

Designing a user interface for the hygienic self- service device SAMPOORNA™

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Abstract

This thesis focusses on redesigning the user interaction of the hygienic self-service device SAMPOORNA™ intended for the purchase of sanitary napkins in rural India, by creating a user interface. The user interface design focusses on enhancing the user interaction and engagement and on stimulating knowledge gain and awareness about the topic of menstruation within a culture where it is considered a taboo. The user interface will be used by adolescent school going girls and is therefore developed to satisfy their needs and aspirations, in order for them to enjoy the interaction with the device and return to it when in need of its service. The outcome of this bachelor thesis is the design of an instantly implementable user interface which stimulates user interaction and engagement, is perceived as enjoyable and attractive and has great potential to be altered to future wishes and innovations. With this user interface design, the SAMPOORNA™ device is introduced into the modern age of digital technologies.

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1. Introduction

For this Graduation Project of Creative Technology year 2018, the user interaction of SAMPOORNA™, a self-service device designed for the purchase of sanitary napkins, will be redesigned. SAMPOORNA™ is a Social Enterprise initiative of Ecodev.

Ecodev is a research and development based social innovation company that works with a small core team and a larger network of experts on various issues, providing specialized services. It has been formed in 2003 by Dr. Subrata Rana and focusses on three key goals:

- To respect local dynamics in development and add value to local initiatives through refinement and linkage with international experiences
- To provide knowledge and skill support to development initiatives furthering capacity to mitigate challenges in a sustainable manner
- To leverage the best practices in technology and manufacturing and make it available to the lower economic spectrum of the society

EcoDev's focus is on South Asia and Africa. Besides India, they have worked in Nepal, Bhutan, Bangladesh, Sri Lanka, Thailand, Kenya, Nigeria, Malawi and Ethiopia [1].

The initiative of the SAMPOORNA™ device is aimed at providing healthy sanitary solutions to school going adolescent girls in rural areas. SAMPOORNA™ addresses three basic challenges of economically backward adolescent girls:

- Access to hygienic sanitary solutions
- Affordability of sanitary products
- Adoption related challenges

In India menstruation is a taboo until the current day. It leaves adolescent girls with a lack of knowledge about menstruation and the use of feminine hygiene products. In the month May of 2016 The Citizen stated that more than 20% of girls in India drop out of school after reaching puberty. When girls drop out of school at an early age, they are less likely to return to education, leaving them vulnerable to early marriage, violence and forced sexual relations [2]. The lack of access to female hygiene products and clean, safe toilets result in unhygienic dealing with menstruation by females in India. Cloths are being used, which are often reused and not washed properly, since it is considered shameful to be seen washing these menstrual cloths. Using dirty cloths can cause health issues at a very young age. Girls have to go back to their homes to tend to their menstruation. For most Indian girls living in rural areas this journey is a long one, so most of them do not return to school. Furthermore, girls lack critical

information about their menstruation. In a study composed in Nagpur, it turned out that the majority of the girls [295 (76.23%)] were not aware of the source of the menstrual bleeding. Only 10 (2.58%) were aware that the source of the menstrual bleeding was the uterus [3]. Not being able to manage menstruation right, handicaps girls in their mobility and education. SAMPOORNA™ provides the necessary infrastructure and product at an affordable price to this section of the society [1], by combining the latest technology in manufacturing and distribution of sanitary products. The SAMPOORNA™ device is depicted in image 1. The device is currently being used in schools in the district of Kolkata West-Bengal and is stationed in all girls' schools to give access to sanitary products in rural areas. The device is paired with an incinerator which is located in the lavatory and which enables the users to immediately dispose of used sanitary napkins.



Image 1: SAMPOORNA™ self-service device, by EcoDev Solutions [1]

When the SAMPOORNA™ device was first introduced, it drew a lot of attention since the girls had never experienced a vending device before. However, this excitement ceased after a period of time and the girls did not utilize the device and its products as often anymore. The SAMPOORNA™ device is currently still in its first phase and has a simple design. The device does not engage users to interact with it and is not perceived as fun. It is important to redesign the user interface of the SAMPOORNA™ device in order to persuade the target group to use the sanitary pads that the SAMPOORNA™ device provides in furtherance of

stimulating hygienic menstrual management and mobility during this period.

The main purpose of this study is to explore ways to add a 'fun' element to the interaction of the SAMPOORNA™ device in order to enrich the user engagement, stimulate the use of the device and to make the user consider it as aspirational. Moreover, in order to gain a better understanding of the user, the social context of the SAMPOORNA™ device has to be researched and ethical considerations have to be investigated. Therefore, the research question used in this thesis is:

- “How can the user interaction of the Sampoorna™ device be redesigned in order to enrich the user engagement, stimulate the use of the device and be considered aspirational?”

A State of the Art research has been composed, investigating previous research, which has been conducted on the topic of designing hygienic self service devices and manners of improving user interaction with said devices, in order to prove the importance of the current research. The State of the Art research can be found in Appendix 2.

Numerous research has been conducted on how to design interaction and how to improve user engagement. Methods of persuasion have been tested in order to change the user's behaviour. Research about changing behaviour mainly focusses on addictions and healthy living, not on commercial aspects, like persuasion and interaction. Research focussed on human centred design and persuasive technology has been conducted, which is in regard to computers and mobile application. No research has been found on self service devices like vending devices relating to persuasive technology and interaction.

Other research concerning this topic has been made based on devices like coffee devices and vending devices based in educational institutions. Research has been composed to analyse the aspects a coffee devices needs, in order to be considered 'pleasant'. The focus is mostly on ergonomics and not on user interactions and interfaces. Additional research focusses on guiding the user to purchase a specific product. Since SAMPOORNA™ only contains one product, it differs from the other self service devices. No research has been found on vending devices carrying sanitary products.

Also, the taboo on menstruation has been researched numerous and to a great extend. Aspects like mythology, knowledge and menstrual management have all been researched. However, never have aspects like user interaction or persuasive technology been simultaneously found researched within this context.

It can be concluded that it is of importance to stimulate adolescent girls in India to manage

menstruation in hygienic ways. Sanitary pads are much more hygienic compared to old cloths mostly used in rural areas of India. Redesigning the user interface and finding ways to make interacting with the device more fun, will result in attention towards and use of the device. Since no prior research has been found on marketing sanitary products in its current social context it is important for this research to be executed. Furthermore, this research can help to understand the taboo on menstruation in India and how to design within its context, with the hope of lessening its influence. Therefore, this research can be considered relevant.

2. Approach

This research started off with multiple consultations with the company EcoDev Solutions, in order to get a clear overview of their vision of this assignment and gain general information on the corresponding social context. After gaining this knowledge, research was conducted to further examine the social context of the SAMPOORNA™ device, obtain an overview of previously conducted research on this subject and investigate the ethical features the taboo on menstruation possesses that are relevant for designing within its context.

After this extensive research was completed, the knowledge gained was used in order to enter the ideation phase. To generate ideas for the assignment, a brainstorm was conducted. After discussing the outcome of this brainstorm with EcoDev Solutions, guidelines were defined in order to assess the generated ideas and evaluate which idea would best suit this assignment. The defined guidelines were revised and it was concluded that they needed improvement, since no clear conclusion could be drawn from the current guidelines. The guidelines previously used were extended in order to create a clearer overview of every ideas' potential, where after, in repeated revision the final concept was chosen.

In order to specify the chosen concept, multiple general specifications were defined, to construct a more coherent depiction of the elements the design should hold. After these specifications were defined, a basic design could be constructed which was viewed and discussed with EcoDev Solutions. After attaining their approval and advise, a second and more detailed design was created. Thereafter, a final design was produced within a professional software, in order to create a final design which could actually be implemented by the company.

To assess the final design of the chosen concept, an evaluation was obligatory. Participants were gathered to appraise the design and give necessary feedback. This feedback was then used to construct the conclusions of this research.

The approach of this research is graphically depicted in figure 1, shown below.

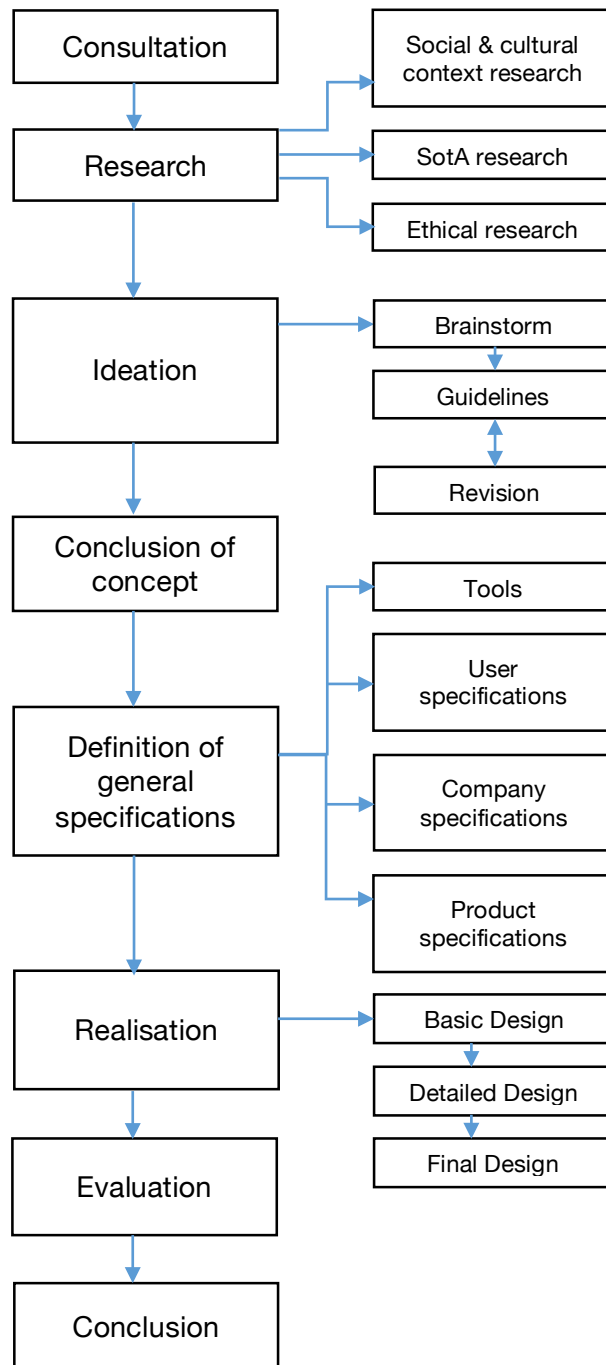


Figure 1: The graphical overview of the used approach

The layout of this thesis will now be explained. In chapter 3, the exploration and ideation phase, which prepares for the design process, is elaborated on. In chapter 3, firstly the context analysis of the research is summarized and afterwards the ideation phase, starting off with the brainstorm and leading up to the final concept being presented. In chapter 4 all general specifications are defined, which include the design process, product specifications and the detailed specifications which will be used in the design. In chapter 5 the realisation of the product is presented, by way of exhibiting three different designs which were all constructed within various stages of the research. The third and final design is used in chapter 6 for the product evaluations. The set up of the evaluations is at first introduced and afterwards the results are presented. In chapter 7, the limitations of this research are being revealed and subsequently the suggestions for further research are elaborated on. In chapter 8 the conclusion is stated and lastly in chapter 9 recommendations are presented.

3. Exploration and Ideation

In the following chapter the context of the research's topic is explored and investigated. Additionally, the ideation phase is discussed with all necessary steps leading up to the final concept chosen in paragraph 3.5: Conclusion.

3.1. Exploration

Considering that the product evolving out of this research, will be used in a culture profoundly different from the culture where this research is being conducted, its context needs to be properly understood before being able to advance with the ideation and realisation phase.

This bachelor research is commissioned by EcoDev Solutions, which is located in India. India is a vast country which is a host of numerous cultures and religions. The regions this research is focussed on are the rural areas surrounding the city of Kolkata. Kolkata is the capital of West-Bengal, bordering the country of Bangladesh, see image 2. EcoDev Solutions has informed that these rural areas lack adequate resources and infrastructure and have a high percentage of illiteracy and poverty. The main users of the SAMPOORNA™ device consist of adolescent school going girls, that live in these rural areas, and are between the ages of 12-20 years. It is very important to grasp their perspective in order to understand the cultural differences that may influence the design and realisation process.



Image 2: Map of India, West-Bengal [4]

One of the main differences and challenges this research faces, is the menstrual taboo, which has a great impact on the society in India. In North-West Europe, this taboo has been lessened throughout the past decades, but still has its influence on people, media and

governments and continues to cause damage [Appendix 2: Ethical research]. However, the impact of the taboo is much greater in India, where menstruation is a topic of shame and disgrace. There is a great lack of knowledge on the topic, because of the stigma surrounding it which results in inadequate schooling [Appendix 1: Social & cultural context research]. This taboo is an important factor, which needs to be considered, while redesigning the user interaction of the SAMPOORNA™ device, since the new design should assist in lessening the taboo and create positive associations towards the topic of menstruation.

In order to prepare for the design process and understand the social and cultural context, a vast literature research has been conducted on the menstrual taboo in India. From this research it can be deduced that the taboo surrounding menstruation has been found to originate from ancient religious mythology which create a stigma surrounding the topic. This results in a lack of knowledge and open discussion about menstruation. Because of this, the taboo is currently still powerful in many areas of India and leaves women with a considerable amount of restrictions during their lives [Appendix 1: Social & cultural context research].

Understanding the context and general perspective of the girls who will be the main users of the service, the SAMPOORNA™ device should encourage social behaviour and stimulate perceptions of purity, comfort, empowerment and social alliance in order to create a more positive attitude towards the subject. It should illustrate that menstruation is not a curse but a connection to nature, a sign of fertility and the origin of life.

A lack of access to sanitary products and public toilets makes menstruation a stressful endeavour. It is imaginable that girls within this context have negative feelings about menstruation and sanitary products. The sense of ease and positivity should therefore be promoted. It should be made aware that dealing with menstruation is not a considerable struggle, but rather a very natural habit.

Education is a vital component in reducing the stigma surrounding menstruation and creating a space for open conversation. Women should be empowered and girls stimulated to strive for education in order to gain a voice of their own. Inspiring and helping girls to start talking about the topic, view it in a more positive manner, gain more knowledge about the biological process of menstruation and see feminine hygiene products as a means to help them finish their education, can gradually improve the situation and assist in weakening the taboo and the negative effect it has on women in India. The full research on the social context can be found in Appendix 1: Social & cultural context research.

Furthermore, there are multiple ethical considerations that need to be examined, concerning the product sold by the SAMPOORNA™ device and the taboo surrounding menstruation. The topic of menstruation is still a sensitive one and the taboo is firmly interwoven within cultures. It will be impossible to design a product that is a hundred percent ethically and culturally acceptable, since a culture is dynamic and differs greatly within a country of such considerable size. There will always be users that may interpret aspects in different, perhaps negative ways, which are not possible to entirely prevent.

However, it is of vital importance to strive for dismantling the force of the taboo on menstruation, since it damages people, social relations, economies as well as societies in a whole. Weakening its influence, perhaps even eliminating it, holds positive consequences for not only the women suppressed by it, but entire nations. The complete ethical essay on the taboo of menstruation can be found in Appendix 2: Ethical research.

3.2. Ideation

For the first phase of the design process, the goal was to generate as many ideas as possible. In order to achieve this, a brainstorm was conducted. Generated ideas were portrayed in a mind map design. An example of the format used is depicted in figure 2 below. The full brainstorm can be found in Appendix 4: Brainstorm.

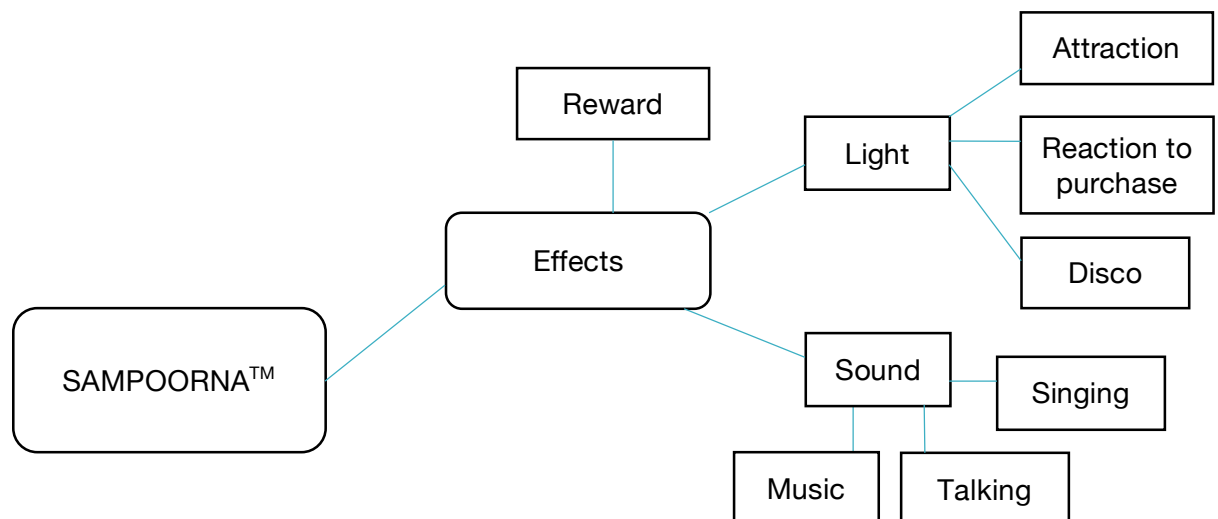


Figure 2: Brainstorm format

It had been made clear by EcoDev Solutions, that their ambition was to add a ‘fun’ element to the SAMPOORNA™ device. Considering that the term ‘fun’ is very broad, many ideas were easily and quickly generated. Four focus points were defined which should guide the brainstorm towards certain directions. These directions were chosen, based upon the state of the art research and consultations with EcoDev Solutions, and were defined important contributors to a concept. They can be found in Appendix 3: State of the art research.

