

Selling Privacy by Design:

A Critical Discourse Analysis of user-experience and privacy expertise in application to
blackboxing practices of menstruation-tracking applications

Student Name: Famke Visser

Student Number: 500304

Supervisor: Dr. João Fernando Ferreira Gonçalves

Master Media Studies - Digitalisation, Surveillance & Societies

Erasmus School of History, Culture and Communication

Erasmus University Rotterdam

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ABSTRACT

This research investigates the privacy invasive data gathering techniques used within menstruation-tracking applications (MTA). As these applications become increasingly popular due to the digitalisation of bodily functions and the ease of administering medical self-care, concerns for privacy grow as well. Oftentimes these applications are not transparent about their technological practices and ‘blackbox’ information and specifics of use algorithmic models. Simultaneously they continue to prompt users to give away their data, which serves as the fuel for functionality of the MTA. In answering the research question ‘*How does the user-experience of menstruation-tracking applications relate to privacy and datafication?*’, Critical Discourse Analysis is used to investigate thoroughly and critically seven in-depth interviews. Prior to the analysis interviews were held with both users of MTAs as well as privacy experts. Within the interviews they were asked to think about their privacy experiences and the possibility of the implementation of Privacy by Design (PBD). It resulted in finding that improvement of transparency, visibility, data minimisation and respect for user privacy is wanted by users, which define some of the principles of PBD. Moreover, the implementation of such principles are increasingly important as this research found that increased datafication of the body has created the growing urge to control the body, yet has also resulted in more people becoming in-sync with the tracking technology rather than their body. Finally, as more people become in-sync with this technology, the continuation of usage of, for example MTAs, comes with a growing risk to loose privacy, especially as this is offer ‘rewarded’ with increased functionality of the technology. Ultimately, this research wishes to showcase how by bridging the gap between the cost-benefit considerations regarding user- and privacy-experience of users, companies and privacy experts, an increase in privacy does not always have to mean a loss in functionality. Yet only as long as companies are willing to transform their perspective on privacy protective measures such as PBD from something obligatory into an asset and selling point, can users experience an increase in privacy without a decrease in functionality.

KEYWORDS: *Privacy by Design, Menstruation-tracking application, Blackbox, User-experience, Privacy Expertise, Datafication, Body literacy, Bodily privacy*

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1. Introduction

A serious decline in global privacy concerns have been found in the 2022 Global Privacy Monitor (GPM), a global survey conducted every four years. The monitor showcased that while global privacy concerns remain high at 71%, a decline can be found in comparison to the previous survey of 2018 (GDMA, 2022). This decline is most possibly connected to half of all respondents (around 22.000) being comfortable with sharing their data, seeing it increasingly as a tradable good which they are willing to give away, essential for the increase in functionality in return (GDMA, 2022). This comfortability is especially portrayed within the amount of downloads of menstruation-tracking applications (MTA) shown in Figure 1. In 2022, the MTA Flo was the most downloaded app in the US, having 35 million downloads (Ceci, 2024; Wylie, 2024). Globally, the number of users of MTAs is estimated around 50 million (Poli, 2022; Rosato, 2020). These numbers as well as those within Figure 1 could be expected considering the high numbers of downloads of other popular tracking applications. However, this expectation decreases when the invasive data gathering practices of MTAs and their possible threats to intimate privacy come into the picture.

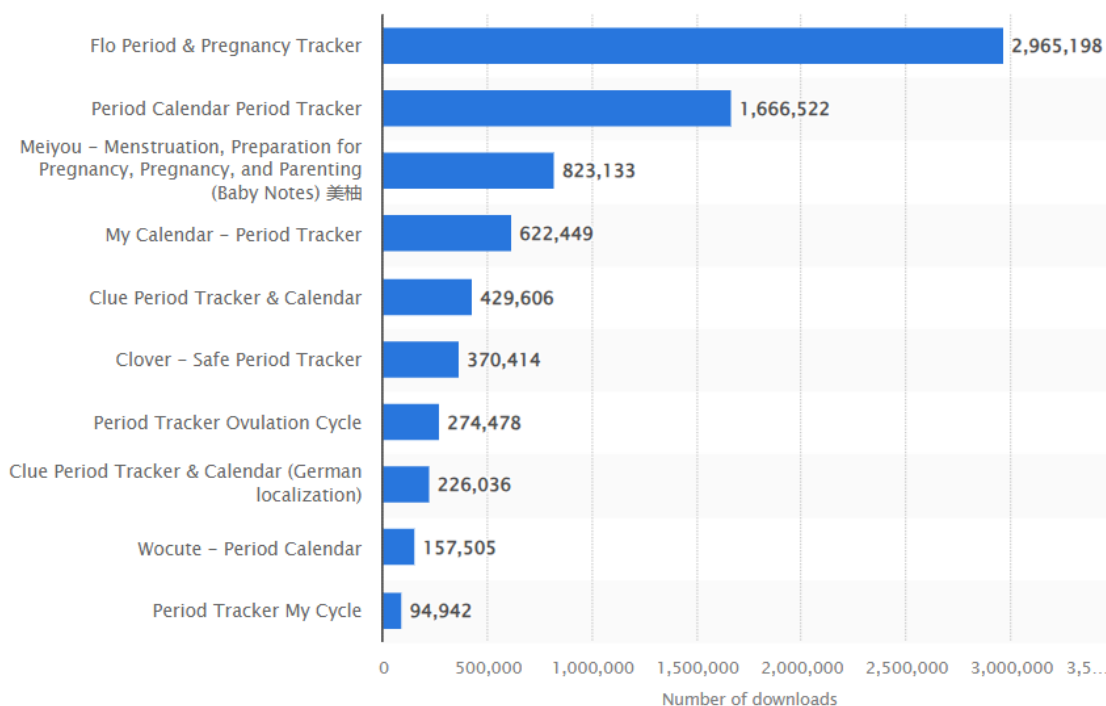


Figure 1: Ceci, 2024

Increasingly, MTAs such as ‘Flo’, ‘Clue’, and ‘Eve’, are aiding menstruators in tracking not just menstrual cycles, but also eating habits, vaginal discharge, weight

differences and even sexual activity (Ford et al., 2021). Even more, some of these apps claim to be a new “natural” contraceptive. An example is ‘Natural Cycles’, which argue that using their app, containing a body temperature tracking algorithm, is 7% more reliable than the use of condoms (Natural Cycles, 2024). Besides unwanted pregnancies as result of usage of these applications (Citron, 2022), Natural Cycles has also received criticism regarding its extensive data-gathering techniques and the invasion of privacy of its users. More often than not, these apps have a privacy statement that is hard to understand, takes more than 10 minutes to read and is complicated in design and layout (Bits of Freedom, 2019). It raises questions about why these applications remain so popular and how privacy could be increased within the apps as they continue to be used (Levy & Romo-Avilés, 2019).

While there has been various research on MTAs, it often focusses on specifically the user-experiences, usage in relation to endometriosis and other cycle issues or on the emphasis of advantageous and disadvantageous for the feminist movement. This research wishes to take it a step further and look into the privacy experiences of users, specifically how this relates to the possible implementation of Privacy by Design (PBD). This principle is legally grounded and recognised in the European GDPR and obligates organisations and companies to consider the protection of privacy as a starting point and key aspect in the process of creating a product (David, & Prosch, 2010, p. 296). Another comparative aspect was added as interview participants originated both from the EU as well as the US. The legislative situation within the US has drastically changed since the overturning of *Roe V. Wade*, leaving the power regarding abortion legislation in the hands of the independent states. It has resulted in a situation where 21 states have made abortion illegal, some completely, some under specific circumstances (Tracking Abortion Bans, 2024). The safety within which women in the EU find themselves, is no longer obvious for women in the US. In fear of the possibility of being legally prosecuted, many users of MTAs in the US have now started to delete all the applications and have transferred to offline practices of tracking.

This research attempted to offer a solution in which the functionality of MTAs are not lost, ensuring the persistence of this trend in digital feminism, while also increasing the protection of privacy of its users. This research follows a structure which starts with presenting relevant theories such as the privacy paradox, privacy calculus and the digital cyborg assemblage (Lupton, 2015). Secondly, a research design explains how seven participants were interviewed. Varying from being privacy expert and MTA user, as well as originating from the EU and the US. It moreover explains the relevancy of applying Critical Discourse Analysis. Thirdly, an operationalisation table portrays how the analysis was

grounded in theory. Followed by a results section presenting the interviews and the ideologies and experiences of the participants. Finally the discussion and conclusion discuss the many interactions and trade-offs surrounding the user-experience of MTAs as well as the possible application of PBD.

From the experiences of privacy experts as well as the wishes of MTA users, it has become clear that not the complete application of all principles of PBD is necessary in order to improve the user- and privacy-experience of MTA users. The research followed the below mentioned research question and two subquestions, which aided in investigating and understanding MTAs, Privacy by Design and the user-experience of menstruators.

RQ: How does the user-experience of menstruation-tracking applications relate to privacy and datafication?

SQ1: How is the usability of Privacy by Design experienced by privacy experts and users?

SQ2: How is the use of menstruation-tracking applications related to body literacy?

2. Theoretical Framework

2.1 *Flows of feminism*

2015 is dubbed by Cosmopolitan magazine as the year menstruation went public (Ford et al., 2021, p. 51). Prior to and following this declaration a lot has happened which contributed to the public image of menstruation. While the first menstrual product was, reportedly, created in 1919, only in 2010 was menstruation “blood” first shown in an ad, albeit as a blue liquid (Huber, 2021). This was additionally the year that the first MTA came on the market (Huber, 2021). While it was firstly meant for the (mostly offline) tracking of symptoms and one’s cycle, MTAs soon developed into applications predicting the course of one’s cycle, giving explanations connected to tracked symptoms and forming predictions and advice on one’s fertility. Before diving further into the possible uses and algorithmic models existing behind these applications, some attention needs to be paid to the preceding societal history and implications of MTAs.

Prior research has thoroughly analysed the intersectionality between feminism and menstruation, leading to interesting insights in menstruation activism. Feminism has had a long history and is still prevalent, even more with new digital technologies. Simone de Beauvoire argues feminism goes back as far as (at least) the 15th century, even if the first wave of feminism is said to have started in the 19th century (De Beauvoire, 1949). The history of feminism is said to have greatly transformed and inspired modern day feminism. Moreover its relation to privacy, both offline and online, can be seen throughout the various feminist waves. The first wave, led by suffragettes, fought for women’s right to vote, amongst other related legal changes. Second-wave feminism lasted roughly from the 1960’s until the 1980’s and was predominantly focussed on challenging existing structures, such as the patriarch, male-dominated institutions and cultural and systemic difference between men and women. It aimed to open up the debate surrounding various topics, creating independent voices for women contrasting with men, especially in relation to menstruation and the manufacturing and usage of menstrual products (Worcester, 2013, p. 151). Where second-wave feminist opened up the debate, the more radical third-wave feminists (starting around 1990) sought to change the status quo by promoting their own initiatives and ‘homemade’ menstruation products, instead of relying on those ‘men’-made. They also translated the movement to the media, attempting to radicalise others through the dissemination of magazines and blogs (Worcester, 2013, p. 151). The fourth wave (2012-2014) is said to be less influential, yet greatly changed the media used for disseminating ideas as it took current debates and moved them on the internet and online media. Finally, the fifth and current wave

is important for this research as it shows the coming together of various years of feminism, and is said to be a “radical fight against sexual abuse on every level, [keen to distress] the overwhelming pressure of entrenched misogyny.” (Courtemanche, 2019). Despite the differences between waves of feminists, one of the main prerogatives for all these feminists was to create a private, individual and safe space. They rebelled against existing and often determining power dynamics by calling more attention to the topic of menstruation and possible harms inflicted by persisting heteronormative, patriarchal and capitalist systems (Merskin, 2011, p. 436).

2.2 What makes a woman?

The feminist movement can be inherently tied to the question ‘What defines a woman as a woman?’. Third wave feminists sought to answer this by using more inclusive terminology instead of excluding people with other gender expressions, dubbing anyone who menstruates a ‘menstruating body’ instead of ‘a woman who menstruates’. The third wave feminists were moreover some of the more radicalised regarding menstruation and body literacy. Bobel identifies two subcultures within this wave; feminist spiritualists and menstrual activists (Merskin, 2011, p. 436). Feminist spiritualists wished to go back to the natural essence of their bodies, in which body literacy, the wish to know/feel your body, could be considered a central concept (Bianca, 2021, p. 8). Moreover, these spiritualists promote their beliefs by commodifying it and selling information and practices (Merskin, 2011, p. 436). Its counterweight, the menstrual activists, sought to disable the FemTech market and menstruation products stemming from it, rather than adding onto it or influencing the market (Merskin, 2011, p. 436; Worcester, 2013, p. 151). The need to disable to FemTech market, is arguably not ungrounded. Often defined as a market in which technology is made for and catered to the female sex, the FemTech market produces things such as pads, tampons, pregnancy tests, but also waxing or hair styling products (Worcester, 2013, p. 151). The essence of the terminology as well as the market itself, conflicts exactly with what some third wave feminists stood for. The market in its practices started to determine what makes a woman, a woman. Assuming the ‘female’ to be one thing, generalised and fitted within a certain marketing target, pertaining to the persistence of a capitalised power structure, with no regards to privacy of individuality. It is this market and its often capitalist priorities, which instals certain heterotypical ideals within society and generally accepted norms. While the product, such as pink razors or waxing products, can be refused to be bought, the idea with which it, such that women should not have body hair,

becomes ingrained within society. For the FemTech market, a woman is a woman in so far as they create the woman and target her. Moreover, this attempt of defining a woman decreases the privacy for an individual to decide about their self what does or does not make them a woman, and instals power in society through capitalist systems amongst others. Ultimately, without this privacy individuals become unable to express individuality and authenticity and form an identity or self (Richard, 2021, p. 113). It refrains them from being able to investigate, navigate and evolve the relationship with one's body, menstruation and hormones; the cyclic self (Bianca, 2021, p. 2).

