate the tampon tax, a tax some states impose on the purchase of menstrual products (Braws, 2018). Menstrual equity refers to the belief that all menstruating individuals, regardless of their circumstances, should have adequate and appropriate access to menstrual products so that they can to fully participate in school, work and society as a whole (Kosin, 2017; Braws, 2018). According to Jennifer Weiss-Wolf, activist and author of *Periods Gone Public: Taking a Stand for Menstrual Equity*, through conversation and acknowledgment, what is, after all, normal can be normalized.

### 2.3 Theoretical Background: Motivation Theory

Previous research has suggested that motivation plays an important role in the acceptance of information technology by influencing both the actual use and the intention to continue using the system in the future (Davis et al., 1989; Lordache & Lamanaskas, 2015). Motivation can also play a role in influencing consumer decision making in product adoption. In this study, a motivational model for the acceptance of menstrual underwear will be utilized that explains the acceptance and intention to use

with two key factors: perceived usefulness (extrinsic motivation) and perceived enjoyment (intrinsic motivation). While the former is instrumental, being goal oriented, the latter is hedonic, being related to pleasure and inherent satisfaction created by a specific activity (Davis et al., 1992; Iordache & Lamanauskas, 2015).

Extrinsic motivation is the type of motivation built upon external rewards or punishments (Nikou & Economides, 2017). Perceived usefulness (PU) is an extrinsic motivation defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989). In non-work settings, PU may refer to consumers' perceptions regarding the outcome of the experience (Davis et al., 1992). If a product is seen as useful or beneficial, the consumer may think positively about it. Intrinsic motivation is viewed as the perceived enjoyment (PE). Lepper & Malone (1987) define intrinsic motivation as "a force that involves doing activities without external inducement. Without any reward, a person is willing to act as long as he is interested or personally enjoys the task." Enjoyment is defined as "the pleasure the individual feels objectively when committing a particular behavior or carrying out a particular activity" and in previous research is found as a key factor in user's acceptance of the Internet (Moon & Kim, 2001).

## 2.4 Proposition Development

### 2.4.1 Extrinsic Motivation

#### 2.4.1.1 Sustainability

Traditional feminine hygiene products take a toll on the environment. Plastic tampon applicators, which aren't recyclable (due to 'contamination' of bodily fluids), pile up in landfills across the globe. Many women use pads, which also wind up in landfills



(Tschinkel, 2019). As more consumers demand sustainability from brands, menstrual underwear provides an eco-friendly alternative to wasteful disposable menstrual products. Making the switch will drastically cut waste as a single pair can last for several years, reducing environmental damage altogether (Ricci, 2018).

#### 2.4.1.2 Comfort

Typically, when women are on their periods, they may not feel their best. Symptoms include bloating, acne and feeling vulnerable. In addition, women may not own “cute” underwear to wear during their period. Most menstrual underwear is lined with patent-pending technology designed to be moisture wicking, absorbent and leak resistant. The liner is made with quick-drying carbon cotton, which wicks moisture away up to three times faster than regular cotton. This prevents any unpleasant dampness, as well as combating unhygienic breeding grounds of bacteria. A hygienic alternative, menstrual underwear is often made with an ultra-thin nylon and Lycra blend to fit seamlessly against the body like a second skin (Ricci, 2018). They can be worn on their own or as a secondary to organic tampons, reusable pads and menstrual cups. Anti-microbial properties allow for girls and women to wear menstrual underwear while looking, smelling and feeling good.

#### 2.4.1.3 Affordability

Periods are expensive and till this day taxed in several states. With the use of over hundreds of feminine care products in her lifetime, the amount spent doesn't account for inflation either. Menstrual underwear ends the consumer's reliance on disposable, single-use products. They're strong and washable, so a single pair can be reused time and again. Because many are made with a stretchy, elasticated fabric, such

as Lycra, they are more impervious to the everyday wear-and-tear of normal underwear. They're longer lasting, lessening impact on the planet.

Based on the following research the below is proposed:

*P1: Extrinsic motivation will influence consumers acceptance and adoption of menstrual underwear*

#### 2.4.2 Intrinsic Motivation: Alternative Hedonism

Current affluent consumption patterns are negatively impacted by by-products including stress, time-scarcity, pollution, and excessive waste that may destroy or prevent other forms of happiness and pleasure (Soper & Thomas, 2006). It has been argued that defining the “good life” is not only driven based on affluent, Euro-American consumption but “new thinking of human pleasure and self-interest gratification of consuming differently” (Caruana, Glozer & Eckhardt, 2019). There is potential in alternative hedonism to mobilize social change towards sustainability. Alternative hedonism is the pursuit and enjoyment of pleasures with less emphasis on consumption (Syse & Mueller, 2014). The concept of alternative hedonism identifies self-interested motivations for less environmentally destructive practices, as well as the altruistic motives commonly associated with green and ethical consumption (Soper & Thomas, 2006). Soper (2008) indicates that individuals need not to buy more, “use up” or even consume at all an object or service to gain some kind of pleasure.

##### 2.4.2.1 Ethical Consumption

Previous research has suggested that engaging in environmentally-friendly activity or ethical consumption can feel good and influence how people see themselves in a positive light (Taufik et al, 2015; Venhoeven et al., 2016). Ethical consumption is

defined as “personal consumption where choice has been informed by a particular ethical issue— be it human rights, social justice, the environment or animal welfare” (Williams et al., 2005). The “warm glow” has a large influence on purchase intention and is the personal benefit that people feel when they do good. The prospect of a “good feeling” attracts consumers to purchase product that makes ethical, sustainable claims (Iweala et al., 2019). Switching to menstrual underwear means washing and reusing a single product. More importantly, several brands offering the sustainable product engage in philanthropic events donating to non-profit organizations and helping in providing girls and women all over the world feminine care products (Tschinkel et al., 2019).