Focus points:

1. Using the concept of ‘nudging’ which means ‘to push slightly or gently, especially with the elbow, to get someone's attention, prod someone into action’ [5], which in marketing is used to gently push someone towards a desired behaviour. This can also be interpreted as ‘behavioural modification’.
2. Create interaction, to make something more interactive and engage the user's attention.
3. Using a rewarding system to award desired behaviour.
4. Changing the cosmetic design in order to draw attention and/or intrigue users.

All brainstorm ideas were reviewed and inspected. Finally, 20 ideas were selected that fitted the assignment and which were realistic to construct. These twenty ideas were to be further examined to test their functionality, accessibility and commercial visibility, in order to evaluate which idea should eventually be decided upon. A list of guiding aspects was constructed which would assist the assessment.

The defined guiding aspects were:

1. Functionality
2. Accessibility
3. Personalisation
4. Attraction
5. Rewarding
6. Behavioural modification

In Microsoft Excel, a matrix was constructed to assess every idea on how well they satisfied the defined aspects. The ideas were written in the first column and the top row depicts the defined aspects. How well an idea performed on a certain aspect was recorded in the rows underneath the row showing the guiding aspects. This matrix is depicted in figure 3.

Ideas	Functionality	Accessibility	Personalisation	Attraction	Rewarding	Behavioural Modification
Give the machine an aspect of nature. Design it so it looks like a tree (of life). Extra: Enhance the colour/light of the leaves when a product has been purchased. Additionally, nature sounds or a melody can be implemented as well.	It would not make the functionality any more difficult when only incorporated in the design, without extra colour/light effects	It is accessible to people from all ages and with disabilities	Gives the user identification with (love of) nature	Attracts attention	Can be rewarding when added a light effect or sound	Design brings people in and reward gives positive feedback
Give the machine a personality. Make it look like a person or (fictitious) animal. Give it a social presence. Make the machine talk/play music or shine (light) when a product has been purchased.	Does not change functionality, when no extra music/light effects are added	Can be perceived as unattractive/childish to older children and adults	Gives the machine an identity, which the user can identify/recognise	Attracts attention and affection	User can be rewarded with a music/light effect	Design brings people in and reward gives positive feedback
Create a place on the machine where touch is stimulated, by showing the silhouette of (a) hand(s). Extra: Invite multiple girls to touch the machine at the same time and give them a reward by playing music or lighting up the space that is touched.	If we'd like the touch to be registered in order to ID the user, then extra aspects need to be implemented. Also, when creating light/music effects, it will complicate the functionality. Also, software will be included which is vulnerable to crashes.	Can be less attractive to adolescents and older children, since it can be perceived as dirty when multiple people touch the same area. Furthermore, kids in wheelchairs may not reach the area to touch	A hand is the embodiment of our DNA, since it is a unique print. By touching the machine with multiple girls, it gives a sense of connection and personal bond with the machine	The image of hands invites touch and attracts attention since it evokes a sense of (past) presence from others	When touched it can give out a reward and a special reward when touched by multiple people simultaneously. However, implementing this reward will complicate the functionality.	The image of a hand draws people in to place their own hands on the outline. Furthermore, positive feedback gives a sense of achievement and happiness

Figure 3: Section of the brainstorm matrix

The designed matrix assesses all different guiding aspects per individual idea and gives it a value, these values were labelled with a colour:

Red	Unsatisfactory
Orange	Perhaps satisfactory
Green	Satisfactory

These labels give a very rough estimation of how satisfactory an idea is assessed, concerning a certain aspect. For example:

Idea: “warmth is given when touching the device, to mimic the effect of human physical contact”. However, in a country like India, physical contact can be considered ‘dirty’ and ‘unwanted’, which makes the level of reward unsatisfactory. Furthermore, in countries with hot climates, coolness is more likely to be considered ideal than warmth. Thus, this idea is rewarded a red colour label, since it does not satisfy the reward aspect.

Eventually, an overview was generated of the level of satisfaction all twenty concepts scored based on the assessment previously defined, using the guiding aspects. By awarding each concept colour labels a simple and unambiguous understanding of all scores was accomplished. Now a conclusion could be drawn as to which concept would be most suitable to implement.

3.3. Guiding aspects

Unfortunately, a clear conclusion could not yet be drawn, since too little aspects were taken into account, which resulted in an unclear examination as to which concept would be most suitable. In order to get a more complete and improved overview of every ideas' potential, new structured indicators would be used to get to a desired choice. The current matrix needed to be expanded.

At first, the defined guideline aspects were:

Functionality, Accessibility, Personalisation, Attraction, Rewarding and Behavioural modification. The values of the aspects were to be redefined, in order to achieve a broader assessment, which could result in clearer distinctions between concepts. The value would now be defined from 0-10. Thus, for every guiding aspect a concept can receive a maximum of 10 credits.

Behavioural modification was to become one of the main desired effects, since it establishes that the users will employ the device and will continue using the device. The device should attract the user because:

1. It is considered fun
2. The user is in need of the product

Currently the users are not employing the device consistently, which is one of the main affirmed issues. It is important that the design should persuade users to keep returning to the device, when needed. Factors that will help ensure the user to return to the device are: functionality, personalisation and accessibility [Appendix 3: State of the art research]. Satisfying functionality ensures that the user understands how to operate the device and get the desired results. Personalisation will make the interaction with the device fun and aspirational and accessibility establishes the convenience of the user accessing the device and its products.

Additionally, a new guideline aspect needed to be tested, namely the costs and ease of implementation. This was by demand of EcoDev Solutions, since it was considered important to investigate financial and commercial aspects of the assessed ideas, since local technicians should be able to install the product and its cost should not exceed its benefits. The new aspect consists of two goals:

1. Is it easy to implement?
2. Is it promotionally effective?

Two further aspects that were also added were safety and robustness. Safety is very important when dealing with children and being located in school areas. Robustness was added since it is desired that the product could keep functioning for numerous years, and not decay very rapidly.

The aspects were, for the purpose of gaining a clearer overview, divided into the categories:

- Financial indicators: Which consist of the aspects 'ease of implementation/execution', and 'commercial effectiveness'
- Main indicators: These are the primary aspects, which include functionality, accessibility, personalisation and engineering robustness. 'Attention' has been made a subject of 'personalisation'. 'Behavioural modification' has been moved to 'Outcome', since it is considered a result of all indicators and 'engineering robustness' has been added as a main indicator.
- Derived Indicators: These are indicators which are after effects of the main indicators, which consist of 'Incentivisation' and 'Aspiration'.
- Outcome: Which is the behavioural modification that takes place due to collective result of all the above mentioned indicators.

The new aspects structure:

Financial indicators
- Ease of implementation/execution
- Commercial effectiveness
Main indicators:
- Functionality
- Accessibility
- Personalisation
- Engineering robustness
Derived indicators
- Incentivisation
- Aspiration
Outcome
- Behavioural modification

3.4. Evaluation

With the added guideline aspects, a new and extended matrix was developed, in order to get a clearer and richer overview of the ideas' potential. Every idea was assessed on the defined 8 aspects. These aspects are depicted in the top row and the ideas in the left column. This created a valuable overview of the concepts and how they meet the prescribed requirements. This matrix serviced in choosing the most desired outcome. A part of the extended matrix is depicted in figure 4 below.

[illegible]

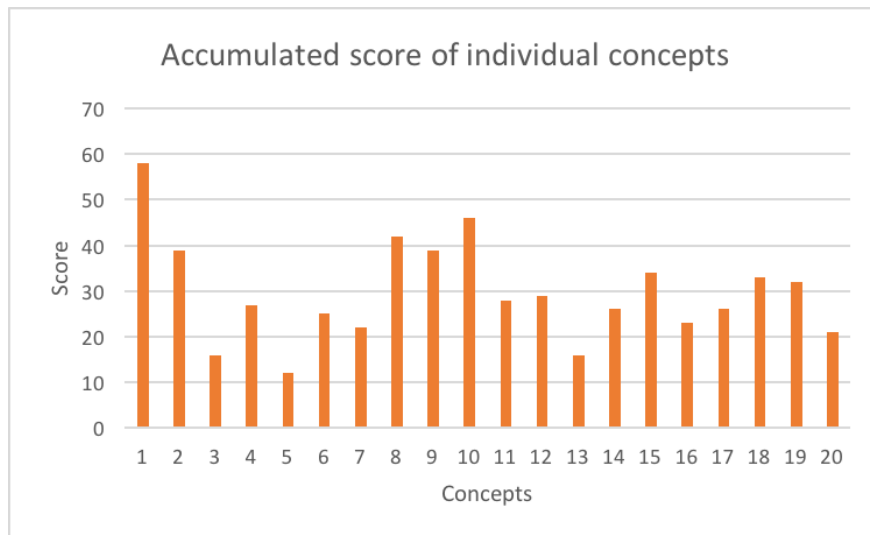
Figure 4: Part of extended design matrix

Every aspect was graded separately. Each concept initially possessed 5 credits for an individual aspect, so its score wouldn't reach below zero, and points were subtracted or added, depending on the concepts' pro's and con's regarding the aspects. If a concept would contain added software, this would, for example, difficult the implementation and a credit would be subtracted. Concepts were afterwards given a colour label depending on their accumulated score.

Green	Between 40 and 80 overall credits
Orange	Between 25 and 40 credits
Red	Under 25 credits

This scale was chosen, because of the distribution of credits over the 20 ideas. A score of 40 points is half of the maximum score (80), which should be the minimum requirement for a

green label (Pass). Scores below 40 credits were split up into two categories: Orange and Red. The scale of 25 credits was chosen instead of 20 credits, since almost no concepts scored below 20 credits, and most concepts in between 20 and 25 credits, were assessed to not have sufficient potential. An overview of the accumulated scores can be found in graph 1, depicted below.



Graph 1: Accumulated scores of concepts' assessments

3.5. Conclusion

The concepts that were labelled green and thus received the highest scores were the concepts:

	Idea	Score
1	Give the device an aspect of nature. Design it so it looks like a tree (of life). Extra: Enhance the color/light of the leaves when a product has been purchased. Additionally, nature sounds or a melody can be implemented as well.	58/80
2	Give the device a face of a fictitious character that gives a sense of warmth, comfort and social interaction.	42/80

3	Attaching an LED screen, which shows a green tree or plant. When a product is purchased the tree sprouts (beautiful) flowers. The more products are purchased; the more flowers will be portrayed on the tree.	39/80
4	Create a design that is full of lively, bright colours and depicts (beautiful) flowers. Extra: A scent of flowers and additional sounds can be added.	46/80

The second concept was quickly discarded, since it would be unattainable to create a fictitious character with whom everyone of ages 12 until 20 could identify and enjoy. Since the adoration of nature is not prone to be specific to a certain age group and is generally enjoyed by everyone, an aspect of nature would be considerably more accessible and successful to implement. Furthermore, nature is chiefly uninfluenced by trends and timeframes, whereas a fictitious character could be liked by a certain generation and not appeal to another. It is also likely that the design of a fictitious character may bore after numerous years of continuation.

Considering that the three concepts remaining were quite similar, they were decided to be merged into one concept. A user interface would be designed with an aspect of nature which would be represented by flowers. These concepts scored highest on the aspirational aspect, which was considered a most valuable development for the SAMPOORNA™ device, since aspiration would evoke positive associations, a feeling of dignity and would stimulate user attention and interaction.

So the main concept was constructed:

Attaching an LED screen, which shows a green tree or plant. When a product is purchased the tree sprouts (beautiful) flowers. The more products are purchased; the more flowers will be shown on the tree. These flowers will reset at the end of a certain time period.

An important problem that occurred was that the SAMPOORNA™ device still needed to show all the necessary information concerning the product, which would not be possible when such an animation would be portrayed. Thus the concept was altered:

Attach an LED screen which depicts an aspect of nature, containing the necessary information concerning the product. The user is being encouraged to touch the informative icons on the screen. By tapping on the icon, attached to the aspect of nature, the user is directed to a page where they will receive more information about this specific aspect of the product.

Furthermore, an image or form can be linked to a page explaining more about the SAMPOORNA™ project and EcoDev Solutions.

The biggest con of this concept was the installation of an LED screen. Furthermore, it would be difficult to link the system of payment to the LED screen in order for the user interface to react when a purchase has been made. In consultation with EcoDev Solutions, it has been chosen to disregard the complication of adding an LED screen, since adding this technology brings about multiple future opportunities to digitalise and add further software and applications to the system. Furthermore, since the people living in the area of West-Bengal are currently getting more connected and plentiful people are using or starting to use smartphones, it corresponds to the development of technology and technological use within the area.

4. General Specification

The following chapter will explain the next phase of this research, namely the general specifications. Now that a concept had been chosen, multiple aspects concerning the concept's design needed to be defined. The aspect of nature needed to be chosen as well as the interpretation of the informative pages. Additionally, icons used and necessary interactions were determined as well as further product specifications. These specifications were used in order to develop multiple designs, which would finally result in a final design, capable of being implemented by EcoDev Solutions.

At first the design process is being explained, describing the creation of the design concepts and tools used. Secondly, product specifications are being defined that are of interest to the user and EcoDev Solutions. At last the detailed specifications are determined, including all pages, information and interactions used.

4.1 Design process

In this paragraph the process of creating the concept designs is being explained, including all various steps taken.

4.1.1. Basic Design

At first a few basic designs needed to be constructed in order to get an idea of how the chosen concept would look. It was decided upon that for academic convenience the information would be portrayed in English, which for the interest of the user should be translated to Bengali ahead of implementation. The homepage and icon pages were defined, including the associated interactions. For the aspect of nature, a tree with flowers was chosen as well as a cluster of flowers. It was decided upon to use the icons EcoDev Solutions currently uses for the SAMPOORNA™ device, which are specifically designed to instruct the user on the operation of the product. Additionally, the desired size of the screen was defined, keeping in mind the size of the actual device. This size specification can be found in paragraph 4.2.2. For the first designs an A4 basic sketch book, a 005 pigment ink fine liner from Uni Pin Pen and an HB pencil were used. These products were chosen, because the sketches needed to be simple and quick indicators of how the product should appear.

4.1.2. Detailed design

A detailed design was created in order to have an improved image of how the final design should appear. A cluster of flowers was finally decided upon to be the aspect of nature. Two imitations of the instructional icons were used, since the actual icons were not yet available. The additional actions of accessing informative pages was added and explained in an accompanying Microsoft Word document. The second design was made in Microsoft Word and the images used were constructed in Adobe Illustrator. Adobe Illustrator was chosen, because it is a well equipped vector graphics editing software which is ideal for designing the product's second, more advanced, design. The images were inserted into a Microsoft Word file so texts could be added, explaining how to operate the user interface and describing every available interaction, so all necessary information could be reached from and presented within an A4 document.

4.1.3. Final Design

Eventually, a final design was created. This design continued to use a cluster of flowers, however the type of flower was altered. The two additional pages were added, which were defined in the previous design and contained information gathered from EcoDev Solutions. A menu was designed in order to easily navigate between these pages. All informative icons were acquired from EcoDev Solutions. Adobe Illustrator was used in order to create or convert the informative texts, images, logos and icons into vectors and adapt them to fit the user interface design. It was decided to create and add an animation, in order to attract the users' attention. A ripple effect was chosen as an animation, since it would fit the image of the flowers. This animation was created within Adobe Photoshop.

The Design tool which was used for the final design is Axure RP 8. Axure RP [6] is a wire framing, prototyping, flowcharting, and documentation tool. It is used to create and style diagrams, add interactivity and notes to diagram pages and elements, and publish finished designs to HTML for viewing via web browsers [6]. Axure RP 8 is ideal for constructing mock up user interfaces, viewing and previewing them. By building the user interface in Axure RP 8, one can easily interact in a similar way with the interface as one would do with a finished and implemented product. The only down side to using this software is that the experience of interacting with a touch screen can not be replicated, since the software is run on a computer device.

4.2 Product specifications

In this paragraph, product specifications are determined, which are divided into two parts: Product specifications for the interest of the user and product specifications for the interest of EcoDev Solutions. These specifications result from the guideline aspects previously defined in chapter 3, observations from EcoDev Solutions and the social & cultural context research found in Appendix 1.

4.2.1. For the interest of the user

In order to successfully guide the design process, certain general specifications for the benefit of the user needed to be defined, which are necessary to be kept in regard. These specifications are listed individually:

- Due to the fact that the product will be used by adolescent girls of ages ranging from 12 to 20, the user interface should be easy to navigate and intuitive to use. It should not contain any advanced interactions or design options. The text and icons portrayed on the user interface should be large, in order to be easily recognisable and clear to the user.
- Considering the designated users are all female, the colour scheme used, should be one that attracts and is overall liked by women. A study conducted by Bonnardel et al [7], where differences in preference between Indian and English women and men were tested, discovered Indian women to prefer the colour shades of turquoise and (Indian) pink. So the colours of turquoise and pink will mainly be used in the design process, as it corresponds to the preference of Indian females.
- The functionality of purchasing the product should not be interfered with, since it would complicate the action. The product should be an augmentation of the present design of the SAMPOORNA™ device, but should not replace the current system of purchase.
- The language used for this research and the designs will be English for academic and general convenience. When implementing the design, all information should first be translated to Bengali, in order to fit its surroundings.

4.2.2. For the interest of EcoDev Solutions

Specifications considering the LED screen needed to be considered when designing the product, which are relevant to the company commissioning this research. These specifications are listed within this paragraph.

Considering that the current SAMPOORNA™ device has a size of 650 mm by 600 mm, the screen that needs to be implemented, in order to run the user interface, should not exceed the size of 430 mm by 470 mm, shown in image 3.

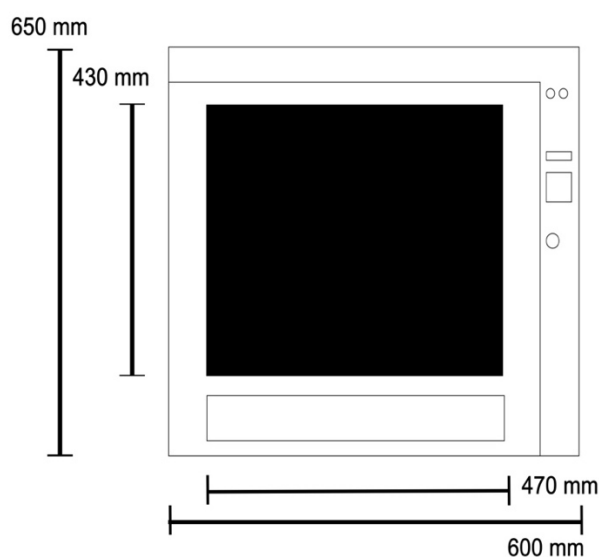


Image 3: Measurement of screen

There are two options for the implementation of the screen.

