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ALTERING HUMAN BEHAVIOR BY DESIGN. HUMAN'S PHYSIOLOGICAL URGE TO URINATE IN UNEXPECTED SITUATIONS

INIMKÄITUMIST MUUTEV DISAIN. INIMESE FÜSIOLOOGILINE HÄDAVAJADUS URINEERIDA OOTAMATUTES OLUKORDADES

Author applies for degree of Master of Technical Sciences (M.Sc.)

Tallinn 2014

MASTER THESIS OBJECTIVE AND TASK

2013/2014 academic year spring (4th) semester
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Master's Thesis topic:
Altering Human Behavior by Design. Human's Physiological Urge to Urinate in Unexpected Situations
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Tasks and timeframe for their completion:

No	Task description	Completion date
1	Preliminary research (users, situations, existing products)	24.February 2014
2	Systems Oriented Design Giga-mapping analysis	3.March 2014
3	Experiments, field research, existing products' tests	10.March 2014
4	User research and case studies	24.March 2014
5	Concept proposition, preliminary brief	7.April 2014
6	Interviews with different user groups	28.April 2014
7	Case studies of unexpected situations	12.May 2014
8	Preliminary concept development and rapid prototyping	20.May 2014
9	Finalizing Master Thesis	26.May 2014

Design and Engineering problems to be solved:
Analyse the possibilities of altering human behavior by design and propose new product(s) or solution(s) (for different users - user groups) that could be used when experiencing the urge to urinate in unexpected situations where no conventional restrooms are available.

Defence application submitted to deanery not later than May 30th, 2014.

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Enterprise based confidentiality and other terms to formulate on the reverse side.

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INTRODUCTION

As humans, we all have the physiological need to urinate several times a day. Usually we don't pay that much attention to this bodily function, because it's something that is part of our lives and we will go to the restroom when we feel the need to go.

It all becomes way more tricky when we have the urge, but for some unexpected reasons we can't go. Either it can be the situation of being stuck in traffic congestion or traveling long distances on a highway without any exit for miles and miles. It can be even more difficult for people with disabilities, for example people in wheelchairs to go from sitting in the wheelchairs to the toilet bowl on their own. Or the situation where there is only few free toilets available (e.g. in the public space in the cities) or no toilet and running water available whatsoever (e.g. in developing countries, refugee camps etc).

We all have experienced at least once in our lives how painful this waiting can be, when all you can think about is the urge to urinate and nothing else. In this agony people have proved to solve it quite creatively using empty water bottles, plastic bags and many other ways, but it's definitely not the best way to go.

All of this raises the question about the possibility of altering human behavior in this personal subject matter. Hence the following research question is raised: in what terms would it be socially acceptable to urinate in unexpected situations and what kind of a solution should exist in order to do so.

Many companies have already tried to solve the problem if you experience the need to urinate in traffic situations and there are, in fact, several products available on the market but those aren't very widely used. In this master thesis I will be analyzing existing products on the market in order to identify their weaknesses and by doing so I can get a better understanding of what constraints needs to be fulfilled when offering a product, service or a solution which would satisfy the above mentioned human need.

The fact that many companies are working to solve this issue in traffic situations refers clearly that they see this as a problem area worth tackling, but I wonder how many of them have approached this in a systematic way, concentrating on human's needs through human-centered design, because it seems they all are lacking something that would make these products widely used all over the world.

Methods I used in this master thesis research are all derived from human-centered design and design thinking. I used GIGA-mapping technique by systems oriented design and also conducted empirical interviews with open-minded individuals ready to discuss the subject matter. In addition, I ordered several existing products in the market from online shops and executed experiments and user tests in order to have a diverse understanding of the issue. I carried out part of the research in the United States of America, in California where I had the opportunity to travel for a research and study visit. During the 20-day research visit I conducted user research interviews for getting insights from people's lives and experiences, interviews with experts in various fields, analyzed user case studies and documented traffic situations in cities and on freeways, generated and analyzed ideas in order to understand peoples' ways of thinking about alternative solutions for this personal activity.

This thesis offers the possibility to raise awareness of the topic and give suggestions for improving the future for the better when making it more human-centered and ecologically sustainable. It is the first step of a design development project which will hopefully sooner or little bit later turn into a startup company working towards of solving the fundamental need of every human being in a more sustainable way. Raising awareness and educating people globally about the importance of sustainable sanitation is hopefully the starting point for creating a better world for the future generations.

1. BACKGROUND AND RESEARCH OBJECTIVE

Everyone has a story or two about their experiences having the urge to urinate really bad. Although it's usually not common to share these stories, my master thesis will include some of the collected stories that could offer insights and lead to opportunities and solutions for changing what currently prevails.

My first-hand experiences tell the vivid story how the urge to urinate appears when one least expects it and in a way those experiences mark the beginning of how this research thesis topic came to me already few years ago.

In May 2011, I had an arthroscopic knee surgery at Magdaleena Outpatient Clinic of East-Tallinn Cental Hospital, Estonia which was the result of a childhood trauma when I unluckily jumped down the stairs and bent my knee. The accident happened back in the 90s and twenty years later I was suggested to have a knee surgery to figure out what is causing the pain. I was operated by Estonia's leading sports traumatologist, Dr Mihkel Mardna so I felt confident in general, but still little bit afraid as this was my first stay in the hospital.

The most relevant sequence of events in terms of this research paper started right after the surgery. For the recovery I had a peripheral intravenous drip line inserted into a vein on my arm for rehydration and giving the medicine and as a result this liquid intake started to slowly fill my bladder. As I was staying in a shared room with another patient - a woman in her 50s - I didn't feel comfortable using the bedpan in front of her. So I decided to hold it until the nurses let me walk into the bathroom myself.

As hours passed, the waiting became intolerable and I simply had to suppress my dignity and ego and called for a nurse who promised to bring me the bedpan. The whole experience of using it for the first time was mind blowing. The nurse handed it to me and expected me to know what to do with it. Somehow I managed to slide it under myself, but as it was so uncomfortable to urinate in a horizontal position (nobody changed my bed position) when laying in bed on top of the plastic piece of this medical device, I simply couldn't go for more than 15 minutes. I was just laying and waiting in pain but nothing happened. Of course the urge to urinate grew with every minute and finally I managed to do it, but it was the worst thing I have ever done. When I was finally finished I called for help and it took another 5 minutes or so to get it away from me. The unpleasant experience got even worse when nobody gave me a tissue or wet wipes to maintain my personal hygiene, luckily I had my own paper handkerchiefs within reach and I could call it a day in hopes of forgetting it ever happened. But I didn't forget. In fact the negative experience gave me the impulse to think about this user experience from the designer's point of view, because no doubt I am the only one experiencing this while staying in the hospital.

Another personal experience comes from the summer of 2013, while traveling through California for a hiking trip to Sierra Nevada mountains when I experienced something what could be called the greatest urge to pee in my entire life. Looking back to the day, it was something I didn't expect at all and it hit me without warning.

In the morning of our car journey that had to take us from Southern California to Sequoia National Park I ate cereal with milk and decided to buy some sweet drinks from the gas station where we stopped to get gas before hitting the road. The weather was nice and sunny and we wanted to drive through Los Angeles as fast as possible in order not to get stuck in the morning traffic.

Soon after I had finished drinking my soda I felt I have to go to the restroom some time in the near future. When I brought up the conversation about it, my friend who was driving asked if I could hold it for more and I was sure I could. We kept on driving and my need to go to the bathroom grew slowly with every mile.

As I had not travelled within the U.S. before where distances are longer and speeds higher, I didn't know what are the distances from one gas station to another, so I really didn't have the sense of time and distance and couldn't objectively estimate my willpower and bladder strength when waiting to get to the restroom.

When we were approaching the first gas station I decided that the urge is not that bad yet and we can keep on driving to the next station as well. Little did I know it wasn't until another 45 minutes of driving to get us there. The time went by so slowly and I was in such pain the whole way. And there was no rest stops or exits on the Interstate either.

Once we managed to stop in the next gas station, I had hard time walking to the bathroom because the pain was terrible. I wanted to run, but could only walk very tiny steps at the time. When I finally got to the restroom I learned that one toilet cubicle was occupied and another one didn't have the lock on the door – it was broken. Latter didn't stop me though and I just pulled the door after myself so it remained half-open, but that was the least of my concern. I couldn't believe the waiting was over and I was so happy I could have cried.

After getting back to the car and continuing our journey my abdomen hurt for several hours, because my bladder was so stretched out it took a while when everything fell back into it's place.

As Chris Dixon puts it in his speech at Startup School 2013 "the best ideas come from direct experience with the problem" (Dixon, 2013) it is how these personal stories explain the choice of this thesis. Having experienced the painful urge to urinate multiple times in the last few years made me think why I was experiencing it and if there was a way to improve the current situation. After recognizing the existence of the problem space I wanted to research the subject matter further to identify opportunities for a better and more dignified ways to relieve oneself in unexpected situations.

The aim of this research is to find out if it is possible to alter human behavior by design and make the activity of urinating socially acceptable when offering a new and possibly better solution to relieve people's pain in unexpected situations.

2. METHODOLOGY

This thesis is based on IDEO's human-centered design process according to which every new product, service or system should meet the untold needs of the users or solve problems what people are encountering in their everyday lives. In addition to desirability by people, new solutions have to be technically feasible and financially viable, also socially responsible and environmentally sustainable (Kelley & Kelley, 2013; HCD Toolkit).

The approach I have chosen to follow in this thesis research is derived from Roger Martin who writes in his book *The opposable mind: how successful leaders win through integrative thinking* that we need to examine users' unrecognized needs and propose solutions which would satisfy those needs (Martin R. L., 2009).

In order to identify the needs and develop solutions, this thesis is also based on *Double Diamond* model which is a way of mapping the design process which Design Council in UK worked out in 2005. It consists of discovery, definition, development and delivery phases(Introducing design methods, 2013).

In fact, parallels are eminent between *Double Diamond* model and divergence-convergence model by Bela H. Banathy (1996) and Nigel Cross (2000) where both models are visually similar, shaped like a double diamond. Divergent and convergent stages of a design process refer to the designers' thinking modes through the whole process. It is where Banathy states that diverging and conversing takes place in both phases where at first we diverge in inquiry, then converge in making choices and creating image for future system, after which we again diverge in creating alternatives and converge in evaluating these in order to make a selection to choose the best desirable solution(Banathy, 1996). And Cross adds that in order to get to the final convergent design proposal, the process will involve divergence periods where one has to widen the search, seek for new ideas or go back to the square one (Cross, 2000).

In addition to Banathy and Cross, Tim Brown, the CEO and president of IDEO writes in his book *Change by design: how design thinking transforms organizations and inspires innovation* about divergent thinking process which multiplies options in order to create choices, whereas convergent thinking makes choices when deciding among existing alternatives. Design thinking according to Brown is continuous movement between divergent and convergent thinking processes and analysis and synthesis which are also essential parts in the process of creating options and making choices (Brown, 2009, p. 66-67, 69).

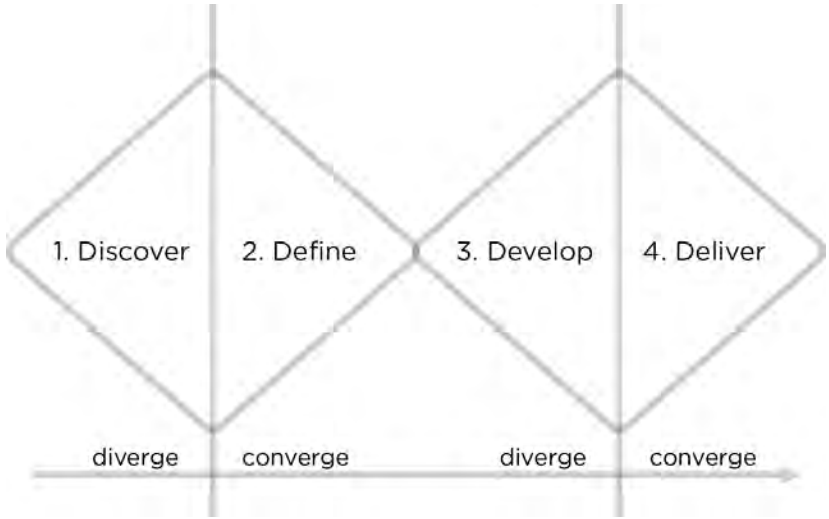
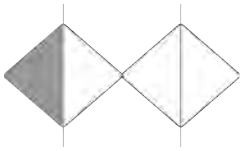


Figure 1. Double Diamond model & Divergence-Convergence model.
Adapted from Design Council (Design Council).