2.3 Body literacy & the menstrual-tracking object

As seen so far, the cyclic self is inherently related to privacy, individuality and body literacy. Body literacy likely stems from old, native, non-digital practices, where one's connection to their body was the only way to understand its workings, without modern day medical practices. Improving medical practices and research meant an increase in how society understood human bodies, but also how an individual could understand their own body. However, only around 2005 was the concept first promoted as rhetoric to be used within menstrual advocacy (Wershler, 2020). The term was used to help women justify that learning to understand their bodies and working with it, specifically their menstrual cycle, was “not a whimsical pursuit but rather an essential knowledge vital to [their] wellbeing.” (Matus, 2005, p. 6, In Wershler, 2020). Moreover, it allowed women and menstruating bodies to move away from societal, medical and heterotypical understandings, towards private experiences and medical self-care. Consequently, they would no longer be dependent on “handing over power and decision-making about sexual and reproductive health” to men and medical experts (Wershler, 2005, p. 6, In Wershler, 2020), and instead gained freedom in the creation of the cyclic self.

Juxtaposed with its current empowering nature, FemTech was firstly catered to men who wished to gain more control over the decision- and meaning-making process of the body of their wives (Bianca, 2021, p. 8). It allowed them to urge women to track their cycle, chart their bodily functions, and in doing so, sexualise and objectify the female body into something made for reproduction. This idea was defined in 1996 by Tia DeNora as the ‘alienation-through-objectification’ argument and while much contested, the idea moves the female/menstruating body away from its natural essence towards an object that can be statistically tracked (Bianca, 2021, p. 8). While reducing the body to the activity of tracking and charting seems alienating, the practice became empowering and popular for many

women. Especially when, in 2005, women started using the term body literacy as rhetoric for advocating for themselves and their cyclic health.

Fast forward to 2010 and body- and health-tracking applications start to rise, gain popularity and are increasingly used to track various bodily functions in a similar statistical and datafied manner. Although some relation to the ‘grounded’ practice of feeling your body as supported by spiritualist feminists will possibly be maintained, new technological developments originating from the FemTech market, have greatly changed the navigation of the cyclic self (Bianca, 2021, p. 7). Some argue the digital cyclic self could cause the reversal of bodily objectification, yet others argue that menstrual-tracking takes on neoliberal, individualistic practices, enforcing existing heteronormative, binary and capitalist systems (Bianca, 2021, p. 17). However, attention should also be paid to the other side of the coin, which shows misogynistic biases in software development. A 2015 survey portrays a great lack of gender diversity, showing that women only make up 21% of the complete software development workforce within the US (Wang & Redmiles, 2019, p. 1). Although likely that this has increased in recent years, it is just as likely to assume that in 2010, when the first MTAs were developed, this number was even lower. The same research tested for implicit biases amongst 160 software developers from seven different companies and found significant evidence that all of the subjects held implicit biases (Wang & Redmiles, 2019, p. 6-7). Even more, these biases were found to significantly influence the decision-making process, putting women at a constant disadvantage both within the work field as well as within the developed software products (Wang & Redmiles, 2019, p. 7). It showcases the likeliness that not just the users of MTAs, but also the developers and companies behind these developers, contribute to the persistence of heteronormative and misogynistic beliefs towards women and menstrual and reproductive health.

2.4 Understanding the technology behind menstruation-tracking

In understanding user-experiences of MTAs, we should pay attention to both the frontstage and backstage design of these apps. These interfaces are reflected in the technological affordances and interactions offered to the users, as well as the additional analyses and predictions following a user’s personal data input (Ford et al., 2021; Levy & Romo-Avilés, 2019). Generally, most applications offer functions which instigate the tracking of one's menstrual and ovulatory cycle and any and all accompanying symptoms and behaviours, such as location and intensity of pain, sleeping patterns, intake of medication and/or contraceptives, vaginal discharge, cravings, exercise and sexual activities

such as masturbation. Additionally, users are shown an interface in which they can find an interactive calendar presenting all submitted data, such as the day the user started menstruating or the day their ovulation is predicted. These predictions are created with the prior submitted data, including tracking of menstruation, the aforementioned symptoms, and for example which contraceptive is used, but also with secondary and often generalised data used to train the model (Levy & Romo-Avilé, 2019). While the applications show some variations in the affordances, most offer a basic version and a premium version for which the user is expected to pay a monthly subscription. Most apps are designed with a front which avoids all talk of dirty symptoms and negative feelings. Leading users to choose symptoms representing clotting or bowel movements which are fun and brightly coloured and use symbols of clouds and suns to represent certain ‘moods’ (See Figure 2 & 3).



Figure 2: Symptom options in Clue



Figure 3: Symptom options in Clue

All in all, most trackers promise to give users knowledge and power over their bodies through making perceptible what could otherwise remain unknown. But while granting knowledge of the bodily functions of a user, albeit in an objectifying, politically and socially heteronormative manner, knowledge on the functions of the app is deliberately concealed (Bianca, 2021, p. 9). The ‘intentional-not-knowing’ frame within software development entails increased prompting of users to give more data for the functionality of the MTA, while lacking to offer transparency about the details of the predictive models, which is actively blackboxed (Bianca, 2021, p. 9-10). This frame is further ‘proven’ as visibly none

of the existing MTAs have released specifics about their algorithmic models. Nonetheless, prior research has been able to make guesses on how these models might work and most of them deduced that predictive models are used. These models vary from Mean & Median calculations, to Convolutional Neural Networks (CNN) which identify patterns, Recurrent Neural Networks (RNN) which consider the sequential nature of cycles, and Long Short-term Memory Networks (LSMN) which are able to accumulate knowledge and re-apply them (Kelta, 2023; LeCun et al., 2015, p. 439-442; Li et al., 2022, p. 6). Seemingly, all these models could work for the calculation and prediction of the next menstruation or ovulation date, though varying in specificity. However, all depend on the accurate and regular tracking of a the most generalised 4-day menstruation within a 28-day cycle, with back pains before the menses and heavy flow and migraines during. If this data changes or if a user forgets to track three or four days, the model is likely to become inaccurate, suggesting an irregular, abnormal menstruation, a possibility of pregnancy or other health diversions (Earle et al., 2021, p. 97; Li et al., 2022, p. 5).

Therefore, while the transferral of body literacy moving online was especially empowering for current feminist movements, the above disquisition portrays that this might not be completely beneficial. Users and their bodies are not only objectified to fit within predetermined symptom categories, but this data is used to make predictions which might not be accurate or individualised as they are based on generalised statistics. Even more, this information is seemingly deliberately kept from its users, to which a little more access is given only if users start paying for a premium subscription. Additionally, the development of these apps is accompanied by increased surveillance capitalism. Meaning that increasingly, governments, organisations and businesses commodify personal data of users in order to provide certain services and products (Ford et al., 2021, p. 51).

So for the empowered movement of menstruation-tracking and the wish for an increased understanding of one's own body, users have to actively give away their money, personal data or both to big companies who can use this freely.

2.5 The body becomes data

As has become clear within this theoretical framework, tracking devices do not only draw data from the body, they 'force the body into a technological infrastructure', making the body become data (Hutchinson & Novotny, 2018, p. 117-118). It relates to the blurring boundaries of sociology and technology, resulting in concepts such as technological determinism and social determinism. The notion of social determinism as theorised by

sociologist Emile Durkheim implies social interactions alone determine individual behaviour. In application to media and technology studies, it implies that social interactions about and with technology determine its development. Its counterpart, technological determinism encompasses the notion that technological change, often taking place independently from political, social and economical forces, is the cause for social change (Wyatt, 2008, p. 168).

Scientist and philosopher Donna Haraway, changed this discussion by bringing sociology and technology together in the concept of the Cyborg. The Cyborg shows that the relation of society and technology is not a question of 'either-or', but rather an ongoing and dynamic dialogue in which our bodies are dynamically made up from interactions between discourses, ideas, practices and material (technological) objects (Lupton, 2015, p. 569-570). Its essence challenges the rigid separation between society and technology, men and women, sex and gender, going as far as to argue that it is both human and not human at all (Lupton, 2015, p. 569). Deborah Lupton situated the concept within more recent digital practices and argues that the modern day digital cyborg assemblage does not represent a being with super-human powers, but rather as "the ordinary person who uses digital technologies to monitor [their] bodily functioning or movements or perform medical self-care tasks." (Lupton, 2015, p. 572).

In application to this research, we can see that not only the lines have been blurred between the social, our bodies, and the technological, tracking devices, but the increased use of tracking devices has also situated us within performing of medical self-care tasks. Leading us to the concept of the cyclic self-fashioning assemblage (Bianca, 2021, p. 11). This concept, similarly to the digital cyborg assemblage, inherently recognises the fertile body as having multiplicity, determined through interactions with the self, others and social and normative ideologies and values (Bianca, 2021, p. 12). While not connected by Bianca (2021), a clear connection can be found between the embodiment of societal norms and values and the increased use of MTAs. Especially as such apps often frame the fertile body as a relational effect, caused by (in)actions, instead of a given entity with given functions. Although some research shows that hormonal- and menstrual-tracking has become more than just medical, contributing to feelings of empowerment, wellness and beauty (Ford et al., 2021, p. 49), it also inserts the menstruating body within an objectified, generalised and alienating frame. Leading us again to the research questions which aim to understand what kind of effect this can have on the users. Because while users feel like their body and its

functions are being centralised within one of the main goals of a MTA, the same application decentralises the body and turns it into a collective of data which can be commodified.

2.6 Threats against intimate privacy

So, within the process of gaining insight and understanding in one's hormonal health, users of MTAs are giving away personal and considerably intimate data, threatening their own privacy (Bianca, 2021, p. 10; Citron, 2022; Ford et al., 2021, p. 53). Research has shown that most users are unaware of the extensive amount of gathered data because of the aforementioned 'blackboxing' (Bianca, 2021, p. 9-10; Levy & Romo-Avilés, 2019), as well as difficult to read privacy statements (Bits of Freedom, 2019; Levy & Romo-Avilés, 2019). This threat to privacy has thus called for reactions which have been and will continue to be socially determining for the development and usage of MTAs.

Legal expert Danielle Citron (2022) has raised legal attention to privacy violations of intimate data, urging governments and governing authorities to take more responsibility instead of leaving users subject to big companies. Law is often regarded within the field of privacy to form the basis for the existence and persistence of privacy, allowing further development within social and technological applications. Many long-lasting discussions have centralised privacy as a concept, attempting to define it within a singular understanding (Mulligan et al., 2016, p. 3). Yet as it is a very contested concept, this research recognises the intertwining nature of privacy. This research aims to show how developing applications in line with PBD cannot be realised without acknowledging user and expert experiences, nor can it be without understanding the multiplicity of privacy. The use of MTAs threatens a wide variety of privacy types, including privacy of family ties, privacy of personal data, and, perhaps most important, the privacy of the body, thoughts, autonomy and identity (Koops et al., 2017, p. 518-537). The latter is very nicely expanded upon by Richards (2021) who makes a strong case for the development of identity within privacy:

“At the most basic level, privacy matters because it enables us to determine and express our identities, by ourselves and with others, but ultimately— and essentially— on our own terms. Privacy offers a shield from observation by companies, governments, or “the community” within which our identities can develop. In other words, privacy gives us the breathing space we need to figure out who we are and what we believe as humans.” (p. 113).

Richards moreover argues that digital tools, such as MTAs, facilitate the oversharing of personal, sensitive beliefs and ideas central to these identities and possibly drive those identities to more homogenised and stultified ones (Richards, p. 125). While MTAs seemingly give users the ‘breathing space’ Richards refers to, they instead constantly prompt users to overshare very detailed accounts of their menstruation and personal experiences. Data which is then added and configured to a large database used to train and develop the algorithm, homogenising the individual navigation and expression of an identity, making it a social process. Once a prediction is made on given data and an irregular menstrual cycle is labelled as ‘abnormal’, even if it is caused by forgetfulness of tracking, the user might adapt not just the perception of their cyclic self but also its inscription to and interactions with society.

2.7 What does tracking cost?

Nonetheless, despite such privacy invasions, MTAs are still popular. It was estimated that an app such as FLO, was the most downloaded app in the US in 2022, having 35 million downloads (Wylie, 2024). Meaning that possibly 35 million users were subject to privacy invasions and the collection and commodification of their data. Even more, the GDMA (2022) showed the global decrease in privacy concerns, possibly exposing many users of MTAs privacy invasions without them necessarily worrying about it. Research has defined this recurring discrepancy between one’s understanding of and one’s actual privacy behaviour as the privacy paradox (Gerber, Gerber & Volkamer, 2018; Waldman, 2020). It possibly explains why generally people feel strongly against disclosing private information such as vaginal discharge or sexual habits towards other people, yet actively disclose such information when using a MTA (Gerber, Gerber & Volkamer, 2018). Although reasons for this disclosure are likely varying, the pressure to disclose such information through the use of a device aiding in medical self-fashioning, can be related to societal pressures. Heteronormative standards enforce a certain level of control over the fertile female and menstruating body. While this used to be enacted by husbands, then medical experts, this exertion of power and control is now enacted by individuals who using MTAs and are following these implied standards (Bianca, 2021, p. 11; Merskin, 2011, p. 436).