The first option is to purchase a large tablet.

I.e. the Fujitsu Lifebook U745. Its specifications are displayed in table 1.

Tablet	Operating System	Physical size Inch	Physical size CM	Width Pixel	Height Pixel	Device width
FUJITSU LIFEBOOK U745	Windows	14.0	35.6	900	1600	900

Table 1: Fujitsu Lifebook U745 specifications

Considering the design will only consist of basic, vectored graphics and does not contain numerous and extensive animations, it should be desired to keep the resolution of the screen low. The design will be displayed satisfactorily on a smaller resolution and by choosing a smaller resolution, less energy will be consumed by the screen, when active.

The second option would be to purchase a touchscreen open frame monitor, which is a product often used for gambling- and vending devices [8]. An example of an open frame monitor is depicted in image 4.



Image 4: example of a touchscreen open frame monitor [9]

Open frame monitors are available in sizes 13.3 inches up until 98 inches and are usually sold in large numbers with a minimum order of 100 products. These monitors can be purchased with High Definition (HD), Full High Definition (FHD) and Ultra High Definition (UHD) resolutions, where HD, would beyond suffice for the SAMPOORNA™ device. The high definition resolution would consist of 1280x720 pixels, which is a 720p resolution.

4.3 Detailed specifications

The concepts element, ‘an image or form can be linked to a page explaining more about the SAMPOORNA™ project and EcoDev Solutions’, will be defined by implementing pages containing additional information. The needed specifications concerning these pages: ‘the type of pages, the used instructional images or forms and necessary interactions’, will be specified in this paragraph. This will give a clear structure to the design process and overview of the requirements for the final product.

4.3.1. Pages

Homepage

Of main importance to the design is the homepage. The homepage contains the aspect of nature, which is the focus point of the elected concept. Furthermore, the necessary information concerning the product needs to be depicted on the homepage. This information will be gathered from EcoDev Solutions. The homepage will contain the directions to 5 other pages, containing more information about the instructions the icons represent.

Icon Pages

The user interface design will accommodate 5 icon pages, which will be linked from the homepage. The icon pages will portray additional information about one of the five main aspects of the product sold by the SAMPOORNA™ device. The information accompanying the icons, visible on the SAMPOORNA™ device, is currently depicted in the language Bengali, which is spoken in different areas across South East Asia, including West-Bengal. EcoDev Solutions had not developed an English version of this information and was therefore not able to provide it. Novel information has to be generated and added to the design, which will correspond to the icons and the context of this research.

4.3.2. Icons

Icon 1

This icon depicts the first icon visible on the current design of the SAMPOORNA™ device. Considering it is the first icon, it has been defined as the informant about menstrual management, which is considered to be the general theme. See image 5.



Image 5: Female figure in underwear

Icon 2

This icon depicts the second icon visible on the current design of the SAMPOORNA™ device. The second icon indicates the application of the sanitary napkins, which can be purchased from the device. It instructs the user on how to apply the purchased sanitary napkin. See image 6.



Image 6: Application of sanitary napkin

Icon 3

This icon depicts the third icon visible on the current design of the SAMPOORNA™ device. This icon symbolises the maximum amount of time a sanitary napkin can be used. See image 7.



Image 7: Time limit

Icon 4

This icon depicts the fourth icon visible on the current design of the SAMPOORNA™ device. This icon represents the storage of the sanitary napkin. It illustrates that a user is capable of storing the purchased item in their handbag, for personal convenience and easy access. See image 8.

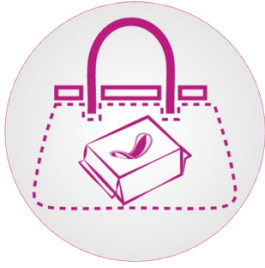


Image 8: Storage of sanitary napkin

Icon 5

This icon depicts the third icon visible on the current design of the SAMPOORNA™ device.

This icon visualises menstrual health and physical wellbeing. See image 9.



Image 9: Menstrual health

4.3.3. Additional pages

Additional screens depicting information about menstrual management, knowledge that will assist on breaking the taboo on menstruation, information on EcoDev Solutions or any other relevant theme within this topic, can be added to the design in order to educate the user and raise awareness about the topic of menstruation.

4.3.4. Interactions

Considering that the user interface will be interactive, the necessary interactions need to be defined in order to make the user interface intuitive and simple to operate.

Main Interactions

Certain interactions were defined, which will be visible on all pages. These interactions are:

- **The menu bar**

The menu bar will contain the option to navigate throughout the pages.

- **The EcoDev website**

The logo of EcoDev Solutions will be depicted, which will navigate the user to the company's website, for further information.

Additionally, particular pages will contain interactions which are specific to that page.

Home page interactions

The home page has the option to interact with the instructional icons. These icons will be linked to the defined aspect of nature and will function as a button, directing the user to a page containing additional information on the instructions the specific icon represents.

Icon pages' interactions

The icon pages, will include buttons directing the user to the next or previous icon page. This way, the user does not have to keep returning to the home screen in order to explore all information the icons display.

Additional pages interactions

The additional pages will, in this phase, not include any extra interactions, since they will solely provide the user with additional information. Furthermore, limiting the amount of interactions possible will simplify the design and make it more accessible to younger users and users who are not proficient in the operations of modern technologies.

5. Realisation

After the ideation and specification phase, the concept could be realised. Multiple designs were made, with the first one being a basic overview of the products' design and lay-out, the second design being more advanced and explaining the possible interactions, and the third design being the final product design.

5.1 Basic design

At first four design options for the home page were constructed by ways of sketching. The current form of the device was drawn and the user interface was added to the design. The homepage contains all five main instructional icons in these four different design options, linked to the defined element of nature. The first design option (left) contains a second sketch (bottom left) showing the option to zoom in on one the icons to gain further information about an instruction. The sketches are shown in image 10.



Image 10: Sketch designs of the user interface

5.2 Detailed design

A second design was created which was more advanced than the first design and which process of creation had been more time consuming. This design elaborated on the first design option, see image 11, left. This new design gave a clear image of how the final design's home page should look, without being able to perform the interactions.

For the aspect of nature, a flower was chosen, since flowers are universally considered feminine and beautiful, which are positive associations and can classify as aspirational.

The design of the flower was constructed in Adobe Illustrator, as was the outline of the SAMPOORNA™ device. All measurements, that were previously specified in chapter 4, were used in making the second design. This design did not include all icons and relevant information from the SAMPOORNA™ device, since EcoDev Solutions was not yet able to provide them. This second design was put into a Microsoft Word file, which contained additional information on the future interactions and argumentation on the choices of layout. The homepage of the detailed design is depicted in image 11. In image 12 the option to zoom in on a flower receiving further information, is shown.

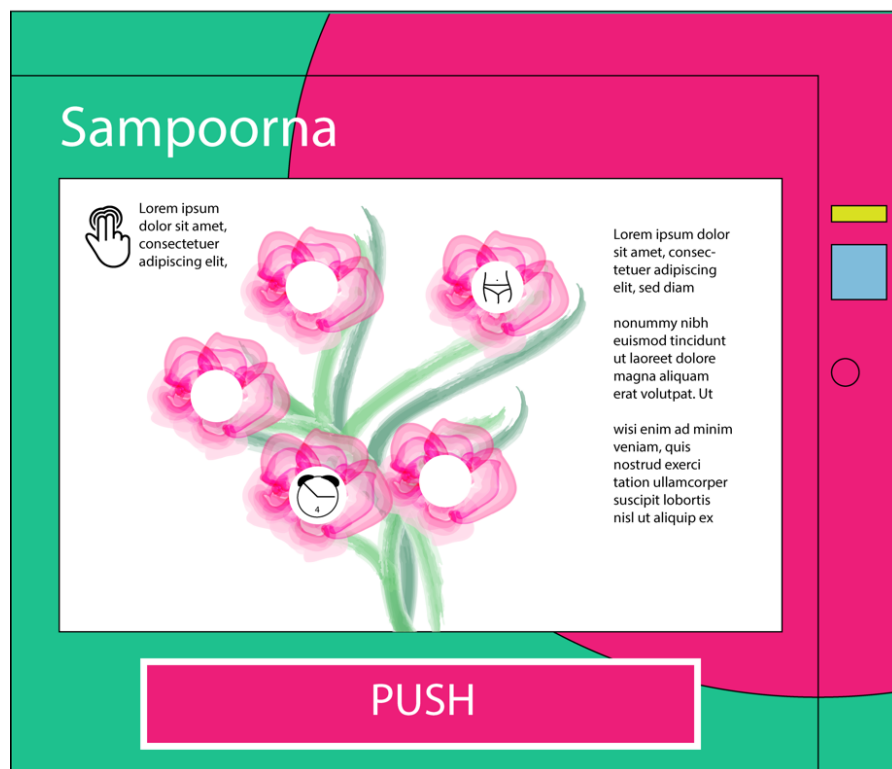


Image 11: Second design of homepage UI



Image 12: Second design of Icon page UI

5.3 Final design

A third and final design was created in the professional user interface design software Axure RP8.

The flower depicted in the third design is a water lily, which is India's national flower and therefore well known in India as well as its representation of motherhood, fertility, purity and the beauty of youth [10].

Each icon is visible within the middle of the flower, in order to create one totality. The flowers depict a drop shadow, which creates dimension and make them appear interactive. A short animation of a ripple effect is visible beneath all the flowers in order to draw the attention of the user to specific icons, without strongly demanding their attention or making the design too distracting.

The buttons of the home screen show a drop shadow when touched, as a way of giving feedback to the user, when performing this action. The colours of the buttons and logos are adapted to match the images and texts to create unity within the design. A logo of EcoDev Solutions is shown in the top right, which functions as a button directing the user to

the EcoDev website. Two further pages are accessible containing additional information on EcoDev Solutions and menstrual management.

All elements used, i.e. icons, logos and texts, were gathered from EcoDev flyers, images or booklets and were converted to vectors and adapted to fit the design and aesthetics of the user interface. The information displayed in the final design is created to imitate appropriate information displayed within this context.

Image 13 depicts the home page and image 14 shows the icon page which can be accessed by clicking on one of the icons on the home page. Image 15 and 16 depict the informative pages, where image 16 contains information on the company EcoDev Solutions and image 15 on menstrual hygiene. A finished design, wherein a screen is implemented into the SAMPOORNA™ device operating the user interface, is shown in image 17.

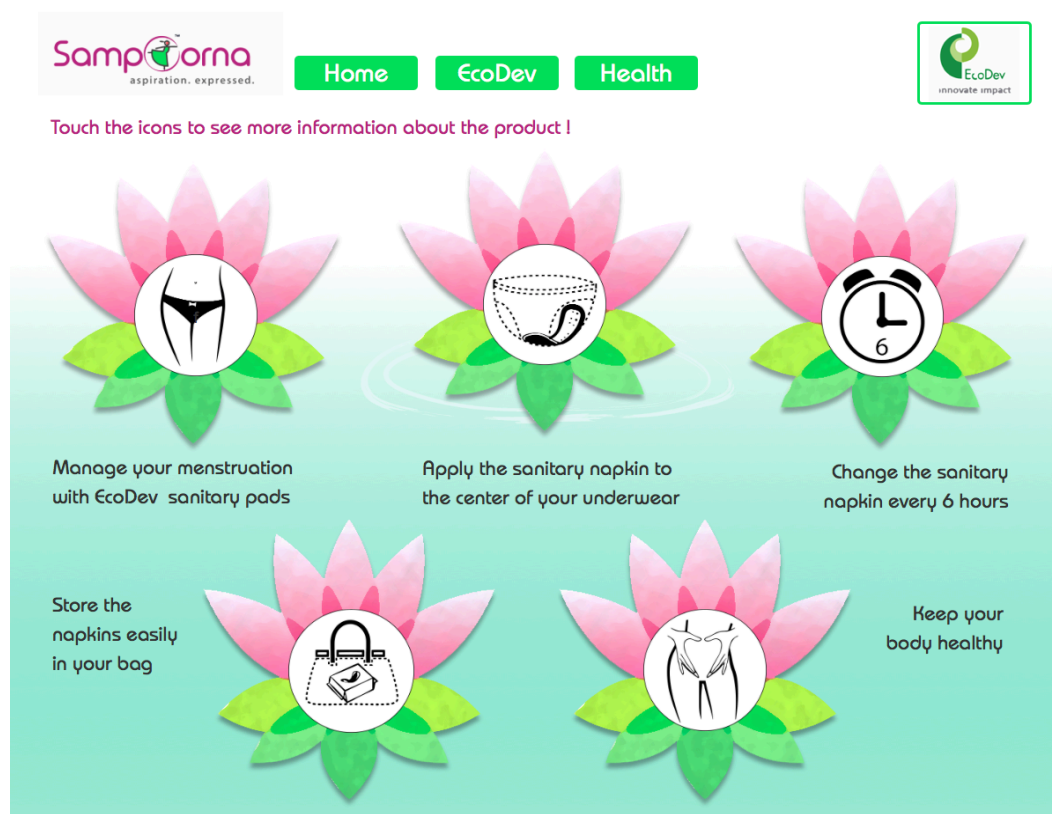


Image 13: Homepage of final design



Use up to 6 hours

Check your sanitary napkin every two hours to see if it needs to be changed. If the sanitary napkin is wet on the surface and no longer absorbing menstrual fluids, it is time to change it

You can dispose of the sanitary napkin by putting it in the incinerator which is located in the bathroom area.

Image 14: Icon page of final design

Adolescence brings enormous physical, psychological and emotional changes in the lives of young girls. The journey to adulthood starts with the onset of menstruation. It puts girls into a complex situation that warrants significant health awareness - in most cases, particularly in rural and marginal habitats, secrecy and conservatism bring perils; leading to reproductive health problems that she carries throughout her life.

MENSTRUAL HYGIENE IS FUNDAMENTAL TO



EDUCATION

Adolescent girls miss **5 days** of schooling during their menstrual cycle. **23%** of them even drop out after they have started menstruating.



ECONOMICS

Close to **31%** women reported to miss 2.2 days of work on an average. Over **27%** of total Disability Adjusted Life Year (DALY) lost due to reproductive ill health in India



HEALTH

70% of women suffer from Reproductive Tract Infection (RTI) in their lifetime, which may even lead to Cervical Cancer. This not only affects the physical health but also hampers the mental well-being



ENVIRONMENT

It is estimated that **9000 tonnes** of sanitary waste from over **430 million** sanitary napkins is being generated annually in India. More than **80%** is not treated scientifically at source, causing enormous environmental hazards



HUMAN RIGHTS

88% of women lack Menstrual Health Management (MHM), affecting their right to health, education and work in favourable condition.

WHAT CAN BE DONE?

TALK

Break the taboo of secrecy at home, schools and work. Change the paradigm for shame to moment of celebration of womanhood

SUPPORT

Support young girls and women to further their endeavour for better menstrual hygiene

ACT

Provide holistic innovative solutions through products, infrastructure and process



Image 15: Health, additional page of final design

ECODEV SOLUTIONS

WE ARE

A leading edge Knowledge Management & Advisory Company having its Headquarters in India since 2004

OUR MISSION

To add value to enhance performance to clients working in Complex Diverse and Risk prone ecosystems.

OUR PROJECTS

We have implemented over 100 assignments in 15 countries since 2004

PARTNERS

The World bank, Asian Development Bank, IFAD, UNDP, JICA, DFID, KfW, GIZ, DANIDA, Trans National Companies & INGO, Foundations viz., Alliance for Green Revolution in Africa (AGRA), Rockefeller Foundation, Bill & Melinda Gates Foundation

Products & Strategic Solutions

L3: Leasing Leveraging Livelihood

Promoting Agriculture Mechanisation of Smallholder Farmer in Africa

Business Excellence Index (BXI) & Credit worthiness Excellence Index (CXI)

Assessment of entrepreneurial and credit worthiness of MSME using Psychometric Tools

SAMPOORNA

Facilitating menstrual hygiene of adolescent girls

SAMPOORNA is the desired action for the young adolescent girls, helping to address menstrual hygiene. **SAMPOORNA** acknowledges the challenges that hinder the spread of effective menstrual hygiene among women particularly in the communities living in remote, rural and marginal areas.

ACCESSIBILITY

Still today, large sections of adolescent girls and women do not have the access to safe, hygienic and scientific sanitation during menstruation.



SAMPOORNA addresses the challenge of accessibility of Sanitary Napkins. It is available in schools, customised in small packets, with an add on disposal mechanism.

AFFORDABILITY

High quality Sanitary Napkins as appropriate means of sanitation for menstruation is out-of-bound to many women due to poor economic conditions.



SAMPOORNA ensures affordable access to Sanitary Napkins. Napkins are being dispensed at a cheaper than market price.

ADOPTION

Lack of affordable access to hygienic Sanitary Napkins leads to slow adoption. Women are forced to resort to unhygienic measures, often leading to diseases.



SAMPOORNA's continuous counselling of young adolescents at schools and involvement of all stakeholders ensures impact.



Image 16: EcoDev, additional page of final design



Image 17: Finished product design

6. Evaluation

In this chapter the evaluation process is explained. At first the set-up is discussed and afterwards the results are being presented.

This evaluation was conducted in order to test the final design on the guiding aspects defined in chapter 3, the specifications for the interest of the user in chapter 4.2. and to expose any cultural difficulties which may occur. In order to achieve this a set of questions were constructed to test these aspects and specifications. These questions were asked to and discussed with the participants.

A qualitative evaluation was chosen instead of a quantitative evaluation, by reason of the cultural context and differences involved in this research. Due to limitations on time and resources it was not possible to travel to West-Bengal in order to evaluate the final design with the designated users. Thus it was of importance to work with participants, found in the current environment, which would relate best to the user.