2.1. Discover



Discovery phase of the Double Diamond model is the beginning of every design project which is also widely known as the "fuzzy front end" where it is unclear where the project will eventually end up. It is the part of the project where one has to be curious and ask as many questions as possible while being comfortable with uncertainty. Asking "why" and "how might we" questions gives an opportunity to reframe a problem, redefine the constraints and reveal hidden information which helps to understand the context and offer valuable insights for the next phases. The discovery phase of human-centered design is all about user research and the sincere interest in people and their lives and the ability to empathize with individuals whom you have never encountered before when wanting to solve their problems and satisfying their needs.

In the discovery phase, it is common to observe the users in order to understand where problem areas occur, try out how it is to be the user when empathically putting yourself into the shoes of others, conduct one-to-one interviews with a sample of users which will help identify opportunities, brainstorm and visualize everything quickly on paper which communicates the idea well enough and in turn will stimulate more ideas (Introducing design methods, 2013).

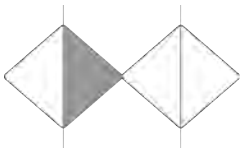
In addition to above mentioned techniques, GIGA-mapping technique by systems oriented design (see Appendix I) was used and a GIGA-map was created through a teamwork in one-week workshop by Birger Sevaldson. This technique enables to tackle the complexity of a problem by mapping out all of the different aspects of the topic one step at a time in a visual way (Sevaldson, 2011).

In the discovery phase, I reviewed relevant literature in the libraries of Tallinn University of Technology and Estonian Academy of Arts in Estonia and Gleeson Library of the University of San Francisco and Copley Library of the University of San Diego, in California. The secondary research from the latest online based sources, business and design magazine articles and blog posts was also essential part of the research in order to understand the context and to be up-to-date with the latest developments in the field.

It is also in the discovery phase where I conducted user and market research, empirical interviews with users and experts in various fields, brainstormed ideas (also credits go to the visual GIGA-map), tested the existing products in the market by trying out and observing how it would be to use the products which I was able to acquire through online shops, analyzed test results and user case studies, documented traffic congestions and traffic jams in the cities and on freeways in California, generated and analyzed ideas in together with people to understand peoples' acceptance in adopting new ways of thinking about this personal business.

Conducting a part of this thesis research in the different culture space in California gave me the opportunity to see the issue from a different perspective. Or as Martin writes: "Opposing models are the richest source of new insight into a problem. We learn nothing from someone who sees the problem exactly as we do" (Martin R. L., 2009, p. 124).

2.2. Define



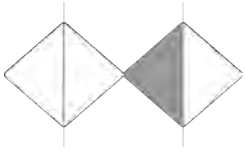
In the definition phase, creating customer journey maps and comparing gathered information is the next step which helps to form the foundations for the second part of the double diamond model - that is the development and delivering phases. This is the design project phase which helps to make sense of all the gathered information, insights and possibilities from the discovery phase. Recognized human needs are interpreted into business opportunities at this point.

As a conclusion from discovery and definition phases, the design brief is being formed which will be the stepping stone for the next two phases of the project. Brief is for framing and guiding the project, communicating clear goals what the design project hopes to achieve, while being abstract or not too concrete which gives the distinctive flexibility to be open to changes when something unexpected will be revealed during the development process. The design brief consists of value proposition and the description of the functionality and features of the soon-to-be-proposed solution which will be the bases for the next half of the project offering benchmarks by which to measure progress and a set of objectives to be realized.

In the definition phase I compared and analyzed gathered information and insights from the discovery phase in order to make sensible decisions before forming the

design brief. I also searched for suitable business models and analyzed promising distribution channels and marketing strategies for entering the selected market.

2.3. Develop

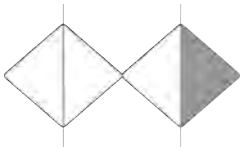


Development phase is where the solutions are created, prototyped, tested and iterated. Through rapid prototyping and several processes of trial and error it is possible to explore, improve and refine the ideas.

Personas and user scenarios offer the understanding of the context where users would be interacting with the product or service and by doing so, it offers the possibility to refine the concept. Role-playing out the whole product/service user case in the real world can prompt intuitive reactions and again it can refine the ideas. With the help of rapid physical prototyping and building a model of the idea one can test the proposed principles and get insights how the product or a service would be used in the real world (Introducing design methods, 2013).

Development phase is where I created an early rapid prototype to test the working principles of the first promising ideas. This is also the phase where the development of the design project will end at this point. Developing and delivering the solutions for this design problem needs extended timeframe in order to successfully test the ideas, iterate prototypes and assess the acceptance of the proposed solution among the prospective target market.

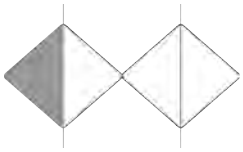
2.4. Deliver



This is the phase where the final product or service is being launched in the selected market. Before launching, the final testing is being made and if all goes well that is the phase of the product development process where to collect feedback from real-world customers who have already acquired the product. Getting feedback offers the possibility to analyze customers' user experience and the general acceptance of the offer.

I agree with Tim Brown that in all of those four phases of a design project one needs to be optimistic and believe that things could be better than they currently are because with that kind of an optimism you will have bigger chances of achieving a positive impact when serving the unmet needs of the people (Brown, 2009, p. 76).

3. PROBLEM BACKGROUND AND CONTEXT



As every human being, we all need to eat, sleep and excrete body wastes so we could be able to function in this world where we live in. Human's physiological need to urinate several times a day is self-evident and shouldn't need more attention, unless the urge to urinate occurs unexpectedly or comes with unpleasant occasions or in relation with medical situations. The incidents when one has the urge to urinate unexpectedly occurs everywhere in the world and that is why the problem is actual all over the world. Because no matter where you live, we all spend a lot of time in the restroom.

A bathroom firm Bathstore survey found men are using the toilet for one hour and 45 minutes a week (91 hours per year), while women spend there just one hour and 25 minutes a week (74 hours per year; which on average equals one year, seven months and 15 days in one's lifetime), meaning men spend 17 hours more per year on the toilet (Killelea, 2014; Sanghad, 2014).

According to American Standard's 2008 Bathroom Habits survey people are doing a lot more in their bathrooms besides the obvious: 88% use at least one electronic device; more than a third read their mail (both regular post and e-mail); 43% get dressed; 20% sing; 19% listen to music via radio or iPod; 15% talk on the phone; and 3% watch TV. The survey also examined consumer toilet frustrations and that included fixtures that don't flush all the way (19%), appearance (18%), running water or needing to jiggle the handle (18%), and not conserving water (17%) (American Standard Bathroom Habits Survey Shows We're Multitasking, Even In the Bath, 2008).

In 2011, Google commissioned a survey in partnership with market research firm Ipsos OTX in the U.S. in order to find out how smartphones are being used by the consumers as a part of their daily lives and the results referred to the fact that 39% admitted to having used their smartphone while going to the bathroom (Rao, 2011).

Another survey commissioned in 2011 by online address-book site Plaxo was conducted and the results revealed that nearly 1 in 5 people accidentally drop their phones into the toilet (Matyszczyk, 2011).

Also in 2011, researchers from the London School of Hygiene & Tropical Medicine and Queen Mary, University of London analyzed 780 swab samples (390 from mobile phones and 390 from the hands that used them) in 12 cities in the U.K and found that 16% of both hands and phones were contaminated with *E. coli*, fecal origin bacteria potentially causing illnesses. That is most likely because people don't wash their hands after using the toilet (Song, 2011). The article suggested if you don't have access to soap and water, the least you could do is use an alcohol-based hand sanitizer.

In October 2011, marketing company 11Mark conducted a survey called “IT in the Toilet” according to which about 75 percent of 1000 Americans admitted to using their mobile phones while in the bathroom (IT in the Toilet, 2012; Castillo, 2012). The results of the online survey that came public in the beginning of 2012 revealed people are reading text messages (67%) and sending text messages (59%), answering phone calls (63%), initiating phone calls (41%), reading emails (42%), surfing the web (38%), using apps (38%) and using social networking (28%), last but not least people are making online purchases (10%) while on the toilet (Mello Junior, 2012). Today, the total percentages could be even higher due to the increasing number of smartphone users.

3.1. Web and Mobile Apps

Following the success story of Airbnb, Max Gaudin and Travis Laurendine decided to set up a service of Airpnp, which “takes care of the lavatory logistics so you don’t have to”. Analogous to Airbnb service which lets you rent out your appartement or the whole house to people who instead of staying in hotels can stop at other people’s homes or vacation cabins, Airpnp gives residences and businesses the opportunity to rent out their bathrooms to people in their immediate location who need to use it. You can locate the nearest toilet easily through a mobile optimized web application and by paying the amount set by the owner of the place, you can get the access to someone’s toilet when you need to. Airpnp app, launched in March 2014, is currently not as widespread as Airbnb, but it is growing as the service gets more recognition. The founders cleverly suggest everyone to “become an entrepeeneur” and make money when they let people use their bathrooms (Airpnp; Hong, 2014; Schiller, Need To Find A Bathroom? The Sharing Economy Has Got You Covered, 2014).

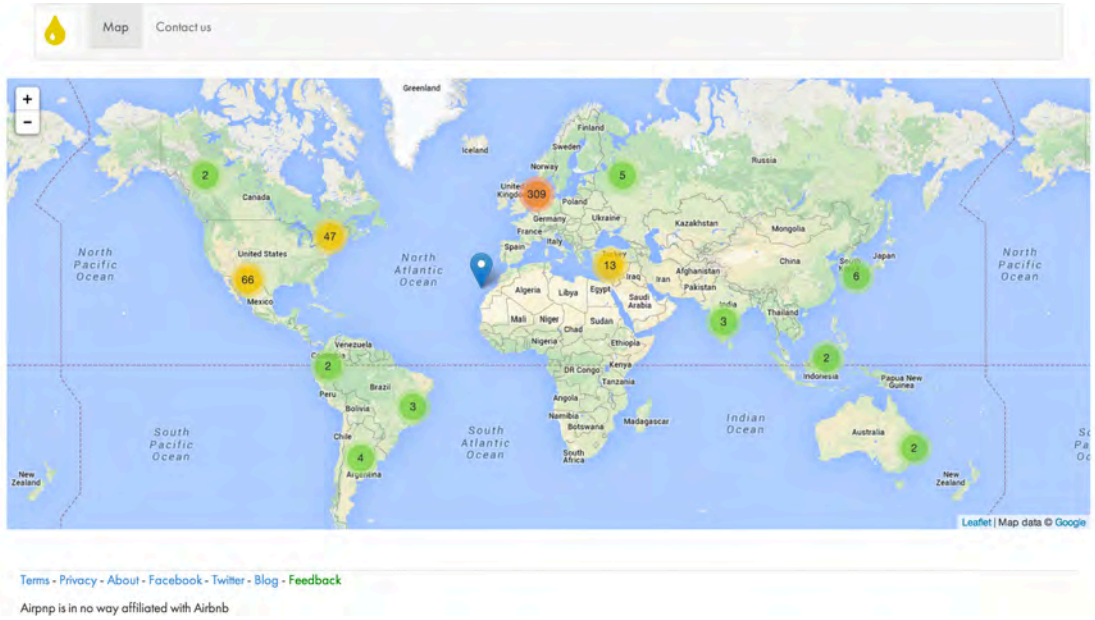


Figure 2. Airpnp restrooms web application map for locating the nearest restroom. Numbers in circles refer to the number of toilets currently available for the public use added by the owners of the facility. Source: Airpnp.com (Airpnp)

The service of Airpnp isn't the only one on the market. Application called Flushd allows you to locate nearby public restrooms across the globe which can decrease the time you would be spending on searching for a restroom in the public space. Created by James Edwards, the app is based on bathroom listings from Foursquare and clicking on the "emergency locator button" you can find the nearest public restroom, which you can later review and even stream the personalized reading material on your smartphone while you are on the toilet. With the next updates, Flushd plans to set up a reward system so you can be earning prizes and discounts for using the app (Flushd; Hoeller, 2014; Schiller, Flushd Wants To Build A Network Around The In-Stall Experience, 2014).