Such exertions of power and control are not limited to practices surrounding menstruation-tracking, it can be seen within any field of activities touched by privacy. There is a constant dialogue between two parties of which one wishes to control the data of the other, while the other wishes to control their data and thus their privacy. It leads for example

to users being bombarded with questions concerning their privacy rights, whether they accept certain terms and policies or whether they are willing to give away their personal data which unbeknownst to them will be misused for all sorts of purposes. All these questions are furthermore often communicated in difficult language, situated within complicated layouts and, if not accepted, could decrease functionality. This portrays the presence of privacy fatigue, in which the user needs to pay constant attention to what data and rights they might be giving away this time (Choi, et al., 2017). This privacy fatigue often forces users to start making trade-offs between what they find more important. Are they for example willing to give up their personal mail address so they can read the latest blog on 10 tips of dealing with menstrual cramps? Privacy calculus explains that people experience a need to make such a trade-off when wanting to use new technology or affordances. Users weigh the costs of giving away their data against the benefits of being able to use the application (Gerber, Gerber & Volkamer, 2018). Regarding the use of MTAs, privacy fatigue extends beyond online tracking and into the offline experience of an individual, their cycle and all social interactions surrounding it. As the cyclic self is normatively seen as something relational, it does not stop at solely tracking the menstruation cycle every day. Everything that is being tracked can be reflected upon and scrutinised, can then be integrated in ideas and ideals about the body and the self, in turn influencing the multiplicity of one's identity and the social interactions that flow from it. It shows that lack of privacy or feeling overwhelmed in having to make decisions concerning privacy, is not limited to online behaviour, it translates to the private space in which someone creates, navigates and interacts with their self.

2.8 What can Privacy by Design do?

Privacy by Design (PBD) might offer a solution to the exposure to privacy invasions and the extensive data gathering of tracking devices such as MTAs. PBD centralises privacy, integrating it seamlessly into a process, product or service, using it as a starting point instead of an afterthought (Klitou, 2014; The 7 Principles, n.d.). PBD is made up of seven principles, which all allow companies to create a safe environment for their users in which they maintain choice and control over their own data (David & Prosch, 2010, p. 296; The 7 Principles, n.d.). The below described principles are in line with explanations given by David and Prosch (2010, p. 302), yet also adapted to fit the scope of this research.

1) Proactive not Reactive. This principle asks companies and developers to consider data minimisation, judging what pieces of data are absolutely necessary for the optimisation

of the product. The cost of this data should be met with an equal amount of (extra) privacy through privacy protective measures for the user.

2) Privacy by Default. This principle requires the accounts of users to be as private as possible. Instead of users actively having to turn their account private, they should be allowed to actively choose to turn their account public.

3) Privacy Embedded into the Design. This principle requires that access to the data for workers is limited and restricted. Those who have access should be logged and monitored. It could also mean that gathered data is anonymised or connected to a user-ID instead of identifiable information.

4) Positive Sum, not Zero-Sum. This principle requires that an increase of privacy does not cause the decrease of functionality. Instead of removing a feature completely, developers should consider how the feature could still function while the highest possible privacy is assured.

5) End-to-End Lifecycle Protection. This principle requires that prior to data collection, considerations should be made on how long the collected data needs to be stored and used. Additionally, goals for its collection should be determined and data should be deleted as soon as the goals have been achieved.

6) Visibility and Transparency. This principle requires that users are made aware of all sorts of data collection, the purposes for this collection and with which third parties this data could be shared. This should include an opt-in option, meaning that for purposes which are not strictly necessary for the functionality, users would have freedom to opt into this data processing.

7) Respect for User Privacy. This principle requires a user-centric approach to any and all work activities and company goals which might affect the privacy of the user. It requires everyone involved in the data processing to be trained on respectful use of privacy data.

PBD and its principles have existed for 25 years, first defined by legal expert Ann Cavoukian (David & Prosch, 2010, p. 295). It has been researched thoroughly and has even found its way into the European GDPR from 2018 onwards, yet there are few proposed practical applications. Consequently, it has framed PBD as just another legal obligation, losing focus on the important and protective implications it can offer to both a company and users. Moreover, it has created an ever growing gap between the privacy values of users and of developers and companies (David & Prosch, 2010, p. 300; Klitou, 2014). Within this research it is suspected that the difficulty of its application actually lies in the assumption

that all seven principles have to be applied in equal amounts in order for PBD to succeed. There have been cases which exemplify how the application of even just one or two of these principles can already greatly impact the user and privacy experience.

The first example showcases how the application of machine-learning predictive models could actually improve the accuracy of most MTAs. Such a machine-learning model would be trained once based on general data, including a great scala of information on both regular and irregular menstrual cycles (Earle et al., 2021; Lui et al., 2021, p. 10). Once applied to the individual user, the model would only use data given by this user to develop itself further to the specific bodily functions of this user. Meaning it could create both increased predictive accuracy and an improved privacy experience as it respects user privacy, and follows the principles of data minimisation and end-to-end security. An example of such a model could be the federated model. The model follows a technique that “allows a machine learning model to be trained using data from all users while only storing a user’s data on that user’s device.” (Liu et al., 2021, p. 1). Moreover, Liu et al. (2021, p. 10) show the significant accuracy with which the federated model can make predictions, fully equal to that of a ‘regular’ server model except for the level of privacy protection.

Another, more tested, example can be found within Microsoft’s Security Development Lifecycle (SDL). It aims for the integration of privacy and security of five predetermined stages of development. For each stage a certain privacy rating is determined, which needs to be achieved before the design process can move onto the next stage (Rubinstein, 2011, p. 1423-1424). Moreover, the determination of the right privacy rating is dependent on current legal privacy and security frameworks, creating a very thorough and privacy sensitive process.

All in all, PBD, even when not all principles are implemented, can cause great improvements in the protection of user privacy and data. Yet in order to implement PBD, a gap needs to be bridged which encompasses not just improving the privacy experience of users in MTAs, but working with dynamics between user and developer, between individual and society, between sociology and technology. Going further, this research wishes to expand on the applicability of PBD on MTAs. While PBD can be considered as very valuable, research lacks in forming advice on its practical application, especially in relation to users of technologies, in this case users of MTAs. In interviewing various participants, as explained below, this research aims to find a relation between how MTAs are used and how privacy is experienced during this usage, as well as investigate what PBD could mean for the improvement of user- and privacy- experience.

3. Research Design

In aiming to answer the research questions, a qualitative methodological approach was deemed beneficial, specifically, Critical Discourse Analysis (CDA). CDA was used to analyse semi-structured in-depth interviews and enhance the insights resulting from this. This approach was deemed beneficial as this research aims to understand how different people who menstruate experience their menstruation while interacting with MTAs and society, as well as in relation to their experience of privacy. A contrast was created by additionally interviewing experts within the field of privacy. Their experience and knowledge might offer new insights from a different angle, specifically with regards to the implementation and usage of PBD.

CDA allowed for the uncovering of discourses and their meanings lying underneath communication and lexical choices which appeared neutral (Machin & Mayr, 2012a, p. 5). In this case being ‘critical’ towards certain lexical choices, meant the denaturalisation of language, allowing to “[analyse] linguistic elements in order to reveal connections between language, power and ideology that are hidden from people.” (Fairclough, 1989, in Machin & Mayr, 2012a, p. 5). While it might be apparent in texts what the author or speaker is doing, by exploring the exercised discourses and underlying meanings, we will gain understanding of how certain linguistic features are produced and what ideological goal they might serve (Machin & Mayr, 2012a, p. 5). Instead of solely focussing superficially on recurrent themes, as done in Thematic Analysis, CDA allowed the researcher to visualise discursive patterns situated within discussion of privacy and menstruation.

As portrayed within the theoretical framework, menstruation is an experience incredibly influenced by and often still entrenched within heteronormative, patriarchal and capitalist systems. Similarly, the concept of privacy and its invasions is situated within a web of many actors and finds intersection with menstruators who, without expertise in privacy, lack awareness and skill in protecting their privacy when using MTAs. Moreover, while privacy experts do have these skills and awareness, they often miss understanding when it comes to user experiences. This web of intersections was allowed to be investigated critically through CDA.

3.1 Sampling

Qualitative, semi-structured in-depth interviews have been conducted with 7 participants in total. The interview participants were sourced mainly through convenience sampling, meaning first contacts were made through the researcher’s network within

Erasmus University Rotterdam (EUR), a student sports association and a friend group from their hometown. Within these networks snowball sampling was applied, leading to 7 participants. Through a professor from the EUR, contact was made with a network of experts and users situated within the United States. At first it was seemingly more preferable to find participants solely within the EEA, as this would result in more confirmation of experiences situated in the European Union and the European GDPR. Nonetheless, the differences in experiences from people living within and outside the EEA, allowed for a comparative perspective, additionally yielding more interesting results.

Throughout the non-probability sampling process, the researcher attempted to assure only people were selected with whom there was no direct or personal connection so the extent of possible bias would be limited. Too much affinity with an interview participant could affect the reliability and validity of the research, especially as it might lead the interview away from new insights of the interviewee themselves.

Of the 7 participants 6 were users of MTAs, of which two were also experts. The seventh and final participant was not a user, but an expert. The conducted interviews lasted from 45 up until 85 minutes. Operationalisation Table 2 (p. 27) allowed for the integration of theory throughout the interviews, while data from the first few interviews allowed for minor adaptations within the following interviews. More importantly, it allowed for the verification of certain ideas and topics discussed in later interviews (Johnson, 2001). Conducting interviews with both users of MTAs as well as privacy experts who have practical experiences in working with privacy principles and their application in policy and technology, helped to understand the gap between privacy experience and privacy design (Bednar, 2019; Levy & Romo-Avilés, 2019)

3.1.1 Experts

Expert interviews often result in more depth and richness in results, consequently privacy experts were interviewed as they could offer their expertise and knowledge on privacy design, processes surrounding privacy implications, implementations of the privacy law and regulations, security, data or informatics. Besides their expertise being an inclusion criteria, gender was also considered. However, it was decided that gender would not be an in-/exclusion criteria in the selection of the experts, because if the interviewee happened to use MTAs themselves, they could also be interviewed about this experience, especially in relation to their work as privacy expert. In total three experts were found for an interview.

Two experts originated from the Dutch Ministry for Public Health, Wellbeing and

Sport and both occupy an advisory role in the application and execution of privacy law and principles within various organisations related to the Ministry. Even more, one of the participants highlighted that these roles exist because of the execution of Privacy by Design within their organisation. The participants are 26 and 34 years and have a background in legal studies, focussed on privacy law. The 26 year old expert is a person who also menstruates and uses a MTA and was consequently asked about their user-experience as well. Similar questions were asked to the final expert, a 27 year old research assistant with a PhD in the area of surveillance, privacy and communication. This expert was situated within the US at the moment of the interview and therefore questions asked were also focussed on experiences related to living in the US.

3.1.2 Users

The users interviewed were people who menstruate and were selected mainly on their usage of the app besides also their age. Interviewees were selected within the age range approximately of 18 until 35 as this is arguably an age in which they would think about menstrual and hormonal health. Between the ages of 18 and 30 women are most fertile, and most women become pregnant between the ages of 25 and 35 with their first child (Wat is de beste, 2022). Notwithstanding, the fact their their usage of the app could also be solely based on wanting to understand their cycle.

While searching for participants, one participant was found originating from the US, a 36-year old mother. While she was no longer using a menstruation application, she was nonetheless included as a valuable interviewee as she had used an application for a long time and had seemingly strong feelings of having to refrain her of usage because of the overturning of Roe V. Wade. A court ruling in the US which undid the basic right to abortion. The other participants were women ranging in age from 26 to 27, who are living in the Netherlands and work as a nurse in an oncology department, as programme organiser for a university and as content creator. The content creator moreover made a lot of content on the topic of menstruation, cycles, and hormonal contraceptives.

Table 1: Overview of Pseudonymised Participants

<i>Participant</i>	<i>Gender</i>	<i>Age</i>	<i>Category</i>
Emma	Female	26	User
Holly	Female	36	User
Anna	Female	26	User
Iris	Female	27	User
Oscar	Male	34	Expert
Luisa	Female	26	Expert / User
Nadine	Female	27	Expert / User

3.2 Ethics

Before each interview, the interviewee was sent an informed consent form as can be found in Appendix B, additional to further explanation of the research aim as well as a Microsoft Teams invitation through which most interviews took place. Depending on whether the interviewee is a user, expert, or both, the general contents given are slightly altered, so as not to confuse the participants about questions they would not be asked. All participants were also informed about the use of recording for the transcribing of the interview and were simultaneously assured of the anonymisation and pseudonymisation of the collected data. Moreover, the interviewee was assured no (in)directly identifiable information is shared. Interview participants were allowed to either send back the signed document or give oral agreement prior to the start of the interview. All of them gave oral agreement.

As the discussed topic is arguably very sensitive for users, especially considering the intimate (bodily) data that is discussed might be connected to mental struggles related to their menstrual and ovulation cycle, all interviews and questions were approached carefully. All the interviewees, both user and expert, were informed that answering was only necessary if and when they felt comfortable and that they could step out of the interview at any given moment. All interviews were completed and none of the interviewees said to feel discomfort.

3.3 Data collection

As CDA holds potential to yield very saturated results by thorough exploration of gathered data, the amount of interviews was limited to 7 in-depth interviews, additionally because a potential eighth respondent refrained from partaking. Prior theorisation of CDA by

Machin and Mayr (2012) as well as Tonkiss (1998), suggests that in conducting interviews, it is important to leave room for the interviewee to lead the interview. As by following their flow, guided by some topic-based questions, interviewees will be encouraged to express themselves in line with their own ideologies and experiences of power relations. Leading the interviewees with ideas from the interviewer, might pollute their answers and data. Possibly causing results positioned within prior ideas and understandings of the researcher instead of yielding new and different results.