#### 2.4.2.2 Female Empowerment

In Western society, women don't think twice about having a period—there is better access to products. Potentially, for one week out of the month, having a menstrual cycle is an ordinary part of their daily routine. However, in certain countries around the world, menstruating is seen as a sign of a woman being “unclean” and there are cultures which shun women during their periods. Added to that, resources to help them during their cycle may be scarce or not even exist at all and women are left to use rudimentary methods that can be unhygienic, or even dangerous (GirlTalkHQ, 2015). Brands that offer menstrual underwear are not only shifting experiences to help women feel comfortable and confident during their periods but sharing the experience with girls and women in third world countries. Many brands are committed to educating women and girls about menstruation and reproductive rights. Purchasing a pair of menstrual

underwear means supporting global menstrual equity and ending “period poverty” (Tschinkel et al., 2019). Accordingly, this study proposes:

*P2: Intrinsic motivation will lead to acceptance and adoption of menstrual underwear*

### 2.4.3 Perceived Risks

Perceived risk (PR) is the “nature and level of uncertainty that a consumer feels when making a particular decision” (Cox & Rich, 1964). It is a critical factor to consider within the context of sustainable consumption. Perceived risk plays a key role in holding consumers back from adopting new and innovative products (Rogers, 1995) such as menstrual underwear. There are many facets of PR but the three most prominent to the study are functional, financial and social risk. It is posited as a prominent barrier to consumer acceptance of products or services (Featherman and Pavlou, 2003).

#### 2.4.3.1 Financial Risk

To avoid financial risk, consumers strive to find better deals and collect information about the price-quality ratio. Financial risk is the potential monetary and economic loss (Kang & Kim, 2013) associated with the costs and uncertainty of purchasing an unpredictable product or service (Shapiro, Reams & So, 2019). The cost of a single menstrual underwear can run from \$16 to \$40. The initial cost of one item or plenty may negatively affect the intent of purchase because it is seen as a large financial loss. In addition, if a consumer purchases menstrual underwear and is disappointed in the outcome, that too can be seen as a financial loss if the product cannot be returned.

#### 2.4.3.2 Functional Risk

From a decision-making perspective, consumers search for and evaluate information about a product's attributes before making a purchase (Wei & Jung, 2017). Functional risk or performance risk is the possibility of the product malfunctioning and not performing as it was designed and advertised (Horton, 1976). This risk has a significant impact on consumer purchase intention.

#### 2.4.3.3 Social Risk

The culture surrounding menstruation must change in order to improve the reproductive health of adolescent girls and women. When an individual chooses to buy something outside the social norm, such as an emerging product (i.e. menstrual underwear), the perceived social risk is that friends and family would frown upon the purchase. Social risk is defined as the extent to which the consumer thinks that other people will judge them on the basis of the brand or product in use (Brody and Cunningham, 1968).

Based on the literature above, the following proposition states:

*P3: Perceived risk will act as a barrier in acceptance and adoption of menstrual underwear*

## CHAPTER 3

### METHODOLOGY

#### 3.1 Overview

The purpose of this study is to understand consumer perception, acceptance and adoption intention of menstrual underwear. This chapter describes the methods and process used for data collection. Information on the population and sample of study participants is also included. The procedure is described in detail. The section ends with assumption in methodology.

#### 3.2 Research Design

This qualitative study employed a three-step approach. Initially, a pre-usage, semi-structured interview was conducted to learn the participants' opinions on menstrual management and sustainable living. The purpose of the pre-usage interview was to identify whether the phenomenon of menstrual underwear exists in consumers' minds and if so, what it constitutes. A semi-structured interview approach with open-ended questions to guide the in-depth interviews related to the phenomenon was used as the instrument. The advantage of the semi-structured interview method is that it enables mutuality between the interviewer and participant, which enables conversation to veer off course on tangents, related information or whatever sparks their interest that is deemed relevant to the conversation. In the second step, participants were sent one menstrual underwear to be used during their period for the following two months. They recorded their experience based on specific guidelines that was later used for qualitative data analysis. The exploratory nature of the second step allowed the researchers to collect information on the immediate thoughts and emotions during the

usage. This process also let participants discuss the barriers that may prevent them from buying and using menstrual underwear. The last step was an after-usage interview following up on the overall exposure and experience with the product.

### 3.3 Data Collection

#### 3.3.1 Sample

Menstruation has historically justified girls and women from “fully participating in society, justifying control over them in general and over their sexuality” (Merskin, 1999). Despite menstrual shame that still exists today, in a study conducted by marketing research company, OnePoll, and menstrual cup brand, Lunette, it was found that there is a generation shift regarding menstrual health. Millennials and Gen Zers are openly discussing the topic of menstruation no matter the gender. Of the 2,000 women surveyed, 67% of them feel comfortable talking about their periods and no longer feeling embarrassed (SWNS, 2019). Thus, a purposive sample was selected. Purposeful sampling is widely used in qualitative research for the identification and selection of cases related to the phenomenon of interest (Palinkas et al., 2013). At the beginning of the study, 26 participants were enrolled but only 21 were able to fully participate. (80.77%). There were 5 discontinuations due to different reasons like feeling unclean and uncomfortable (2 participants), feeling like she was no longer a good candidate because her menstrual flow was not conducive with the menstrual underwear (1 participant), and late additions where menstrual underwear could not be distributed and used because of time restrictions (2 participants). Recruitment methods included recruiting purposive subjects from two large, Southern universities and ‘snowballing’ procedures. Participants were informed that participation in this study is confidential

and their information provided cannot be linked to their identity. They may feel uncomfortable discussing menstruation and trying on the menstrual underwear but will experience no penalties for not participating or completing all study procedures. Participants were informed that they will receive menstrual underwear, a value of \$30, as compensation for their participation in the interviews and trial stages. Institutional Review Board (IRB) approval for the protection of human subjects was attained prior to data collection and analyses.

### 3.3.2 Procedure

A qualitative study employing a three-step approach was conducted. Initial step was the semi-structured pre-usage interviews conducted face-to-face or over the phone depending on the participant's availability. The interview tended to last about 45 minutes to one hour. Interview questions were grouped thematically. The first set of interview questions asks participants about their menstruation experience and what feminine hygiene products they used for management. Next, respondents were asked about their general knowledge and interest in living a sustainable lifestyle. Then, participants were asked if they have heard of menstrual underwear and if they did, what were their thoughts (see Appendix A). This process allowed the researcher to gather information and learn the participants' attitudes and opinions on menstrual management and living a sustainable lifestyle. Lastly, subjects were asked demographic questions to better understand the sampled population. Included in those questions are race, education, household income, employment and status.