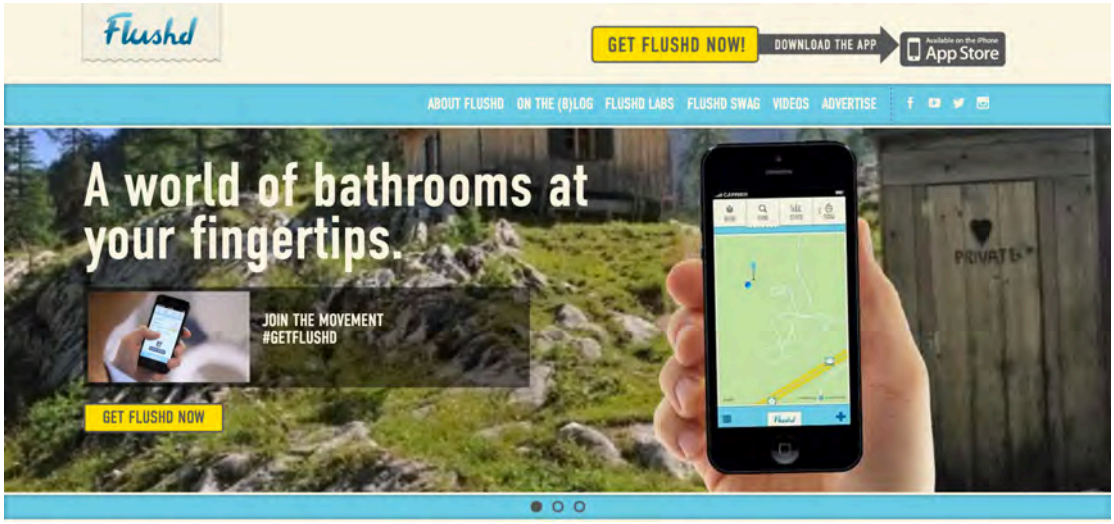


Figure 3. Flushd homepage. Source: Flushd homepage (Flushd)

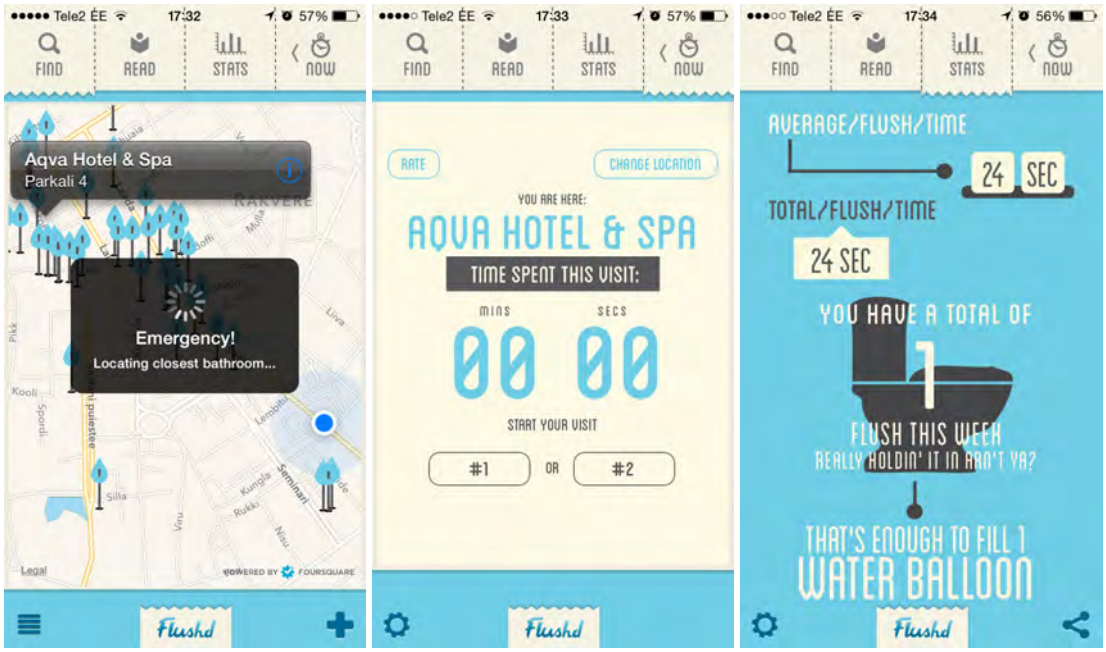


Figure 4. Flushd application screenshots from using the iPhone application on May 22, 2014. After each "flush" you can see the statistics about it in a visually memorable way.

3.2. Taboos and Stigmas

As the general view to this personal and deeply discreet bodily function is considered a taboo which commonly no-one wants to talk about or even witness someone taking a leak in public, it is the topic where the mindset can be hard to change.

People in general feel uncomfortable when they have to mind their own personal business in front of the others, even if they are accompanied by their boyfriend or girlfriend, family members or close friends. Mostly, they will prefer to spend that time alone and when they are out in the nature, they will go far away into the bushes, behind trees or pile of rocks or anything that's relatively close by and offers moderate refuge. Some people even avoid going to the restroom in public spaces or for example in buses, because to them these restrooms are too public or even claustrophobic.

On the other hand, there are many couples in a long-term relationship who don't make a big deal from peeing with bathroom door open, because it's just another everyday activity and not the craziest part of their lives they have shared with their partner. In that sense the limits only exists in our heads.

Taboos often extend to cover discussion of taboo topics, resulting in euphemisms and replacement of taboo words, for example if someone needs to urinate, they could also be saying: answer the call of nature, take a leak, take a piss, take a whiz, take a squirt, go for number one, tap a kidney, change water on the goldfish, drain the dragon, give the pee ration at the urination station, lower the water level, go *oui oui* (in France), void the bladder or write a name in the snow (in cold weather only) (King, 2010).

The boundaries of taboos will usually fade when people are drunk. Then the one who is under the influence of alcohol doesn't really care at all where they will urinate if they feel the urge coming up or if anyone will see them doing so.

Urinating is and maybe always will be fundamentally a private natural bodily activity, where the lack of accessible restrooms influence people's dignity, privacy, safety and many more aspects of their lives. But there should be no stigma assigned to it, because it is part of what makes us all human. Airpnp service and Flushd app are both taking the first steps in bringing the topic to the wider public and by offering solutions they could be potentially changing people's perceptions about it in the long run.

It could be argued that the existing of the taboo around urination is a good thing, because if it was accepted to urinate publicly without any shame then our streets, parks and public space would be disgustingly smelly and covered with excrements all over the place.

In fact, the city streets of San Francisco in some neighborhoods already smell like urine but that is due to the mild climate and the city's social programs where a high number of homeless people adds up creating a visible problem in the city. As this is a complex problem area, improving the sanitation situation for homeless people and people with mental disorders living in the streets anywhere in the world could be the subject for the next design challenge.

3.3. Creative Solutions

In unexpected situations, mostly in traffic jams and other traffic related situations, people have managed to solve their problems in very creative ways. We definitely have to appreciate human ingenuity in the process where the stream of creativity strikes any of us when there is no other way out. One could draw parallels with aforementioned situation and David and Tom Kelley's coined term of creative confidence, according to which we all have creativity inside of us but that is something we all have to embrace, express and after a number of iterations we are able to figure out a solution to anything (Kelley & Kelley, 2013).

In less crowded places with lots of nature around you, it is common to go to the bushes and become "one with the nature" or urinate into the rivers, lakes, seas or the ocean. "The Completely Confidential Bathroom Habits Survey" revealed that 74% of all 1 million respondents as of today (the survey is currently ongoing) admitted of having urinated into the ocean, lake or river (and that is not including when they were a little kid). Even more people, 79% of all survey respondents admitted of having urinated in the shower(Bathroom Survey, n.d.).

In fact, the latter is something the Brazilian environmental group SOS Mata Atlantica says people should be doing to save water. The NGO initiated the campaign in order to save the Mata Atlantica, a belt of wildlife along the Brazil's Atlantic coast which has been continuously disappearing over the last few decades due to pollution and cities using the water resources from that area (Abou-Alsamh, 2009). According to the environmental group if one household would avoid one flush a day, it could save up to 4380 liters of water annually. The spokeswoman Adriana Kfouri said the TV ad being "a way to be playful about a serious subject." That is why the TV ad featured cartoon drawings of people from different fields of life urinating in the shower, narrated by children's voices the commercial ends with: "Pee in the shower! Save the Atlantic rainforest!" (The Huffington Post, 2009).

Video material on Youtube reveals how people have found their safe haven creatively from accessible everyday objects which have been available and in their hands' reach so they have dealt with their problem of emptying their bladders for example into plastic bottles or empty containers, coffee cups, plastic bags, towels, not to mention quirky positions out of the car windows (even by females!). Of course, if caught this kind of public activity will get people in a big trouble with the police. It is also very common to position yourself between the open car doors for less exposure.

Creativity in general can be considered something with a positive attribute when solving one's everyday problems, but there remains the question whether it is justified in terms of losing one's dignity and privacy along the way, contaminating the nature, or breaking the law because once you start to mind your own personal business in front of other people, it will most probably be the subject of laughs and can result someone finding themselves as the stars in a YouTube video.

3.4. Youtube Videos

The enormous amount of videos from YouTube prove the urge to urinate to be a subject for jokes and pranks among young and old alike. In fact, this personal issue doesn't seem to be that big of a taboo in the anonymity of the Internet. It can also be the question of who was filming the clip and who was having the urge to urinate in that particular moment when the video was being produced so it's hard to draw definite conclusions, but the fact is that the wide variety of video material on the Internet proves that the issue exists and people are dealing with it one way or another.

In a way it is controversial to the privacy aspect in this subject matter, but thanks to the surprisingly numerous videos in Youtube I was able to examine user cases through observing Youtube videos after typing into the search box relevant keywords for researching the topic.

One user case from Youtube video features a couple in the traffic situation where the young woman had a terrible urge to urinate. During a conversation with her partner, she admitted that she is really not happy right now and might not be able to walk into the place once they would get there. Her partner questioned her if she needed a bottle because he had one, but she turned him down saying it doesn't work like that. The guy objected: "Yeah, it can. I have done it before." As soon as they found a public restroom, she couldn't walk to the toilet and admitted: "It's really bad!" And her boyfriend replied: "I won't laugh at you if you peed your pants." But as pictures speak more than thousand words, the pain can be seen from her face (Bisque, 2011).

Figure 5. Youtube video screenshots of a young woman with a great urge to urinate. Source: Youtube (Bisque, 2011).

Another user case from Youtube shows a 8-year-old boy on a long car ride, filmed by his sister. Sister explained the whole situation in the comment section below the video:

“We were on the Interstate and there were absolutely no bathrooms or rest stops or any opportunities nearby that we could stop at between the moment he had to go and the time we arrived at our destination. We were literally 5 minutes from our destination, a restaurant, where he could go and pee. He did make it to the bathroom without peeing his pants!” (Martin K. , 2011).

Figure 6. Youtube video screenshots of a 8-year-old in need for a bathroom stop. Source: Youtube (Martin K. , 2011).

Those two examples among countless other videos in Youtube prove that the urge to urinate can happen to anyone and that is a sort of a situation where no one wants to end up in.

3.5. Human Physiology

As dr. Peter Snyder, one of 2011 Ig Nobel Award winner and one of the authors of a research study *The effect of acute increase in urge to void on cognitive function in healthy adults* points out an old truth about the urge to urinate, it is no surprise that it is a pain which we all know very well. In the previously mentioned study, researchers found that in the situation when people experience the urge to urinate and they are at their top threshold of pain and can't stand it anymore, the level of impairment on reason and problem solving is equivalent to about a 0.05 blood alcohol level (Torchinsky, 2012).

Dr. Snyder admitted in the same interview with Jason Torchinsky that when considering professions where people are in situations where they can’t get away to relieve themselves, for example long-distance trucking, then it is the area where the results of this research have visible consequences in the real world. When the pain gets so intense in the traffic situation that the driver is distracted and can not focus on the road anymore, one can easily end up in a traffic accident, injuring themselves and possibly others.

After publishing the study and winning the Ig Nobel award, dr. Snyder has received lots of feedback from people from various fields and also truck drivers who told that they keep an emergency urine bottle in the vehicle just for those unexpected situations.

Dr. Snyder implied that as urination itself is a very active process, it takes a lot of concentration when one has to physically and consciously hold it and unlike any other type of pain, there is no way to distract oneself from thinking about it. So if you're on the highway and driving at the speed of 110 km/h, and you really have to go, you really are impaired. That is why you have to make sure it doesn't get to that desperate point in the first place.

To a thought provoking question if dr. Snyder would be an advocate for some sort of a in-car urination system, he replied: "If my kids were still a little younger, I'd seriously consider it. I think for myself, I'd rather pull over. But with kids, it would beat having to stop every half hour" (Torchinsky, 2012).

3.5.1. The Urinary System

The human's urinary system produces, stores and eliminates urine which is a fluid waste excreted by the kidneys. The urinary system altogether includes two kidneys, two ureters, the bladder, two sphincter muscles and the urethra. The whole system works together with the lungs, skin and intestines to maintain the balance of water and chemicals in the body. Depending on the amount of fluid consumed and the amount of fluid lost through breathing and sweating, adults eliminate about a 1,42 liters of urine each day. Certain beverages, for example coffee, can also cause increased urination in some people. In fact, small amounts of urine are emptied into the bladder from the ureters about every 10 to 15 seconds (Zimmermann, 2013).