The interviews were grounded on theory as presented in Operationalisation Table 2. For example, privacy fatigue was integrated by asking about privacy management of the interviewee and how they experience the constant management. Sociological and technological determinism were integrated by inquiring about how technology played a part in one's day to day life. Additionally, after the first three interviews, the gathered data was quickly scanned and screened in comparison to the topic list which was then sharpened based on some of these prior findings. The topic list that was followed, as can be found in Appendix A, included the topics *Menstruation*, *Menstruation-tracking*, *Data Management*, *Privacy* and *Privacy By Design*. The topics were discussed in varying degrees during the interviews depending on whether the interviewee was a user, expert or both and depending on what the interviewee seemed to want to talk about most. Interviews with users followed a discussion of their menstruation, the use of the menstruation app, their data and privacy management and finally PBD. As users were assumed to not be knowledgeable in the topic of PBD, it was shortly explained to them prior to asking question related to PBD. For the privacy experts, similar topics were discussed, yet attention and time spent on each topic varied. The interview was focussed on their expertise and knowledge of privacy and PBD, which were discussed in context of their private life as well as any work experience. Then menstruation and MTAs were also discussed, but in a more general matter as done with PBD for the users. All in all, while the topics and questions guided the interviewees, they were allowed to take the reins as much as possible and discuss what they preferred to discuss.

3.4 Data analysis

The collected data of the interviews was analysed following various steps as discussed by Machin and Mayr (2012b) and Tonkiss (1998), allowing us to understand hidden meaning and ideologies in each layer of the text (Machin & Mayr, 2012a; Tonkiss, 1998). As the interviews yielded large corpuses of texts, it should be acknowledged that not all linguistic choices were analysed with the same level of detail. In order to ensure that the

most important topics and answers were nonetheless analysed, a second round of sampling was executed. Prior to the analysis, it already became clear that some specifics discussed within the interviews were not as relevant for the purpose of answering the research question as they seemed when the question was posed. Examples of this could be the specific symptoms of one's menstruation, what functionalities are used within MTAs, but also more contextualising statements about e.g. the election of Donald Trump or the framing of the news. While not disregarding the importance of this contextualising information, these text fragments were not scrutinised and analysed as thoroughly as other parts. This second round of sampling was discussed thoroughly with the supervisor of this research as well as two peer students who are also writing a Master's thesis. All of them are experienced in qualitative analysis and understand the extensiveness of qualitative analysis, specifically while doing CDA. During the analysis, the following steps were used iteratively:

Word connotations. Both Machin and Mayr (2012b, p. 32) and Tonkiss (1998, p. 254) describe this as focussing on the basic choice of words and certain key words used throughout the text. In this research, word connotations were used to describe certain choices in words or expressions which portrayed certain beliefs, backgrounds and ideas of the interviewees.

Overlexicalisation. Overlexicalisation is often defined as the repetitive use of (quasi-)synonymous words giving a sense of over-completeness (Teo, 2000, p. 20, in Machin & Mayr, 2012b, p. 37). In this research this step was used in a similar way, but the researcher did not just look at words, but also expressions and text fragments conveying similar ideologies and discourses. Moreover, this was not just used for conceptual or theoretical terms, but also for words that expressed a certain feeling which in turn could indicate whether the interviewee regarded something as positive or negative.

Suppression and silences. Suppression or lexical absences highlight words or terms missing within texts that one might expect to be present and which could indicate a deliberate choice to support or scrutinise certain ideologies or discourses (Machin & Mayr, 2021b, p. 38; Tonkiss, 1998, p. 258). In this research the focus was therefore on contrasting what was being said with what possibly was not being said. Within that contrast implications of how someone thinks about a certain ideology or discourse, could be found.

Structural oppositions. Often defined as 'ideological squaring', all participants are situated within a system of opposing ideas, systems and concepts (Van Dijk, 1998, in Machin & Mayr, 2021b, p. 40). In this research it was looked for both explicitly and implicitly, as certain words are in essence connected to a web of oppositions conveying both

positive or negative meanings. This could be for example words like we versus them but also expressions which situate a person of knowledge on one side of the argument and a person without similar knowledge at the other side.

Lexical choices and genre of communication. Lexical choices and genre of communication portray how in conveying a certain message or ideology, words are deliberately chosen to show certain expertise, knowledge or authority (Machin & Mayr, 2021b, p. 42). In this research, this was considered to differ from ‘word connotations’ as it is often found in ‘more expensive’ language, instead of more basic wording. This step also often portrays two opposing groups, conveying some feeling of authority and equality or inequality.

3.5 Positionality

Within the conducted research, positionality requires some consideration, especially as conducting CDA requires the researcher to be critical. It should be recognised that the researcher themselves has used menstruation applications in the past and is strongly opinionated against its privacy invasive tendencies. Additionally, the research contains a background in surveillance studies and work as a privacy officer. This might lead to a biased perspective towards existing privacy designs of menstruation applications, creating a larger urge to improve these designs. Therefore, a reflexive attitude was maintained by following the proposed tools of CDA and applying them iteratively, arguably ensuring reliability and validity within the research.

Nonetheless, upholding ‘objectivity’ in the normative sense by distancing oneself from the ideologies and beliefs of the interviewees, was not an aim of this research. As Donna Haraway (1988) has described, objectivity is situated within prior knowledge and affiliations with certain topics. This situated knowledge will allow for a more ‘subjective’ connection with the interviewees and a more thorough understanding of their lived experiences. In a research where CDA is utilised as a form of research analysis, it is important to understand the deeper meaning of what is being said which could be difficult if one is not willing to immerse themselves into these texts. Nonetheless, it is recognised that following this more immersive and arguably subjective approach while utilising CDA, some intended meanings or ideologies could be missed as they do not align with that of the researcher. Similar, to ideologies that do align with that of the researcher and do no longer catch their attention.

Table 2: Operationalisation Table

Theory/ Concept	Dimensions	Sub-dimensions	Topic(s)	Expert	User
Body literacy	Body literacy refers to being able to investigate, navigate and understand one’s own body (Bianca, 2021; Wershler, 2020).	<ul style="list-style-type: none"> - Understanding general health and wellbeing of the overall body. E.g. tracked with health trackers such as FitBit, SmartWatch, Samsung / Apple Health (Bianca, 2021; Lupton, 2015); - Understanding cyclic health and wellbeing, including understanding and navigating one’s menstruation, ovulation and reproductive system. Rhetoric for menstrual advocacy (Wershler, 2020). 	<ul style="list-style-type: none"> - Is tracking done and for what purposes?; - How does participant feel when tracking?; - How does it affect them daily?; - How did it relate to understanding of one’s cycle? 	X	X
Cyborg Assemblage	Technology exists blurringly with the human body, increasingly it is used to empower the individual in tracking and understanding their own body (Lupton, 2015).	<ul style="list-style-type: none"> - The empowerment of the individual when tracking bodily information as “data” (Lupton, 2015); - The use of mHealth / Menstruation applications 	<ul style="list-style-type: none"> - Reasoning behind the use of these applications; - Advantages & disadvantages of usage, with focus on implications for privacy. 	X	X
GDPR / AVG	The General Data Protection Regulation of the European Union is an extensive account of laws and regulations on the processing of personal data by companies, governments and authorities.	- Various laws specified to menstruation applications and privacy protection.	<ul style="list-style-type: none"> - What laws are important?; - Can some applications evade these laws? - How well are these laws applied?; - How applicable are these laws?; 	X	

	The AVG is specified towards the Netherlands.		- What kind of improvements/changes could be made?		
Privacy by Design	The seamless integration of privacy within the design process from the starting point instead of it being an afterthought (Klitou, 2014). The theory consists of various principles which, when applied perfectly, should create a win-win situation for all actors (David & Prosch, 2010, p. 296)	- 7 principles: 1) Proactive not Reactive; 2) Privacy by Default; 3) Privacy Embedded into Design; 4) Positive-Sum, not Zero-Sum; 5) End-to-end Lifecycle Protection; 6) Visibility and Transparency; 7) Respect for User Privacy.	- The usability of PBD in practice; - The current application of privacy (by design); - The user experience of current privacy designs; - How to improve privacy experience?	X	X
Privacy Calculus	Weighing of costs against benefits with regards to privacy and privacy questions (Li et al., 2016).	- Possible protections for privacy; - Possible violations for privacy.	- Awareness of threat of privacy?; - How extensive is the threat of privacy?; - Why use certain applications?; - What is considered when deciding to download an application?; - Explaining of consideration process.	X	X

Privacy Fatigue	Feeling overwhelmed by the abundance of privacy-related questions and concerns when using the internet and other online technology (Choi et al., 2018).	/	<ul style="list-style-type: none"> - Are there negative feelings about privacy (associated with use of menstrual applications)?; - Feeling overwhelmed for users; - Feeling overwhelmed for experts. 	X	X
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Privacy Paradox	Opposition between understanding/feelings towards privacy and the actual behaviours performed (Gerber et al., 2018).	/	<ul style="list-style-type: none"> - How are menstrual applications used?; - What are the general feelings towards the usage of these apps?; - How do people come about starting to use these apps?; - The influence of public discourse 	X	X
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Sociological Determinism	Sociology as influential on the development of technology. It is created based on current sociological developments and changing needs for certain technology (Wyatt, 2008).	/	<ul style="list-style-type: none"> - The changing needs for mHealth / menstruation applications; - The process of society / users / law influencing technology - The interactions between users and developers; - The influence of public discourse 	X	X
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Technological Determinism	Technology as influential on society and its individuals, determining the social and cultures processes and developments (Wyatt, 2008).	/	<ul style="list-style-type: none"> - The development of mHealth / menstruation applications; - The process of technology influencing users / society / law 	X	X
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4. Results

This section will discuss the main findings following the critical analysis of the interviews conducted with users of MTAs and experts in the field of privacy. The structure of this section reflects the most important thoughts, notions and discourses from the interviews which were exposed through CDA. The findings will be discussed by situating certain lexical choices of the interviewees within a greater social and societal context. The results are connected throughout their presentation with concepts and theories as presented in this research's theoretical framework, as well as additional concepts and theories which the researcher deems important towards the meaning-making process of the reader.

Furthermore, while a vast array of findings are worthy to mention, the ones presented here were deemed most relevant in answering the question central to this research: '*How does the user-experience of menstruation-tracking applications relate to privacy and datafication?*'.

Important to note is the organisational structure of the results, as the researcher has attempted to create meaning in the present discourses by relating them to historical and societal processes. Similar to the structure of the theoretical framework, the results section follows the discussion of *Digital Empowerment within Menstruation*, *Bodily Datafication*, *Bodily Privacy*, *Privacy Discourse* and *Privacy By Design*. This structure represents the historical and societal background of empowerment and menstruation, connects it to digitalisation and what this has meant for body literacy and privacy. It is then followed with presenting lived experiences of privacy and Privacy by Design, addressing what it could possibly mean to the user-experience of MTAs. The structure is intended to represent the current situation surrounding the usage of MTAs, which led to the formation of the central research question. Topics like control, trust, heteronormativity, capitalism and both technological and sociological determinism will be weaved throughout the complete section as they weave throughout the discourses ingrained within the interviewees, their thoughts and ideas.

4.1 Digital Empowerment within Menstruation

4.1.1 Differences in Generations

When starting the interviews with users of the apps, they were asked to share their experience with menstruation throughout their lives. Multiple participants answered this by relating it to experiences they had with their mother, in school, with peers and also by relating their current self with their younger self. The female participants who were interviewed vary in age between 26 and 36 years, meaning that their parents and/or mothers

would not be able to use digital tracking methods themselves when they were the age the participants are now. Emma (26) compared her own experience with that of her grandmother:

“Ja, nee, ik ben wel heel blij met technologie ja. Vroeger deden ze het in een in een notitieboekje. Mijn oma volgens mij, ja die zette stipjes en die ging dan echt meten en een grafiekje zelf tekenen, ja. Maar daar moet ik niet aan denken, veel te veel moeite.”

“Yes, no, I am quite happy with technology yes. They used to do this in a notebook. My grandmother I think, yes, she used to place dots and then she would actually measure this and draw a graphic herself, yes. But I do not want to think about that, way too much effort.”

Her expression of how happy she is with technology becomes clear when looking at the lexical absences. By stating that her grandmother would ‘actually’ do this the analogue way, that she does not ‘want to think about that’ and that it would be ‘way too much effort’, all implies a comparison with the ease with which she is able to track digitally through the use of MTAs. It is a telling example of the technological advancements and digitalisation of menstruation in recent years. Yet while Emma seems happy about this, the lexical absences later in the interview might imply that digital tracking could take up just as much time:

“Ja elke dag wel, ja hij synchroniseert hem dus met de Aura app en dan Natural Cycles, dat is eigenlijk het eerste wat ik doe ’s ochtends. Ja, het kan ook ’s middags en soms doe ik het ’s avond, maar dus wel dagelijks, ja.”

“Yes, everyday actually, yes it synchronises with the Aura app and then Natural Cycles, that is actually the first thing I do in the morning. Yes, you could also do it in the afternoon or evening, but you do it daily, yes.”

While it seems that digital tracking might involve similar steps and the same amount of time as analogue tracking, there is no implication of finding this too much effort. It could be explained by her word connotation of ‘synchronises’ and ‘app’ which implies that the temperature measuring ring she wears day and night does the tracking work for her. It seems as if the apps and ring she uses prompt her to track yet without having to do the complicated work of understanding or figuring out the algorithm behind it. It relates to the

aforementioned frame of ‘intentional-not-knowing’ argued to be created within software development (Bianca, 2021, p. 9). This is further supported when Emma compares her own uses of social media technologies to that of her grandparents and uncle:

“Ja, het zou zeker kunnen dat ik misschien wat minder de gevaren ervan inzie, terwijl ik ze eigenlijk juist meer zou moeten zien.”

“Yes, it could definitely be that I maybe see less of the dangers in it, while it should actually be me who sees them more.”

Through structural opposition Emma showcases the differences in the lived experience of her generation versus that of older generations. By adding ‘more’ into her comparison, she implies that older generations are not completely lacking certain knowledge, but she situates herself within the position of a ‘digital native’. Implying that her knowledge and experience of the digital world which she gathered from a young age, should make her be more aware of online dangers that older generations who lack this same knowledge.