The second step was the usage stage that took place in the comfort of the participant's home. Participants received Ruby Love menstrual underwear and were



asked to record their experience based on a set of instructions during usage over a two-month time span (see Appendix B). Based on the order type, researchers received individually boxed menstrual underwear, or a variety pack of menstrual underwear (see Appendix C). Each package comes with a card detailing cleaning instructions but laundering directions as well as the set of instructions to conduct the journaling were also sent to participant's emails (see Appendix D). According to the company's website, Ruby Love is designed with a built-in absorbent organic cotton liner free of plastics and can hold up to 2.5 tampons. Dri-tech mesh lines along the crotch to help stop front, side and back leaks. The capacity can be augmented with the addition of a pad. For multiple use, participants will need to launder their underwear. Right after use, users must rinse the underwear immediately with cold water. Period underwear can be thrown in the washer with other articles of clothing, but it is highly recommended to deter use of bleach and fabric softeners as this may damage the absorbency factor. Lastly, these products don't need to be thrown in the dryer and can be hung dry. All participants sent back responses via email.

In the final step, once participants have sent in their last journaling experience, an after-usage interview was conducted face-to-face or over the phone depending on the participant's availability which lasted 15 - 20 minutes. Participants were asked about their experience and final thoughts on the menstrual underwear (see Appendix E).

Data collected were analyzed through transcribing audio data, memoing, identifying patterns, words, and phrases of commonality amongst the participants, which were then coded into themes.

### 3.4 Underlying Assumption and Limitation of Methodology

Information provided by participants was assumed to be accurate and not impacted by social desirability. There is a possibility that participants could have responded in a manner that will be viewed favorably by the interviewer. The respondents could have been embarrassed or uncomfortable sharing their menstruation experience, lack of environmental awareness, and knowledge, as a result, inflate the results.

## CHAPTER 4

### RESULTS

#### 4.1 Overview

A qualitative study employing a three-step approach was used for this study. This chapter examines the perceived benefits and risks affecting the acceptance and adoption intention of menstrual underwear. In the next section, a description of the sample is discussed. In the following sections, findings of the study are presented.

#### 4.2 Sample Description

Twenty-one subjects fully participated in the study. Respondents were between the ages of 18 and 26 years old. The majority of respondents had earned a bachelor's degree (61.9%) and were single (85.7%). Although each individual human body functions differently, women share similar menstrual symptoms before and during menstruation (see Table 4.1). Eight (38.1%) used a combination of pads and tampons. Five (23.8%) only used tampons or eight (38.1%) only used pads.

#### 4.3 Findings

##### 4.3.1 Menstruation

Participants responded to questions about their menstrual cycle by discussing their flow, symptoms, and how menstruation affects their bodies. Participants' responses suggest that menstruation is not a pleasant experience. Thirteen (61.9%) of participants experienced discomfort and pain before and during menstruation which distracts them from daily activities such as school or work. Menstrual symptoms such as dysmenorrhea, heavy menstrual bleeding, and perimenstrual mood disorders are known to be widespread among the general population (Schoep et al., 2019).

Table 4.1

*Sample Description*

<b>Interview #</b>	<b>Age</b>	<b>Education</b>	<b>Marital Status</b>	<b>Flow Description</b>	<b>Symptoms</b>	<b>Product Used for Menstrual Management</b>
Interview 1	24	Bachelor's Degree	Married	Normal and consistent	Cravings, tender breasts and cramps	Birth control, tampons, and pantyliners
Interview 2	18	Less than high school degree	Single	Normal	Bad cramps, backaches, and cravings for sweets	Pads and occasionally uses tampon
Interview 3	23	Master's Degree	Single	Heavy	Cramps, fatigue, cravings and feeling feverish	Pads with wings
Interview 4	26	Bachelor's Degree	Single	Normal and inconsistent	Heat flashes, feeling irritable, and cravings	Tampons, pads, and pantyliners
Interview 5	20	Associate degree	Single	Light	Cramping, lower back pain, abdominal pain, and iron deficiency during menstruation	Tampons and pantyliners
Interview 6	23	Bachelor's Degree	Single	Normal	Feeling moody, tender breasts, and loss of appetite before and during menstruation	Pads and tampons
Interview 7	26	Bachelor's Degree	Married	Normal	Abdominal pain	Variety of pads: daytime pads, nighttime pads and thin pads
Interview 8	22	Bachelor's Degree	Single	Heavy	Cramps, face acne, most recently back and chest acne, cravings and mood swings	Overnight pads with tampons
Interview 9	22	Bachelor's Degree	Single	Normal	Fatigue, cramps, cravings or loss of appetite. Before and sometimes during her period, she will get mild acne, mood swings and tender breasts	Pads and organic tampons
Interview 10	24	GED some college but no degree	Single	Normal	Light cramps	Pads and cleansing wipes

*(table continues)*

<b>Interview #</b>	<b>Age</b>	<b>Education</b>	<b>Marital Status</b>	<b>Flow Description</b>	<b>Symptoms</b>	<b>Product Used for Menstrual Management</b>
Interview 11	24	Bachelor's Degree	Married	Normal	Cravings, light cramps and low energy levels	Birth control, tampons and ultra-thin pads
Interview 12	23	Bachelor's Degree	Single	Light	Cramps, bloating, and sometimes headaches	Tampons
Interview 13	18	Less than high school degree	Single	Normal and consistent	Being more irritable, sensitive, craving sweets and using the restroom more	Pads
Interview 14	22	Bachelor's Degree	Single	Normal and irregular	Before birth control, she experienced cramps. Now she experiences bloating and loss of appetite	Birth control, Pantyliners and pads, tampons when swimming
Interview 15	22	Bachelor's Degree	Single	Normal	Minor cramps, and tender breasts before and during menstruation	Tampons, period underwear, pantyliners and pads
Interview 16	23	Master's Degree	Single	Normal	Cramps and tender breasts before and during menstruation	Tampons
Interview 17	25	Bachelor's Degree	Single	Heavy	Migraines the week before her cycle and is prone to getting them during her cycle. She gets really bad cramps, lower back pain and stomach aches	Pads, tampons and pantyliners
Interview 18	26	Bachelor's Degree	Single	Normal	Bloating, fatigue and occasionally cramps	Tampons, pads and pantyliners
Interview 19	23	GED some college no degree	Single	Normal and consistent	Tender breasts before her cycle and cramps	Pads
Interview 20	18	High school graduate	Single	Light to Medium	Cramps, tender breasts, cravings and using the restroom more	Pads
Interview 21	23	Bachelor's Degree	Single	Normal	Tender breasts and mild premenstrual syndrome	Tampons and pantyliners

Some participants grow self-conscious when considering their periods. These factors have a significant impact on quality of life.