6.1 Set-Up

The evaluation was conducted with four female Indian students. The participants were gathered via contacting the Indian Student Association and posting a message in the University of Twente-Marketplace Facebook group. The participants ranged from age 22 to 33 years and are all master students at the University of Twente. None of them originates from a rural area but they were all knowledgeable of West-Bengal and its inhabitants. Some had also visited Kolkata and its surrounding rural areas.

An evaluation sheet template was specifically created for the current product evaluation. This template was designed in Microsoft Word and would record the personal information of the participant as well as their answers to all 9 evaluation questions formulated. The full answer sheets can be found in Appendix 5: Evaluations.

A monitor was connected to a laptop in order to increase the size of the display, which would mimic the size of the screen when implemented into the SAMPOORNA™ self-service device. See image 18 and 19 for the set-up.

At first the participant was introduced to the topic and was explained what the SAMPOORNA™ device is and where it is situated. The participant was then asked to interact with the user interface and was afterwards requested to answer the series of questions.



Image 18: Evaluation Set up



Image 19: Conduction of an evaluation

6.2 Results

Numerous results were derived from the product evaluations. The answers given by the participants were analysed and correlations were discovered and used as results.

Results were separated into three paragraphs: The first paragraph displays the results, which is a summary of all results gathered and which correlate to the view of all participants. The second paragraph presents cultural difficulties that were exposed by one or numerous participants. Since most of the participants possess an intuitive sense when handling digital devices, all difficulties exposed were used as results. A difficulty exposed by one participant might have gone unnoticed by the other participants as they are familiar in operating user interfaces and automatically operate it correctly. Considering that the designated users of this product do not possess this same intuitive perception all possible difficulties should be taken into account.

The third paragraph displays the design difficulties, which were difficulties that occurred during the testing's and were also mentioned by one or numerous participants. Similarly, some of the participants overlooked these design difficulties, since they possess

prior knowledge with operating user interfaces and did not identify the difficulty, which could cause complications for less experienced users. Thus all difficulties exposed were included.

It has been chosen to differentiate the results into these three categories in order to obtain a clearer overview and understanding of the results acquired.

6.2.1. General results

In table 2 the general evaluation results are portrayed sectioned into different categories in order to create an unambiguous overview. These results depict a summary of the participants' perceptions on the final design.

Topic	Result
Design	<ul style="list-style-type: none">○ The design was considered to be attractive, clean and simple.○ The colours were admired○ The instructional icons were considered self explanatory.
Interactions	<ul style="list-style-type: none">○ The interactions were simple and easy.○ It was not clear that the EcoDev logo in the top right was interactive.
Instructions	<ul style="list-style-type: none">○ The instructions for clicking the icons were not clear.○ Information about the incinerator was expressed missing.
Lay-out	<ul style="list-style-type: none">○ The menu bar did not stand out enough and therefore may be overlooked.
Information	<ul style="list-style-type: none">○ There was too much text, mostly on the additional pages.○ The text is nicely depicted and attractive to read.

Positive association/awareness	<ul style="list-style-type: none"> ○ The UI is believed to raise awareness for the topic of menstruation ○ The UI establishes positive associations with the topic of menstruation ○ The UI stimulates knowledge gain.
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Table 2: General results of product evaluation

6.2.2. Cultural difficulties

In table 3 the cultural difficulties are described, which show issues that may arise, due to cultural and contextual differences. These issues may negatively affect the user interaction with the product, when put into the designated social and cultural context.

The Water Lily	<ul style="list-style-type: none"> ○ For the element of nature, a water lily was used, which was interpreted by some participants as a lotus flower. The lotus flower is the symbol of a large political party in India, the BJP. Its logo is a black and white lotus flower with a green and orange background. Since in India, especially in rural areas, a large amount of inhabitants is illiterate, the symbol of a political party carries more weight than its name, since people recognize and vote by the logo and not the name of a party. ○ The lotus can be seen as a symbol of Hinduism, which may come across as religious advertising/propaganda towards the people who do not practice it.
Text	As previously mentioned, in the rural areas of India, a large number of people is illiterate. These are mostly women, since they lack more education than men. Less text should be used, in order to better connect to this group of people and to young girls who still have difficulty reading. Animations or images would in that case be preferable and more successfully demonstrate the necessary information.
Icons	<ul style="list-style-type: none"> ○ Some icons were considered ‘Western’ by the participants. This mostly concerned the icons that depicted a woman’s body. These icons showed the western ideal of an hour glass figure.

	<ul style="list-style-type: none"> Icons depicting a woman's body could be considered provocative within conservative rural areas, since they are not used to seeing such images. They can be considered inappropriate. The handbag that is depicted in one of the icons, does not fit the designated cultural context. Schoolchildren mostly use backpacks instead of handbags, see image 20. They even use a specific type of backpack that is not anymore used in most western countries. In order to better identify with the design and information, it is important for the images to fit its cultural context. In image 21 the used storage icon is depicted and in image 22 a suggestion for a new design is presented.
Touchscreen	<p>Inhabitants of rural areas may have never come in contact with a touch screen, and would not know what to do or how to use it. They might even evade it, since it is something unknown and potentially harming. An explanatory animation may need be designed and looped as initial screen, in order to educate passers by on how to use the device. A further option would be to implement clearer instructions in order to stimulate the user to correctly use the touchscreen.</p>

Table 3: Revealed cultural difficulties



Image 20: Indian children with school bags [11]

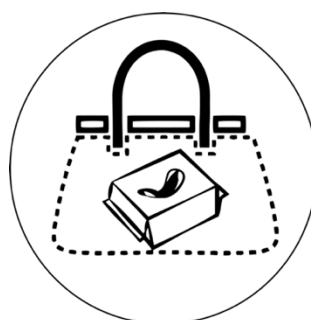


Image 21: Black and white, vectorised version of the storage icon

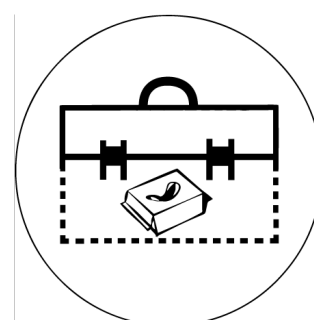


Image 22: Suggested design of the storage icon

6.2.3. Design difficulties

The results depicted in this paragraph show difficulties relating to the design. These are difficulties that may cause inconveniences and ambiguity during the user interaction. The results can be found in table 4, depicted below.

Homepage	When a user is on the homepage, there is no indication visible in the menu bar that shows the user to be on that specific page. This may be confusing when wanting to navigate back to the home page, since the user is not aware of this page being the actual homepage. The 'Home' button in the menu bar should demonstrate an effect when the user is active on that page.
EcoDev logo	The logo of EcoDev in the top right corner was by none of the participants recognised as a button. It did not clearly show its ability to interact with it.
Storage icon	The storage icon was put after the application icon, which may confuse girls into thinking that they can store their used sanitary napkins in their bags. Girls living within a culture where the menstrual taboo has a considerable force, might even hesitate to dispose their sanitary napkins in the incinerator within the girls' lavatory, for the fear of being seen by other girls. So the storage icon should be put before the application icon, in order to prevent confusion.

Table 4: Revealed design difficulties

6.2.4. Conclusion

The results gained by performing the evaluations were used to formulate recommendations which will help enhance the current version of the design. These recommendations can be used in future design processes and are presented in chapter 9: Recommendations.

7. Limitations & Suggestions for further research

In this chapter the limitations of the research conducted, and suggestions for further research are exhibited.

7.1. Limitations

This bachelor thesis carries multiple limitations which have been discovered throughout the research and which were occasionally the result of decisions made during the process.

Certain very crucial limitations are related to the evaluations. First of all, every participant of the evaluation is of Indian origin, but have all enjoyed a high level of education and originate from wealthy and urban communities. They possess considerably different perspectives and skills compared to the women living in rural areas who did only achieve, or have never completed, a secondary level of education. Furthermore, these women do not possess the same familiarity and intuitive behaviour when working with digital technologies.

Furthermore, the amount of evaluations conducted, are lacking in quantity and are not sufficient to generate an acceptable illustration of the general opinion on the final design. Additionally, the ages of the participants used in the evaluation are considerably older than the general users of the SAMPOORNA™ device, who are teenagers that do not possess the same skills and knowledge of the used participants.

Another limitation is the use of the English language in the final design. The necessary information, which was written in Bengali, could not be used for this research, since there was no possibility of translation. Therefore, all texts used in the design are not identical to the texts originally used for the SAMPOORNA™ device. New information had to be generated, which would mimic the information potentially displayed.

A further limitation is time. The time in which this bachelor research has been conducted was not sufficient to successfully explore all necessary cultural and social differences involved. The depth and insight in the perspective of the user could not be gained to a satisfactory extend. This limitation may have also resulted in the election of a solution, not appreciated by the designated users, since they could not be visited and consulted for this research.

A limitation which had a considerable influence on this research was the task to create a 'fun' element. The term 'fun' is very ambiguous and can differ per individual and differs extremely within and between cultures. To truly discover what the concept of 'fun' entails for

the designated users of the product, a more extensive researched should have been constructed by interacting with the users on a personal level.

Since no previous literature has been found on the topic of hygienic vending devices, this research is the first to tackle the issue of redesigning a user interaction of a self-service device selling sanitary pads, within an area where the menstrual taboo still has a great influence on everyday life. This greatly limits this thesis since no previous researches and results can be used as assistance and validation of the gained results. The topic is still unexplored and needs a considerable amount of further research in order to achieve reliable and representative results.

Lastly, the inaccessibility and absence of the SAMPOORNA™ device made it difficult to assess the device thoroughly, since the only references available were pictures. This made it challenging to accurately understand how the device looks, feels and functions. Therefore, the complexity and details concerning the device could not be sufficiently investigated and grasped. This has limited the ideation, specification and design phases.

7.2. Further research

Further research can assist in overcoming the previously mentioned limitations.

Further research should be composed on deepening the knowledge of the important cultural and social aspects and differences that need to be recognised and taken into account when adjusting the user interface and general design of the SAMPOORNA™ device. The actual designated users should be consulted on their preferences and their skills on operating with digital technologies should be tested in order to observe if explanatory elements need to be implemented to improve the ease of interaction.

The actual designated users should be consulted for further researches and the user interface should be translated to its appropriate language, Bengali. This will generate an improved understanding of the user interaction. Additionally, evaluations need to be composed in greater quantities in order to achieve a better and more defining representable image of the user's view on the design and possible difficulties.

In order to achieve reliable and representative results, a considerable amount of further research needs to be done on hygienic self service devices, user evaluations, and the sale of sanitary napkins in India, to gain all necessary information on the social and cultural aspects of the user and the SAMPOORNA™ device. A longer period of time should be devoted to further researches, which should be composed within the designated area, to

gain more valuable and novel insights. These new insights can benefit in gaining a legitimate view of the user and the environment and can help improve future designs.

To successfully implement an element of 'fun' a comprehensive research should be conducted on elements the designated user of the SAMPOORNA™ device considers enjoyable and these outcomes should be used in order to further optimise the user interface and enhance the user experience.

Lastly, that one may achieve the best results when composing further evaluations and testing, it is important to employ the actual SAMPOORNA™ device in order to get as close to the real implemented experience as possible and gain valuable information.

8. Conclusion

The goal of this bachelor thesis is to redesign the user interaction of the SAMPOORNA™ device in order to enrich the interaction with the user, advance the user engagement and stimulate users to visit and return to the device when needed.

The research question that has been generated at the start of this research now needs to be answered:

- “How can the user interaction of the Sampoorna™ device be redesigned in order to enrich the user engagement, stimulate the use of the device and be considered aspirational?”

The fundamental approach for enhancing the user engagement, is to give the device more opportunities for interaction than it currently admits. Presently, only the actions of payment and subtraction of the product are available, which are rather considered basic interactions. To strengthen the user engagement, the interaction needs to be perceived as fun. If the newly designed interaction is conceived as desirable and provokes curiosity to interact, it will stimulate the use of the device. Extra contact with the device will create a stronger bond between user and device and will make the user consider the device when in need of the product.

The design and interaction need to be adapted to the wishes of the designated user in order to be considered desirable and aspirational. Also, in order for the product to assist in lessening the taboo on menstruation the design should encourage positive association towards the topic and illustrate menstruation as a special connection to nature. The design should battle the stigma currently surrounding the topic, by educating the users on menstruation and menstrual management, inspire users to talk about the topic and allow feminine hygiene products to be used as a tool to lessen sanitary difficulties.

For the creation of this product the perspective of the designated user was investigated by conducting an extensive research on how women in rural India perceive and manage menstruation, together with an ethical research on the taboo of menstruation in order to understand the context of the SAMPOORNA™ device. With the knowledge obtained, a brainstorm was conducted to generate numerous ideas, which resulted in a product concept. To stimulate the user interaction a touchscreen user interface was designed, which can be

implemented in the SAMPOORNA™ device and enhance the user engagement. Elements were added which are meant to stimulate positive associations and be perceived enjoyable by the designated user. The user interface was designed in a way which enables the implementation of improvements and desired additional elements in the future.

The produced user interface considerably enhances the user interaction and gains a valuable user engagement and experience, by digitalizing the information portrayed on the SAMPOORNA™ device, stimulating user interaction and knowledge gain and creating a community platform which can easily be extended. The user interface gives the user the opportunity to gain knowledge about the product, menstrual hygiene and EcoDev Solutions, while still being in control of the informational intake.

The aspirational association was difficult to achieve, since the products the device provides are not considered aspirational and therefore the association is difficult to incorporate. However, the beauty of the design does attract and excite the user and stimulates positive associations towards the topic of menstruation, as confirmed by the participants during the evaluation. The flower used as an element of nature connects to the topic of menstruation and subliminally encourages the association of the bond between menstruation and nature.

The constructed user interface does not complicate the action of purchasing a product, rather is an augmentation to the existing 'dull' and basic design of the device and can therefore be considered more 'fun' than the original design of the SAMPOORNA™ device, while still keeping the device functional and accessible.

Thus, the outcome of this bachelor thesis is the design of an instantly implementable user interface for the SAMPOORNA™ self-service device, which stimulates user interaction and engagement, is perceived as enjoyable and attractive and has great potential to be adapted and altered to future wishes and innovations [see image 17, chapter 5]. With this user interface design, the SAMPOORNA™ device is introduced into the modern age of digital technologies.

9. Recommendations

The user interface design is currently in its first phase and is still open to additional features and innovations. It needs to be further developed in order to achieve its maximum potential and any difficulties issued during the evaluations, need to be resolved. After the user interface has been refined accordingly, it can be implemented within a software that is able to depict the interface on a device of choice. In consequence, the chosen device will be implemented into the mechanical design of the SAMPOORNA™ device.

Numerous modifications could still be implemented in order to improve the user interface design and its user engagement. A modification to the user interface, which can gain a finer performance is i.e. the modification of the aspect of nature. The aspect of nature, in the final design depicted as a flower, has the flexibility to be interchanged for different aspects. These should preferably not relate to any religious or political associations or affairs. It will remain important that the aspect chosen is known to the Indian people in order to be recognised and identified with.

A further beneficial development would be the implementation of a rewarding system. A rewarding system for regular users can add a sense of community surrounding the SAMPOORNA™ device and will stimulate users to return to the same device in order to gain benefits. This rewarding system is currently being tested and researched by A. Groene, bachelor student Creative Technology. This system could be implemented within the user interface and could display a personal message to the user, gaining brand loyalty. As it has been discovered by Consolvo et al [12], positive reinforcement can be used to encourage change, by rewarding the user for performing the desired behaviour and attaining his/her goal.

Also, Customising the shape and appearance of the device can result in greater impact and attraction. The overall shape of the design is open to changes which should correspond to the user interface design in order to benefit the user experience.

A very important advancement of the current system would be to use the additional pages to further educate users about menstruation and ways of managing menstrual health. These pages need to be synchronised to the needs and capabilities of the focus group. For example, videos and animations could be displayed explaining the use of the product and educating the user, to not exclude the illiterates or users lacking proficiency in reading. Furthermore, educative animations can assist in lessening the taboo on menstruation by invalidating myths and superstitions surrounding the topic, simultaneously educating the users. Such developments will personalise the device and encourage user identification.

Likewise, instructing the user on the operation of the device, by ways of an introductory animations, can help educate the user on the navigational structure of the user interface. This may help users, who would normally hesitate to use the device, because they lack the experience and skill of working with digital, interactive technologies. With an instructive animation the user will quickly learn how to operate the device and less likely hesitate to use it.

Different options for viewing and displaying the information can be inspected in order to determine the most suitable manner of presenting such a taboo driven and sensitive topic, in a way which does not repel the user, but rather invites them to gain knowledge and interact with a device, which might have previously been considered shameful.

Furthermore, manners to limit the energy consumption should be investigated in order to enable the device to be located in areas with low resources while still being operational.

Additionally, all icons and images used should fit the cultural context and should not portray a western ideal or concept.