These generational differences also translate to experiences of menstruation and perspectives on contraceptives. Contraceptives have been around since the 1960’s, after which the possibilities expanded, similar to the social implications. Anna (26) exemplifies these differences when she got an IUD and told this to her mother. While she had been taken the pill for eight years already, her mother viewed the change to an IUD as a very big step:

“[...] dus het is niet alsof ik ineens seks ga hebben of zo, weet je wel? Maar dan toch vond zij blijkbaar, misschien is dat wel meer in die generatie, dat weet ik niet, de spiraal dan echt wel nog een heel ander verhaal dan de pil, dat ja. [...] En ik denk dat ze het toch ook wel bijzonder vond omdat ik op dat moment helemaal geen vaste partner had, of ja eigenlijk helemaal niet, ik eigenlijk helemaal sowieso niet wild in bed was. [...]” (Anna, 26).

“[...] so it was not like I was suddenly going to have sex or something like that, you know? But so apparently she thought, maybe that is that generation, I don’t know, the IUD is then really a completely different story than the pill, so yeah. [...] And I think that she also thought it to be somewhat special because at that time I did not have a regular partner, or actually I did not, I was actually not wild in bed at all.”

In her answer, a combination of lexical absences and structural oppositions can be found. Fragments like ‘maybe’, ‘generation’, ‘different story’, ‘somewhat special’ all imply that Anna’s mother was comparing herself and her daughter based on her own experiences and perspectives, yet also showcases the difficulty she has in understanding Anna’s decision. Moreover, the text shows a great use of overlexicalisation in which the reasoning behind an IUD is reduced to having sex, even with multiple partners. It is often believed that the pill is more appropriate for managing hormonal health and symptoms, while the IUD, an Intra-Uterin Device, establishes the vagina as ‘contraceptive frontier’ (Clarke, 2000, p. 61 In Bianca, 2021, p. 6). Such a frame is not unexpected for someone like Anna’s mother who has probably experienced the younger years of her menstruation with the pill or condoms as the most accessible options. Moreover, only in recent years has talk about menstruation and contraceptives become more accepted and more progressive. We can therefore quite confidently show how Anna’s body and the act of getting an IUD is sexualised by societal standards and beliefs. Exemplified when Anna is stating ‘I was actually not wild in bed at all’, in this case the term ‘wild’ is a lexical choice used instead of ‘not having a lot of sex/partners’. By explaining ‘so it was not like I was suddenly going to have sex’, Anna again showcases for her there is more behind contraceptives than using it because you are having sex.

4.1.2 Similarities in persisting stigma

The aforementioned examples already show the persistence of societal, heteronormative standards within how menstruators of all ages experience their menstruation. Portraying how menstruation and the cyclic self is indeed often seen as relational to society and interactions. A stigma that is particularly influential and already touched upon, is that of the notion that women are solely meant as vessels for reproduction. The history of feminist waves which have battled and rebelled against this notion have paid off in the sense that all menstruating participants of this study, were conscious about this stigma. Attempting to change it themselves for example by having open conversations with peers, colleagues and followers. Yet, as will be exemplified, the stigma is still persisting within medical, educational and arguably capitalist systems. Emma (26), who is a content creator, exemplifies this structural difference as she happily explains that she has become knowledgeable regarding her cycle and hormonal functions of her body, because she took it upon herself to read into this. Yet she, as well as other participants, express an unfortunate lack of information about this when they were younger;

“Ik had het eigenlijk op school al wel willen weten zo. En ook mannen, dat die dat dan ook leren.”

“I actually would like to have known when I was in school still. And also men, that they learn about it then as well.” (Emma, 26).

“[...] in plaats van alleen maar de ervaring van je moeder of de seksuele voorlichting je op de basisschool kreeg, wat bij mij echt geen goede seksuele voorlichting was.”

“[...] instead of solely the experience of your mother or the sexual education which you received at primary school, what in my eyes you really could not call good sexual education.” (Anna, 27).

While all participants indicate to have received some form of sexual education in school, they also imply a lack in discussing hormones or anything apart from the process of heteronormative reproduction. Moreover, the structural oppositions implied by ‘men’ and ‘mother’, situate women again as the ones responsible for preventing unwanted pregnancies. Instead of a father sharing his expertise and knowledge, instead of young boys and men being taught about the female experiences, the systemic norms which burden women and situate them as vessels for reproduction persist. This lack in education and awareness from men, is something that Anna (26) also indicated from her sexual experiences with men:

“Mannen, als je met mannen naar bed ging, gaan ze dan, vragen ze zo na de seks, oh, je zit trouwens toch wel aan de pil, weet je wel. Dat ik denk van ja, zo stom eigenlijk dat iedereen er standaard vanuit gaat [...]”

“Men, if you would go to bed with men, then they, they ask after the sex, like, oh, you are taking the pill right, you know. Then I think like, so stupid actually that everyone standardly assumes this [...]” (Anna, 26).

The structural opposition implied with ‘you are taking the pill, right’ and ‘standardly assumes’, exemplifies again the difference in responsibilities for women and men. While men get to enjoy themselves and worry only once after climaxing, women need to think ahead, make sure to take precautions and prevent unwanted pregnancies. A burden which continues after the sex as it could leave a feeling of stress and unease.

4.1.3 Differences in legislation

And while Anna and Emma, like all four Dutch user participants, have to worry about tracking their cycle daily and perhaps having stress about not wanting to get pregnant, this feeling goes even deeper for the two user participants living in the US. Holly (36) and Nadine (27), have had to refrain from menstruation-tracking through digital and online applications. They are not protected by the GDPR in their activities and while the Health Insurance Portability and Accountability Act (HIPAA) is installed in the US, this does not cover medical apps, such as MTAs. Even more, the recent overturning of the court ruling *Roe V. Wade* has undone the basic human right to abortion within all states. States can now independently determine whether abortion is allowed or not, resulting in the prohibition of abortion or legalising it under very strict terms within 21 states already (Tracking Abortion Bans, 2024). This situates these two participants, as well as many other women and menstruating bodies in the US, within a legal framework which is threatening for the menstrual and hormonal health of the fertile female body. Holly explained that after having had two children, she does not wish for more. And while she is taking a contraceptive, she is additionally regularly taking ovulation and pregnancy tests to assure that if she does get pregnant, she could arrange for an abortion on time, in line with the legislation in her state. Nadine explains she suffers from PCOS and is often very narrowly tracking her bodily symptoms, yet this has gotten more difficult, meaning that gaining insight in her PCOS is also more difficult. Both express their struggle with having to go ‘old school’ and to track using ‘pen and paper’:

“The prevailing advice in media and feminist circles, was to delete the apps from your phone. [...] Yeah, so remove any potential for evidence that they could collect. If they decide to go after women and legally prosecute them.” (Holly, 36).

“[...] I still want to be able to track this without potentially getting, like, punished by law for it.” (Nadine, 27).

The overlexicalisation of fragments like ‘prevailing advice’, ‘delete’, ‘remove’, ‘evidence’, ‘go after’, ‘legally prosecute’ and ‘punished by law’, all indicate the incredibly dire situation. It portrays how possible dangers of tracking, something the Dutch user participants would likely not consider, now become materialised for the American user participants. They are put within a situation where they no longer, really, control their individual bodies.

Rather the systemic, heteronormative standards with which they might have interacted, have become tangible and have started physically controlling their bodies. Seemingly taking away forms of privacy which are so important in navigating and expressing the cyclic self.

4.2 Bodily datafication

4.2.1 Bodies in medical systems

The aforementioned differences in experience between mother and daughter, between men and women and between users living in the US and Netherlands, can all be related to the datafication of the body which is arguably intertwined with the objectification of the body. As this topic is of an inherently biological and medical nature, it is unsurprising that the medical field has influenced this datafication and MTAs. Looking at the greater picture of medical research, we can argue that this cannot exist without the investigation of human bodies, which necessitates and causes the creation of data of these bodies. In investigating to what extent similar medical datafication of the body is translated to MTAs the researcher decided to download the MTAs Clue and Flo which are most popular, also with the participants.

What was found was the excessive use of the word 'contraceptive' or 'anticonceptie' in Dutch, or the 'antibabypille' in German. This term is so standardly used, we might not even think about what it implies. It reduced the bodies of people who menstruate to something made for reproduction and for which the pill can help against conceiving babies. In reality, hormonal contraceptives are also prescribed as medicine to counteract symptoms of for example endometriosis. Additionally, the applications use language like 'irregular', 'abnormal' and 'normal pattern'. Language which then translate into conversations from the interview. Anna (26) for example read some notification she received from the app she used:

“Oh, er staat hier wel dat ik geen cyclus afwijking heb, ‘de gezondheidsapp kan je melding sturen als je vastgelegde menstruaties cycli afwijken van het normale patroon.’”

“Oh, here is says that I do not have a cycle abnormality, ‘the healthapp can send you a notification when your tracked menstruation cycles divert from the normal pattern.’”

The words 'abnormality', 'divert', and 'normal pattern', showcase structural oppositions, which imply that any differentiation from what the application deems normal, is abnormal.

Exacerbated even more by sending users a notification if they are registered as ‘abnormal’. Indicating that abnormality is something that should always be investigated and requires extra healthcare. While in reality, it might also just be caused by a naturally irregular cycle. Even more interesting is that Clue does advise users on abnormalities in their cycle, yet also states that the app ‘has not been tested in clinical studies and does not take into account cycle-variation, and therefore cannot be used as contraceptive.’ (See Figure 4). Stating furthermore that ‘there is not really a “normal” when it comes to menstruation’ (See Figure 5).



Figure 4: Information page Clue



Figure 5: Information page Clue

Apparently, a certain lack of coherent information is also not unique to the menstruation applications. Various participants have shared experiences and struggles with their doctors, general practitioners and other health care professionals. One participant was for example only informed of the high amount of hormones in the pill she was taking, after she noticed it was not working to her liking and she wished to change to an IUD. Another participant noticed the IUD she had recently gotten was negatively affecting her mental wellbeing. However, only after she changed to a different OB/GYN was she listened to and was the IUD taken out. A final participant shared that when going to the doctors because of

concern about her cycle, she was given the diagnosis of PCOS. However, this diagnosis was perceived as very impersonal and quick to her:

“Het is ook gewoon iets heel kwetsbaars wat je dan deelt met de dokter en waar je zelf mee zit. Maar je krijgt de diagnose en verder laten zij het los. Ze laten je eigenlijk met allemaal vragen achter die ze niet beantwoorden. Omdat het zo snel ging, maakt dat het ook wel meer dubieus.”

“It is also just something very vulnerable what you share with your doctor and where you are struggling with. But you get a diagnosis and they just let it go. They actually leave you with so many questions they do not answer. Because it was so quick, it makes it even more dubious.” (Iris, 27)

The overlexicalisation of words like ‘dubious’, ‘quick’, ‘vulnerable’, ‘let it go’, really conveys the idea that the healthcare which Iris received was very distant and did not regard her as a vulnerable individual who was struggling, but more like another case with a certain amount of symptoms. It showcases a certain generalisation within healthcare, which is similarly visible within MTAs as data of individuals is often generally used to apply to all participants.

4.2.2 Bodies in menstruation-tracking applications

Yet while some aspects of health care are translated to MTAs, they also offer new ways of medical help. For example, many US users who cannot receive the right health care, have turned to usage of these apps to still track their bodily functions and for example avoid getting pregnant. Furthermore, different participants explained they have had to advocate for themselves to receive the right healthcare and were able to do so by tracking their cycle and using this data while going to their doctor. Moreover, some would even change their tracking behaviour if it would be advised by their doctor or if it was indeed needed in order to receive the right healthcare:

“Toen ik naar de dokter ging, kon ik daarmee precies aantonen hoe mijn cyclus is geweest, wat voor symptomen ik had en ook wat er niet juist niet gebeurde.”

“When I went to the doctor, I could use it to exactly show how my cycle had been, what kind of symptoms I had and also what was not happening.” (Iris, 27).

Iris argued that in tracking she would pay attention to what was not happening. The addition of ‘what was not happening’ indicates that she started to get worried about her cycle once she realised that her symptoms were different from what she considered normal. Yet for her, and possibly the other participants, this tracking became somewhat obsessive:

“En door obsessie verandert je menstruatie toch niet. Ik heb natuurlijk geen reguliere of makkelijke menstruatie wat al best veel emoties met zich meebrengt, door dit dan ook nog bij te houden wordt het obsessief en blijf ik juist heel erg in deze emoties hangen.”

“And an obsession does not change your menstruation anyways. I do not have a regular or easy menstruation of course, what already brings many emotions with it, by tracking this as well it becomes obsessive and then I really stay lingering in these emotions.” (Iris, 27).

It is interesting that Iris chose the words ‘obsession’ and ‘obsessive’, as it makes one wonder what there is to obsess about with regards to a menstruation. Without the datafication of the body, without tracking, without it being researched and treated within the medical system, she might never have known there was something going on. But seeing those symptoms embodied in data might allow for an obsession and for controlling or attempting to control what is happening with your body. This idea might be in line with how Luisa (26) explains happens to her sister when she forgets to take her smartwatch when going for a walk:

“Dan voelt het alsof ze niet gewandeld heeft, want haar stappen zijn niet getrackt, zeg maar. Ik denk dat je er ook in kan doorslaan, dus ik gebruik ook geen app om bij te houden.”

“Then it feels like she did not go for a walk at all, because her steps have not been tracked then, you know. I also think that you can go too far, so I also do not use an app to track.”

Luisa continues to explain that for her it is enough to just feel her body and feel like she is healthy. It goes back to the ‘alienation-through-objectification’ idea, where the more the body is datafied and mathematised, the more distance is created between feeling your body. Exemplified further by Iris and Emma who both explained that when struggling with the irregularity of their cycle, the tracking app they would use, would still send notification they

almost had to start their period. Leaving them with a feeling of disappointment when it again did not happen. Yet instead of recognising the app might be in the wrong or taking distance from this app, Iris stated:

“[...] Maar ja ik beseft me ook wel dat die app daar natuurlijk ook niks aan kan doen.”