It's hard to focus in class because the pain can be unbearable, and I have to constantly use the restroom which takes me away from activities. I, also, think having to change out of a pad takes time out of my day. It's almost an inconvenience, honestly. [Participant 2].

Discomfort during menstruation can reduce my learning efficiency. During this time, especially the first and second day, I am usually more tired and want to sleep. [Participant 7].

I get really bad cramps and feel like I can't get out of bed. I generally feel more tired and lazy. I am unfocused and procrastinate. I have also taken off work because my cramps got really bad. [Participant 14].

#### 4.3.2 Impact on Product Choice

Consumer behavior can broadly be explained as the consumer's attempt to satisfy needs and wants through the purchasing of products or services (Gunay & Baker, 2011). The decision, however, in making the purchase to satisfy the consumer's needs and wants is influenced by numerous variables. Subjects discussed which feminine hygiene products were used for menstruation management and why they use them. More females use pads (38.1%) to tampons (23.8%), but eight (38.1%) used a variety of feminine hygiene products. Of the participants that wear or have worn pads, ten (47.62%) mentioned their mom as the major influence in their choice of product management.

I use pads because that's what my mom taught me. She told me it is much safer, and I can agree since I'm not inserting anything in me. [Participant 4].

My mom mainly purchased products for me, and she bought pads. [Participant 7].

I started off with pads and only use them because my mom and cousin use them. [Participant 6].

However, participants who typically wear pads because of their mothers, have recently started wearing tampons because of change in personal preferences and daily activities.

I use pads because that's what I've always used and was what my mom bought me. I recently started using tampons since I am active in band. Sometimes my pad would chafe which is uncomfortable. I want to feel completely comfortable, so I needed something that absorbed my flow better. [Participant 2].

Growing up my mom only ever taught me how to use a pad. I wasn't allowed to wear tampons. In high school, I started using tampons and learned that through girlfriends. I really liked it because it prevented leakage better. [Participant 11].

Some respondents are active users of tampons and have strong attitudes toward the disuse of pads.

I don't like pads because I don't like sitting in my period. It's unhygienic. Tampons are more discreet and smaller to carry around. I feel like it's more common because women usually ask other women, 'hey, do you have a tampon?' [Participant 1].

I use tampons because they're cleaner than using pad and also more discreet. A pad is like a diaper to me. [Participant 5].

There are those respondents who wear both pads and tampons depending on the activity and environment.

Tampons allow me to be more flexible in my activities. I only wear pads at night but not during the day because I don't like the feeling of a pad. It can feel uncomfortable and also makes a crunch noise like a diaper. [Participant 9].

Some interviewees voiced their concerns on the use of conventional products.

When asked about the personal concern of their health they were unaware of alternative products.

I read a lot about TSS and am aware of the chemicals in tampons. Personally, I would like to fall back on using them, but I am not sure about the alternatives. [Participant 11].

With tampons, I am inserting something inside of me. With pads, not so much. I

do know that they're both not eco-friendly but what can we do? It's necessary for managing our periods. [Participant 4].

#### 4.3.3 Underwear Styles Worn During Menstruation

Concerns and pressures around body image are a significant barrier to many aspects of female's lives (Russel et al., 2016). Participants often note that they feel different when menstruating such as having low confidence and low self-esteem. With the right underwear, the undergarment can transform the way adolescent girls and women look and feel. Especially during menstruation, their preferred style of underwear can provide them with a piece of mind.

Cute underwear makes me feel good. I feel comfortable. I wear no-show cheeksters which means they're seamless, so I don't ever worry about panty lines. [Participant 1].

Underwear worn during menstruation can trigger psychological security.

Common phrases amongst subjects included "feel comfortable," "feel safe," and "protected."

Classic brief underwear makes me feel secure. They sit at my waist and there's no rolling, bunching, or pinching. I feel more confident wearing them. [Participant 2].

I wear boy shorts, because it keeps everything in place better. It covers more area than your typical bikini style. I feel safe from accidents. It just holds better so it makes me less worried about leaking and accidents. I feel more confident in doing my daily activities without worrying whether the outline will show under my jeans. [Participant 12].

#### 4.3.4 Concern with Soiling Fabrics

The results showed mixed opinions on insecurity. Eighteen (85.7%) out of 21 participants had concern for soiling fabrics.

It's embarrassing and feels gross. I am concerned with leaking and not being somewhere where I can change out of my clothes. [Participant 2].



Of the participants who did not have any concern, two often changed out of the product used for menstrual management therefore avoiding leakage or soiling and one felt more control of her period now that she is an adult and knows what's best for taking care of her body.

#### 4.3.5 The Impact of Costs

Costs per month among the subjects ranged from approximately \$3 to \$75. Overall, most participants believed managing periods are expensive. Responses revealed that costs spent related to menstruation include pads, tampons, pantyliners, pain medication, feminine wipes, intimate cleansers, new underwear, birth control, food cravings, and facial products. A few participants were unaware of their spending habits and expressed disbelief.

I am spending about \$410 a year. I never thought of it being so expensive until now. [Participant 4].

I estimate spending \$75 a month so about \$900 a year. Now that I'm reflecting, I didn't realize I spent this much on my period. I am shocked. I am expensive. [Participant 11].