References

- [1] EcoDev Solutions, [Online]. [Accessed: 10.04.2018]. Available: ["http://ecodevsolutions.com"](http://ecodevsolutions.com)
- [2] The Citizen, "In Nepal - puberty,". [Online]. [Accessed: 23-03-2018]. Available: <http://www.thecitizen.in/index.php/en/newsdetail/index/7/7836/menstruation-keeps-girls-from-school-in-india-20-drop-out-reaching-puberty>
- [3] S. B. Thakre, S. S. Thakre, M. Reddy et al, "Menstrual Hygiene: Knowledge and Practice among Adolescent School Girls of Saoner, Nagpur District". Journal of Clinical and Diagnostic Research. 2011 October, Vol-5(5): 1027-1033
- [4] Map of Kolkata. [Online]. [Accessed: 08.06.2018]. Available: <http://www.mapofkolkata.com/general-information/>
- [5] Definition of verb 'Nudge'. [Online]. [Accessed: 12.05.2018] Available: <https://www.thefreedictionary.com/nudge>
- [6] Axure. [Online]. [Accessed: 07.06.2018]. Available: <https://www.axure.com/support/training/core/1-basics>
- [7] V.Bonnardel, S.Beniwal, N. Dubey et al, "Gender difference in colour preference across cultures: An archetypal pattern modulated by a female cultural stereotype". 2017. DOI: <http://doi.org/10.1002.col.22188>
- [8] Kontech Electronics Co Ltd. [Online]. [Accessed: 11.06.2018]. Available: <http://szkontech.manufacturer.globalsources.com/si/6008830933209/pdtl/Open-frame-monitor/1154537583/Open-Frame-Monitor.htm>.
- [9] FlintStone Digital, Southern Stars Enterprises Co Ltd. [Online]. [Accessed: 11.06.2018]. Available: <http://www.commercial-display-manufacturer.com/products/Raspberry-display-raspberry-pi-display-board-pitouch.html#.Wx5r4qN7FsM>
- [10] Flower Meaning. [Online]. [Accessed:08.06.2018], Available: <http://www.flowermeaning.com/lilly-flower-meaning/>
- [11] Anita's travel site. [Online]. [Accessed: 11.06.2018]. Available: <http://www.mytourbug.com/indian-school/kidswithschoolbags/>
- [12] S. Consolvo, D. McDonald, J. Landay, "Theory-driven design strategies for technologies that support behaviour change in everyday life". Conference on Human Factors in Computing Systems – Proceedings, Theory-driven design strategies for technologies that support behavior change in everyday life. S. S. S Consolvo, 405-414, 2009

Appendix

1. Social & cultural context research

In order to better understand the social context of the SAMPOORNA™ device and the current attitude towards menstruation and feminine hygiene products, an extensive literature review has been conducted.

In India menstruation is a taboo until the current day. It leaves adolescent girls with a lack of knowledge about menstruation and the use of female hygiene products. In the month May of 2016 The Citizen [1] stated that more than 20% of girls in India drop out of school after reaching puberty. When girls drop out of school at an early age, they are less likely to return to education, leaving them vulnerable to early marriage, violence and forced sexual relations [1]. The lack of access to female hygiene products and clean, safe toilets result in unhygienic dealing with menstruation by females in India. Girls have to go back to their homes to tend to their menstruation, since this is the place they feel most comfortable. For most Indian girls living in rural areas this journey is a long one, so most of them do not return to school. Furthermore, girls lack critical information about their menstruation. In a study composed in Nagpur [11], it turned out that the majority of the girls [295 (76.23%)] were not aware of the source of the menstrual bleeding. Only 10 (2.58%) were aware that the source of the menstrual bleeding was the uterus.

It is important for this taboo to be broken so that girls are able to contribute to the Indian economy and can gain a position wherein they are able to promote better circumstances. Furthermore, the discussion about menstruation should be stimulated by providing the young adolescent children with education about fertility, menstruation and sex. In order to break down this taboo, it first needs to be understood how it was evoked and what the current state is. It is necessary to understand what the ongoing practices are in order to improve the manner girls and women in India deal with their menstruation. For the Graduation Project of Creative Technology year 2018, the user interaction of a vending device will be redesigned. The vending device is constructed to distribute sanitary pads to adolescent girls in rural areas of West-Bengal, India. In order to remodel this apparatus, it is necessary to understand its context.

Therefore, the objective of this literature review is to gain information about the current taboo of menstruation in India, how it came into existence and how it expresses

itself in everyday life. It will become clear what today's ways of dealing with menstruation are and how it gained its form. This knowledge will be used to understand the outlook the potential users of the sanitary pad vending device possess. The following research question will be answered: Where does the taboo about menstruation in India come from and how does it express itself? At first the nature of the taboo will be discussed. The origin of the taboo and the mythological stories that influenced the way the Indian citizens think about menstruation will be explored and it will be investigated how this taboo expresses itself in present day practices. The current ways Indian adolescent girls deal with their menstruation, the ways the Indian girls gain their knowledge about menstruation and if they possess adequate information about the process will be analysed. At last, ways are explained of bringing about positive alterations with the intention of eventually breaking the taboo.

The origin

The belief that menstruation is a curse and that menstrual blood is impure date back to very old religious myths. Tan et al [14] declare that Religion is the most significant factor that has, over the course of many centuries, spawned the belief that menstruation should be looked at with shame and fear. The oldest existing religious text in India is The Rig Veda [4]. It is a part of the four Hindu scripts called the Vega's. Chawla et al [2] discovered that in this text the subject of the god Indra slaying Vritra's (the first dragon and king of demons) is mentioned over a hundred times. However, a Vritra was considered a Brahmin, which is a form of priest. To kill a Brahmin was considered a major sin. It has been declared in the Veda that guilt, of a Brahmana-murder, appears every month as menstrual flow as women had taken upon themselves a part of Indra's guilt (from Chawla [2] as mentioned in Garg and Anand [3]). Tan et al mention the same reference, namely that the god Indra freed himself from his sin, by dividing his sin into four parts and giving them to trees, water, fire, and women. Garg et al [3] deduce that this text has given rise to the belief that women are impure during their menstruation, since Hinduism centres on notions of purity and impurity and references like these give the notion that women are impure since they carry Indra's sin.

Tan et al [14], however, express that within Hinduism, conceptions on menstruation differs. In South-India the first menstruation is seen as a positive event and celebrations mark this event as special. It is only in Orthodox and Brahmin families that women are seen as impure during their menstruation and are prohibited to attend to their daily routines. At

the end of their menstrual period the women are purified by taking a ritual bath. Only then are they considered pure again. Garg et al [3] discovered a similar notion, namely that menstruating women are not allowed to take baths, especially not during the first few days of their period. Water is seen as the earthly form of the Hindu deities, so it is considered sacred and needs to stay clean, which is mentioned in both Garg et al [3] and Tan et al [14]. Activities like sexual intercourse, childbirth and menstruation are considered impure and earthly acts that can contaminate the water and therefore take away its purity [3].

A study composed by Rajagopal and Mathur [10] showed that a significant 88 per cent of all school-going and non-school-going girls in the study had a negative feeling about menstruation, and considered menstrual blood as *ganda* (that is, unclean or impure). Not being able to bathe and clean themselves will result in menstruating women being unclean and unhygienic and only strengthen the notion of menstruating women being able to contaminate food as well as friends and family. Garg et al [3] discovered that the biological purpose of menstruation in the female reproductive cycle is not understood. Instead, the prevalent concept is that of menstrual blood being the accumulated dirt that flows out of the body every month. Misconceptions like these result in girls associating their own bodies with contamination and divine curses. Tan et al [14] draw the same conclusion that women's menstrual flow is regarded as a manifestation of a sin and is therefore accompanied by notions of contaminations.

Restrictions

Restrictions during menstruation hinder Indian women in their daily life, as well in private and public spheres. Restrictions can be imposed on food, hygienic practices and social and religious activities.

In an urban community in West-Bengal Yasmin et al [7] detected that 98.6% of the respondents followed some restriction or taboo during menstruation and that restrictions on types of food was maximum in Muslims (59.4% respectively). Poor body odours attest the idea that women who touch preserved foods during menstruation will spoil them, which connects to the findings of Shobha et al [5] that not entering the kitchen was the main restriction among the rural girls during menstruation. According to a study by Kumar and Srivastava [7] women reported that during menstruation the body emits some specific smell or ray, which turns preserved food bad. And, therefore, they are not allowed to touch sour foods like pickles. Garg et al [3] encountered corresponding results. Dietary restrictions were followed during menstruation and sour food like curd, tamarind, and pickles were

usually avoided by menstruating girls. This was also prevalent in the study of Shanbag et al [9] where food taboos were common during menstruation and 42.6% avoided certain food items common ones being sweets (21.6%) spicy food (3.9%) curd and milk products (9.1%).

As mentioned before, water is seen as the physical form of Hindu dieties and is therefore considered holy. Menstruating women are not allowed to contaminate its purity with their menstrual blood. Tan et al [14] described the ritual of women taking a bath at the end of their menstruation to cleanse themselves of their sin. Shobha et al [5] discovered that some girls in their study would wake up very early to wash themselves, so that their families would not notice it. Garg et al [3] discovered that menstruating women were not allowed to take baths at least for the first few days of their menstruation. Restrictions on washing result in the bad body odour connected to food restrictions and also result in unhygienic practices.

The study from Shah et al [5], amongst tribal girls in rural Gujarat, brought to light that almost half the girls had to sit separately during menstruation, 89% were restricted in what they could touch, and almost half experienced changes in the behaviour of family members. Approximately a third was not allowed to go outside the house alone during their periods. Studies in West Bengal [7], the Nagpur District [11] and Karnataka [9] all show the same high number of social restrictions imposed on the girls observed.

Multiple studies have shown that the nature of restrictions differ for various religious beliefs. Even though most women are not allowed to attend religious functions, this seems most prevalent in Hinduism. Since more than 80% of the Indian population practice Hindu faith, this affects the largest amount of Indian women. A school-based study by Varghese et al [6] examining religious restrictions discovered that the proportion of girls not attending the respective religious functions during menstruation was 86.3% among Hindus, 42.5% among Christians, and 79.1% among Muslims. The attendance of religious ceremonies appears to be the most practiced restriction, with a mean of 85.48 % (94.2%, 71.79% and 90.47% respectively) out of three ([7],[11],[9]) studies mentioned. However, Yasmin et al [7] had a different result in West-Bengal where the religious restrictions were most prevalent among Muslims (97.3%).

It can be deducted that the many restrictions placed on menstruating girls and women hinder their mobility and give them the image that during their menstruation their bodies are tainted. The negative perception of menstruation, as explained and researched by Rajagopal and Mathur [10] is therefore evident.

Menstrual management

Many different ways can be used to manage one's menstruation. The most commonly used tools are sanitary pads and cloths. The use of these two products seems to differ for rural and urban areas as well as level of education.

Rajagopal et al [10] discovered that nearly three-quarters (73 %) of both school-going and non-school-going girls used sanitary pads as protection during menstruation. The use of sanitary pads was found to be higher among school-going girls than non-school-going girls. The use of cloth was comparatively higher among non-school-going girls [10]. Thakre et al [12] found a similar difference in rural and urban areas. They discovered that significantly more (60.6%) urban girls were using sanitary pads as compared to rural (30.8%) girls. Since girls living in an urban setting are more likely to attend schooling than girls from rural areas, this is a rational discovery. In an urban community of West Bengal, the amount of girls using sanitary pads also turned out to be relatively high. 82.3 per cent of the girls used only sanitary pads [7]. This confirms the results of Varghese et al [6] that the level of education is an important component. Higher education correlates with fewer menstrual restrictions, which makes the management of menstruation less burdensome. Furthermore, children from educated parents are more likely to have the means necessary to purchase sanitary pads.

Knowledge

The taboo surrounding menstruation creates for a lack of open conversation about the topic, which result in misconceptions and unhygienic practices due to shame and ignorance.

Most schools do not educate their children on reproduction and parent's do not discuss this topic with their children as it is not considered proper. The result is that a considerable amount of young children does not possess any knowledge about the operation of their bodies and its development during puberty. Rajagopal et al [10] discovered that three-quarters (73.3 %) of school-going girls in their research and an even higher proportion of non-school-going girls did not have any prior information regarding the onset of the menstrual cycle. This means that even less than 26,7 per cent of the girls knew what was happening when they had their first menstruation. The studies of Thakre et al [11] and Pandit et al [13] show that some of the girls questioned even believed that the source of bleeding was a curse from god (1,03% and 15,04% respectively). This verifies the

negative perception of menstruation. The first encounter with menstruation tends to be a traumatising one for a great number of these girls. A different study [11] from Thakre et al confirms these numbers. They found out that only 36,95 per cent of the surveyed girls knew about menstruation before having their first period.

It is clear that all studies mentioned show a great lack of knowledge about menstruation and a lack of informants. Schools do not assume the role of informant and a great amount of girls are totally unprepared when receiving their first menstruation. All studies confirm that the mother was the main informant for the girls.

Positive change

This literature review acknowledges that the taboo on menstruation is inflicting harm on women and girls all around India and in order to positively reshape the current climate multiple alterations should be supported. Enhancements such as open conversation, women empowerment, education and effective knowledge transfer will result in positive transformations.

Shah et al [5] and Yasmin et al [7] remark that the access to sanitary hygiene products need to be enhanced and safe hygienic practices need to be encouraged. Garg et al [3] wish for women to be empowered through education and for their role in decision-making to be increased. This will result in women gaining a voice and being able to open up discussion about the topic of menstruation. The importance of education is underlined by the research of Varghese et al [6] who discovered the level of education to be a significant factor in the amount of taboos the girls are bound to. Girls who had attained an education higher than 10th standard had fewer menstrual taboos. So, it seems possible to invalidate traditional beliefs, misconceptions and restrictions regarding menstruation by improving the awareness of the origin of menstruation, its function and importance.

Teachers and parents need to be educated and stimulated to open up conversation about the topic in order to remove incorrect knowledge and spread true information about menstruation. Yasmin et al [7] believe that eventually the fear of the topic that comes with the lack of knowledge will decrease. Shanbhag et al [9] additionally emphasize on to the role of mothers when it comes to filling the gap of knowledge about menstruation. It is vital to remove ignorance by educating mothers, regardless of their level of education, about the topic of menstruation and its functionality. Since the mother is the main informant of adolescent girls, they should be equipped with proper knowledge. Garg et al [3] explain that honest dialogue about the poor hygienic circumstances can help to improve the hygienic

practices, like increasing the number of public toilets for women and stimulating the use of sanitary napkins.

Conclusion

Now, it is possible to answer the research question stated: Where does the taboo about menstruation in India come from and how does it express itself?

It can be deduced that the taboo originates from ancient religious mythology like the Hindu texts of Rig Veda, where women are considered to be impure during their menstruation.

This creates a stigma surrounding the topic, which results in a lack of knowledge and open discussion about menstruation. Because of this, the taboo is currently still powerful in many areas of India and leaves women with a considerable amount of restrictions during their lives. As a result, women are prohibited from attending their daily life's regimes. With this knowledge it is possible to gain a better understanding of the menstrual taboo in India and have an improved outlook on the lives of the users when experiencing their menstruation. Knowing the social context and the general perspective of the girls who will be the main users of the service, the vending device should encourage social behaviour and stimulate perceptions of purity, comfort, empowerment and social alliance in order to create a more positive attitude surrounding the subject.

The sanitary products and dispenser should stimulate feelings of purity and comfort in order to change the negative associations connected to menstruation. It should illustrate that menstruation is not a curse but a connection to nature, a sign of fertility and the origin of life. Correct information about menstruation should be clearly visible or accessible on the sanitary napkin distributor as well as on the product itself, in order for girls to have easy access to correct knowledge.

A lack of access to sanitary products and public toilets make menstruation a stressful endeavour. It is imaginable that girls in this context have negative feelings about menstruation and sanitary products. The sense of ease and positivity should therefore be promoted. It should be made aware that dealing with menstruation is not a considerable struggle, but rather a very natural habit. The sanitary napkin distributor should stimulate correct use of the product and should express that the product will make managing menstruation less complicated and more comfortable.

Education is a vital component in reducing the stigma surrounding menstruation and creating a space for open conversation. Women should be empowered and girls should be stimulated to strive for education to gain a voice of their own. A sanitary napkin distributor

should show that the use of the product will enable girls to continue their studies without their menstruation hindering them.

The mother has been found to be the main informant of knowledge. Her role should be emphasised and mothers should be stimulated to share information regarding this natural process with their daughters. It should be seen as a proud part of womanhood. The mothers need to be stimulated to see menstruation as a way of connecting to their daughters and their daughters should see their mothers as a trusted guide and fellow experiencer of the process. This bond between mother and daughter can be made more prevalent by the use of images on the distributors and by adding text stimulating adolescent girls to approach their mother about the subject and ask her for support.

Furthermore, sanitary products should be shared in a social way and being talked of between girls and woman. By talking about the topic, girls will be able to relate to each others worries and learn from each others practices. They will have the opportunity to find comfort in sharing their knowledge and gaining insights. Sharing can be stimulated by text on the device or product that encourages girls to buy more of the product and give them to their female friends and relatives.

Inspiring and helping girls to start talking about the topic, view it in a more positive manner, gain more knowledge about the process of menstruation and see female hygiene products as a means to help them finish their education, can gradually improve the situation and help to weaken the taboo and the negative effect it has on women in India.

Most studies regarding the topic of menstruation have been composed in different areas around India. Results may differ for the area used for the Graduation Project, which is Kolkata in West-Bengal. This literature review gives a general understanding about the taboo on menstruation which may vary per area and district. Furthermore, it is recommended to compose further research on the expression of the menstrual taboo on the sales of sanitary pads and cloths. Research is mostly composed on the use of sanitary pads and practiced restrictions due to the taboo. There is, however, a lack of understanding about the price and ways of obtaining these female hygiene products. Investigations can be done on the most desired manners of attaining these products and on ways of packaging that may influence the user's behaviour towards the product and its function.