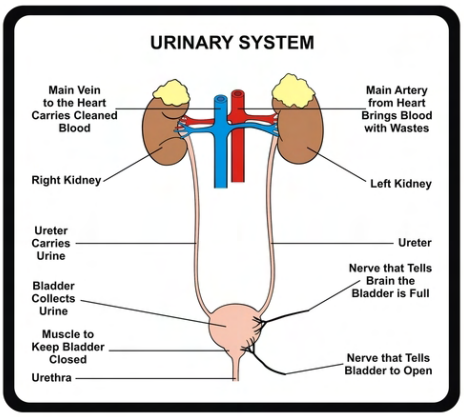


Figure 7. Urinary System. Source: LiveScience.com Credits: Shutterstock

The bladder itself is a hollow organ that is located within the pelvis. Bladder stores urine — the liquid waste made by the kidneys when they clean the blood. It's muscular tissue within the wall allows it to enlarge or shrink as urine is held or emptied (Urology care foundation, 2011).

A normal, healthy bladder can hold up to almost half a liter of urine comfortably for 2 to 5 hours. When the bladder needs to be emptied, the nerves in the bladder send signals and the sensation to urinate becomes stronger as the bladder reaches its limit. At that particular point, nerves from the bladder send a message to the brain that the bladder is full after which one's urge to empty the bladder intensifies (Zimmermann, 2013).

The only difference between the female and male urinary system is the length of the urethra (in females it is about 3,8cm to 5,1cm long, in males about 20cm). Due to the smaller length in females, women are more prone to bacteria and urinary tract infections than men (Zimmermann, 2013).

The most common way to injure one's bladder is in motor vehicle accidents, falls from a high place or having a heavy object fall on the lower abdomen of a person. Automobile passengers that have a full bladder and are wearing a seat belt around the lower abdomen may have the force of the collision focus on the lower abdomen and thus the full bladder. To prevent this, people should wear their seat belt properly as a lap belt and always empty your bladder when planning a long car ride (Urology care foundation, 2011).

3.5.2. Problems and Diseases of the Urinary System

Problems in the urinary system can arise for varying reasons. Bladder and urinary tract infections are more common among women as they are more prone to outside bacteria than men. Also, women who have recently given birth may experience urinary problems. Bladder control issues are common in women who are over the age of 50 years old, some of those conditions include overactive bladder, urinary incontinence, stress incontinence, bladder stones and etc (Krucik, 2013).

Overreactive bladder (OAB) is a chronic condition of the bladder which causes sudden urges to urinate and that happens suddenly and at any time of the day, in either way if the bladder is empty or full and all of that may cause urine incontinence (leakage) (Baird, 2012).

Although rare in men, bladder infections do occur more often as men get older and while it is uncommon it could be the sign of something blocking the urinary tract or even more serious problem such as cancer or kidney stones. In addition, men can experience urinary problems due to complications with their prostate, the gland that surrounds the urethra and results in symptoms which include urinary urgency and frequency, pelvic pain and pain during urination (Krucik, 2013; Zimmermann, 2013).

David W. Hilbert from Femeris Women's Health Research Center, Medical Diagnostic Laboratories in Hamilton, New Jersey writes in his research article *Uropathogenic Escherichia Coli: The pre-eminent urinary tract infection pathogen* about urinary tract infections the following:

"Urinary tract infections (UTIs) are a major source of morbidity and associated healthcare costs in the United States. UTIs are also a major health problem for hospitalized patients, especially those undergoing long-term catheterization. UTIs are defined clinically by the presence of a significant level of bacteria in the urine (i.e. bacteriuria). Patient symptoms are painful, urgent and frequent urination, along with malodorous and/or cloudy urine" (Hilbert, 2011).

Interstitial cystitis (IC), also known as the painful bladder syndrome, is a chronic condition which can cause bladder scarring and can make the bladder less elastic

which usually changes the bladder capacity so it cannot hold as much urine as before (Zimmermann, 2013).

Bladder cancer is more frequent in men and diagnosed in about 67 000 Americans each year. The symptoms include back or pelvic pain, difficulty urinating and urgent and/or frequent urination, also mimicking other diseases or disorders of the urinary system (Zimmermann, 2013).

Kidney stones are clumps of calcium oxalate that can be found anywhere in the urinary tract and it can cause pain in the back and sides, as well as blood in the urine. Kidney failure on the other hand, also called as renal failure, can be a temporary (often acute) condition or can become a chronic condition resulting in the inability of the kidneys to filter waste from the blood. Acute cases may be caused by trauma or other damage, and may recover over time with treatment. However, renal disease may lead to chronic kidney failure, which may require dialysis treatments or even a kidney transplant (Zimmermann, 2013).

Catheterization may be necessary if a person has a urinary incontinence (leakage), urinary retention (not being able to urinate) or a surgery that made the using of a catheter necessary and in this case a catheter (tube) will be used to drain the urine from the bladder (Mannheim & Liou, 2012).

3.6. Medical Situations

The act of urination can be much more difficult or sometimes even impossible to complete when a person is having health issues or different problems with their urinary tract, temporary limitation in their movements, when they are using a wheelchair to be able to make their way through everyday life or they are bedridden due to a sickness, old age, injury or because they are paralyzed.

3.6.1. Wheelchair-Bound People

All wheelchair-bound people have to have lots of strength in their arms so they could be able to use the metal poles to help themselves from wheelchair to the toilet and back to the wheelchair when they need to urinate. If they don’t have enough strength, they have to ask for help several times a day.

In fact, lots of people prefer to use public restrooms which are intended to be used only by people in wheelchairs because these restrooms tend to be cleaner and better equipped. That means that a person who would really need to use it, has to wait when the restroom will be vacant for them. It could be argued that the urge can not wait whatever you are able or less able, but most probably for people with no disabilities it is much easier to go and find the restroom than it is for the people with disabilities.

A story of a 31-year-old Catherine Blanchette-Dallaire, who was in a wheelchair for four months for rehabilitation after breaking her ankles in a kayaking accident paints a colorful picture of a initially fun night out in the town with her friends.

Figure 8. Catherine Blanchette-Dallaire in a wheelchair for four months. Source: On Roule au Québec homepage (On Roule au Québec, n.d.).

It was around 00:30 o'clock on a weeknight after Catherine had waited and waited until she really needed to go, because she knew it would take her 30 minutes to go the bathroom, when she finally felt she has to start looking for one she could use in her situation. What turned out was that every place was closed because it was so late at night already. Catherine thought on her own: "This isn't happening! I'm a grown woman, I take care of myself. I'm not going to pee my pants!" Finally when she found a restaurant that was still open and asked for the bathroom because she really needed to go, the restaurant worker had to admit that the bathroom is in the basement. She could only reply: "No, no, you don't understand. Bring me a bowl or a glass or something! It's happening right now!"

One month after that vivid night Catherine came to the idea of creating OnRouleAuQuébec, an interactive user-generated online directory of wheelchair accessible places, businesses, shops and buildings in Montreal (On Roule au Québec, n.d.; Shimosakai, 2013).

Another initiative led by ordinary people sets similar example. The Blue Badge Style is a site established by Fiona Jarvis in the UK in 2007 and her mission is to ensure that it would be a positive, cool, fashionable and elegant way to glide through life and experience everything out there even if you are less able and as for her case, using a wheelchair for example (Blue Badge Style, n.d.). The contributors to the cause are making an effort of mapping out unexpected steps and inaccessible facilities so less able people would know what to expect in and around their community. For this reason, Blue Badge Style has developed a smartphone app which is *A Guide for a*

Less Able Lifestyle. Currently this mobile application functions only in London, but they plan to expand globally.

When Jarvis kept on falling off her high-heels 20 years ago, she realized she might have multiple sclerosis (MS) which is an "unpredictable, often disabling disease of the central nervous system that disrupts the flow of information within the brain, and between the brain and body" (National Multiple Sclerosis Society, n.d.).

The Blue Badge Style contributors have come across with bizarre situations when on the phone having a conversation with restaurants or bars and asking about their disabled access. It is quite common for them to get an answer of "sure, we have a disabled toilet, yep, with hand rails, emergency alarm, a lowered sink and mirror. It's fully equipped." When specifying if the disabled toilet is up or down a flight of stairs, after a long pause on the other end of the phone the common reply follows: "Oh… it's down in the basement." When asking for a specification if thee is a lift to get downstairs, the originally very friendly member of the stuff has to admit with regret: "no."(Blue Badge Style, 2013).

These downstairs disabled toilets are paradoxically accessible and inaccessible at the same time. They are equipped to be accessible for the less able but are in an inaccessible location which doesn't make any sense whatsoever. Blue Badge Style contributors even named this situation as the Accessible Toilet Paradox, where the justified question arrises: "why would you make an accessible toilet inaccessibly downstairs?"(Blue Badge Style, 2013). When restaurants, bars and venues are trying to help less able people then they should go all the way and make sure the user can actually access their facilities.

Blue Badge Style conducted an Interest Panel survey in the end of 2013 and the results are not surprising: less able people and also their carers feel that too little is being done in order to make different venues accessible for less able visitors, agreeing that too many places are failing to adapt their buildings to become more inclusive, making it hard to find out information about the accessibility prior to the visit (Blue Badge Style, 2014).

Helen Davies of Pink Flamingo Shopper, the research agency behind the survey, found that the respondents are passionate about change. People want to feel inclusive in society and more than 80% would visit a venue if the place could communicate accessibility on their website via a nationally approved symbol. Davies added: "Education is really important and the survey clearly shows that clarity of information would make a real difference" (Blue Badge Style, 2014).

Similar to Kickstarter which is the world's largest funding platform for creative projects, new platform for crowd-funded travel called Trevolta was launched in the end of 2013 which is a website where anyone can plan a trip and get funded so anyone has the chance of making their dream travel plans come true. Current trip campaign at Trevolta is called *20 Cities in 50 Days in a Wheelchair* and the idea behind Kunho Kim and Brad Riew is to make a road trip in order to publish a guide for wheelchair-accessible traveling across 20 major cities in the states. The team plans to start from San Francisco on July 11, 2014 and arrive in Boston on August 28, 2014 and the travel guide will be reviewing hotels, restaurants, museums, and other main attractions in each city along the way from the point of accessibility for people with wheelchairs.

Figure 9. Kunho Kim in a video posted on Trevolta crowd-funded travel site. Source: Trevolta (Riew, 2014).

As Kunho Kim, paralyzed from the waist down during a skiing accident in Montana four years ago writes in their campaign site:

"When you live in a wheelchair, it is not always easy to know whether you will have access to any given facility. This makes it often difficult for the wheelchair-bound to plan travel vacations. Currently, sources of information regarding wheelchair-accessible travel in the United States are disparate, unorganized, and sometimes wrong. There is a clear need in this area for improvement" (Riew, 2014).

As of May 23, the team has backed up and exceeded their goal of $6000 for this trip with the help of 146 generous people all over the world.

These initiatives affecting our everyday life one step at at time show clearly how people are very interested and willing to give their contribution to make a difference. They are following what Omid R. Kordestani said in his commencement speech at San Jose State University on May 26, 2007: "In life, you make the small decisions with your head and the big decisions with your heart. Follow your heart and do listen to those aha moments in life" (Kordestani, 2007).

Restroom accessibility in airplanes is whole another obstacle wheelchair-bound people have to face when traveling long distances by air. They have to ask for help and are then being pushed by an airline staff inside an aircraft with an aisle chair buckled up with safety belts that is narrow enough to fit in the cramped aisle when they need to use the restroom. Riding the aisle chair is according to wheelchair users: "a very unpleasant experience; I get my side pinched or my elbow banged at least three times each trip" (Burgstahler, 2010).

Wheelchair users point out that in case one is unable to complete the transfer from a wheelchair to the airplane aisle chair and from the aisle chair to the airplane seat by themselves, one has to rely on airline staff and also face the increasing chance of an injury during those several lifts that take place before, during and after the flight where the seat belts and armrests are often in the way (Burgstahler, 2010).

People who use wheelchairs due to spinal-cord injury may have also suffered bladder function and control damage and in this case they have to use catheter system to empty their bladder when draining urine discreetly into a bag which is hidden under their clothes.

In any case, it is a complicated life for all of the wheelchair-bound people that no-one ever wishes for anyone to experience. Once you are tied down in a wheelchair, you have to have willpower and determination to deal with it and hopefully the future improvements in every aspect of their life will be possible.

3.6.2. Bedridden Patients

When a person is bedridden, they more or less or entirely depend on the caregiver who has to take care of every aspect of their life. This includes feeding, giving medicine, washing, cleaning, getting dressed and taking care of their personal hygiene whether they are in hospitals or at home.

Nurses and caregives use condom catheters for some men who are incontinent but according to John Usher, a registered nurse: “it never works too well and is very uncomfortable for the patient and the caregiver. . . . That thing is the worst, it leaks all the time, gets caught in pubic hair and is very painful to put on and remove” (J. Usher, personal communication, February 18, 2014).

Adult diapers are also widely used in hospitals and homes all over the world, but diapers are very bad for the surrounding skin if the patient is sitting in their urine over extended period of time (J. Usher, personal communication, February 18, 2014).