Some participants of the study had concerns about the costs of managing periods.

I think they should be free. It's a necessity so why do we have to pay for it? [Participant 13].

Do I think these necessary products should be free? Yes. [Participant 25].

Although managing menstruation is costly, many participants deemed it necessary and something they cannot avoid.

I must say the cost is higher than I thought. However, this expense is necessary. [Participant 7].

It's a little expensive but not too excessive. I mean, it's necessary costs. [Participant 10].

I think it's reasonable because it's necessary. [Participant 19].

#### 4.3.6 Thoughts on Methods of Disposal

Several participants showed concern for the current methods of disposal in the US regarding sanitary disposal units. Five (23.8%) participants were more concerned about the cleanliness of the disposal unit. Key words such as “disgusting” and “blood” were often recorded.

I think it's gross. I would think because we are dealing with blood it should be disposed of differently. What if the other person had HIV and you accidentally touched their blood? [Participant 1].

I really think there needs to be a better way of disposing tampons such as specific trash cans that can be dealt with like a hazard since we are dealing with someone else's blood. [Participant 8].

On the other hand, 11 (42.31%) were more concerned on the methods of disposal on an environmental impact level. I feel like I'm littering. Sometimes I wonder where this is going to go. Is it going to decompose? But what other options do I even have? [Participant 3].

I think we can have better methods of disposal rather than just trashing it because I know all this stuff is going to the landfill which is already bad because of greenhouse gases. [Participant 15].

The remaining six participants were either not concerned or never thought about methods of disposable for feminine hygiene products.

#### 4.3.7 Showing Concern for the Environment

Subjects were asked questions related to their general knowledge and interest in sustainable living. One question explored the understanding of the statement, “If things continue on their present course, we will soon experience a major ecological catastrophe.” Twelve (57.14%) participants expressed an understanding of the

statement. They presumed environmentally aware and presented strong attitudes of their view on environmentalism.

We as humans have to take care of the earth before we destroy it even more. Our careless actions have caused damage to the earth and the only way to fix is reversing our habits to become more environmentally friendly. [Participant 9].

The main thing with our earth is that we as humans are impacting it negatively. We need to be more cognizant of the amount of waste we generate because a lot of it is ending up in the ocean and killing off small species. [Participant 12].

People need to take more responsibility. We need to be more mindful of the earth and find solutions especially the issue of global warming. [Participant 16].

#### 4.3.8 Menstrual Underwear

At the beginning of the study, 16 participants (76.2%) have never heard of menstrual underwear. Seven (33.33%) have heard of menstrual underwear and expressed immediate interest upon discovery.

I thought this was awesome concept and did my research. Landed on Knixwear for its seamless design. I looked at Thinx but just haven't gotten the chance to buy anything yet. [Participant 15].

It's definitely more environmentally friendly, but I have to wash it. In order to be more environmentally friendly, I have to put forth more effort in general but it's a good option. [Participant 20].

During the usage trial, expectation on the menstrual underwear is usually related to price, convenience and waste reduction. However, after the trial, some mentioned hedonic aspects of menstrual underwear.

I feel less insecure because the underwear held everything together and did what it said it would do. It was reliable so I feel more confident overall. [Participant 3].

The experience of this product has greatly improved how I felt during menstruation. Because this product is very similar to the underwear I usually wear, I feel like I'm not on my period to some extent. And I'm not worried about it leaking sideways. [Participant 7].

It made me feel secure and confident to conquer my day. [Participant 12].

The underwear boosted my confidence because I felt free and comfortable while on my period. [Participant 20].

#### 4.3.8.1 Perceived Risks and Benefits

Over the course of the study, perceived benefits and risks evolved. During the pre-usage stage, even though not all participants have heard or experienced the use of menstrual underwear, eight (38%) believed when using the product, they are able to save money because of its reusable aspect. Other perceived benefits included waste reduction, a safer alternative, and convenience.

During the trial, participants revealed concerns related to absorbency levels, leakage, weight of the product, odor, quantity and hygiene. The following statements illustrate this conclusion:

I was paranoid if there was going to be any leakage. I was also worried about the weight of the underwear and whether it would start to weigh down due to a heavy amount of fluid. Even though the product guarantees there is no odor that was another concern of mine. [Participant 10].

How can this work for a whole week of your period? We would have to buy multiple pairs and I know these are not that cheap. [Participant 20].

While most did not mention the hand-washing process of the underwear, there were concerns from three (14.3%) participants about washing out menstrual blood by hand.

I thought about throwing it in the laundry, but I was concerned with my period blood mixing in with my other clothes. I received instructions on rinsing the product by hand, but I am not comfortable doing that. [Participant 16].

I had to rinse the underwear under cold water before throwing them in the wash. I hated seeing my blood in the sink. [Participant 17].

I would wash it, but I would do that at home. I don't want people to see my blood at a public sink. [Participant 20].

#### 4.3.8.2 Menstrual Underwear Design

Product design refers to “a set of constitutive elements of a product that consumers perceive and organize as a multidimensional construct comprising the three dimensions of aesthetics, functionality, and symbolism” (Homburg et al., 2015). It is a prominent determinant of competitive advantage and a driver of performance. (Homburg et al., 2015; Jindal et al., 2016; Gilal et al., 2017). With several new players developing their own brands, the market for menstrual underwear is becoming more competitive. The availability of new designs is increasing. Concern regarding the design of the trial product was a reoccurring response which may have potentially impacted the participant’s acceptance of the menstrual underwear.

I was concerned with the thick panty lines. Also, the absorbent part of the underwear can be longer. If I were laying down, I would assume my period would drip down my back [Participant 1].

The underwear was snug. My biggest concern was the visibility of panty lines and slight feeling of wetness when the underwear got full. [Participant 9].

I honestly don't think the underwear is that cute, so I felt a little frumpy. [Participant 15].

This underwear has thick seams that accentuate a panty line. Personally, I didn't have a good first impression. The underwear also had a pocket for a pad. [Participant 16].

#### 4.3.8.3 Usage

Period-proof underwear is designed to be leak-resistant, but five (23.8%) subjects did not find the product entirely effective. They experienced leakage during the trial.