- [1] The Citizen, "In Nepal - puberty," [Accessed: 23-03-2018]. [Online]. Available:<http://www.thecitizen.in/index.php/en/newsdetail/index/7/7836/menstruation-keeps-girls-from-school-in-india-20-drop-out-reaching-puberty>

- [2] J. Chawla, Matrika The Mythic Origins of the Menstrual Taboo in the Rig Veda. 1992. Economic and Political Weekly 29(43):2817-2827, 1994-10-22, 00129976
- [3] S. Garg , T. Anand, "Menstruation related myths in India: strategies for combating it.", 2015.
- [4] Oxford Bibliographies, "The – traditions", [Accessed: 23-03-2018]. [Online]. Available: <http://www.oxfordbibliographies.com/view/document/obo-9780195399318/obo-9780195399318-0173.xml>
- [5] S. Shah, R. Nair, P. Shah et al, "Improving quality of life with new menstrual hygiene practices among adolescent tribal girls in rural Gujarat, India". Reproductive Health Matters, 21:41, 205-213, DOI: 10.1016/S0968-8080(13)41691-9, 2013.
- [6] M. Varghese, S.James, L. Ravichandran et al, "Religious restrictions and cultural taboos related to menstruation in adolescent girls: A school-based cross-sectional observational study.", 2015.
- [7] S. Yasmin, N. Manna, S. Mallik et al, "Menstrual hygiene among adolescent school students: An in-depth cross-sectional study in an urban community of West Bengal, India" IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN: 2279-0853, p-ISSN: 2279-0861. Volume 5, Issue 6 (Mar.- Apr. 2013), PP 22-26
- [8] World Atlas, "India-India", [Accessed 23-03-2018]. [Online]. Available: <https://www.worldatlas.com/articles/major-religions-in-modern-india.html>
- [9] D. Shanbhag, R. Shilpa, N. D'Souza et al, "Perceptions regarding menstruation and Practices during menstrual cycles among high school going adolescent girls in resource limited settings around Bangalore city, Karnataka, India". International Journal of Collaborative Research on Internal Medicine and Public Health 4(7):1353-1362, 2012, 18404529
- [10] S. Rajagopal, K. Mathur, "Breaking the silence around menstruation': experiences of adolescent girls in an urban setting in India", Gender & Development, 25:2, 303-317, DOI: 10.1080/13552074.2017.1335451, 2017.
- [11] S. B. Thakre, S. S. Thakre, M. Reddy et al, "Menstrual Hygiene: Knowledge and Practice among Adolescent School Girls of Saoner, Nagpur District", Journal of Clinical and Diagnostic Research. 2011 October, Vol-5(5): 1027-1033
- [12] S.B. Thakre, S. S Thakre, S. Ughade, "Urban-Rural Differences in Menstrual Problems and Practices of Girl Students in Nagpur, India". Indian Paediatrics, Volume 49, September 16, 2012
- [13] D. Pandit, P. K. Bhattacharyya, R. Bhattacharya, "Menstrual Hygiene: Knowledge and Practice among Adolescent School Girls In rural areas of West Bengal". IOSR

- [14] D.A. Tan, R. Haththotuwa, I.S. Fraser, "Cultural aspects and mythologies surrounding menstruation and abnormal uterine bleeding". MD Best Practice and Research Clinical Obstetrics and Gynaecology

2. Ethical research

A bloody taboo

Menstruation. A topic not openly discussed and still hidden away. A bodily function that is so vital, that our entire race depends on it. Even though it has existed since the beginning of the human race, it is still a taboo. But why is that so, and what effects does it have on people and entire nations? In this paper multiple aspects of the taboo on menstruation will be dissected and investigated, to answer the question 'Where does the taboo on menstruation come from and what effects does it have?'.

The history of the menstrual taboo

Most of us know what a taboo is, but where does the term originate? The term taboo comes from the Tongan 'tapu' or Fijian 'tabu', which means prohibited, disallowed or forbidden. The English explorer James Cook visited Tonga and afterwards used the term 'tapu' for anything that was considered forbidden [11]. "A taboo has a sacred, impure and even forbidden characteristic. They are there to maintain an order in society. A taboo is there to protect, which means that there is a sense of fear underpinning it" as told by Fusaro [4], citing Freud and Douglas. This fear is a factor that drives the taboo into secrecy. Many taboos are not spoken of or people lack knowledge about the topic. This ensures that the taboo will survive throughout multiple generations. "Every practice considered as a taboo remains very invisible in society, even if some social issues can be linked to it. Taboos are rarely evoked, because they hurt the moral" [Schoemaker and Tetlock, as cited in Fusaro [4].

Global history

Menstruation is a taboo related to a bodily function. There is not much information on menstruation in ancient times, since recording history was predominantly done by males, but stories have been found that link menstruation to magic, superstitions and sin. Women have

been menstruating for as long as we know, even in times when little was known about the functions of the body and the reproductive system. If today, with all the knowledge we possess, the menstrual taboo is still so prominent, it can be deduced that in these times with limited knowledge and an excess of myths and beliefs, the taboo surrounding menstruation must have been immensely stronger.

Menstrual blood has been an important topic in ancient myths. Mayan's believed that menstrual blood was a curse posed upon the moon goddess for committing a sin. Her menstrual blood turned to all forms of dangerous things, like snakes and poison. In many cultures period blood was believed to have the power of purifying, protecting and of casting spells. In ancient Egypt information has been left of period blood being used as an ingredient in medicine [1].

Religion has been an important factor in establishing the menstrual taboo. Religious texts have spoken about the uncleanness of menstruation and have imposed many restrictions on women. The Rig Veda, which is the oldest Hindu text, has explained menstruation as a sin, which women have taken upon them so the god Indra would be relieved of his sin. Menstruation is seen as a physical and spiritual impurity; therefore, many restrictions are imposed on menstruating women [15]. However, there is no occurrence of a cleansing ritual at the end of the menstruation.

In Judaism, the fifteenth chapter of Leviticus has had a lot of impact on the image of menstruation. It talks about the uncleanness of women and how it is transmittable to other people and objects. "For roughly two weeks a month a woman is considered 'niddah', which is her time of uncleanness. At the end of the two weeks a woman needs to be ritually cleaned, with a bath called 'mikveh'. Upon completing the mikveh, she is to approach the temple with a sacrifice in hand—usually a pair of doves—hoping that the rabbi accepts her as clean once more" [12].

In Christianity, not many superstitions exist surrounding menstruation. Only within communities that share the belief of Leviticus and in Greek, Eastern and Russian Orthodox churches some rituals concerning menstruation were and still are being upheld, like not being able to receive communion during menstruation or having to live separately during this period [11]. In Islam the tradition is a less harsh version of the Jewish tradition. The restriction women have, are on touching the Quran, entering a mosque and having sex during menstruation. Furthermore, there are also rituals concerning a cleansing bath at the end of the menstruation.

Buddhism does not have that much of a negative association with menstruation. The only negative traditions concerning menstruation have been adapted from Hinduism. In

Shintoism, Japan, women are permanently considered impure, since they are capable of menstruation. While on their period they are not allowed to enter sacred places. One of the only big religions that is completely women friendly when it comes to the topic of menstruation is Sikhism, which sees menstruation as a purity rather than an impurity since it is a source of life.

Religion has had a large impact on the knowledge and beliefs of its followers. With the emergence of science, further information was discovered about the human body. Especially with the development of the science of anatomy around the 17th and 18th century. It was in the 18th century that the connection between menstruation and ovulation was made [9]. However, no significant changes or improvements were made, by gaining that knowledge. The taboo continued to stay forceful and many doctors still believed certain myths, i.e. that a menstruating woman could turn food bad, that menstruation was considered a disease and could lead to madness. Famous doctors have spoken about menstruation in a belittling and ridiculing manner. James MacGrigor Allan, who when addressing the Anthropological Society of London in 1869, even stated that:

“At such times, women are unfit for any great mental or physical labour. They suffer under a languor and depression which disqualify them for thought or action, and render it extremely doubtful how far they can be considered responsible beings whilst this crisis lasts. Much of the inconsequent conduct of women, their petulance, caprice and irritability, may be traced directly to this cause [. . .] In intellectual labour, man has surpassed, does now, and always will surpass woman, for the obvious reason that nature does not periodically interrupt his thought and application” [17]. With these words Allan openly argues that women are biologically built to be inferior to men and that nature wills it so.

The first improvements, concerning the taboo, occurred during the 20th century. During World War I, French nurses started using cellulose bandages as pads, which was very innovative at that time. In 1936, the first Tampax tampon was introduced to the market and the first tampon advertisement was published. The company Tampax was created by business woman Gertrude Tendrich, who bought the design of a tampon from doctor Earle Cleveland Haas. Ten years later Walt Disney published an animation informing children about menstruation [18]. So, women started using different and more comfortable ways of managing their menstruation and in the late sixties, the tampons which are similar to the ones we use now, were created. Multiple companies producing and selling tampons were erected. It only took a while before people actually started using them. The 20th century, although still full of menstrual superstitions and taboos, has been a great century for the development of women's health and wellbeing. Women gained the rights to vote and speak their mind. This

stimulated positive changes, more open discussion and a loosening of the taboo on menstruation within the west.

Benelux history

Until the mid 20th century, the taboo on menstruation was prominent within the Benelux and its inhabitants. There was no open discussion about the topic and many would not even have the necessary knowledge about reproduction. Girls would have to go to their mothers for information and were told that from now on they needed to keep away from boys [14]. Within the Church and its followers, everything related to sex was considered a taboo. However, when the secularisation process sped up during 1960-1970, people felt more free to talk about such topics [13]. The church did not have the same power anymore on people's everyday life and conversation. Women started using the tampons around the late seventies. In 1975 the first tampon commercial was broadcasted on Dutch television, which starred Dutch actress Sylvia Kristel. The tampon gave women much more freedom and mobility during their menstruation. In the Netherlands and Belgium most taboos have already been breached and there are many people trying to break the taboo on menstruation. Even though there have been many improvements in the past decades, the taboo on menstruation is still very much alive. In a research campaign conducted by the sanitary napkin company Libresse, the result showed that 57% of their Dutch correspondents would hide their pads and tampons out of shame and 52% of Dutch teenagers would rather be bullied at school than talk about menstruation [18]. The taboo is currently expressed through the shame women still feel concerning the topic of menstruation and the way television channels never address the topic, which keeps it very hidden and unacknowledged. However, times are changing and many improvements have been and are currently being evoked.

It can be concluded that the menstrual taboo has clearly been a popular topic of myths and superstitions and has been upheld by almost all religious beliefs. Lack of knowledge keeps these old myths and superstitions alive. When religion started to take up less of a role in people's lives, the stigma surrounding the topic lessened. Most developments concerning the taboo, took place in the second half of the 20th century, when women got the chance to express themselves. Markets for products helping women to manage their menstruation started appearing. The shame and lack of knowledge regarding the topic of menstruation, kept and still keeps menstruation a taboo.

The damage of the menstrual taboo

A taboo can be very harmful to society and can have a great impact on numerous aspects, for instance: social relations, the economy, nature, media, and society. However, the worst damage the taboo does is to people.

people and social relations

In numerous countries around the world, still no education is given on the topic of menstruation, since people are too ashamed to discuss it. This leads to girls having their first menstruation, without knowing why. Such an experience can be traumatic, since having sudden excessive bleedings and pains may lead girls to fear that they have obtained a deadly disease or are cursed by some deity. When a person does not understand the cause of menstruation, myths and superstitious have room to influence someone's life. This could have been easily prevented by education and open discussion.

Furthermore, in many cultures, menstruating women are given limitations. They are not able to touch and eat certain foods, to wash themselves, attend or enter religious buildings and functions or sometimes even sleep in their family homes and touch their relatives. Such restrictions teach women to believe that their bodies are tainted and creates negativity, secrecy and shame. It also hinders women in their mobility, sexual precautions and education.

Menstruation is often used as a weapon to show the difference between men and women. It is used as an excuse to call a woman 'emotional' or 'unequipped'. This leads to discrimination at the work environment. Women are considered to take more sick days because of their menstruation, when there actually is a large number of women that does not experience the symptoms of menstruation, like abdominal or pelvic cramping, lower back pain, bloating and sore breasts, food cravings, mood swings and irritability, headaches and fatigue [21]. While others suffer so badly from these symptoms that they are truly considered ill during their menstruation. They are being charged for having these symptoms, whereas they are actually strong enough to go on when suffering these symptoms and still perform appropriately. These women tend to have a hard time opening up about their discomfort and are not improving on their condition or managing their heavy symptoms in a way which makes their lives more comfortable, because they are too ashamed. So the menstrual taboo can have an extensive negative impact on women's wellbeing, careers and professional image.

There have been and still are many stereotypes when it comes to menstruating women. For example, a woman is winy, angry, and eats chocolate while crying emotionally when she is on her period. There are also bountiful jokes about the premenstrual syndrome, like "Why do

they call it PMS? Because Mad Cow Disease was taken” and numerous more [22]. The term ‘You are PMS’ing’ is full of negativity. Women are expected to lose their rationality and capabilities during ‘that time of the month’. Thus, women have become very skilled in hiding their menstrual symptoms. They do not talk about their physical complaints while on their menstruation, since they do not want to be considered weak or overemotional or conform the stereotype. They are shamed for having many emotions and therefore are trying to repress them, but when did having emotions become such a bad and shameful thing?

Furthermore, when men are too ashamed to gain knowledge about menstruation and fertility, this may harm the social relations and interactions between men and women, since ignorance may lead to false prejudices and may even stimulate ridicule. Also, when men are too ashamed to buy feminine hygiene products for their partner or family member, this only affirms the strength the taboo still has on people. Thereupon, the taboo on menstruation actually stimulates sexism in social associations between women and men. It also makes sure that women are discouraged to share their experiences and hardship and keeps people distant from each other. The taboo can create stigma, shame and secrecy between family members, friends and relationships and can also have a negative influence on a woman’s social status.

As said by D. Fusaro [4]: “A taboo like this oppresses the ones who live with it, since they are reduced to silence and invisibility, which means that all their issues will be forgotten. The menstrual taboo oppresses and stigmatises women with the aim of keeping them away from the public sphere. Menstruation is considered as a threat for patriarchy so that women have to keep their periods invisible and controlled”.

Media and economy

The Citizen [23] states that in the month May of 2016 more than 1/5th of girls in India did not go to school, because of their menstruation. This results in missing 12 weeks a year from school and thus gaining a large backlog compared to the male students and even results in quitting school and not graduating at all. The dropout because of menstruation has a large impact on the economy and governance of the country, since these women miss the resources to actively participate in the economy and stimulate it. They are also lacking in high positions and decision making, due to their lack of education. This results in the government not understanding the issues that are the cause of this dropout, since there are no women that can represent it and attack the problem.

It’s not just the girls and women who would benefit from education about menstruation, the supply of feminine hygiene products and the disappearance of the menstrual taboo. Wider

society and national economies can profit from better menstrual management. With every 1% increase in the proportion of women with secondary education, a country's annual per capita income grows by 0.3%. Closing the unemployment gap between adolescent girls and boys would result in an up to 1.2% increase in GDP in a year [5]. Were the media to address the economical issues mentioned above, it would be a considerable step towards change. The media can function as a source and display of a cultures' norms and values. It has the power to change the way a society views a certain subject. For the topic of menstruation, media has mostly made sure that the taboo was kept enforced, by not speaking openly about the topic and by showing a fictitious image of menstruating women in feminine hygiene commercials.

A study composed by Spadara et al [3] shows that TV commercials of sanitary napkins depicting menstruation as something that is not talked about led Italian women to experience an elevated state of self-objectification. Commercials often portray menstruation as something that should not be talked of. They use cryptic terms in feminine hygiene commercials and try to avoid the words 'period' or 'menstruation', which influences the way women think about their reproductive systems. They see it as something that is not considered desirable. Commercials for tampons and sanitary napkins mostly depict happy and carefree women, not feeling any symptoms of menstruation, who are being desired by the opposite sex. Such images can make women believe that this is the way they should be, when having their menstruation. Such specific character building can be very dangerous for its audience, especially considering the topic is still very sensitive and relates to a natural aspect and process of the body. These commercials can indoctrinate women, as well as men, to believe that this fictitious image is actually truthful and does not remotely educate viewers on the truth about the subject. They depict such a fictitious image of menstruation, whereas simultaneously keeping the topic hidden and undiscussed.

However, there have been positive changes over the past few years. The first commercial for sanitary pads showing the colour red, has aired in 2017 [24]. This argues the hypocrisy of blood being visible everywhere on television, and at the same time period blood being totally forbidden to be broadcasted.

Nature

A topic that is not often discussed, but which is certainly a relevant one, is the damage the taboo on menstruation inflicts upon the planet. Even though the invention of tampons and pads has had many benefits for people as well as economies, it has gravely damaged the earth we live on. Most of the tampons and sanitary pads are wrapped in plastic, and when wrapped in plastic, feminine hygiene waste can take centuries to biodegrade. Since the average woman uses between 11,000 to 16,000 tampons in her lifetime, this leaves behind a residue far beyond her lifespan [7]. The manufacturing of tampons and pads – turning wood pulp into soft, cotton-like fibres, is both resource- and chemical intensive [25].

Over 50% of the world's population menstruates, however, because there is a lack of open conversation about feminine hygiene and the ecological impact of the products used, the taboo has stunted the development of new and more organic products, with little to no innovations for over 80 years [8]. "It seems counterintuitive that despite the explosion of sustainable options for a broad range of products over the past five years – clothing, food, baby care, coffee, skincare, cleaning products – options for this most intimate and inconvenient aspect of women's lives have scarcely changed in a century" [25]. The shame accompanying the taboo on menstruation has kept the disposable feminine hygiene products popular, since they are easy to acquire and get rid of.

Furthermore, the issue of sanitary products harming women's bodies has also been an overlooked topic. Tampons and sanitary pads have often been bleached and treated with chemicals, which the manufacturers are not legally obliged to reveal. Women are forced to expose themselves to bleach, pesticides, chemical fragrances and dioxides, in order to manage their menstruation and keep about their daily lives. They even risk the disease Toxic Shock Syndrome, which is often associated with high absorbency tampon use and can be fatal if not treated promptly. "TSS is caused by either *Staphylococcus* or *Streptococcus* bacteria. These bacteria normally live harmlessly on the skin, nose or mouth, but if they get deeper into the body they can release toxins that damage tissue and stop organs working" [25].

Only in recent years, products have been developed which are considerably more ecological and safe for the body, i.e. Menstrual cups and re-usable sanitary pads and tampons. They are the current solution to the ecological damage of the feminine hygiene industry. However, these products are expensive and difficult to access, especially for women living in less developed countries who possess fewer resources. These women are often not able to even buy disposable sanitary pads, since, because of the strength of the taboo, these products are difficult to access and are made very expensive.

Government

The government can have a considerable influence on the demolition and enforcement of taboos. Yet occasionally the initiative for change has to come from the citizens themselves, since the government does not act. In 2016 there was a large uproar about taxes on feminine hygiene products. Many past governments assigned luxury taxes to feminine hygiene products, which made such a basic and important product even more expensive. In some countries the tax on tampons and sanitary pads was even higher than on chocolate or caviar. In Australia sanitary products have a 10% tax. There have been multiple petitions to change this, however the government decided against it. In Slovakia, taxes on feminine hygiene products are no less than 20% [27]. They even have the same label as perfume. These taxes have been active for decades, but only a few years ago people started realising how irrational these high luxury taxes were, and became fed up. To say that a tampon or sanitary napkin is a luxury, is to imply that women have the choice to menstruate or not, which is untrue. Without feminine hygiene products a woman is not able to go about her daily life during her menstruation, and since bleeding freely is not acceptable in today's society, not having feminine hygiene products would leave a woman helpless and trapped.