Beside diapers, bedpans are common medical devices used in hospitals and in-home care situations, offering the possibility of reuse, after it has been emptied, cleaned and disinfected. This also means that the availability of a carer is needed who would turn the patient to one side, put the bedpan under the patient and roll the patient back on the bedpan. For removing the whole sequence is repeated. Beside regular size bedpans there are also fracture bedpans which are smaller and have one flat end and can be specifically used by patients who have had a hip fracture or they are recovering from hip replacement operation and can not raise their hips high enough or roll over onto one side to be placed on top of a regular size bedpan.

When the bedridden patient is getting better, it is also sometimes possible to switch from bedpan to using handheld urinals or go to the bedside commode but even those products need to be emptied and washed by someone who is able to do it.

The owner of a landscape and sports ground construction company in Püssi, Estonia, Janno Mõru has used three different bedpans (made of metal, rubber and plastic) when he was partly paralyzed several years ago. Janno admits that “the nurses turned

me on one side and this is how it was done. I don't really remember anything about it," (J. Mõru, personal communication, February 3, 2014), which proves how people prefer to forget all of those unpleasant situations they have had to go through during their lifetime.

Among preventing and decreasing falls and hospital acquired infections, medical institutions are working on preventing and decreasing bed sores. According to John Usher, hospitals are interested to keep the costs down and they would implement a new product if it decreased the occurrence of bed sores, because bed sores alone cost hospitals a lot of money when the nurses are treating patients' bed sores (J. Usher, personal communication, May 4, 2014).

Meaning, there is lots of room for improvements in terms of human's dignity, security and satisfying people's everyday needs when they are experiencing limited mobility, either temporarily or permanently.

3.7. Traffic Situations and Traffic Congestion

Nearly everyone traveling short or long distances by land with an automobile can witness or end up in some sort of a traffic situation from time to time. It can be traffic jam caused by a road accident or due to rush-hour in densely populated areas, someone urinating on the side of the road (usually men) or the situation where people find themselves in pain, suffering the urge to urinate. As those Youtube case studies proved earlier, the urge to urinate can happen to anyone and possibly among wider number of individuals as people are traveling more and more these days.

The chances of getting in trouble in traffic are the biggest in the most mobile society in history – the United States of America. In 2006, the average American traveled 30000km, which is 3/4th of the Earth's circumference and more than twice as much as the average European (O'Toole, 2010, p. 5).

Figure 10. Traffic on Highway 101 south on April 29, 2014 when traveling from San Francisco to Los Angeles, California.

O'Toole explains that being mobile, gives you the opportunity for better jobs, broader social and recreational options, lower prices for consuming different goods and many more possibilities compared when you don't own an automobile. But as the result of

more people owning a car, traffic congestions are getting bigger and more widespread each year.

O'Toole admits: "While the interstate highway system was an incredible advance in its time, it is simply not capable of providing the mobility Americans demand today, much less in the coming decades" (O'Toole, 2010, p. 37).

According to the Texas Transportation Institute's 2012 Urban Mobility Report published in December 2012, traffic congestion is a very large problem which cost American urban commuters $121 billion in 2011 and people traveled 5,5 billion hours more due to congestion. On average, during the peak period each commuter spent an extra 38 hours of traveling in 2011 (compared to 16 hours in 1982) and in areas with over 3 million people, commuters spent even more – 52 hours. Every commuter wasted almost 72 liters (19 gallons) of fuel in the year of 2011, which is a week's worth of fuel for the average U.S. driver. It is no surprise that Fridays are the worst days to travel because of the end of the work and school week, also it is the starting of the weekend when lots of people want to get outside of the urban areas. If you had to make important trips, you'd have to plan for approximately three times of traveling time as it would take you in light traffic conditions so you would be prepared for unexpected car crashes, bad weather conditions, special events and other irregular road incidents (Schrank, Eisele, & Lomax, 2012).

Figure 11. Traffic on Highway 101 heading north from San Francisco to Marin County over the Golden Gate Bridge on Sunday, April 27, 2014.

This is one of the reasons why entrepreneurs are working on inventing ideas for creating even faster modes of transport. Elon Musk, the founder and chief executive of SpaceX and electric car company Tesla, and often referred to as the *next* Steve Jobs(Shontell, 2013; Reilly, 2014), proposed the near-supersonic *Hyperloop* transport concept (Musk, 2013) to link San Francisco and Los Angeles in August 2013, which could make nearly the speed of sound energy efficient traveling possible once it is built. According to the concept, it would be possible to travel from one city to another in 30 minutes (Amos, 2013). The Hyperloop would be able to transport people and cars up to 800 miles per hour with cheaper tickets than a plane ride (estimated one trip would cost $20) via aluminum pods enclosed inside of steel tube. This kind of transportation is reasonable when connecting cities with high amount of traffic in between them, like Los Angeles to San Francisco, New York to Washington D.C., New York to Boston. And as Musk says: "Over 1,000 miles, the tube cost starts to become prohibitive, and you don't want tubes every which way. You don't want to live in Tube Land" (Vance, 2013).

Until Hyperloop isn't built and working, having the convenience of a car when owning one in California (especially in Los Angeles and southern California, see Figure 14) is nearly necessary, offering people the sense of freedom when they drive on the "free"-ways to get away from their everyday routine during quick getaways on the weekend (see Figure 11). And that is why people have to deal with the road traffic situations when they need or want to travel from one place to another, which is becoming particularly dense in urban areas (Ed van Hinte, 2008).

Figure 12. Traffic congestion heading down from Highway 280 to the 6th street of San Francisco on May 6, 2014.

Whereas a lot of the San Francisco's Bay Area traffic congestions are occurring due to bridges, tunnels and toll collection (see Figure 12 and Figure 13), the gridlock in Los Angeles happens as a result of an overwhelming volume of cars and trucks (see Figure 14) that drive on the highways every day (Cabanatuan, 2013).

Figure 13. Traffic congestion on Highway 280 heading to the downtown of San Francisco on April 18, 2014.

As Robert Thompson who is working in video game industry, from Irvine, Orange County revealed during an interview, his 45 minute drive to work has easily been a 2 hour drive with terrible Los Angeles traffic and now he is taking the train instead. He admitted he always went to the restroom before he got in the car, just to make sure. Now it's easier for him since he is commuting by train with toilet facilities in case he would need to use it (R. Thompson, personal communication, April 29, 2014).

Figure 14. Traffic on Highway 5 south near Burbank on April 29, 2014 during traffic research travels from San Francisco to Los Angeles, California.

This is also what Janno Mõru pointed out memorably when he asked me during our interview instead: "How about when you travel or are stuck in traffic? Men can urinate into a bottle, but are women wearing diapers?" (J. Mõru, personal communication, February 3, 2014). Hearing these questions from someone else really resonated with me. And Janno wasn't the only one making the point.

Conversation with Kertu-Lilli Meerbach, a student of Engineering Materials and Marketing in Tallinn University of Applied Sciences revealed her personal experience when people are driving to and from big events – for example Burning Man, taking

place in the end of summer every year in the Black Rock Desert in northern Nevada – where people experience extremely long traffic jams (it's the worst when 63 000 participants + all the staff members are leaving from the event!) and they all have hard time waiting in pain when they have the urge to urinate but they can't leave their cars. Usually the car queue moves very slowly but consistently and no-one is able to leave the car in this situation. There are also lots of car accidents and techical faults due to the massive amount of dust in car motors. As soon as one driver decides or has to stop, it creates even bigger traffic congestion on the road. Product for urinating in the car would be very useful in this situation. Kertu-Lilli said she would use it if she could urinate like a man and not be squatting near the bushes where everyone would understand what she is doing over there (K.-L. Meerbach, personal communication, April 23, 2014).

Figure 15. Traffic congestion on the way to Burning Man 2006. Photo credits: Raul Salumäe private collection

Figure 16. Traffic congestion two days after the event when leaving from Burning Man 2012. Photo credits: Kertu-Lilli Meerbach private collection

When bigger crowds are relying on the means of personal transportation regardless of whether they are driving to work, school or spend their leasure time in the nature or at massive open-air events, traffic congestions are inevitable occurring more and more often these days. And in the light of all of those different traffic situations one could possibly end up in, John Usher drew my intention during an interview to the fact that a product could be marketable to people who drive long distances daily or are working as professional truck drivers, where also a huge problem area can be found.

3.7.1. Professional Truck Drivers

The problem of experiencing the urge to urinate is self-evident when people spend a big part of their daily life driving long distances as professional truck drivers.

As John Usher was explaining about truck drivers in the United States, the following was revealed: “Truck drivers here are famous for peeing in bottles and throwing them out the window. I know male truck drivers who always peed in bottles and it wasn’t an emergency situation, just the way truck drivers do it“ (J. Usher, personal communication, February 18, 2014).

As there are only few rest stops available in some states, catching urine-tossing truck drivers difficult and fines not big enough, truckers continue to do so.

Figure 17. Common view on roadsides. Source: Daily News (North Dakota confronts its nasty ‘trucker bomb’ problem, 2012).

Side by side male truckers, there is a growing number of female truck drivers today and it is estimated that more than 200 000 truckers (of more than three million truck drivers altogether) in the United States are women. The profession has become more popular among females since the figure of female truck drivers has increased fifty percent since 2005 (Go By Truck Global News, 2013).

Figure 18. Female truck driver. Source: Go By Truck Global News (Go By Truck Global News, 2013).

As women can't physiologically urinate into an average sized bottle and they also tend to have higher expectations to cleanliness of the restroom facilities than men, they can find themselves in trouble when arriving at the truck stops which aren't as clean as many women would like them to be.

According to Ellen Voie, the president and CEO of Women In Trucking Association, some of the toilet facilities at the loading docks haven't been cleaned for ages (Voie, 2011), which can create the situation where women truckers prefer not to use the facilities at all but suffer the urge later down the road instead, which in turn can lead to urinary tract infections.

Also male truck drivers sometimes bring their wives to go on vacation together, where again the problem of needing to urinate can occur, meaning this area of the profession could need some improvements as well.

3.7.2. Small Airplane Pilots

Another means of transport where the lack of restroom facility can create an unexpected problem for pilots and their passengers is flying with small airplanes.

Environmental scientist and amateur pilot Karl Duesterberg emphasized that the need to urinate can also arise when he goes flying with his airplane, which is a small plane for two people and no space for toilets there. Beside, there is no way to move around and in fact, moving around could crash the airplane. So the people really have to stay seated, because if they go too far back, the plane stalls (K. Duesterberg, personal communication, April 28, 2014).

Male pilots can use condom catheters, while women could be using an in-flight toilet for female pilots. The latter could consist of a soft silicone moulded bit which will be placed in front of the female urinary passage and the extension hose with urine bag. The product can leak, so the female pilots using it should be ready for it.

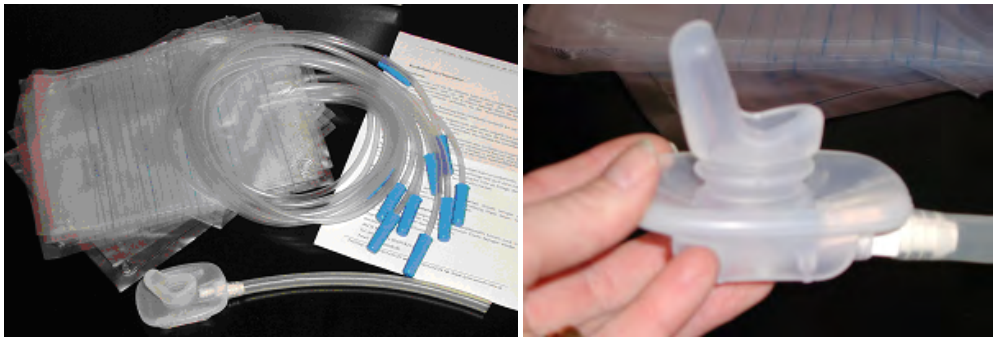


Figure 19. In-flight toilet for female pilots. Product kit and it's molded closeup. Source: Female Pilot In-Flight Relief (Sparrow, n.d.).

3.8. NASA Solution in Space

To go even further, Michael Flynn, research scientist and life support engineer working at NASA's Ames Research Center for 20 years, has been focusing primarily on water recycling in space since the launch costs of a space mission are extremely high, he emphasizes: "Spending money to launch water into space is prohibitively expensive" (SmartPlanetCBS, 2011).

That is why NASA and Michael Flynn team is working on developing and improving water recycling systems which allow to recycle all wastewater that is being produced on spacecraft, including urine, hygiene water etc so it could be recycled back to drinking water for astronauts to drink while they are out in the space. The team's work is based on technology called forward osmosis where the membranes are the key to the technology which filter wastewater to safe, drinking water. Semi-permeable membranes are behind the technology of forward osmosis where the natural diffusion of water takes place. Flynn explains further: "The membrane acts as a barrier that allows small molecules, such as water, to pass through while blocking larger molecules like salts, sugars, starches, proteins, viruses, bacteria and parasites." When recycling urine, a two-stage filtering system has to be used where the urine must be first filtered using an activated carbon bed, which will remove urea and alcohol that would otherwise pass through the membrane (Mansfield, 2011).