“[...] *But yeah, I also realise that that app is of course not to blame for that.*”

The addition of ‘that app is [...] not to blame’ is quite interesting as it would imply that it is actually her who is to blame. It raises questions about why she thinks not the application but rather herself is to blame, because is it not through the constant prompting of these apps to log and to track her cycle, that she has perhaps become more obsessed with this cycle?

4.3 Bodily privacy

4.3.1 Privacy in relations

In contrast to being prompted to share details about the menstrual cycle, various participants have said that sharing information and details about this, is not as easy within personal relations. While some found it very comfortable to talk with their mother about this topic, a similar attitude was not found with other participants. How participants referred to privacy in relation to their menstruation differed quite a lot between participants and between who they were talking with. Various participants stated to have a very good relationship in which they can share very openly about their menstruation, how they are feeling and what they are experiencing. Yet, when it comes to considering using a Partner app which connects with their MTA, allowing their partners to see what they are tracking and for example how heavy their flow is, answers differ. While Emma said to not mind sharing such information through the app as she already shares this in person as well, her statement of ‘not minding’ does imply a structural opposition in which she is aware there is actually something to mind and that others might mind this. Iris, for example, shows this notion of minding such information sharing:

“Op zich hoeft hij niet allemaal te weten wat mijn symptomen zijn of waar ik last van heb, omdat ik dat zelf niet per se heel sexy vind. [...] Ik zou het wel oké vinden om mijn menstruatie te delen en bijvoorbeeld wanneer ‘rode’ en ‘groene’ dagen zijn.”

“I do not necessarily think he needs to know everything about what my symptoms are or what is bothering me, because I do not think that to be very sexy per se. [...] I would be okay to share my menstruation and for example when the ‘red’ and ‘green’ days are.”

In her explanation, it seems that what she is okay with sharing, is again reduced to fit the image of women as sexualised objects. The word connotations of ‘not sexy’ and ‘red’ and ‘green’ days, imply the presence of this heteronormative idea. So while she does not wish her partner to know about the dirty details of symptoms, she does not mind sharing what days she would be okay with having sex. The ‘red’ and ‘green’ days represent the day she is least fertile and the day she is most fertile. Consequently, the green days would be days on which conceiving a baby would be best. However, Iris does portray awareness of such stigmas in other situations and with other relations. For example by opening up the conversation with her male colleagues:

“Maar nu praat ik daar echt wel heel makkelijk over, want ik ben gewoon een vrouw en ik menstrueer en hij is een man, dus waarom zou ik het er niet gewoon over kunnen hebben? Ik vind dat dat eigenlijk heel normaal is.”

“But now I talk about this really very easily, because I am just a woman and I menstruate and he is just a man, so why would I not just be able to talk about it? I actually think that is super normal.”

In saying ‘I am just a woman and he is just a man’, she presents a structural opposition which can be read either of two ways. It could imply the wish to regard these bodies as nothing more than just working bodies, not objects of sexualisation or reproduction. Or it could imply the systemic opposition between men and women within our current society. Women have to deal with all aspects of menstruation, while men can enjoy solely the benefits. And when women are opening up about this, they are scrutinised and told to keep it more private, creating exactly what is exemplified by what Iris does and does not want to share with her partner.

4.3.2 Trade-offs in privacy

The boundaries between what users do and do not want to share with MTAs are more blurred however. Various participants did not touch upon privacy or said not to worry about

privacy until being asked about this during the interview. Other participants did already mention it, specifically the trade-off often made between the functionality offered in return for giving away certain data or privacy, but these were only the three experts. Nonetheless each participant did refer at some point in the interview to the financial systems and activities behind applications. Emma (26) made the difference between on the one hand the application using her data to improve the algorithm and consequently how it would help other users and the use of ads and selling of products on the other hand:

“[...] ik wil daar ook wel aan bijdragen, aan die informatiedeling eigenlijk. [...] ik vind dat wel een mooi iets eigenlijk. [...]. Ja, ik denk dat het verschilt in dat er hierin niks verkocht wordt aan mij, dus er zijn geen advertenties.”

“[...] I want to also contribute, to that information sharing actually. [...] I think that that is something quite beautiful actually. [...]. Yes, I think the difference in this is that nothing is being sold to me, so there are no adds.”

Even more, Emma refers to this ‘information sharing’ as ‘quite beautiful’ instead of, for example, ‘convenient’ or ‘smart’. It showcases again the frame of ‘intentional-not-knowing and how companies and its developers ‘blackbox’ details about what could and would be done with such data. It enforced the capitalist systems behind these apps and persuades and prompts users to continue using it, without offering an appropriate level of transparency equal to the level of privacy invasive behaviour. While Luisa (26) starts off with a similar idea, stating she has nothing to hide, she does realise it should not justify the selling of this data:

“[...] ik heb altijd ook zoiets van, ja, ik heb toch niks te verbergen. Ik doe geen gekke dingen dus, maar dat is natuurlijk. Dat staat niet per se gelijk aan, dat het niet erg is om je privacy te verkopen.”

“[...] I always think like, yeah, I do not have anything to hide. I don't do dumb things, but that is of course. That does not necessarily equal that it is not bad to sell your data.”

The word connotations ‘hide’ and ‘dumb things’ uncover exactly the ingrained presence of ‘blackboxing’ within software development. It enforces the idea that as long as we do not do anything ‘dumb’ or stupid, our data cannot be misused or used against us. This feeling that

our controlled actions could refrain companies from misusing, could be considered as the only thing that can be done against such invasive data gathering practices. Holly explains that while she has “resigned” herself to the fact she has “no control over my own data”, this attempt of control against ‘stupid’ actions is something she does enforce for her two young children:

“Everything they do or have access to is through mine or my husband's accounts so that we can monitor it, and also so that if they do something stupid it won't follow them their whole lives.”

Although done with better intentions than her being tracked by companies, by referring to her children’s online activities as ‘stupid’ instead of for example ‘clumsy’ or ‘dangerous’, she puts herself in an authoritarian position. In this case the genre of communication is not an expensive word itself, yet it implies differences in knowledge, power and position between her and her children. For her own data the trade-off shows there is nothing to do about her loss of data. However, for her children she has positioned herself in between the big companies that want their data and her children that are not aware yet of such trade-offs. It could even be understood as in order to protect her children’s data, she has sold her own data. It exemplifies that the trade-offs do not just exist as paying money in order to receive more functionality. More often than not, the trade-off is between how much privacy and data you are willing to give away for what level of functionality:

“[...] ik denk dat er altijd wel betaald voor moet worden en als het niet is met geld, dan zal het wel met gegevens zijn.”

“[...] *I think there will always need to be paid for and if that is not with money, then it will be with data.*” (Oscar, 34)

Though not explicitly said, the lexical choice ‘there will always need to be paid’ implies the existence of capitalism, of the big financial systems always existing behind any sort of technological development or application. And when this financial system cannot be funded with money, it can be with data of any and all users, disregarding age or threat to their privacy. Ultimately, this is all done so they can develop the technology further and consequently raise their revenue.

4.4 Privacy discourse

The above described scenario raises questions about why some people are not more angry about having to give away data and privacy, why no bigger steps are taken to improve this situation, and why people feel they have nothing to hide. Answers could be found in shared experiences of Oscar (34) and Luisa (26) regarding the Dutch and European privacy laws and regulations such as the AVG and GDPR. Expressions from Oscar such as “Nou zijn de meningen erover verdeeld of de AVG mooi is” [“opinions are divided when it comes to whether the AVG is nice”] and “AVG zegt nee” [“AVG says no”], already imply some sort of disapproval or disregard towards the AVG coming from companies as well as their employers. It is further supported by Luisa who shares her experiences in consulting a company regarding their implementation of privacy:

“Dus echt creëren van awareness [...] en wat minder denk ik, wat minder doomdenken, [...]. Maar ik wilde ook zo ver mogelijk wegblijven van dat beangstigende deel van de AVG en meer denken in de opties die het eigenlijk biedt en hoe het ervoor zorgt dat je kan samenwerken en data kan delen en verwerken.”
“So really creating awareness [...] and a bit less of, a bit less of doomthinking, [...]. But I also wanted to stay away as far as possible from that scary part of the AVG and think more in options of what it can offer and how it can make sure that you can collaborate and share data and process it.” (Luisa, 26)

The overlexicalisation with both Oscar and Luisa is clear when you look at ‘AVG says no’, ‘divided’, ‘doomthinking’, ‘scary’. It moreover gives a sense of lexical suppression or absence considering that in saying this they are implying that people are actually wary and afraid of the AVG. They are scared of something that is put into place to protect them and their data, possibly because it will limit their use of technology in certain aspects. It shows that users might fear the protection of data more than the violation of their privacy. This could be explained further by the fact that all privacy experts noted that privacy is often accompanied by a loss of functionality:

“[...] als je alleen maar zou kijken naar compliance, [...] dan zou er geen product meer op de markt gebracht worden. [...]. Soort van volwassenheids-niveau kunnen bereiken, wat, wat acceptabel is. En niet gelijk voor alleen maar, ‘privacy is heilig.’”

“[...] if you would only look at compliance, [...] there would be no products brought out onto the market. [...]. Sort of reaching a maturity-level that is, that is acceptable. And not just going for, ‘privacy is holy’.”

In stating this, Oscar showcases that companies often refrain from the implementation of the highest level of privacy, as it would take away from the functionality of their work processes. Additionally, it gives an explanation of why people fear increased privacy as it could take away certain freedoms in using technology. One could argue that when companies are not willing to follow the highest possible standards of privacy, this notion translates to the users. Users situated for example within the Netherlands, would then also not feel the necessity for improved privacy. While users situated for example in the US, would actually miss this certain level of privacy as this is also not ensured or obliged by law.

4.5 PBD in menstruation-tracking applications

4.5.1 Creating awareness

Within this results section, we shortly touched upon persisting stigma related to menstruation. Additionally, we have seen that recently there has been a growing interest in technologies from the FemTech market such as MTAs. One participant even stated that this growing use of these applications, might cause the reduction of stigma’s surrounding menstruation. Iris explains that she feels that a lot of menstrual symptoms, such a vaginal discharge, are often seen as ‘dirty’ and ‘unhygienic’. But because the app requires users to put in this data, especially in order for it to work well, she argues:

“[...] dan is het niet vies, maar dan zijn het juist tekenen van hoe je cyclus loopt en of dat goed loopt. Ik denk dat de apps het dus wel makkelijker maken om erover te praten.”

“[...] then it is not dirty, but those are signs of how your cycle is working and if it is working well. So, I think the apps can make it easier to talk about it.”

Her rephrasing the ‘dirty’ aspects as a ‘sign [...] it is working well’, represents the structural opposition between what is believed in heteronormative society and systems versus what is believed in more progressive circles. Again, this lexical choice showcases that a change in language used within MTAs, as well as healthcare, can create awareness and change the menstruating body from something dirty to something natural.

A similar change in language and awareness, is exactly what the privacy experts advocated for regarding privacy. As shown before, Luisa argued that instead of focussing on the “doom” aspect of privacy, the focus should be on what is possible within the privacy legislation. Additionally, she and Oscar, argue that instead of seeing “privacy as holy”, “it is more a question of raising awareness.” [“het meer kwestie is van awareness creëren.”]. The word connotation of ‘question of’ implies a certain optimistic belief that once awareness is raised, privacy can be achieved. Moreover, it also implies that instead of fighting against the current trend of making privacy obligatory yet not guiding e.g. companies in its implementation, privacy will also not be achieved. And as also argued before by the privacy experts, in the collaboration with these companies the best privacy standards might be upheld.

4.5.2 Principles become expected

When interviewees were asked about whether they read the privacy statement of the apps they were using, none of them answered yes. While Holly said to have ‘scanned through’ noting ‘key words’, others said to ‘simply press ‘accept’ and move on. Unsurprisingly as the terms and agreement and privacy statement of Clue for example had a 22 minutes reading-time combined. However, what was notable for those who were asked this question and did not have prior understanding of PBD, they started saying things that indicated they would prefer the implementation of principles of PBD. The principles ‘Proactive not Reactive’ and ‘Respect for user privacy’ were found when participants were inclined to say that they felt so much data did not need to be gathered in order for the application to work:

“There are things that could create a same user experience, just minus all of this personal information, right?” (Nadine, 27)

It not only implies that proactively limiting the data being gathered, the products could maintain similar functionality. It shows that by doing so, companies consequently show more respect for the user’s privacy. Improving arguably the extent to which users are willing to give data and feel trust in using the application. Oscar further supported this idea:

“maar dat je opeens een invulveld krijgt met wat is je favoriete Disney film? Ja, waarom heb jij dat nodig?”

“but that you suddenly have a box with what is your favourite Disney film? Yeah, why would you need that?”

Through structural opposition, a comparison between an app asking for irrelevant data and being asked to share data about a Disney film, showcases actually the ridiculousness and irrelevance of the information that is always being asked.

‘Visibility and Transparency’ came up multiple times, mentioned by almost all interviewees. Even more, throughout the presented results the frame of ‘intentional-not-knowing’ and blackboxing of information seen within software development, could imply a greater need for visibility of activities of companies. The argumentation that was given most often in support of wanting transparency was so that participants could more consciously make decision about their privacy:

“En als ik dan geïnformeerd zou worden dat ze dat doen, dan zou ik er geen toestemming voor geven.”

“And if I would be informed, if they would do that, than I would not give them permission.” (Luisa, 26)

Luisa showcases here not just that with transparency her privacy and data management would change, but the addition of ‘if they would do that’ showcases the distrust there is in companies. It exemplifies additionally why so many companies might never want to improve their transparency because they might fear it would exactly do the opposite of attracting customers, it might scare them off.