Menstruation can be used as a way to legitimize the pay gap between men and women, since women are believed to take more sick leave, because of their menstruation, they should be paid less. Whereas sickness during menstruation differs entirely per person and some may never feel sick when having their menstruation. Menstruation is something that for employers adds to the inefficiency of a pregnancy leave. Since in most countries there are no laws that protect women from these types of discriminations [32], it can harm their careers and futures. Discussions on period leave were raised last year. Paid leave that enables women to take a day off when experiencing heavy symptoms during their menstruation. But does this actually help women, or worsen the stereotype by acknowledging that women are not able to work during their menstruation. Making them even more vulnerable to discrimination. People who do not understand or have never experienced these severe menstrual symptoms, would think that women taking period leave are just complaining and using it as an excuse to take a day off. A period leave would raise awareness about menstruation and women experiencing strong symptoms, but does a 'normal' sick day not suffice? Since so many women do not even experience these heavy period pains. As a consequence, men could also be inclined to rally because of the positive discrimination and inequality of this leave. It would be more efficient to better the facilities at work places so women are more capable to manage their menstruations.

In The Netherlands there is a 6% tampon tax, which sounds great, since it is the minimal tax scale. However feminine hygiene products are hidden away under the label of ‘wound-dressings with medical objectives’ [28], as if menstruation is a wound that needs to be healed. This still shows that the topic needs to be concealed.

In India the Goods and Services Tax (GST) on feminine hygiene products are 12%, since mid-2017. Previously the tax on these products was 14,5 %. It sounds like an improvement; however, it does not accomplish much [30]. 88% of women in India can not afford these commercially packaged sanitary napkins and consort to other unhygienic methods of dealing with their menstruation. The accessibility of feminine hygiene products is also very low, due to the fundamental lack of awareness about the topic and the stigma surrounding it.

Innovation

The aim of this essay is to get a better understanding of the taboo surrounding menstruation and to confirm that it is mainly fuelled by a lack of education, awareness and understanding of its biological process. The taboo has had its influence on many cultures and religions but has always been a symptom of underdevelopment and should be, within this modern age of intercultural communication, considered outdated. Innovation within the educational system, media and governance, has already helped numerous countries in lessening the taboo and can still benefit many more.

Women as well as men need to be adequately educated on the topic and realise that there is nothing wrong or mystical about the topic of menstruation. It is a vital bodily function that allows humans to reproduce, which is the objective of the human race. Women need to be allowed and empowered to go about their daily lives, realising that they have the capability to create life because of their menstruation and that they should not be hindered, because of it.

Change will be set into motion, when men dare to speak up about the topic and when women are allowed to take up influential roles and are enabled to fight for the women that are still trapped within the taboo’s influence. Women, as well as men, can work together on breaking the taboo which will benefit the lives of many people, the economy and societies in a whole. Establishing vending devices in schools, located in rural India, already supports breaking the taboo on menstruation. It gives adolescent girls living in rural and conservative areas access to sanitary products and allows them to continue their education, being able to join the workforce and have a voice of their own.

Conclusion

So we can conclude that the taboo on menstruation has already existed for as long as the human race and has been handled differently per culture, religion and area of time. It has continued to be upheld due to a lack of knowledge and stigma surrounding the topic. After women were given the right vote and work during the 20th century, the taboo lessened. This resulted in upcoming markets and research for feminine hygiene products, which gave women more mobility and freedom during their menstruation. Yet, the taboo still has a substantial force on societies and does a lot of damage to people, social relations, economies and the planet. It is still present in media, workplaces and governments. The taboo hinders innovation and appropriate accessibility of feminine hygiene products, especially in less developed countries where women are not financially able to buy these products. In the past years, many positive changes have been realised, like the creation of organic and eco friendly products, taboo free commercials and the reduction of taxes on sanitary products. However, a lot of awareness, knowledge gain, open discussion and acceptance still needs to take place in order to start breaking the taboo on menstruation.

Sources

- [1] Lecia Bushak, May 2016, "A Brief History Of The Menstrual Period: How Women Dealt With Their Cycles Throughout The Ages", [accessed: 18.05.2018], [website]: <https://www.medicaldaily.com/menstrual-period-time-month-history-387252>,
- [2] V.Venema, March 2014, "The Indian sanitary pad revolutionary", [accessed: 18.05.2018], [website]: <http://www.bbc.com/news/magazine-26260978>
- [3] G. Spadara, S. d'Elia and C. Mosso, 2017, "Menstrual Knowledge and Taboo TV Commercials: Effects on Self-Objectification among Italian and Swedish Women", 2017, [accessed 18.05.2018], [website]: <https://link.springer.com/article/10.1007/s11199-017-0825-0>
- [4] D. Fusaro, May 2016, "Menstruation in news media: The impact of media discourses on the menstrual taboo in France", MSc Thesis
URL:<http://lup.lub.lu.se/luur/download?func=downloadFile&recordId=8872699&fileId=8872707>
- [5] O. Perczynska and D. Preiss , October 2014, "Not just a girls' problem: the economic impact of menstrual shame", [accessed: 18.05.2018], [website]:

- <https://www.theguardian.com/global-development-professionals-network/2014/oct/30/costly-periods-economic-impact-of-menstrual-shame>
- [6] Shreya, November 2016, “The Ecological Impact of Feminine Hygiene Products”, [accessed: 18.05.2018], [website]: <https://rctom.hbs.org/submission/the-ecological-impact-of-feminine-hygiene-products/>
 - [7] N.Kounang, November 2015, “What's in your pad or tampon?”, [accessed: 18.05.2018], [website]: <https://edition.cnn.com/2015/11/13/health/whats-in-your-pad-or-tampon/index.html>
 - [8] Unknown, May 2016, “BREAKING THE MENSTRUATION TABOO “, [accessed: 18.05.2018], [website]: <http://www.nielsen.com/in/en/insights/reports/2016/breaking-the-menstruation-taboo.html>
 - [9] Christel, Yoni Care, April 2017, “Een geschiedenisles van Mariah: taboes & menstruatie”, [accessed: 20.05.2018], [website]: <https://www.yoni.care/nl/blog/2017/04/geschiedenisles-taboe-menstruatie/>
 - [10] R.Stockton, March 2015, “Let It Bleed: A People’s History Of Menstruation”, [accessed: 28.05.2018], [website]: <http://allthatsinteresting.com/menstruation-history>
 - [11] Cook & King, 1784,”A voyage to the pacific ocean”, Page 462, [website]: <https://archive.org/details/voyagetopacifico03cook>
 - [12] Lorenzo Jensen III, July 2015, “Here’s What The World’s Major Religions Say About Your Period”, [accessed: 28.05.2018], [website]: <https://thoughtcatalog.com/lorenzo-jensen-iii/2015/07/heres-what-the-worlds-major-religions-say-about-your-period/>
 - [13] C. Schuyt, E.Taverne, 2000, “1950, Welvaart in zwart wit: : de Nederlandse wederopbouw in 12 beelden”, [accessed: 29.05.2018], [website]: http://www.dbnl.org/tekst/schu069welv01_01/schu069welv01_01_0016.php
 - [14] K. Vancauwenberghe, 2007, “Schaamrood, De ervaring van menstruatie bij katholieke Vlaamse vrouwen (1920-1960)”
 - [15] Oxford Bibliographies, “The – traditions”, [accessed: 23-03-2018], [website]: <http://www.oxfordbibliographies.com/view/document/obo-9780195399318/obo-9780195399318-0173.xml>
 - [16] T. Persaud, M.Loukas, S.Tubbs, “History of Human Anatomy”, Book, 2014, ISBN: 9780398081041

- [17] K. Lister, Columnist of I News UK, 2018, "The Victorian period: when menstruation was a dangerous disease that could lead to madness", [accessed: 04.06.2018], [website]: <https://inews.co.uk/opinion/columnists/victorian-period-menstruation-nineteenth-century/>
- [18] Walt Disney, "The History of Menstruation", 1946, [movie], <https://www.imdb.com/title/tt0190806/>
- [19] Period.nl, 2016, "Back to the future: tampons", [accessed: 04.06.2018], [website]: <http://www.period.nl/factsfigures/back-to-the-future-tampons/>
- [20] E. Jonk - Metro News, October 2017, [accessed: 04.06.2018] [website]: <https://www.metronieuws.nl/nieuws/binnenland/2017/10/vrouwen-verstoppen-tampons-uit-schaamte>
- [21] US Department of Health and Human Services, January 2017, "What are the symptoms of menstruation?", [accessed: 04.06.2018], [website]: <https://www.nichd.nih.gov/health/topics/menstruation/conditioninfo/symptoms>
- [22] Unknown, [accessed: 04.06.2018], [website]: <http://jokes4all.net/pms-jokes>
- [23] The Citizen, May 2016, "Menstruation Keeps Girls From School: In India 20% Drop Out Reaching Puberty", [Accessed: 04-06-2018], [website]: <http://www.thecitizen.in/index.php/en/newsdetail/index/7/7836/menstruation-keeps-girls-from-school-in-india-20-drop-out-reaching-puberty>
- [24] Bodyform Channel, October 2017, "Blood Normal", [accessed: 05.06.2018], [website]: <https://www.youtube.com/watch?v=QdW6IRsuXaQ>
- [25] R. Spinks, April 2015, "Disposable tampons aren't sustainable, but do women want to talk about it?", [accessed: 05.06.2018], [website]: <https://www.theguardian.com/sustainable-business/2015/apr/27/disposable-tampons-arent-sustainable-but-do-women-want-to-talk-about-it>
- [26] The National Health Service UK, 2016, [accessed: 05.06.2018], [website]: <https://www.nhs.uk/conditions/toxic-shock-syndrome/>,
- [27] BBC News, August 2015, " 'Tampon tax' paid around the world", [accessed: 06.06.2018], [website]: <https://www.bbc.com/news/world-32883153>
- [28] Nederlandse Belastingdienst, [accessed: 07.06.2018], [website]: http://www.belastingdienst.nl/wps/wcm/connect/bldcontentnl/belastingdienst/zakelij/btw/tarieven_en_vrijstellingen/goederen_6_btw/geneesmiddelen_en_hulpmiddelen/verbandmiddelen/

- [29] R.Singh, V. Thawani, September 2017, “Tax-free sanitary napkins “, [accessed: 06.06.2018], [website]: <http://ijme.in/articles/tax-free-sanitary-napkins/?galley=html>, DOI: <https://doi.org/10.20529/IJME.2017.083>
- [30] Daily O, May 2017, “Tax on sanitary pads, not on sindoor-bangles: Modi government doesn't get women”,[accessed: 06.06.2018], [website]: <http://www.dailyo.in/variety/gst-menstruation-taxation-menstrual-health-sanitary-napkins/story/1/17389.html>
- [31] P. Das, K.Baker, A Dutta et al, 2015, “Menstrual hygiene practices, WASH access and the risk of urogenital infection in women from Odisha, India”
<https://doi.org/10.1371/journal.pone.0130777>
- [32] C.Lampen, 2017, “Can Period Leave Ever Work?”, [accessed: 07.06.2018], [website]: <http://www.bbc.com/capital/story/20170908-can-period-leave-ever-work>

3. State of the Art Research

Over the last few years, numerous studies have been composed on persuasive design and user engagement. Most of these studies focus on the persuasive abilities of computers and human centred design. Adding components like rewards or cues, have been proven to have a positive effect on stimulating interaction.

The effect of rewarding users for positive behaviour has been discovered to increase interactivity and engagement. A positive reward after the expression of positive behaviour stimulates the user and motivates them. Consolvo et al [5] discovered that positive reinforcement can be used to encourage change, by rewarding the user for performing the desired behaviour and attaining his/her goal. The appearance of an image or a sound can therefore give a sense of reward to the user of the device and stimulate the user to interact. Furthermore, Fogg [14] has determined as a result of his study in persuasive technology that giving praise is the most powerful persuasive use of language. Praise, when offered sincerely or not, affects people's attitudes and their behaviours. For a self service device like the Sampoorna™ device a form of reward could give the user a positive association with purchasing an item and could lead to increased interaction.

Another way of persuasion is through physical, psychological and social cues. When perceived as social actors, devices can leverage principles of social influence to motivate

and persuade the user. Adding psychological cues to a device can lead people to infer, often subconsciously, that the device has emotions and simply having physical characteristics is enough for a technology to convey a social presence [14]. A more attractive technology (interface or hardware) will have greater persuasive power than an unattractive technology, which shows that a great contributor to interaction and engagement is the element of beauty in design and user interface.

Beauty of the design can add greatly to a pleasurable interaction. In the “The Interplay of Beauty, Goodness, and Usability in Interactive Products” Hassenzahl researched that beauty of the design has a great impact on the interaction. Beauty has a strong relation to identification. When using the ‘Indian’ pink colour the user is able to identify the product or device to its cultural identity, since Indian pink has been discovered to be the most favoured colour by Indian women [4].

The colour design of auto-vending devices has also been proven to be a great contributor to improving user interaction. Jiang and Sun [11] have discovered that the colour design of a vending device should always notice novelty and creativity to make it have vitality and more competitiveness. The colour of auto-vending device for cupped beverage not only can satisfy the request for appreciating beauty, under the particular condition, but also has strong influence, which can cause the transfer of people's emotion and interest to attract people's attention.

A product has the ability to communicate a favourable identity to relevant others, making it social. Beauty is something to be shared, to be approved by others. Individuals may expect the beauty of a device or product they use or own to rub off on them. [7] The social aspect of beauty can be a great influence in convincing the users' peers to use the Sampoorna™ device. It has been discovered by Markopoulos and Dekker in “Interaction Design and Children” that children of the age 13 and above become more independent and their needs focus mostly on needs of identity and sexuality. Their activities become more socially and more goal-oriented [3]. Adolescent girls, who are the main users of the Sampoorna™ device, give high importance to their social group during puberty and therefore are greatly influenced by their peers. So if the interaction with the Sampoorna™ device can create a favourable identity to its user, then it is likely that the user will share it within their social circle.

New social trends are also novel ways to increase interactivity and add a ‘fun’ element to the user engagement. In “Designing for self-representation: Selfies, engagement and situated technologies” the impact of self representation in creating attention was researched by Fredericks and Tomitsch. People seeing their self-representations not only

draws the attention of passers-by, but also creates a strong visual connection between the interaction and the visualisation. The application of self-representation, therefore, has the potential to increase participation with the device [6]. Since this trend is very popular with young adolescents it can be a great way to improve the engagement with the Sampoorna™ device.

A more physical way of interaction is body-based interaction. Nijholt [1] has proven that people of all ages and backgrounds indisputably like and enjoy body-based interaction with systems. On the one hand, it feels more natural and intuitive, while on the other hand it “frees” them from the highly static and rather mundane interaction with desktop and mobile computing platforms. Furthermore, in general, body motion is conceived as more “fun,” irrespective of the actual application’s content. Since it is an element of ‘fun’ that the Sampoorna™ device is missing, body-based interaction could encourage users to engage more with the device.

In order to create a rich user interaction, usability is an important factor. Usability is widely recognized as critical to the success of an interactive system or product [13]. However, whilst designing interaction and engagement, it is important to focus not only on usability of the experience but also on customer’s satisfaction in order to create a good user experience and gain more user engagement. In “Introduction to the Special Section: Designing a Better user Experience for Self-Service Systems”, van der Geest, Ramey, Rosenbaum and van Velsen state that most case studies of design processes of self-service systems have focused mostly on what we are calling “classic usability” research. Those studies give a good view of the approaches and methods that designers have applied to ensure that their systems are easy to use and useful for the intended users in their specific context of use. In classic usability studies, the focus is often on designing for the instrumental, “make-it-work” qualities of the system, and less attention is usually paid to designing for the other component of classic usability, satisfaction. They recommend the practice of mixed-method strategy, which give designers a rich descriptive narrative about user views, feelings, and reactions that can help guide specific design choices [8]. user satisfaction is of high importance since delightful user experiences create memorable products and generate brand love. Creating delightful user experiences can help EcoDev in building a community around their Sampoorna™ device.