What's even better, the osmosis system doesn't need energy and it produces a liter of water in four to six hours, about which NASA's officials say that "the water from the system will be cleaner than U.S. tap water" (Murphy, 2011).

3.9. Sanitation in the World

The fact that a lot of people these days go to the restroom with their smartphones and other electronical devices to browse through their email, tweets, Instagram pictures and newsfeed tells the story of how people are taking the existence of the restrooms for granted. But that is something no-one should do.

According to the latest estimates, the World Health Organization and UNICEF Joint Monitoring Programme of Water Supply and Sanitation, which were released in the beginning of 2013 and which are based on the data collected in 2011, 2.5 billion people (36 percent of the world's population, mostly in rural areas) lack improved sanitation facilities, 1.1 billion people (15 percent) practice open defecation (when they have no place to defecate other than in fields, forests, bushes, water and other open spaces) and 768 million people use unsafe drinking water sources (Roma & Pugh, 2012; Unicef, 2013; Cook, 2014; UNESCO, 2014).

United Nations Deputy Secretary-General Jan Eliasson emphasizes that urgent action is needed to end the crisis of 2.5 billion people without basic sanitation, whereas of the world's 7 billion people, 6 billion have mobile phones, meaning more people have access to mobile phones than to proper sanitation(United Nations, 2014).

The CEO of CauseLabs, T.J. Cook believes: "In order to truly solve big problems related to the environment, sanitation, education, poverty and other health and social issues, the ultimate goal must be to change human behavior, awareness and attitudes. The role of technology is to serve as a catalyst to jump-start these changes (Cook, 2014). And many companies and NGOs are already researching and developing products and solutions to solve these burning problems.

For example, Unilever and Water and Sanitation for the Urban Poor engaged IDEO.org to help determine the best approach for developing new products and services and thanks to research in Ghana, IDEO.org designed a new sanitation offering which combines product, service and business design. Now people in the city of Kumasi, Ghana can rent a stand-alone toilet in their homes and it's cleaning service which will be done three times a week. IDEO.org also designed a brand for the service – Clean Team – which stands not only for sanitation business, but also a social business and a sanitation solution to redefine the status quo (Reineck, n.d.).

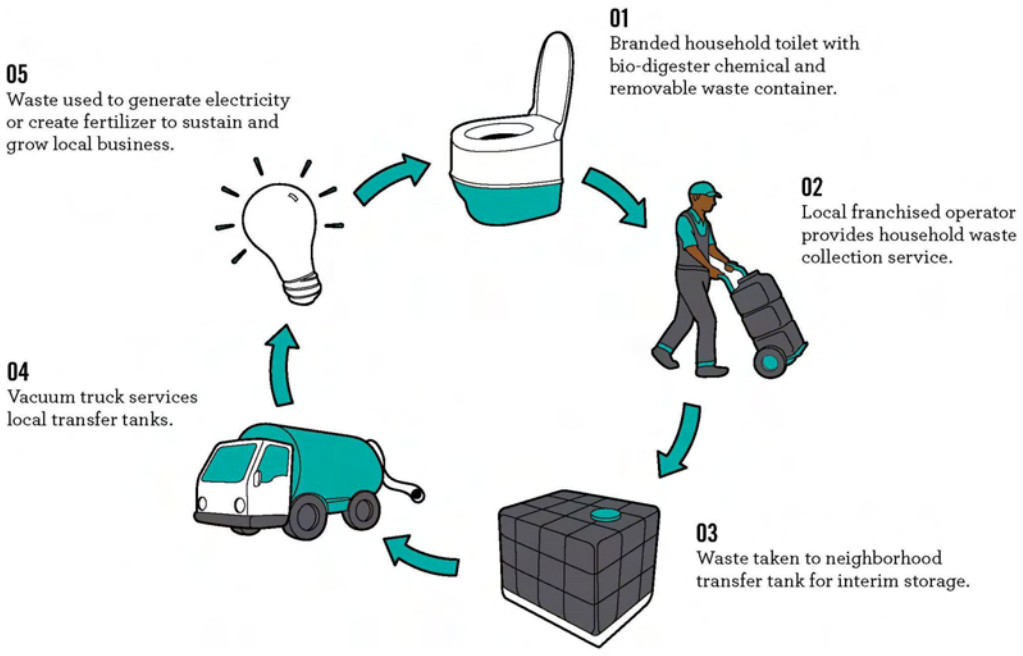


Figure 20. Clean team business model. Source: Clean Team homepage (Clean Team, n.d.).

Gail Klintworth, the Chief Sustainability Officer working at Unilever knows that poor sanitation is an issue which can affect everyone but women are often the most at risk. Klintworth says: “A lack of access to a clean, safe toilet can impact girls’ attendance at school, increase women’s burden of work and leave females at risk of sanitation-borne diseases and even violent assault”(Unilever Domestos, WaterAid, WSSCC, n.d.). When women and girls who live without restrooms spend 97 billion hours each year finding a place to go, risking with facing shame, diseases, harassments and attacks.

Madeleine Miandrivazo of Madagascar is a young mother and it wasn’t until recently when her family had a toilet built next to their house. Madeleine shares her experience: “The place where we went before is about 6 km from here. It was threatening and dirty. It was frightening too so most of the time we went with friends. There are men who are not really nice. When they see lonely women there they rape them or something like that. . . . I don’t want my daughter to go to that place because I’m afraid of her being raped. . . . since I have the toilet here I can use the time I spent going to that place to do something else. I’m in charge of the household and have two children. Before, when my children needed the toilet I had to take them all the way to that place so I didn’t have the time for example to cook and clean. Now I have the time to prepare food and my mind is at ease. Your future becomes brilliant if you have a toilet”(Unilever Domestos, WaterAid, WSSCC, n.d.).

Sadia is a young Pakistani lady with severe sight impairment who admits: “I feel ashamed asking a friend to take me to the toilet but there is no other way. The toilets are hazardous and unhygienic anyway but particularly for me as I have to use my hands to feel the floor and take the proper position”(Unilever Domestos, WaterAid, WSSCC, n.d.).

Globally, women spend an average of 6 hours every day on collecting water, firewood and looking for sanitary facilities. Sanitha Pathiyanthara says that at the current rate, it will likely take another 62 years to meet the global sanitation targets (Pathiyanthara, 2014). “More aid, research and investment needs to be focused on building gender-sensitive infrastructure for water, sanitation, roads, schools and hospitals. Within the sectors, innovative, user-friendly measures need to be promoted,” adds Pathiyanthara.

In those crowded rural and urban areas, where the construction of canalization for toilets is difficult for various reasons or currently impossible, there is definitely room for improving sanitation and many opportunities for raising the quality of life for all of those billions of people who lack proper sanitation and practice open defecation.

3.10. Refugee Camp Situations

Another very problematic area in addition to the general poor sanitation conditions all over the world, is connected to refugees and sanitation in refugee camps.

According to UNHCR Global Trends Report 2012, the facts are devastating:

“By end 2012, 45.2 million people were forcibly displaced worldwide as a result of persecution, conflict, generalized violence and human rights violations. Some 15.4 million people were refugees: 10.5 million under UNHCR’s mandate and 4.9 million

Palestinian refugees registered by UNRWA. The global figure included 28.8 million internally displaces persons and nearly one million (937 000) asylum seekers. The 2012 level was the highest since 1994, when an estimated 47 million people were forcibly displaced worldwide" (UNHCR, 2013).

According to the report, 52 percent of all refugees are men and 48 percent women, and 46 percent are children under 18 years (UNHCR, 2013).

Alongside with Afghans in Pakistan, Bhutanese in Nepal, Burmese in Thailand, Somalis in Kenya and many more, Syrian refugees in Jordan, especially women experience fear and disgrace and have lots of security issues when going to the toilets far away from their refugee tents.

Hanan, Syrian refugee in Za'atari camp in Jordan, which is now housing more than 100,000 refugees (UNHCR, 2014), says: "Biggest problem in the camp is the toilets. They are far away from the tents and very dark at night. No woman or girl goes there after nightfall. And in the daytime, the women go in groups for safety. There is no way to lock the door, and they don't feel safe. We need light, it is too dangerous for us here in the dark" (Susskind, 2013). That is also the reason why many families dig holes by their tents and use these holes as toilets, but in wintertime, the torrential rain spreads the contents of these toilet pits throughout the camp and the water gets easily contaminated.

Another aspect what Hanan also emphasized are the challenges women and girls have to deal with when it comes to maintaining personal hygiene during menstrual periods. Women in refugee camps have difficulties to access to sanitary napkins and they have no appropriate places to change or dispose their pads (Susskind, 2013).

Figure 21. Refugee camp latrine in Ethiopia. Source: International Medical Corps (International Medical Corps).

All of those hardships what people in refugee camps experience from day to day are hard to imagine for everyone who haven't seen it with their own eyes. But the facts speak for themselves and knowing the situation, it offers possibilities to do something about it, because it seems to take too long before people in refugee camps can return home or start afresh somewhere else. In fact, when in 1993, it was estimated that the average length of displacement for refugees was 9 years, then at the end of 2003 it was already estimated to be 17 years(UNHCR, n.d.). Proving it is a huge problem area which needs to be tackled from every aspect of it.

3.11. Water Sustainability

When it starts to happen due to global warming that winters are getting warmer, with less snow and rainfall and growing number of drought days around the year, it is when people living in densely populated areas are experiencing the effects of the shortage of water.

When looking at the wastewater system, toilet flushing alone can consume 50 liters of water per person per day, when taking into account that one flush of a conventional toilet consumes 12 liters of water and people flush it 4 times a day. Water waste is obviously smaller at those households, were a low-flush toilet is being used, which uses 4-6 liters of water per one flush. As droughts are getting more widespread and water is in many areas limited, Moe and Gangrosa argue in their article of *Improving water and sanitation access in developing countries: progress and challenges,* maybe it's time to stop using water for the purpose of sanitation (Moe & Gangarosa, 2009).

In fact, the city of Pleasanton on the East Bay from San Francisco declared a "local drought emergency" in May 2014 when some of the strictest water restrictions in the Bay Area were set, resulting in a 25 percent mandatory cut over past water usage and with stiff fines for violators. Those people who fail to complete the objective, could be expecting their water bills double or triple upon the first offense and even go higher after that. According to city officials, these measures are necessary because the city could run short of water if the current patterns of water use continue(Alexander, 2014).

In many places of the world already, for example in Israel, Australia, Southern California, Florida, and Arizona, the treated domestic wastewater is used for irrigation purposes, toilet flushing and clothes washing, which reduces the withdrawals of limited river and groundwaters (Ashbolt, 2009, p. 33).

Recycling wastewater to drinking water is also growing in popularity since more and more communities in the United States have plants that cleanse sewage to supply drinking water. And as the ongoing drought in California is shortening existing water supplies, one way to withstand it is to stock underground drinking water supplies with recycled wastewater. This is exactly what the Orange County Water District at the Groundwater Replenishment System in Fountain Valley is doing while being an early adopter of recycled sewage water that goes through a long process of purification where sewage water is filtered in the micro-filtration area, then through reverse osmosis membranes and finally recycling through UV light and hydrogen peroxide to disinfect the water which removes any bacteria or viruses. After that the purified

water is sent to flow out into a recharge basin through a 14-mile pipe, where the water percolates into a 350 mile groundwater aquifer (Joyce, 2014).

Today about 2.4 million Orange County residents get their water from a massive underground aquifer and along with the $142 million expansion project underway at the Orange County Water District reuse facility, the officials say the plant will be producing 100 million gallons of potable water a day at half the cost of imported water by the end of 2015 (today producing 70 million gallons of potable water) (Joyce, 2014).

Figure 22. Water after each step of the three-part recycling process (from right to left). In the left sink, there is the final purified water from Orange County's water recycling facility. Source: Southern California Public Radio (Joyce, 2014).

In fact, the water from the recycling process is just like any other and there is no grounds for being afraid of the so-called "toilet to tap" water, because even a water blind test proves that people can't tell the difference between recycled tap water and bottled water (Joyce, 2014).

As professor of Earth System Science at UC Irvine, Jay Famiglietti says: "Population growth is too great, the traditional sources are being depleted, so there really is no choice, we need to invest in projects like sewage recycling in a lot more places then we're currently doing it" (Joyce, 2014).

After three years of extreme drought and harsh restrictions for residents (for example if you drained your pool for maintenance, you are not allowed to fill it up again), the city of Wichita Falls in the state of Texas, may soon become the first city in the United States where half of the drinking water comes directly from recycled wastewater (Kofler, 2014).