I didn't think it was 100% effective because I leaked through them and it stained my shorts. [Participant 5].

If I had used it on a lighter day, I probably would have liked it more because I wouldn't have leaked and dirty my sheets. I leaked the night I wore it to sleep. [Participant 6].

The first time wearing it, my cycle was heavy. I bled through the product within an hour of wearing it. [Participant 8].

I leaked one of the days, so I was sad about that. [Participant 13].

The first night I wore it, I leaked. The underwear is only padded in one area and is not secure everywhere else. [Participant 18].

Overall, menstrual underwear was most accepted amongst participants in the study. Most participants felt like they had decreased their amount of waste using the underwear.

I reduced the amount by maybe 1 - 2 pads. If I think about that yearly, that's almost as much as a full box of pads I didn't wear. I could save money as well. [Participant 3].

I used 1 - 2 less products. [Participant 18].

It was found that 16 (76.2%) participants would likely purchase menstrual underwear at an average cost of \$20.81 per pair as an alternative or secondary for menstruation management. For interviewees who would not likely purchase menstrual underwear, their reasonings' include a low value on investment, lack of personal concern, and risks outweighing the benefits.

## CHAPTER 5

### DISCUSSION

#### 5.1 Overview

The purpose of this research is to understand consumer perception, acceptance and adoption intention of menstrual underwear based on perceived benefits and risks. This chapter provides insights and implications of the research. The limitations of the current study and future research are discussed at the end of the chapter.

#### 5.2 Discussion

This qualitative study explores the attitudes participants place on menstrual underwear and their acceptance or rejection of the product. Based on the findings from the pre-usage survey, it was apparent that most participants have never heard of menstrual underwear and did not fully understand the phenomenon. Fourteen (66.7%) participants were unaware of the existence of menstrual underwear but keywords common amongst their opinions of perceived benefits were cost savings, reusability and waste reduction. The average woman may spend between \$1,000 to over \$15,000 in her lifetime (Kane, 2017), but the reusable aspect of menstrual underwear can assist in decreasing the overall financial burden of menstruation. Many of the subjects expressed positive opinions on the reusable aspect of menstrual underwear mentioning factors such as reduction in the waste and frequency of hygiene product replacement, and at times being more convenient than conventional options. Another key and common point among participants was the environmental impact. Interviewees expressed a conscious concern for the environment mentioning phrases such as “eco-friendly”, “unnecessary chemicals”, and “help cut down on pollution”. With the growing awareness on the

environmental impact of everyday consumer items, menstrual underwear can offer an eco-friendly solution for menstruation.

Although, the findings revealed contradicting responses between subject's attitudes and behavior towards the environment. Behavior was more selective when the action satisfies personal interest. By selecting an aspect of sustainability, some participants showed a positive attitude and behavior. One participant didn't ever think about the disposal method and its impact on the environment but felt it necessary to continue using tampons and pads to manage menstruation. Concurrently, this individual has bought a tumbler to reduce plastic straw waste that may disrupt marine environment and harm turtles.

Responses from the pre-usage and usage stages of the study revealed that the perceived risks of menstrual underwear common amongst participants include functional risks concerning absorbency levels, leakage, weight of the product, odor, quantity and hygiene. These attributes may act as a barrier in the acceptance and adoption of menstrual underwear, but one reoccurring concern was the design of the product itself. One subject mentioned that the underwear was "weird" and "bulky" which contributed to her negative opinion of the product. Others rejected the underwear for different reasons unrelated to the above-mentioned perceived risks. The menstrual underwear either didn't fit their lifestyle, they saw a lack in return on investment or did not care for the product at all. Among the three perceived risks, social risk was not addressed by participants. This may be because of the lack of menstrual underwear in the market and the lack of brand information. Participants are unaware of the brand image and the value behind menstrual underwear. Participants did not show uncertainty



or hesitation for what others may think of them if they were to use menstrual underwear as a management product. However, if menstrual underwear were to be more mainstream, social risks may be a more prominent topic for discussion.

Menstrual underwear not only provides an environmentally friendly solution for conscious consumers but can also improve the overall mental and physical health of the user. Presented in participant journals and their post-usage interviews, while wearing the menstrual underwear, they “felt secure,” “protected,” and more confident during menstruation. In today’s society, there is still negative connotation on the topic of menstruation negatively impacting female’s self-esteem. Menstrual underwear allows women to feel comfortable in their own skin offering them a piece of mind during menstruation. This aspect of menstrual underwear induced more positive attitudes after usage. It was also found that participants did see a difference in symptoms, mainly cramps. One participant explicitly stated that “not using a tampon means less cramping.”

There were no significant differences between participants’ responses in all three stages of the study. Perceived risks and benefits were consistent throughout the pre-usage, usage and post-usage stages. Participants can either be motivated extrinsically and intrinsically to engage in performing certain activities (Davis et al., 1989). For this study, 76.2% of participants were accepting and willing to purchase menstrual underwear. The responses show that subjects were extrinsically motivated to potentially purchase menstrual underwear. They were driven by the benefits such as cost efficiency, reduced ecological footprint and improved physical and psychological well-being.

### 5.3 Implications

#### 5.3.1 Theoretical Implications

This study provides theoretical insights into understanding the factors affecting the acceptance and usage intention of menstrual underwear. This new phenomenon is projected to grow in consumer acceptance but remains a subordinate against disposable feminine hygiene products. As there is limited research on menstrual underwear, this study extends to the current literature on reusable menstrual hygiene products by providing perceived risks, benefits and psychological aspects attributed to menstrual underwear. Accordingly, most participants found to be extrinsically motivated to purchase menstrual underwear, driven primarily by the benefit the purchase and usage can lead to. This contributes to a better understanding of consumers' motivations to consume sustainably, in particular, menstrual underwear.