4.5.3 Privacy as selling point

However, this might not necessarily be the case as all privacy experts argued that privacy could and should be used by companies as a selling point and not solely as something they have to comply with. All of them brought back their thoughts to ‘buzzwords’. Nadine argued that even if companies are following these buzzwords and are seemingly privacy friendly, they might not actually follow through with this. Oscar on the other hand argued that once you start using buzzwords like these, it can have the effect that more users start thinking critically about privacy, as well as the people working for the company. This allowed for an interesting comparison:

“[...] I think it sort of falls into corporate responsibility with that like privacy by design, [...] if people are seeing that companies are being more transparent or accountable, all of those sort of buzzwords [...]. If companies are talking about it [...] I think it does lend itself more ease with the public, but you have to sort of, like, read in between [the lines].” (Nadin, 27)

Nadine here portrays genre of communication in which the implementation of privacy as ‘corporate responsibility’ can be seen as something which is expected to be followed and executed by companies. Additionally the word ‘accountable’ showcases this responsibility, framing it as something companies should oblige to. Only then it could ‘lend itself more ease with the public’, a structural opposition which showcases the dismay which might currently dominate the American public. It moreover implies a certain loss of trust that things could improve, because even if it would improve, it would only ‘lend itself more ease’, barely implying change. Oscar on the other hand, implies that it is not ‘responsibility’, but rather a change in what a company stands for and what they find important as he refers to it as ‘take seriously’:

“[...] er zijn bedrijven die hun privacy zo goed hebben ingericht dat ik echt klant van hen wil zijn. [...]. Dat is ook een soort buzzword, nou al zijn er 3 bedrijven die dat buzzword serieus nemen dan, dan kan er een soort van sneeuwbaaleffect op gang komen.”

“[...] there are companies that have arranged their privacy so well that I really would like to be their client. [...]. That is also a sort of buzzword, even if there are 3 companies that take that buzzword seriously, than it can start a sort of snowballeffect.” (Oscar)

Moreover, while Nadine limits the possible effects to how companies could be regarded by the public, Oscar recognises what it could mean for an industry, affecting not just the public but also other companies. Moreover, the difference between ‘lend more ease’ and ‘take seriously’, implies that taking the quick route of compliance is regarded as less valuable by users than when privacy becomes a core value. All in all, a better implementation of privacy is an important change for both. Even more, it could be an important change for all participants as well as users of MTAs.

5. Discussion

This research investigated how the user-experience of MTAs relates to privacy and datafication. From the interviews it quickly became clear that the use of MTAs and other health tracking applications has distanced the individual from their body through the datafication of bodily functions, making it increasingly easy to track and control. Moreover, both users and privacy experts indicated being prompted by MTAs to give data and privacy in return for the functionality of the application, without specification of exactly what would happen with this data. The ‘intentional-not-knowing’ frame further adds onto the capitalist goals of the companies behind the application, which instead of using money, are now commodifying the users’ data. This was criticized by the privacy experts who argued that the persistence of surveillance capitalism could possibly thwart the complete usability and implementation of PBD. This finding aligns with the first sub-question of this research, which aimed to explore the usability of PBD as experienced by privacy experts and users. It became clear that while privacy experts viewed the implementation of PBD as incredibly important for the protection against privacy invasive data gathering techniques, they also recognised that unless companies change their corporate goals towards increased privacy, it might become difficult to implement PBD. Users on the other hand portrayed a different understanding of PBD. Before they were even inquired about PBD and its usability, they started to list some of the principles themselves, arguing that it might improve their user- and privacy-experience. This led the researcher to the idea that not all seven principles of PBD might need to be implemented in order for the user- and privacy-experience to improve.

For the users this experience does not just consist of the improvement of privacy, but also of the improvement of the MTAs. Following the second sub-question, the results have made clear the connection that can be found between body literacy and the use of MTAs. The results explicated that besides an importance in safeguarding privacy, the users found importance in using the MTA for further exploring their cyclic self. Various users argued that since using MTAs, they felt more at ease in understanding their body and in accepting its workings. Moreover, it widened greatly their knowledge on various topic related to menstruation, causing them to be able to educate others and even raise more awareness on a topic which has been stigmatised for an incredibly long time.

This discussions further explains these findings and relates them to prior presented theories, thoughts and ideologies. It will follow a reversed structure, starting with the second sub-question and building up to show how PBD relates to MTAs and user-experience.

5.1 Increased ease and comfort

Various theories which were grounding to this research, explained identity and the self as having multiplicity and as being formed through the interactions with others, society and values (Bianca, 2021, p. 12). Similarly, it has been argued that the interaction between society and technology, creates multiplicity (Lupton, 2015, p. 569-570). It shows itself in the creation of the digital cyborg assemblage, in this case the cyclic self-assemblage and in the dialogue of sociological and technological determinism (Wyatt, 2008, p. 168). Portraying that not just the lines between society and technology are blurring, they are simultaneously causing more interactions which can be determining for the exploration, navigation and expression of the self. Consequently, the body is no longer 'forced' into a technological infrastructure as Hutchinson and Novotny argued in 2018 (2018, p. 117-118), but becomes an inescapable interaction causing multiplicity. This interaction proves further the idea of Haraway when she argued that the interaction between technology and society is not a question of 'either-or', but rather an assemblage (Lupton, 2015, p. 569).

As such, the question of whether an MTA is empowering for users or not, should be moved away from the 'either-or'. On the one hand, the results have shown that some users experienced an increase in body literacy after starting to use the MTA. Additionally, users argued for an increase in control and understanding of their bodily functions, feeling more in-sync with their body. Even more, it allowed them to understand when something was not working and advocate for better care for themselves, proving the effect of the term 'body literacy' as rhetoric for menstrual advocacy (Wershler, 2020). On the other hand, an increase in worry about privacy was the result of usage for others, especially for those living in the US. Some Dutch users said to only use the MTA at the most basic, where possible offline, level. Not wanting to risk their data being accessible to others. The US participants felt the same about their data, yet their fears became more tangible and grounded with the overruling of *Roe V. Wade*. Yet despite the increase in worry about their data and privacy, none of the users actually wanted to refrain from the functionality of the MTA and the understanding it could give the user about their menstrual health. These findings portray that the user-experience for MTAs is not a question of either using it fully or not using it, or of either privacy or no privacy. It is an interaction between the social aspect of their body and the technological aspect of their privacy and usage.

Nonetheless, their experience unfortunately does not exist within a safe digital space with the highest level of privacy or the most unbiased information. Users of MTAs are exposed to various biases persisting within heteronormative society, as well as capitalist

power structures. Firstly, a male-dominated field of software development, contributes to the translation of biases against women into technology, putting them at a disadvantage within the developed software products (Wang & Redmiles, 2019, p. 7). Secondly, the perception of the male body as being the “norm” within medical research and treatment, causes many women and menstruators, amongst which some of the interviewed participants, to have negative experiences with getting diagnosed as well as treated for symptoms and diseases related to their menstruation, often feeling dismissed, not listened to and overall just not respected (Blach, 2024; Mikesell & Bontempo, 2023, p. 1981). Various literature reviews write about how the complexity of the female body due to its “complicated” menstrual cycle as well as the “difficulty” of dealing with women, has resulted in a gender gap in medical research (Balch, 2024; Jackson, 2019; Lamon & Knowles, 2021; Merone et al., 2022, p. 49-50). Finally, as users move away from ‘regular’ medical practices towards digital medical self-care, they become exposed to persisting capitalist incentives which dominate and often determine the development of technologies such as MTAs. Often these MTAs advertise their service as allowing users to ‘Get to know your own cycle’, persuading the user that the MTA allows them to feel ease and comfort in exploring their cycle, symptoms and feelings. Even providing them with analyses, graphs and predictions, without users having to advocate for basic health care or being dismissed. All they have to do is give away some of their most intimate data. But with the ‘intentional-not-knowing’ frame, the blackboxing of the algorithmic models and the kind and pinkified prompting of users to give this data, it is unsurprising that many users do so without ever expecting harm.

The start of this section argued that the user-experience with MTAs is not a question of ‘either-or’, acknowledging that different interactions with technology can work for different individuals. Yet it seems that with the backstage technological workings of the MTA hidden and the companies being driven by capitalism, users should start to make the trade-off between either full functionality or full privacy. It is difficult to see imagine an improvement of privacy without functionality or vice versa.

5.2 Increased control

We can argue, that similar to body literacy, privacy, especially in relation to identity, can be seen as having multiplicity (Mulligan et al., 2016, p. 3). As has been argued in definition of the ‘Positive Sum, not Zero-Sum’ principle of PBD, as well as by the privacy experts, users should not experience a loss in functionality when privacy is increased (David

& Prosch, 2010, p. 302). However, this trade-off is again not so clear cut as having to choose between either one or the other.

As aforementioned, users have to deal with the capitalistic power structures which are often a determining force behind the creation of technology. And while an increase in revenue is still sought after, it is no longer solely achieved by selling products, it is now also achieved by buying and selling data of users. As shown by Oscar when he explained how users now pay for functionality, “if that is not with money, then it will be with data”. These activities describe surveillance capitalism, in which personal data, instead of money, is commodified and used or sold to improve technologies and/or revenue (Ford et al., 2021, p. 51). This practice is often masked with marketing and corporate goals such as ‘making technology better’ or ‘helping other users’. Something which can be found when a user explained the data sharing necessary for the functioning of her MTA as “something quite beautiful”. She contrasted her data being used for something “good” to it being misused when companies want to sell her something through targeted ads. It showcases that marketing of data being used to help others, leads users away from the fact that they are paying either way, yet instead of through ads, through the usage of a technology.

This new form of surveillance capitalism grew alongside the increasing datafication of our society, ideologies and our bodies. While this research has argued that bodies are no longer ‘forced’ into technological infrastructures, it should be recognised that with the first tracking devices, it might have still been the case. These infrastructures have changed how we perceive our bodies and its functions. Facilitated through various technological affordances and functionalities, users have become equipped with systems which mathematise, analyse, predict and inform how a body should feel, should function and how it can be controlled (Hutchinson & Novotny, 2018). Leading for people such as Luisa’s sister to feelings of being unhealthy or inactive when a smartwatch has been forgotten when going for a walk. Although some of the interviewed users did argue that the MTA did not determine how they felt, they also still indicated that they needed the MTA in order to know for sure what is happening in their bodies. Consequently, they also mentioned that in their usage they weigh the costs of losing privacy against the benefit of gaining functionality, often opting to rather give up more data instead of giving up more functionality. Nonetheless, these same users expressed concerns about their privacy and showcased what could be described as the privacy paradox as their concerns did not align with their behaviour (Gerber, Gerber & Volkamer, 2018; Waldman, 2020).

At the intersection of these two parts of the discussion, the researcher wishes to emphasise that users of technology are no longer forced into technological infrastructures which once might have been the case. Rather, we would argue that users of technology are in their use forced into all the societal, heteronormative, and capitalist systems which have now translated to said technological infrastructures. Combining this with the constant dialogue causing the multiplicity of the users privacy and identity, we could argue that without privacy protective measures in place, users of technology will experience a great loss of privacy of their body, identity, thoughts and values (Koops et al., 2017, p. 518-537). In being prompted to give more of their data, users are exposed not just to losing control over their data, but also over their freedom to form their identity in a private digital space without the scrutinisation from societal, heteronormative and capitalist systems. Yet, in order for users to gain privacy and control, it will require the mostly capitalistic oriented companies to give up certain control.

5.3 Privacy by Design

The cost-benefit calculation these companies make between gaining and losing control, can be explained by the fact that privacy protective measures such as PBD are often regarded more as an option, instead of an asset. As all privacy experts within this research stated, PBD is most valuable when it is used as a selling point within the company policy. Often the implementation or improvement of such measures entails a costly and lengthy processes, instilling unease and some sort of fear within companies. Luisa remarked that when consulting companies on the implementation of PBD, they feared implementing PBD would reduce usability and functionality of the technology. Causing in turn a decrease in user satisfaction and revenue, while costing a lot of money and time. Additionally, clear practical guidelines or applications are hard to be found, making it even more difficult to implement (David & Prosch, 2010, p. 300; Faily et al., 2015, p. 1; Klitou, 2014). Moreover, research has shown that the costs are even bigger than just redesigning one or two technologies or products, as often companies solely engage in measures such as PBD when they redesign the complete company policy and its goals (Rubinstein, 2011, p. 1411). It seems that companies regard the implementation of PBD as an 'either-or' question, possibly making a trade-off between what would create the best outcome for the company in the long run.

Nonetheless, we would argue again that this trade-off is not necessarily so black and white. Both Dutch privacy experts support the idea that in essence PBD requires the

implementation of its principles from the start of a process, especially as some of these principles are difficult to implement at a later stage. However, when Oscar stated that “the regulation did not even have to be written in there. Article 5 of the GDPR employs the same ideas, this is just a buzzword.”, it could imply that the essence of PBD, is already also essential to the GDPR, without the traditional application of PBD as we know it now. This could justify the dissection and implementation of just a few principles of PBD instead of all seven. Moreover, it creates a more reachable goal in terms of implementing PBD for companies, as they could focus on implementing principles that are most fitting to their demographic of users instead of having to completely change company policy.

In the case of MTAs this research has shown that what would be most desired by users, is the implementation of ‘visibility and transparency’, ‘data minimisation’ and ‘respect for user privacy’. These principles were referred to by all users who were interviewed, before they were informed or asked about PBD, proving that these principles are in essence desired without even being written down or spoken of. Whether or not PBD is talked about or its principles referred to as ‘buzzwords’, we can still argue for its usability and extensive effects. Going back to what Oscar claims about PBD, he continues his statement by explaining that on the other hand buzzwords create not only the feeling that companies are thinking about the improvement of privacy, they could also influence the user who might start to feel more concern about their privacy. It moreover shows the interconnectedness of the user-experience with privacy and datafication. It seems that the implementation of PBD, even partially, could change the trade-off some users make about having to give up privacy for functionality. In the case of MTAs it seems that society, through (privacy) legislation and through user interactions, determines the development of technology and implementation of privacy protective measures within the technology.