Even though when people are encouraged to save water or they are threatened with penalties, people can still quite easily ignore the restrictions and pay the bill. Truth of the matter is that everyone's effort is needed in order to make sustainable changes when saving water before it's too late.

3.12. Urine as Fertilizer

In terms of reusing human waste, urine could be used as a fertilizer because urine has a chemical composition virtually identical to agricultural needs (Morgan, 2005); urine is rich in nitrogen, potassium, and phosphorus which are the three main ingredients in artificial fertilizers (Tuhus-Dubrow, 2008).

Nicholas Ashbolt, Senior Research Microbiologist at the National Exposure Research Laboratory and U.S. Environmental Protection Agency is suggesting a different kind of approach. Ashbolt suggests we rethink the whole wastewater disposal, because collected urine (also known as yellow water) can be used as a fertilizer for agricultural purposes (Ashbolt, 2009, p. 34).

Ashbolt explains further how about five companies, particularly in Scandinavia and Germany, are make urine-diversion toilets for domestic use already, and nongovernmental organizations (NGOs) have assisted in developing urine-diversion pit latrines that are self-financing (through the sale of the yellow water) in southern China, Africa, and India (Ashbolt, 2009, p. 34).

Ashbolt proposes a new sewage system for households which would be split into three types of source waters and three types of waste streams (black water from toilet fecal flushes; grey water used in the household; yellow water as the urine). According to Ashbolt: “The black water could go directly to a composter or into a vacuum sewer to an energy-recovery plant. Grey water could be used for recycling or reuse either within the household or locally. The yellow water can be diverted as a fertilizer, as noted above either as a liquid for local use or as a solid precipitate for export” (Ashbolt, 2009, p. 34).

While rooting this particular proposal of a new sewage system in every household can be expensive for people when they would need to rebuild their currently existing canalization, it could be is easier and cheaper to implement it when building new infrastructure from scratch (in developing countries).

Environmental scientists at the University of Kuopio in Finland, Surendra Pradhan and Helvi Heinonen-Tanski did an experiment using sustainable fertilization (human urine) when they grew beets and found out that after 84 days of growing the beetroots, the plants fertilized with urine- and urine/ash combination were found to be 10 percent and 27 percent larger by mass than those which were grown in mineral fertilizer. With those results Heninonen-Tanski demonstrates that "it is totally possible to use human urine as a fertilizer instead of industrial fertilizer" and it turns out recycling human waste this way could make wastewater treatment more sustainable and improve sanitation in developing countries through boosting their food production (Grunbaum, 2010).

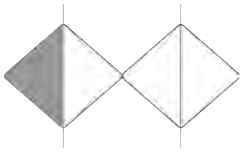
As Heinonen-Tanski adds that an average adult on a typical Western diet urinates approximately 500 liters a year, I agree it should be considered more as a resource and not merely as a waste what we lightly flush down the toilet with the same clean water we use for drinking, because that is what seems to be such a waste instead.

Håkan Jönsson, a researcher at the Swedish University of Agricultural Sciences in Uppsala who has researched urine recycling for over 15 years says that the nutrients in urine are also in the right form for plants (Grunbaum, 2010).

When we would imagine switching regular flush toilets to separating toilets (with divided bowl which could separate urine from everything else while using less water than regular flush toilets), it is something which might take a while before people will adjust to the new system and are willing to accept it. Because as according to Jönsson: “Acceptance is a big problem for this kind of system” (Grunbaum, 2010).

Changing our everyday behaviors to more sustainable is going to be the key to solving our ecological crises of over-population, climate change, rising of the global temperature and decreasing snow-fall and water resources. That is why it is necessary to develop solutions according to existing technologies which would positively impact the societies everywhere in the world. Remodeling sewage systems in order to collect human liquid waste could be easily done when starting from the beginning in developing countries and those areas which lack in sanitation and where wastewater treatment is unavailable or ineffective.

4. MARKET RESEARCH



4.1. Existing Products in the Market

Many companies have already tried to ease the need to urinate in traffic situations and they offer several products from one end to another – from dispose after use (one-time-use-only) products to the sets of products consisting of female urinal device (also known as FUD) and a disposable urine bags.

The latter product set tends to be more or less uncomfortable to use, especially by women and can create a dangerous situation on the road when in order to change one's sitting position so it could be possible to urinate using the product set, people have to unbuckle their seat belts and try to relieve themselves while the car is in motion, when it's not possible to stop the car or turn off the freeway.

Alongside disposable products there are reusable products available on the market but those tend to leak and aren't widely used.

To analyze existing products in the market I searched for available products from the Internet and ordered products from companies which were shipping their products to Estonia so I could conduct empirical user tests in order to gain insights and understandings of how different products work. Several products I found and was really curious to test, but it simply wasn't possible since many companies don't sell and ship their products outside of their operating country.

In those situations, where I couldn't order a specific product so I could test it myself, I collected information and feedback from people through Internet shops, blogs and forums where reviews, comments and recommendations have been posted by individuals who have ordered and used these products themselves.

Following is the analysis of bedpans, handheld urinals, waterless urinals, condom catheters, diapers, disposable urine bags, female urinal devices, Peepoople bags, P-Tree, public toilets and portable toilets.

4.1.1. Bedpans

Bedpans are mostly used in hospitals and in home care situations when people can't leave the bed by themselves. As having used a bedpan before, I can assure that the user experience isn't the best one, because this medical product is uncomfortable and inconvenient to use, it affects persons' dignity and gives the opportunity for accidental spills.

In addition to plastic bedpans, there are also disposable bedpans available on the market, and absorbent linings for bedpans which eliminates the possibility of spills, but the activity itself stays the same. Patients who rely entirely on carers have to be turned onto their one side, then turned back on top of the bedpan and again turned on the side when it's time to remove the bedpan by the care taker.

Nurses Tiina Lihtne and Hille Saar in the hospital of Kuressaare, Saaremaa, Estonia, from the department of nursing care expressed their position during a field research visit to the department: "It is thankworthy that someone wants to improve our working conditions" (T. Lihtne, H. Saar, personal communication, January 28, 2014).

As expected, the nurses admitted that the problem with the bedpan occurs when it gets too full and that is why it's sometimes inevitable that something spills out of the bedpan into the bed, when the bedpan is completely full and the care takers have hard time to take it away from the patient.

Figure 23. Bedpans used in the hospital of Kuressaare, Saaremaa, January 28, 2014.

4.1.2. Handheld Urinals

Handheld urinals are usually plastic containers and are meant to be used in or near the bed when people can't go out of the bed to the restroom. For men, it is easier to use those different types of handheld urinals which are out on the market while not leaving the bed, but after testing the two models of it for trying to find a suitable position I can say that being a female, it's nearly impossible to use it when you can't get out of bed.

When the bed of a female patient is soft enough or even too soft and the heavier part of the body (in that case, persons' posterior) falls too deep inside the bed, it makes the operation of using these products very difficult. I was constantly afraid of spills and shaking the bed too much, so all of my body muscles were under great stress. It is definitely easier to perform the activity when you get up and position yourself on the edge of the bed so you may be able to successfully complete the activity, but no guarantees are given either. Trying out handheld urinals quickly proved that the hard plastic on the edge isn't body-friendly at all and those sharp edges were also causing problems which I could felt immediately. And I can't imagine those sharp edges

being too safe for men either, so these aren't really user friendly products out on the market.

Ülle Pellis, consultant at Invaru shop offering wide range of technical assistance and rehabilitation equipment, skin care and incontinence products in Rakvere said that these types of handheld urinals are usually bought and used by elderly men and women who can't get up from bed that quickly in the morning after waking up, but are feeling the urge to urinate. In that case, they can someone manage (it could be argued that it just needs some practice) to get their first urge under control and after they are slowly stretching their body and making their joins move more freely, they can start their day by emptying and washing their urinal, so it would be ready for the next morning (Ü. Pellis, personal communication, February 25, 2014).

Figure 24. Female urinals bought from Invaru at Rakvere, February 25, 2014

4.1.3. Waterless Urinals

A low cost waterless urinal saves water and can be built locally from available materials, offering the possibility to collect urine for reuse purposes as fertilizer in urban farming (Sustainable sanitation and water management, n.d.).

Eco-lilly urinal is a resource oriented sanitation option for women in areas where there are no facilities for wastewater collection and treatment(Sustainable sanitation alliance, 2007). As this is a solution often used in developing countries where I have never been before, I have no idea how it would be to use it in real life, but I assume it's better than nothing in those areas where people lack in access to proper sanitation.

Figure 25. Eco-lilly waterless urinal in Arba Minch, small town of south Ethiopia. Source: Sustainable sanitation allience (Sustainable sanitation alliance, 2007).

4.1.4. Condom Catheters

Condom catheters are medical products used by men and usually made of silicone or latex, which according to registered nurse, John Usher is something that leaks often, causes discomfort and can lead to urinary tract infections with long term use. No user tests were possible with this product since I didn't find any volunteers, but I trust it is unpleasant to use and something no-one would voluntarily want to try out ever.

Figure 26. Condom catheter set bought from Invaru at Rakvere, February 25, 2014.

4.1.5. Diapers

Alongside the already vast market of disposable diapers, there are re-washable and re-usable cloth diapers again gaining popularity and out in the market, but those require water and energy for washing.

Disposable diapers (also many other absorbent products such as sanitary pads) contain materials that are particularly difficult to degrade in landfills where these products after being disposed usually end up(Alford, 2014).

When considering the use of adult diapers by patients who are forced to wear these over extended period of time, it can develop rashes, skin irritation and bed sores around the sensitive skin, making the product user experience unpleasant or even painful. Besides, truth to be told – no-one wants to sit in their urine.

Figure 27. FuzziBunz cloth diapers sold on the Earth Day 2014 event grounds near the Civic Center in San Francisco, California, April 19, 2014.

4.1.6. Disposable Urine Bags

Peebol pocket sized toilet is a disposable urine bag and something I managed to order online from the United Kingdom and it cost 12,3 euros (plus shipping 2,7 euros). One package consists of 8 disposable urine bags and it is said that one bag can hold up to 1 liter of urine, so in order to find out how it is to use it, I tested it out.

The bag has a mini-grip on top of it, which was pretty hard to open in the first try. The plastic seemed to be stretching more when I tried to open it. I was actually afraid I am going to break the bag, but since I had 7 more of these, I wasn't too afraid and finally managed to open it. The flat urine bag has a top edge made of thicker paper, which is where you should bend it to open the bag, but half of that edge isn't connected to the bag for some reason, which can in turn lead to a mess. The bag itself contains granules which turn urine into spill proof gel within seconds, but as the bag gets heavier when more urine is getting in there, it is hard to hold it and you may drop it when you loose your grip.

As the whole pack of 8 urine bags comes in one tight package, where all of those bags are each separately packed, the absorbent granules particles had made micro-holes into the bags so the bag started to leak after using it for the third time in a row. First two times the urine was easily turned into gel, but when using it for the last time before it started to leak, those granules were not able to do what they are supposed to do anymore. The bag indeed holds 1 liter of urine, but it didn't turn into as strong gel as in the beginning.

All in all, it is a product that the producer says women can use together with their female urinal device (FUD) called Shewee when stuck in traffic situations, but that means your one hand has to hold the bag and the other hand has to hold the female urinal device, which all can very easily turn into a mess.

Figure 28. Peebol disposable urine bag. Peebol urine bag product tests March 8, 2014.

4.1.7. Female Urinal Devices

Many companies have worked out a group of products that is called female urinal devices (also known as FUDs) which women can use to urinate like men in a standing up position. These FUDs are made of medical silicone or plastic for re-use purposes or produced out of cardboard for disposal after you have used it once.

Together with Peebol disposable urine bags, I managed to order Shewee from online shop. This plastic female urinal device cost together with shipping to Estonia as much as 8 Peebol bags – 15 euros.

Package contains of plastic container where to store the device, a funnel and an extension tube which women could use when they are wearing bulky clothes (e.g. snowboarding clothes in winter) so they could point the urine even further away from their body and clothes. Instructions suggested to try out the funnel first under the shower since women are not used to urinate while standing. It is meant for women to use in the nature and other more or less public spaces, where they don't want to expose their posterior and it is promised you can use it while keeping your pants on, just open the zipper or unbutton few buttons.

For women who wear tight pants, it can be quite difficult to place the funnel to the right position and keep it there. It was said you can just shake the funnel after using it and the last drops of urine will be shaken away from the product so you could store it in the container provided, but I couldn't manage to do that fully and still wanted to wash it afterwards.

Figure 29. Shewee female urinal device

Other FUD I was eager to try but couldn't order online since the company doesn't ship their products to Estonia, is called GoGirl. Made of soft silicone in the United States, the GoGirl is a nice product since you can pack it together into a small package and take with you when you go hiking.