#### 5.3.2 Managerial Implications

This study provides managerial insights into how menstrual underwear brands can execute risk-reducing strategies and trust-building mechanisms to encourage purchase intention of menstrual underwear. The responses of participants reveal a gap between conventional and reusable feminine hygiene products. While most are aware of the shortcomings in using conventional products, they also found it necessary and convenient for purchase. Over the past several years, interest in sustainable menstrual products like reusable period underwear has grown but could only be purchased online. Now, Thinx is available in select brick-and-mortar stores such as Nordstrom. There are several other brands and styles that are designed for those who menstruate that could best or better fit their needs. Practitioners should consider offering the product in stores

to increase accessibility and promote menstrual underwear as an alternative or compliment to conventional products.

Experiencing menarche can be daunting and without proper education, terrifying. Advice can provide adolescent girls and women with the support needed to embrace the inevitable experience that is menstruation. Emphasis on the psychological and physical health benefits may assist in encouraging open conversation to evolve from the stigma of periods into how to properly account for them in everyday life.

Design was a major concern reoccurring in responses. Although menstrual underwear is just an undergarment, it's functionality and comfort boosted the self-esteem, and confidence of many participants in the study. During the usage trial, several participants stressed the physical design of the menstrual underwear as "bulky," "thick," and "not flattering." Equal focus on product design and functionality is encouraged.

If practitioners can address the three key areas of accessibility, health and well-being, and design and functionality of menstrual underwear, this product would be more widely accepted among consumers today.

#### 5.4 Limitations

This study has several limitations. A purposive sampling method was used for the study making generalizability of the study limited to this sample population. All of the participants attended one of two southern universities and were volunteers who met the study's criteria making the findings not generalizable to females from other universities or those who were younger than 18 or older than 26 years of age. The data analysis was subjective and the results from the study may not be representative of the female

population. Saturation was reached with a small sample size of 21 participants and was appropriate for gaining in-depth information related to the acceptance and usage intention of menstrual underwear; however, it does not allow generalizability of the findings.

The participants had two months to experiment with one menstrual underwear and menstruation spans over the course of three to seven days. This may have limited their ability to fully experience the product throughout their cycle. Due to the variation in cycles lengths and menstrual flows, it was a challenge to collect data on the subject's experience when using the menstrual underwear.

Subjects were concerned with the product design of Ruby Love underwear. This brand's underwear design may have influenced opinions and responses related to the acceptance and usage intention of menstrual underwear. The style may not have been the participant's usual choice of product. The patent-pending design that locks a pad securely in place is also not a common design for underwear.

Additionally, a limitation for the study was potential researcher bias. Although a professional and unbiased relationship was established for the study, the participants may have known that the researcher is an active user of menstrual underwear and supporter of sustainability. Their opinions and responses to the interview questions may have been influenced by this prior knowledge ultimately motivating them to alter their answers to appeal to the researcher.

## 5.5 Suggestions for Future Research

Health presented a minor role in the acceptance of menstrual underwear. It was found that participants expressed a decreased in symptoms when wearing menstrual

underwear versus disposable feminine hygiene products such as tampons. Future studies should focus on comparing the strength of symptoms with emphasis on dysmenorrhea between menstrual underwear users and tampons users. Future research might reveal different outcomes if the study is conducted with only pad users.

Adult diapers or undergarments for individuals suffering from incontinence was briefly mentioned in the study. Adult diaper product design is similar to that of menstrual underwear and future research can identify perceived benefits and risks and compare the two.

For adolescent girls only just embarking on a lifetime of menstrual cycles, menstrual underwear can offer a comfortable and confidence-building alternative to a pads or tampons. Future studies could focus on the psychological effects of menstrual underwear on adolescent girls. Participants in this study revealed the hedonic aspect experienced when wearing the menstrual underwear. Females were 18 to 26 years of age having fully completed puberty. Some subjects expressed increased feelings of self-confidence and security.

APPENDIX A  
PRE-USAGE INTERVIEW

### Feminine Hygiene Products/Menstruation

Describe your menstruation cycle in detail.

Can you describe your flow? Is it heavy, light, or normal?

What symptoms do you experience during menstruation?

Has being on your period hinder your work performance? Work attendance? If it has, how so?

Which feminine hygiene products do you use for menstruation management?

Why do you use this product?

Which brands do you typically purchase and why?

Typically, how many do you use in a day?

Which style of underwear do you typically wear during menstruation? Why?

How does it make you feel? Explain in detail.

Have you had concern with soiling fabrics during menstruation? Why?

How do you dispose of feminine hygiene products? Explain in detail.

What are your thoughts on the methods of disposal and its impact to the environment?

Approximately how much do you spend on your period monthly? Estimated yearly?

How do you feel about the cost?

Have you ever considered the feminine product used to manage your period is causing your symptoms or enhancing them?

Are you concerned with your health during menstruation? Why?

Are you cautious of the products used to manage menstruation? Why?

### Environmental - General

Do you know the difference between conventional cotton and organic cotton? If yes, explain.

Do you look at cotton in products?

Have you purchased products with organic cotton? How was your experience?

What are your thoughts on the following statement? "If things continue on their present course, we will soon experience a major ecological catastrophe"

What is the most important factor when you purchase product?

Have you ever switched products for environmental reasons?

### Menstrual Underwear

Have you heard of underwear made specifically for menstrual management?

If yes, what were your initial thoughts on the product? (If no, skip question).

What do you think is a benefit to wearing the product?

### Demographic Information

*Choose one or more races you consider yourself to be:*

- a. White
- b. Asian
- c. Black or African American
- d. Native Hawaiian or Pacific Islander
- e. American Indian or Alaska Native
- f. Other

*What is the highest level of school you have completed or the highest degree you have received?*

- a. Less than high school degree
- b. High school graduate (high school diploma or equivalent including
- c. GED Some college but no degree
- d. Associate degree in college (2-year)
- e. Bachelor's degree in college (4-year)
- f. Master's degree
- g. Doctoral degree
- h. Professional degree (JD, MD)

*Information about income is very important to understand. Would you please give your best guess? Please indicate the answer that includes your entire household income in (previous year) before taxes.*

- a. Less than \$10,000
- b. \$10,000 to \$19,999
- c. \$20,000 to \$29,999
- d. \$30,000 to \$39,999
- e. \$40,000 to \$49,999
- f. \$50,000 to \$59,999
- g. \$60,000 to \$69,999
- h. \$70,000 to \$79,999
- i. \$80,000 to \$89,999
- j. \$90,000 to \$99,999
- k. \$100,000 to \$149,999
- m. \$150,000 or more

*Which statement best describes your current employment status?*

- a. Working (paid employee)
- b. Working (self-employed)
- c. Not working (temporary layoff from a job)
- d. Not working (looking for work)
- e. Not working (retired)
- f. Not working (disabled)
- g. Not working (other)
- h. Prefer not to answer

*Are you now married, widowed, divorced, separated or never married?*

- a. Married
- b. Widowed
- c. Divorced
- d. Separated
- e. Never Married



APPENDIX B  
JOURNALING INSTRUCTIONS

## Journaling Experience

Please answer the below questions for your report in depth of your experience.