5.4 Practical recommendations

If PBD were to be implemented in MTAs, at least the three abovementioned principles, it could bring about the following effects. Increasing Visibility and Transparency would require that users are informed about the data collection practices and data processing with algorithmic models, counteracting the blackboxing of the algorithms behind the MTA (David and Prosch, 2010, p. 302). Additionally, implementing Data Minimisation would prevent the unlimited and unexplained gathering of data, requiring the companies to gather as little as possible and justifying what goals the gathering would serve. Ultimately, improving the Respect for User Privacy would greatly improve not just the current MTAs

but also future developments, as well as how privacy and data of users would be handled. These improvements would have great effects on the user-experience within the Netherlands, yet could also greatly effect that of users in the US. As aforementioned, the legislative situation within the US is very unsure, leading women to refrain from using MTAs. If companies would take more responsibilities in improving their privacy protective measures, it might result in a more safe and secure space for US menstruators to start using MTAs once again.

Although we should recognise the possible difficulty and time and money spent on the implementation of PBD, we would argue that this would be money and time well spend. Especially as user and privacy expert, both in the EU as well as the US, regard PBD and its principles as worthy and powerful selling points for a company. Moreover, with 71% of respondents of the Global Privacy Monitor concerned about their privacy and an increase of awareness raised on the intimate and private aspect of menstruation (GDMA, 2022), a raise in privacy as required selling point for MTAs might be expected for the continued usage of the applications. Notwithstanding the fact that with the improvement of privacy within the technological infrastructure of an MTA, its overall design could be improved (Faily et al., 2015, p. 9). It could cause the societal and heteronormative systems found within this infrastructure to also be criticised, changed and ultimately formed into a safer and more inclusive space for users who are exploring and navigating their cyclic self.

5.5 Limitations and Strengths

Within this research, the focus has been on concepts originating, at least partially, from feminist studies and discourses. Unsurprisingly, as the topic touches upon bodily functions most commonly associated with female biology and challenges heteronormative standards within a capitalist, systemic patriarchy. Yet in claiming this study to be of feminist nature, it has to be recognised that feminist studies do not originate solely in white and caucasian histories and discourses. Various research has showcased that too little visibility is often granted to the ethnic and racial background of many feminists and feminist theories (Bianca, 2021, p. 18). It should therefore be mentioned that in this research the interview participants did not vary greatly in ethnic and racial background. Meaning that their experiences with menstruation, MTAs and privacy may differ greatly from if those of e.g. African-American or Asian peoples. Nonetheless, the group of participants varied greatly in their educational background, knowledge and expertise, as well as occupations. Moreover, including participants from both the US and the EU allows for a better perception on the

rather privileged situation within the Netherlands. It allowed the researcher to understand that while the legislation within the EU and the Netherlands are still lacking, it is a great improvement in comparison to the US legislation.

Further considering the sampling procedure, the combination of convenience sampling as well as snowball sampling, resulted in a group of participants who were close enough to the researcher to freely discuss their experiences, yet distanced enough as not to cause too large of a bias through familiarity with the participant. Yet, random sampling would have also offered a greater variety in participants in terms of ethnic, financial and geographic background, as well as in gender identities and sexual orientations. Additionally, this research focussed on the experiences and thoughts of seven people, making the generalisability of the outcomes more difficult and less reliable. Nonetheless, this was done on purpose as CDA was used, successfully allowing the researcher to go in depth and push themselves in finding the most interesting underlying ideologies, discourses and thoughts.

Finally, as discussed prior, the researcher recognises their own positionality, yet cannot confidently state they were not somewhat biased regarding certain practices within menstruation-tracking. As second sampling was applied, while having it tested with peers and the supervisor, it cannot be confidently stated that there was no partiality towards certain statements of participants over others. Nonetheless, the researcher tried their best to represent all voices and perspectives within this research and create a reliable and valid research. However, it is said positionality what also allowed for a more thorough approach to CDA and the research in general. Moreover, knowledge and experience of the researcher within the topics of both menstruation-tracking as well as privacy and legislation allowed for the bridging of exactly the gap that still exists in research between user and expert.

5.6 Future Research

As second sampling was applied within the analysis, some very interesting findings were not touched upon due to lack of time and space. For example the concern many of the participants voiced regarding the online dangers for young children and women. While they expressed that social media could also greatly help young girls and menstruators with navigating their first cycles, it could also greatly harm them if they lack skills of navigating this online world. Future research could yield interesting findings regarding the impact of social media on the menstrual development of these young people. Similarly, research into differences of information about the fertile female and/or menstruating body from social media instead of health care providers could be valuable. Especially as participants have

explained to have found ‘relatable’ experiences online which they did not say they could find with their health care provider. Additionally, a lot of differences in knowledge and thoughts on privacy and privacy management were found amongst the participants, possibly related to their expertise but also the highest level of education they enjoyed. Research could explore further how education and expertise relates to privacy management techniques and understanding of privacy. Generally, more research on the interaction between identity, privacy, menstruation and technology is incredibly valuable and important.

Another leeway into relevant research, would be to develop a federated learning model which could be applied to health tracking applications, as well as MTAs. Especially considering that in essence, such a model is PBD. It could moreover take away the necessity to urge companies to imply PBD within various stages of a design process as it would assure increased user privacy from within the technology. On the other side of this technology, is the example of an offline MTA, which was developed in 2023 with young girls and women in Kenya. In collaboration with UNICEF, they were able to set up an MTA which was offline, private and could be used even without constant or stable connection (Oloo, 2023). Exploring further what saving tracked data offline could mean for the user-experience of MTAs, could yield very interesting technological developments, especially considering the need for US citizens to start tracking offline.

Finally, more research into PBD, its applications and implications would be incredibly valuable. This research tried to showcase the existing gap between PBD, its applications, the needs and wants and experiences of the companies and developers as well as that of the users and privacy experts. But understanding the lived experience of more privacy experts or people working within the field of privacy, might help to understand the usability of PBD itself.

6. Conclusion

This research has aimed to investigate how the user-experience of MTAs relates to privacy and datafication. Moreover, it investigated the usability of PBD as experienced by privacy experts and users. Additionally, it wished to understand the role that body literacy has in relation to MTAs. Considering the afore discussed experiences of the interview participants and the yielded results, it can be stated that the user-experience of menstruators using a MTA is greatly affected by the digitalisation and datafication of our society, specifically of healthcare and their bodies. Medical systems and services have now become readily available within a simple app, providing people with quicker, albeit more generalised, medical help. While creating a more personalised, individual and private-feeling digital environment, it has resulted in users being more in-sync with the technology than their own body. Instead of solely listening to bodily functions, users of MTAs seek to improve their body literacy by turning to this application which objectifies yet also explicates how their bodies are working. A trend which is further entrenched by surveillance capitalistic goals of companies, leading to the ‘blackboxing’ of the intricate workings of these applications. More and more data is required in order for users to maintain full functionality of the application, resulting in the constant interaction between users, their privacy and cyclic self.

In concluding this research and merging the three research questions into one answer, we can safely say that PBD relates to the possible improvement of the user-experience within MTAs as it takes away some pressure of the trade-offs users have to make. Although PBD is always claimed to have to be implemented from the start of a process and in full, this research has shown that the implementation of only three of the seven principles, could already bring about great change in the protection of privacy. This research recommend to improve Visibility and Transparency, Data Minimisation and Respect for User Privacy for all companies and developers behind MTAs who wish to improve the experience of their users and consequently their own revenue. While already resulting in improvement for user-experiences in the EU, it could result in even greater improvements for users within the US. Creating a safe, secure and private digital space in which they do not have to fear legal prosecution.

Even more, this improvement could have effect on the complete technological infrastructure of MTAs, including the integrated societal, heteronormative and capitalist systems, and might positively change the user-experience of all menstruators, disregarding whether they worry about privacy or not.

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Appendix A

A1. Semi-structured interview with Users

- Introduction
- Repeat information within informed consent, again state participant's ability to stop interview at any given time or refuse to answer questions
- Repeat goal of thesis and inform on topic

Priming questions

- What kind of work/study?
- What kind of interests besides that?
- Age?

Menstruation

- How do you experience and manage your period?
 - o Optional: How do you go about managing your period at first?
- What role do menstruation-tracking apps play within your daily live/menstruation?
 - o Optional: When/how did you start using it?
- How has your relationship to your menstruation, cycle, hormones, etc. changed?
 - o Optional: How is your relationship with your menstruation tied to 'managing' your own body?
 - o Optional: How is your menstruation related to your gender?

Walk through app

- How do you use the app on a daily basis? Could you show me?
 - o Optional: How often do you use it?
 - o Optional: How is it tied to your everyday life?
- Do you use it just to track when you are menstruating, or do you follow the complete cycle of your menstruation?
 - o Optional: What other features do you use?
 - o Optional: How do you use it monthly? Do you use it recurrently?
- How has technology impacted your relationship with your body?
 - o Optional: Why do you find it important to use?

Managing data

- How do you think the menstruation apps work?
- What kinds of information/data is asked to be given?
- What do you think happens with the given data?

Privacy

- How do you engage with privacy on a daily basis?
- How do you engage with privacy when using technology?
- Have you ever felt like your privacy was being invaded?
- In comparison to other social media apps, what is the same or what is different in the use of this app?
 - o Optional: How do you use privacy settings?
- Have you ever felt overwhelmed by the questions/concerns regarding privacy when spending time online?

PBD

- Explain shortly the principle
- Do you think hearing this explanation, it could be useful for menstruation apps?
 - o Optional: What principles do you think would be most useful?

A2. Semi-structured interviews with Experts

- Introduction
- Repeat information within informed consent, again state participant's ability to stop interview at any given time or refuse to answer questions
- Repeat goal of thesis and inform on topic

Priming questions

- What kind of work/study?
- What kind of interests besides that?
- Age?

Privacy

- What does privacy mean to you?
 - o Optional: In your work/daily live?
 - o Optional: How do you encounter privacy in your daily life?
- How do you engage with privacy when using technology?
- Have you ever felt like your privacy was being invaded?
- When comparing social media apps, what is the same or what is different in the use of this app?
 - o Optional: How do you use privacy settings?
- Have you ever felt overwhelmed by the questions/concerns regarding privacy when spending time online?

PBD

- How would you define Privacy by Design?
- What do you know about it/how do you use it?
- How do you engage with it/apply it to your work?
 - o Optional: How about in private life?
- What do you think about it?

Menstruation apps

- What do you know about menstruation apps?
- How do you think these apps work?
 - o Optional: What kind of data is being asked?

- Explain shortly menstruation-tracking
- What do you think PBD could do for this app?
 - o Optional: And for its users?

Appendix B

B1. Consent form

For questions about the study, contact:

Famke Visser, [personal information redacted]

Description

You are invited to participate in a research about Privacy in Menstruation-tracking. The purpose of the research is understanding how privacy experiences when using menstruation-tracking apps could be changed with the use of Privacy by Design.

Your acceptance to participate in this study means that you accept to be interviewed.

For users of menstruation-tracking applications my questions will be related to:

- Your experience using menstruation-tracking apps;
- The relation of technology to your menstruation;
- Your management of privacy;
- Your knowledge on privacy by design or other such ideas;

OR

For privacy experts my questions will be related to:

- Your knowledge on privacy law and guidelines
- Your ideas surrounding privacy by design and its application
- Your experience applying privacy principles such as privacy by design
- Your ideas about the workings of menstruation-tracking apps
- Your ideas about privacy in (menstruation-tracking) apps

OR BOTH > for those who are expert & user

Unless you prefer that no recordings are made, I will make an audio recording of the interview. I will use the material from the interviews and my observation exclusively for academic work, such as further research, academic meetings and publications. After this work has been completed, the material will be deleted completely.

Risks and benefits

I am aware that the possibility of identifying the people who participate in this study may

involve risks for their online reputation, work reputation or personal reputation and other such struggles. For that reason—unless you prefer to be identified fully (first name, last name, occupation, etc.)—I will not keep any information that may lead to the identification of those involved in the study. I will only use pseudonyms to identify participants.

You are always free not to answer any particular question, and/or stop participating at any point, without giving a reason.

Time involvement

Your participation in this study will take approximately 45 to 60 minutes. You may interrupt your participation at any time.

Rewards

There will be no monetary compensation for your participation.

You will however be contributing in research that will help move along the public debate surrounding menstruation-tracking applications as well as the practicality and usability of privacy by design.

Participant's rights

If you have decided to accept to participate in this project, please understand your participation is voluntary and you have the right to withdraw your consent or discontinue participation at any time without penalty. You have the right to refuse to answer particular questions. If you prefer, your identity will be made known in all written data resulting from the study. Otherwise, your individual privacy will be maintained in all published and written data resulting from the study.

Before submitting the final thesis, a copy will be sent to you if quotations of your interview are used. You will have the opportunity to check these quotations and suggest any changes that you might wish to make.

Contacts and questions

If you have questions about your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact –anonymously, if you wish— Dr. João Gonçalves, [personal information redacted], Erasmus University Rotterdam.

If you wish to receive a copy of the research after its completion, let me know. Otherwise there will be no other contact or input needed from you.

Signing the consent form

If you sign this consent form, your signature will be the only documentation of your identity. Thus, you DO NOT NEED to sign this form. In order to minimise risks and protect your identity, you may prefer to consent orally. Your oral consent is sufficient and can be given as late as right before the start of the interview.

If you do wish to sign the form, you can do so below and return it via [personal email redacted]

I give consent to be recorded during this study:

Name Signature Date

I prefer my identity to be revealed in all written data resulting from this study

Name Signature Date