In order to design interaction, it is very important to have a Human Centred design approach. To ensure a successful outcome, the design must satisfy the needs and wants of

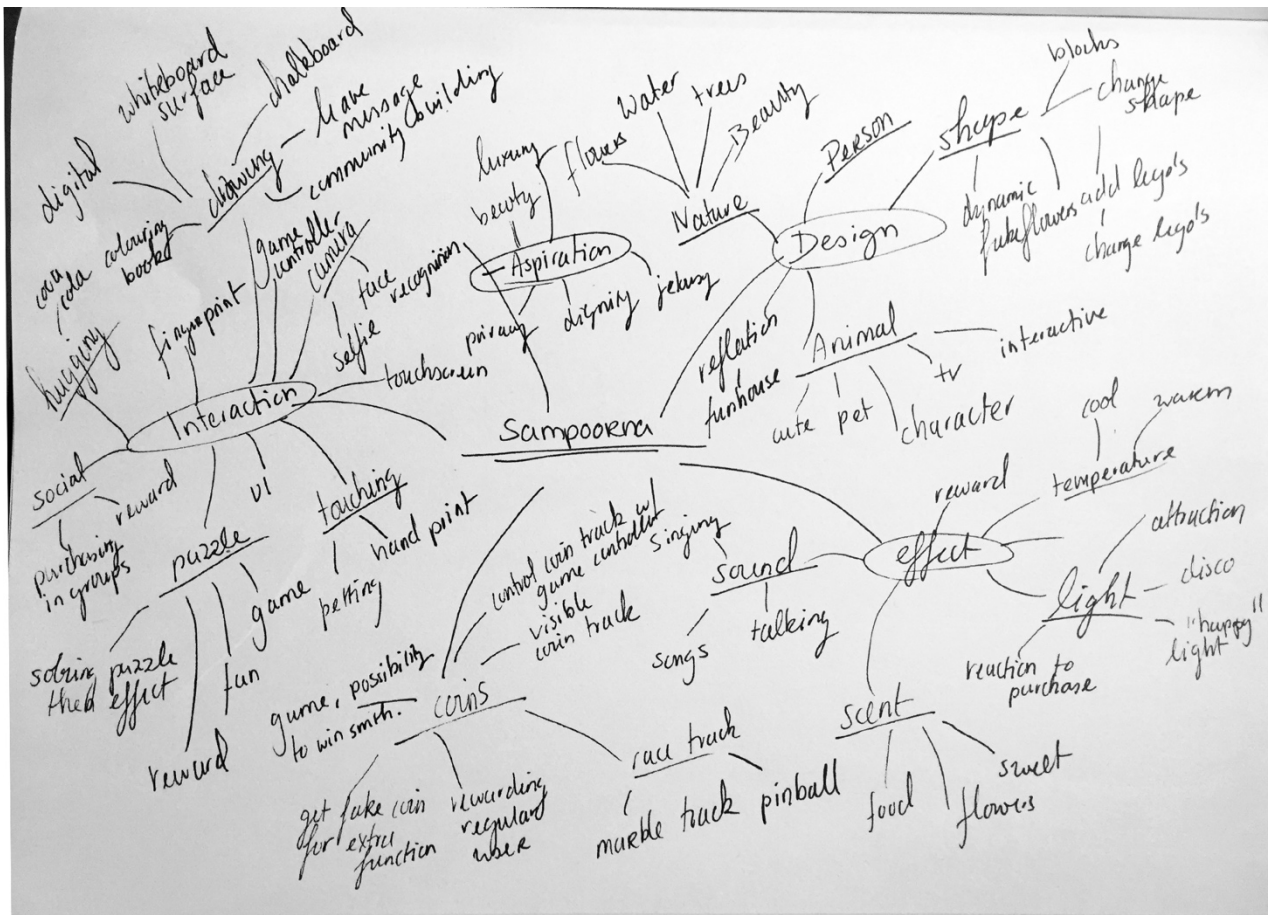
the user when the development is complete [13]. To achieve this, the users must always be taken into account and should be well known to the designer as well as their social context. For the auto vending device its design is of great important to the utility and its ability to create a pleasurable user experience. The shape of the auto-vending device should follow the art rule of variation and unity and meanwhile the whole shape still should be simple and direct. The filtering out of inessential information and being able to use the device in a light-hearted manner will result in a smooth user experience [3]. The colour design of the auto-vending device should not only satisfy the request of man-device coordination and environment and function, but should also value the choice of tone, match the new age request of appreciation beauty and notice novelty in order to create an optimal user experience, as researched by Jiang and Sun [11].

References

- [1] A. Nijholt, Book: "Playfull user interfaces", Chapter 3: Non-instrumented body tracking.
2014. DOI: 10.1007/978-981-4560-96-2
- [2] P. Markopoulos, M. Bekker, "Interaction Design and Children". Interacting with Computers: Volume 15, Issue 2, 1 April 2003, Pages 141–149
- [3] C. Wenshan, H. Yanqun, L. Minyang, "Influential factors of vending device interface to enhance the interaction performance June 2015", Conference: 2015 8th International Conference on Intelligent Computation Technology and Automation (ICICTA). DOI10.1109/ICICTA.2015.285
- [4] V. Bonnardel, S. Beniwal, N. Dubey, et al, "Gender difference in color preference across cultures: An archetypal pattern modulated by a female cultural stereotype", Color Research & Application 2017. 10.1002/col.22188.
- [5] S. Consolvo, D. McDonald, J. Landay, "Theory-driven design strategies for technologies that support behaviour change in everyday life". Conference on Human Factors in Computing Systems – Proceedings, Theory-driven design strategies for technologies that support behavior change in everyday life. S. S. S Consolvo, 405-414, 2009
- [6] J. Fredericks, M.Tomitsch. "Designing for self-representation: Selfies, engagement and situated technologies", ACM International Conference Proceeding Series, Part F134477248-256, 2017
- [7] M. Hassenzahl, "The Interplay of Beauty, Goodness, and Usability in Interactive Products", Human–Computer Interaction, 19:4, 319-349, 2004

- [8] T.van der Geest, J.Ramey, S.Rosenbaum et al "Introduction to the Special Section: Designing a Better user Experience for Self-Service Systems". IEEE Transactions on professional communication, Vol. 56, No. 2, June 2013 DOI:10.1006/ijhc.2001.0503
- [9] M. Maguire, "Methods to support human-centred design", Int. J. Human-Computer Studies (2001) 55, 587- 634.
- [10] B. Fogg, "Persuasive Technology: Using Computers to Change What We Think and Do", Chapter 5: Computers as Persuasive Social Actors, (2003).
DOI: 10.1016/B978-1-55860-643-2.X5000-8
- [11] X.Jiang, Y. Sun, "Design and Application on Auto-vending Device for Cupped Beverage", Research Journal of Applied Sciences, Engineering and Technology 8(22): 2300-2304, 2014. DOI:10.19026/rjaset.8.1232

4. Brainstorm



5. Evaluations

Evaluation 1

Are we allowed to mention your name? yes

Name: Krittika Choudhury

Gender: Female

Age:23

Study: masters, biomedical

Nationality: Indian



- First, we will explain about the Sampoorna device
- Then the user will take a look at the UI and interact with it
- Afterwards we will start asking the questions below

What is your first impression of the UI?
I think it is clear. What it says is what it does. The text at the time icon may be confusing, because it says check up every two hours and the icon shows a six. The layout is easy on the eyes, simple. Self explanatory .
Would you be intrigued by the design when you were in high school?
It depends on target group. The rural kids are very different. If someone very un-educated looks at this, language could be a problem. It should of course be in Bangla. The pictures are self explanatory, so they won't be hesitate to use it.
What do you think of the interaction?

They are logical and it is easy to understand where to go from where. It wasn't clear to me, however, that the EcoDev logo right above is a button. Maybe make it more obvious that you should click on the icons. This could be overlooked.
Do you think the design can be considered aspirational?
Not so sure, since you are not giving them any options to personalise. I don't know how people would react. I don't think a lot of these things exist there, so I don't know what the initial reaction would be. They wouldn't be hesitant, however, I wouldn't say it's aspirational.
Do you think the design can help stimulate knowledge gain about the topic of menstruation?
Yes, probably. If you are looking at the taboo: The home page is fine, but you never know the target group. The home page could maybe be customised on what area you are targeting. This is okay for urban areas. They are more conservative in rural areas. If there is an image that is not according to what they are used to seeing it would not be considered appropriate. They would get uncomfortable looking at some pictures. Again, there are multiple levels of rural. Depending on what you are exactly targeting. The first icon you could change a little bit. The flower design is fine. Even the icons are fine, but in my mind I am thinking about complete rural areas and they would maybe have issues with these icons.
Do you think the design can create more positive associations towards the topic of menstruation?
Yes, since it is a little gamified. Anything which involves something like that makes it easy for people to navigate and makes them want to know more.
Do you think there might be any cultural related problems with this design?
In India the lotus is an icon of political party's. They use a lotus. This is pretty much exact BGP.
Is it clear how to use the UI?
Yes, definitely. Only the button of EcoDev is unclear. I didn't realise that is a button. The website looks fine. If the screen is big it will be readable. Also, there may be too much text on the other pages. Could be hard to read on a small screen.

Is there anything you think can be different?

It looks nice and fine to me. The menu could be a bit bigger. It is now not very clear to see.

Maybe you can create a first screen that is only showing an introduction? And then the second screen leads to the current home screen. When I look at it right now, you can see the information immediately. Maybe there should be one introduction screen, so people do not get to see all the information immediately. So you can have something that plays on loop and when someone comes close to the device and touches the device, then they get a screen explaining about sampoorina and how to navigate to the system. Then they click on where they want to go and it goes to like the screen you have here. The Home screen, with the information.

In the front of a screen, if I see a lot of information it's hard for me to process. It would be easier for me if there is a step to step guide.

Evaluation 2



Are we allowed to mention your name? yes

Name: Priyanka Pereira

Gender: Female

Age: 33

Study: Masters - Educational Science and Technology

Nationality: Indian



- First, we will explain about the Sampoorna device
- Then the user will take a look at the UI and interact with it
- Afterwards we will start asking the questions below

What is your first impression of the UI?

First thing, If you plan to market it in rural areas, they wouldn't know how to use a vending device. Maybe the first page should be about using the device so they'll know. Their priority will be buying the product. Clearly instruct them on how to purchase an item.

I like the colour scheme, I know that these are their colours.

- The animation?

I did not even notice it, only now that you are saying it. I don't understand the added value of it. Maybe it would be better when they click that that animation could appear and then it would go to the specific screen?

- The images?

I know you have used a lotus; it can be very offending, because of the political party BGP. It is the current ruling party in the country. But because in Bengal, where you're using it, they are very against the BGP, it could be an issue. The people in Bengal support a communistic party. It can be offending to people in rural areas, because they vote for the icon of the party, since most of them can't read at all. When they vote they can't read the name, so they use the symbol, so for them the symbol means more than the name.

You can change it to any other flower. The rose maybe? There are a lot of other flowers, but there aren't that many flowers which are well known in India. I know you have used a water lily, but for them the lotus is alike the water lily even though it is a different flower. Another very recognized flower in India is the African Daisy

- The information?

I think it is good. Especially since you are targeting kids, it is nice that everything is big. It is an easy interface.

Would you be intrigued by the design when you were in high school?

I think the design is pretty, I like the colours and everything. It is easy to use. I think the icons are good to be big, but because all attention goes to these 5 huge flowers, I did not even see the two other tabs at the top. Also, there is now nothing that says that you are on Home. Nothing indicates on which page you are currently.

If you change to a different flower, and you choose subtler colours, ... all I see is these 5 flowers. So consider putting the instruction in the centre, so that it is more in your focus. I now don't see these tabs and the instructions, because the tabs are green as well as the flowers, so you don't notice them anymore. So if it would be a different colour it would stand out more.

What do you think of the interaction?

I like that it has an animation when you click it. It is quite clear. It is very easy to use. Especially for kids. The amount of information is little. The attention spans of kids aren't long. The fact is that they're going to the device for buying sanitary napkin, it is good not to have much information. I like the big arrows, making it very clear that you can click it. Maybe consider changing the order.

If I want to go back, to see all the icons, it takes a while to realise you have to click home. When you were on the home screen, you didn't know you were on the home screen. It would be best if you'd create a clearer way to show how you can go back to the Home screen.

Do you think the design can be considered aspirational?

It doesn't particularly do that for me. For me sanitary napkins don't have that effect. Especially if you are targeting rural girls, during those days they don't go to school. If it is affordable for them, I can see that it can give them those aspirations, because for them it is something that allows them to go to school on those days and give them more freedom.

Do you think the design can help stimulate knowledge gain about the topic of menstruation?

The thing is, if you consider the other two tabs, it is not exactly something that school children would be interesting in it. It is very marketing style language. It is very high level language. Business type. These are not the kind of words that children would use.

This is more for adult women, who are more city centre and cosmopolitan. I have been in the villages, I don't know exactly what they are targeting, but none of these words would make sense to them and they wouldn't care because it does not relate to their life. Instead of this, you should do something more like 'How to manage your menstruation'. Show pictures and give them advice on how to take care of yourself. They have many superstitious, so you can do some myth busting, and show that these superstitions are not real. It would be good for these girls to have something that makes them feel that even when they are menstruating everything is fine, it is normal and that they still can do everything. They can still eat with the family et cetera.

To them this texts mean nothing. Just put in something like "Did someone tell you that you can't do this? You know what? That's not true! Just live your normal life etc.".

That would make more sense.

The Health tab is okay, I can understand.

Do you think the design can create more positive associations towards the topic of menstruation?

In the way that it is talking openly about it, sure. I think the second tab, where you then could talk about that they don't have to feel restricted, that is what would create a positive feeling with the product.

What you are now saying with the icons, this gives a positive feeling. You should add more of this.

They can't do anything, these girls, during those days. If they stain themselves, then the whole class will be like "O my god, it is a catastrophe". And the second thing is, many don't have any products. Because of this device, they'll have it, but the mentality is that you don't have anything. You just use cloths, like in the old days. You just sit in the house and can't go to school.

Do you think there might be any cultural related problems with this design?

No. The colours are pretty neutral. The EcoDev pictures of these girls, they look like the girls that would use the product and then they can identify with them better. So I like the pictures. And the pink is nice. Girls like pink. The green for EcoDev and the environmental things are nice.

I would say, rather than showing a handbag, show a schoolbag. They have a specific schoolbag in India. But not a western schoolbag, an Indian school bag.

The icons of a woman's body are both very western. Hourglass figures. This shows a more ideal picture of women's bodies.

Is it clear how to use the UI?

I did not see the three tabs at the top and the instruction. This was confusing. Maybe put the instructions in the centre.

Is there anything you think can be different?

If they feel embarrassed they might think that they can put their used sanitary napkin in the bag, because they are too ashamed to throw it in the incinerator, located in the bathroom. Make clear that they can only store unused sanitary napkins in their bags.

Make the icon about storing the napkin in your bag the second item, before the application icon, so it will be clear that you can only store unused pads.

I did not see the icon for the EcoDev website. I thought it was a non-interactive logo.

Evaluation 3

Are we allowed to mention your name? yes

Name: Shrutika Dandekar

Gender: Female

Age: 24



Study: M. Industrial Design Engineering

Nationality: Indian

- First, we will explain about the Sampoorana device
- Then the user will take a look at the UI and interact with it
- Afterwards we will start asking the questions below

What is your first impression of the UI?
<p>It's very easy. The pictures make it obvious what you want to say. If you are going with a rural area, cut down on the text, especially on the other two tabs. Most are illiterate or don't have the patience to read. Especially women, since they lack education. Maybe show a visual example of how you apply the pad. This should not be on front page but on the link of the pad icon.</p> <p>Overall I think it is pretty.</p>
Would you be intrigued by the design when you were in high school?
<p>Definitely, if there was interactive screen. The colours are very clean. The front page is not very text heavy. If there were something like this, girls would want to go look for themselves, maybe educate themselves.</p>
What do you think of the interaction?
<p>Pretty straight forward. Not too complicated. Maybe make it a bit more clear that you have to touch the flowers.</p>
Do you think the design can be considered aspirational?
<p>I don't know, because it's more question of hygiene, than accessibility or anything else. I think it'll be a new thing to have something that is so easy to use. Rural girls are not used to getting help in this area. Rural back quarters use only cloths not even sanitary pads. I think the design is straightforward and clean.</p>
Do you think the design can help stimulate knowledge gain about the topic of menstruation?

Yes, definitely. Because the pictures tell you what their talking about. Maybe add sub section to tell about the pad and how to put it on.
Do you think the design can create more positive associations towards the topic of menstruation?
Yes, because it is discreet, but still obvious. The design is not very graphic but it tells you what it is going to do. The text is good enough. Simple.
Do you think there might be any cultural related problems with this design?
No, I don't think so. The colours especially, because there is no orange in it. Orange is a Hindu colour and this could be seen as something aggressive and religious. The lotus, is the flower of the BGP, that is a problem. Rather choose a different flower. However, keep the colours. It is not at the moment necessary to change the flower. If you would make it a green/orange lotus, it would be very offending, because of the national party thing symbolisation.
Is it clear how to use the UI?
Yes, simple, clear.
Is there anything you think can be different?
Nothing, part from what I said. I think that is all. Maybe add information about the incinerator. Also, when they have used it, say that they shouldn't flush it through the toilet or something.

Are we allowed to mention your name? yes

Name: Nina Bhuva

Gender: Female

Age: 22

Study: Electrical Engineering Masters

Nationality: Indian

- First, we will explain about the Sampoorna device
- Then the user will take a look at the UI and interact with it
- Afterwards we will start asking the questions below

What is your first impression of the UI?
<p>I don't think there is anything to be concerned about, like cultural differences. The look seems very good, very nice. I love the lotuses.</p> <p>It is nice, fun. I like the selection of colours. It doesn't look like a dull thing. The text looks like something I would want to read. It looks educated and informative. Maybe it would be a bit much for children to read. The home screen is pretty.</p>
Would you be intrigued by the design when you were in high school?
<p>I think adolescent girls would make fun of things like, the icons, because it is not normal to see these things there. Even girls wearing shorts in public is a big thing. People will start staring at you until you feel uncomfortable.</p> <p>There are commercials on TV that show pictures like this, like sanitary napkin commercial or hygiene soap/douche commercials. They use similar images. I haven't heard that they could be an issue, but it is a possibility I can think of. However, there is nothing subtler that can be done.</p>
What do you think of the interaction?

It is good. Convenient.
Do you think the design can be considered aspirational?
<p>Yes, I think, in fact I was going to say that I like that you only shown a clock and the number six, even if I don't go click on it and read the text, I still know what you want to express to me. I think the flowers on the home screen can be a huge issue, since the lotus is the logo of a large political party in India.</p> <p>The animation is good. If it would be faster, it would be more attractive, since a person is more inclined to pay attention to something that is moving.</p>
Do you think the design can help stimulate knowledge gain about the topic of menstruation?
Yes, and I also think that is necessary.
Do you think the design can create more positive associations towards the topic of menstruation?
<p>I think the step of creating something like this, is in itself a positive association with menstruation. The design, I don't know how positively or negatively it could be interpreted. I don't see anything negative except maybe the lotuses. You could make it a rose or sunflower.</p>
Do you think there might be any cultural related problems with this design?
<p>Not really.</p> <p>Only the lotus, because of the political party and because it is associated with Hinduism and Hindu majority. 80 % or more are Hindu in India</p>
Is it clear how to use the UI?
Yes, quite standard. I knew where to click, and everything.
Is there anything you think can be different?
<p>If it is a touch screen, we are not really used to touch screen. If you write very small, click on the lotus or flower, it would be more obvious for the people that it is interactive. Now it is not very clear that you can touch the flowers. Maybe put a a click symbol, somewhere close to the lotus. Furthermore, because of the colour contrast I thought that the three icons displayed on the EcoDev page were also buttons.</p>

Comments: She didn't recognize the EcoDev logo as a button and thus didn't click on it.