- 1. Usage report - write down the dates for each use, how you used it and when**  
**\*Recommended multiple uses**

### Example

a. first day of usage.
6/15/19 – Worn as a complementary to an organic tampon during the day
b. how often used
For that week of my period, I wore this product 2 times: once during the day & once at night
c. last day of usage
6/18/19 – Worn alone at night and experienced no leakage

a. first day of usage.

b. how often used

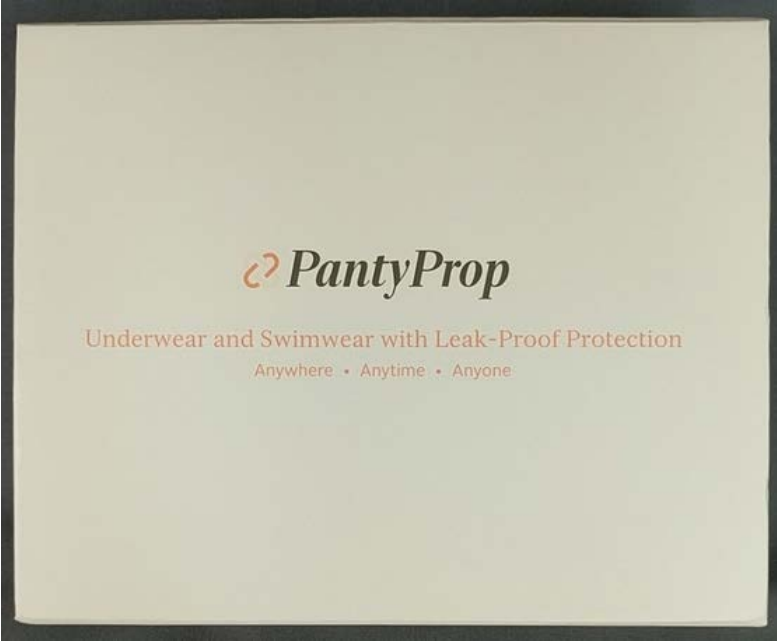
c. last day of usage

- 2. What benefit do you see?**

- 3. What concerns/complaints do you have?**

- 4. How do you feel using the product?**

APPENDIX C  
RUBY LOVE PACKAGING



Life's pesky leaks stop here.

**No Leaks.  
No Stains.  
No Worries.**

Reusable underwear to help prevent  
leaks and eliminate stains.

PantyProp's patent-pending technology features a built-in absorbent gusset, perfectly angled to collect your flow immediately. Wear with or without your tampon, menstrual cup, or pad depending on your flow. If wearing with a pad, pads are locked in and securely held in place in the Dri-tech mesh gusset.

Gusset: Absorbent cotton, Dri-tech mesh  
Body: 20% spandex 80% ITY Cotton  
Machine wash in cold water. Tumble dry on low.  
Do not use fabric softener

[www.pantyprop.com](http://www.pantyprop.com)

APPENDIX D  
EMAIL TO PARTICIPANTS

Hello Ladies!

I can't tell you thank you enough for being a part of my research! This is new territory for everyone as reusable menstrual underwear recently gained popularity in Western countries. Attached is a **journal entry sheet**.

Instructions on Usage - Journal your experience during use in the journal entry sheet. Answer the following questions in depth:

1. Usage report (each period)
  - a. first day of usage.
  - b. how often used
  - c. last day of usage
2. What benefits do you see?
3. What concerns/complaints do you have?
4. How do you feel using the product?

Please email me about your experience as this is a part of the data collection portion. I will reach out for further clarification on unclear answers.


There were many brands to choose from but the panties sent to you are from **Panty Prop** now called Ruby Love.

### How PantyPropTechnology Works

PantyProp's technology features smart, intuitive design. The best in the market. The built-in absorbent organic cotton gusset is perfectly angled to collect your flow immediately, ensuring stain-free comfort, and help stop front, back, or side leaks and stains. It can be worn with or without your cup, tampon or additional pad depending on flow and leak maintenance. For extra added protection, sanitary pads can be worn and locked in and securely held in place in the dri-tech mesh gusset.

**What you do get:** Security, comfort, leak-free peace of mind and complete discretion – you can't see any unsightly bumps from the outside. It's like you're not even wearing a pad.

**What you don't get:** No Leaks, slips, or chafing. Plastic, Polyurethane Laminate (PUL), or plastic. No Embarrassing odors.



Absorbent liner built-in. Maximum protection.

Additional protection: Pads fit securely in the dri-tech mesh gusset.

Menstrual underwear are washable, reusable and simple to care for. After hand rinsing them, throw them in the washer. **AVOID THE USE OF BLEACH & FABRIC SOFTENER** as this may ruin the absorbency factor.



Please reach out if you have any questions or concerns.  
Best,  
Elizabeth Phan

 Journaling Experience.pdf  
208K

APPENDIX E  
AFTER USAGE INTERVIEW



1. Did you wear this product as a standalone or secondary?
  - a. If standalone, did you feel your menstruation symptoms decreased?
  - b. If secondary, what did you wear it with?
2. How did the underwear make you feel?
  - a. Did the underwear boost your self-confidence? How?
3. Did you feel like you decreased the amount of waste using the underwear?
4. What benefit do you see?
5. What concerns/complaints do you have?
6. Would you purchase this product? Why or why not?
  - a. How much would you pay if yes?

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