One lady who goes hiking a lot admitted in a video review that the hole on the other end is too small, which in case of strong urination doesn't let the liquid flow through fast enough and can create a mess and soak your pants. Also problems occur when

you hold the product too firmly from the sides (you should be stretching it from front to back) which causes it to collapse(Davis, 2010).

Figure 30. GoGirl female urinal device. Source: GoGirl.com

Beside re-usable FUDs, there are also disposable female urinal devices out in the market which are meant to be thrown away after using it once. These are made of cardboard and are packed flat in a set of 5. I ordered my set from a retailer operating in Estonia Bonefish OÜ and set of 5 disposable FUDs cost 1,92 euros (+0,38 euros for shipping) and together with shipping it was 2,30 euros (0,46 euros/per piece).

To use this cardboard FUD, you first need to unfold it so it would create a funnel, but using the product wasn't the most pleasant thing since the edges of cardboard are quite sharp and can hurt your sensitive skin area.

In general, using this cardboard funnel seemed like a waste of materials, since I had to dispose the product after using it once and thus making it also expensive way to go to bathroom, but I understand it's advantages when going to a music festival where the portable toilets that have been set up for all of the crowds to use, it can be of great help when the toilet is dirty and you are not able to squat over the toilet bowl when you have a poor knee or hip problems.

Figure 31. P-Mate disposable female urinal device. Source: www.p-mate.ee

4.1.8. Peepoople Bag

Peepoo bag by Anders Wilhelmson, Peter Thuvander and Camilla Wirseen from Stockholm, Sweden is a personal, single-use product to use as a toilet by people who doesn't have access to basic sanitation. It sanitizes human excreta shortly after defecation which will biodegrade and turn into fertilizer (Reis, 2010, p. 406; Peepoo, n.d.).

Ordering this pack of disposable toilet bags wasn't possible either, but people who participated in a product testing survey in poor urban settlements in Bangladesh, they referred to the fact that using the product didn't require them to leave the house (they used the bag inside a container as opposed to holding the bag in their hands) and so it was easy for them in this sense, but on the other hand, although the Peepoo bag is meant for both urine and feces, the vast majority chose to use the bag for feces only, because they said the bag is too small to comfortably urinate and defecate in(Wheaton & Münch, 2009).

Figure 32. Peepoo toilet. Source: Peepoople.com

Figure 33: Collection bin for used peepoos at the school (from one day) in Kibera, Nairobi, Kenya. Source: Sustainable sanitation allience (Sustainable sanitation alliance, 2013).

4.1.9. P-Tree

P-Tree is a product design solution by Dutch designer Sam van Veluw of Aandeboom designers which was used in Roskilde Festival 2011 in Denmark. P-Tree is a temporary tree-friendly urinal for men which can be fixed on every tree using straps and lashings and be hooked up to a central sewage system or connected to a tank with a pump. In Roskilde 2011, the problem of public urination was significantly reduced with these additional urinals (Aandeboom, 2010).

Figure 34. P-tree at music festivals sites attached to trees. Source: Aandeboom.nl (Aandeboom, 2010).

4.1.10. Public Toilets

Public toilets in the cities and around different sightseeing places can be used either for free or paying a small amount of money. These public toilets can be in various cleanliness condition when they have been just cleaned or when they have become really dirty over time, in which case people usually prefer not to go in it, but keep on looking for a new place to go.

Sometimes it can also happen that you will find a place to go in public space, but for fully unknown reason you can not enter, because the door is locked from outside. This is what I happened to witness on top of the Golden Gate Bridge in San Francisco. Luckily I didn't have to go, but I was wondering what would have happened if I did need to go, but couldn't enter.

Figure 35. Public toilets in San Francisco, California on Market street and near Civic Center, April 19, 2014.

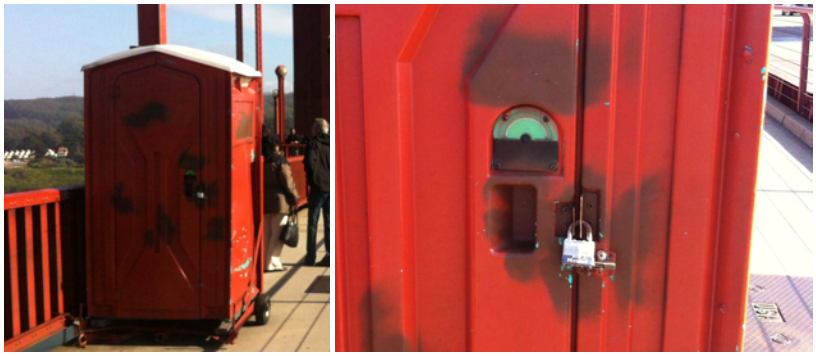


Figure 36. Restroom in public space on the Golden Gate Bridge, but no access to the facilities since it was locked. People passing by suggested it could be meant for bridge construction and maintenance workers only. Golden Gate Bridge, April 27, 2014.

4.1.11. Portable Toilets

Uriwell portable urinal for women, men and children seems like a great product at first, because it is bendable and extendable, but users of the product describe it as something that leaks very often, because the cap isn't sealed well enough and the cap part is also heavier and wider than the bottom part, making the unit fall over which leads to urine leaking out of the bottle (Saxondale, 2010).

Figure 37. Uriwell portable urinal. Source: Amazon.com

Another portable urinal which is also a watering can comes from Sweden and can be used when you want to fertilize your plants and recycle your body waste in a 2 in 1 combination of chamber pot and watering can. The product promises for you to have a simple, natural and fast way to fertilize your outdoor plants, lawn etc (Guldkannan Towa, n.d.).

Figure 38. Towa urine collector-plant fertilizer. Source: Guldkannan.se

4.2. Other Companies' Examples of Working with Stigmas

As many companies are working to solve peoples' problems in many fields which carry stigmas around the subject matter, analyzing their work can provide valuable insight on how they have managed to go about the taboo issues and if they have succeeded in changing people's perceptions about it. As this thesis is about a widely known taboo which is deeply rooted in existing habits and cultural tradition, then researching other development projects from all over the world can offer valuable insights and understanding how to approach people to change their behavior.

4.2.1. Bedsider by IDEO

One of the great examples is the work of a world-renowned design consultancy IDEO and the creation of Bedsider webpage where clear and cleverly written overviews of different birth control methods prove to be a good way to go when educating people about the variety and possibilities for considering when choosing the best method of them all.

Today, when people get a lot of information online, this can be of great help when learning about different options and making conscious decisions about how to avoid unintended pregnancies.

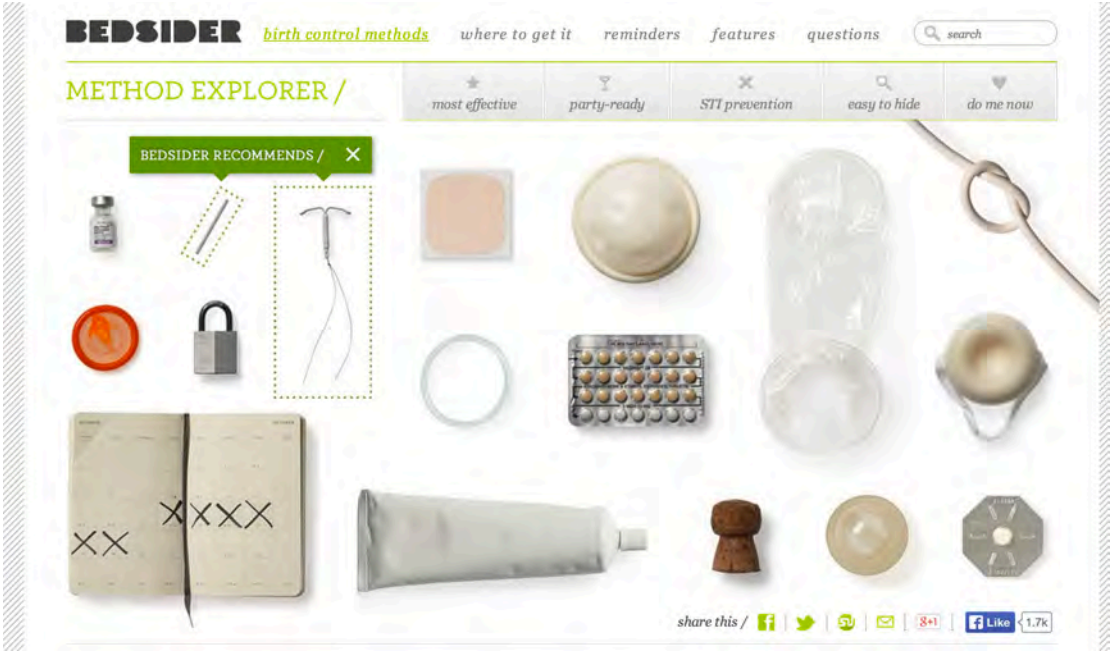


Figure 39. Bedsider method explorer website. Source: Bedsider.org

4.2.2. Female Condoms

The companies working in the field of producing condoms are innovating and bringing new products to the market too. Women's condom is a product where the ongoing innovation currently takes place and probably research and the development in the area won't stop until the product gains wide acceptance and use. As the perception of using it carries a stigma with it, it takes more time, effort and educating people about it, because women who are already using it say they can be in charge and have more decision power in a relationship now (Schwartz, 2014).

When first female condoms were made of polyurethane, then newer ones are made of nitrile, which eliminates much of the noise which the first ones were creating when wearing one during sex (Brownlee, 2014).

And this kind of innovation and improving the product until it is perfect is the key for changing people's perception about it. It just takes time for a product like this to prove itself to it's users. It is understandable that there is the stigma in using female condoms while having sex, but if it has proved to be better user experience than people expected, then why not give it a shot. People need time and also the willingness to educate themselves in order to change their perceptions and mindset towards something new. If humans in general are curious about everything that's new, then everyone should be willing to try out new products too, even if they seem unconventional at first.

Figure 40. Female condom. Source: Fast Company (Brownlee, 2014).

4.2.3. Female Menstrual Cups

Female menstrual cups are also something that countless companies are producing these days, which you can mostly buy online or find it in natural foods supermarkets. Women who use it during their period to collect the menstrual fluid (rather than absorb it in disposable sanitary pads and tampons) say they wouldn't go back to wearing pads or tampons, since the cup is much more body-friendly, convenient and re-usable.

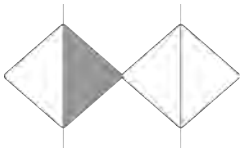
As conventional sanitary pads or tampons are usually made of non-organic cotton, rayon or a combination of these two, there are also synthetic fibers added to increase the absorbency. These products are also being bleached so they would have the ivory white appearance. When using these products over so many years of every women's life, it can lead to health issues, birth defects, reproductive and developmental impairment (Kumeh, 2010).

Figure 41. Different models of female menstrual cups to choose from. Source: Menstrualcup.co

When choosing a product, one could choose tampons or pads which are chlorine-free and made of organic cotton or go for a menstrual cup made of medical grade silicone. Using menstrual cup is healthier for woman's body, more ecological to the environment since there is no waste and on top of that it's almost 20 times cheaper than buying disposable products (Why use a menstrual cup?, n.d.).

As more and more women are becoming aware of those options to choose from, it helps them to make conscious decisions which affect their everyday life and once it is something they want to suggest to their daughters, mothers and friends, those solutions will reach to even wider audience.

5. DEFINITION PHASE



Analyzing all of the the existing products in the market gives a good understanding of what works and what doesn't work, and what is more sustainable in the long run because sustainability is something we should all thrive for.

As disposable products create waste, usually end up in landfills all over the world and are in total more expensive to buy, it isn't sensible to propose another type of convenient disposable product concept which people could throw away after they have used it once. Yes, it is a good idea when it biodegrades and those already existing Peepoo bags are good examples of how these waste products are later used as fertilizers in local fields and forest, but the goal of sustainability can't be achieved globally when we create more and more waste just by filling up a next disposable product because it is convenient this way. I believe it can be convenient in another way too. And that could be a re-usable product concept in this context.

As Tim Brown explains in his book *Change by design: how design thinking transforms organizations and inspires innovation,* that the mindless consumption isn't sustainable any more and we have to find ways to encourage people to move towards a more sustainable behaviors (Brown, 2009), I agree that the mentality of repairing and reusing products as it was customary to do back in the days when products were not that easily available should be brought back to the "fashion", that it's something what everyone wants to do because it's sustainable. Thankfully this mindset is already growing in popularity and through raising people's awareness and educating them about possible alternatives could make it even more widespread.

Interview with Diana Canant, a fascinating people's person and psychotraumatologist currently focusing in global mental health and displaced communities, drew my attention also to the importance of socially responsible entrepreneurship what all of us should think about and it shouldn't just be about making big profits. Canant agreed that the re-usable product is more sustainable since it doesn't create additional waste when compared to all of the disposable products which you throw away after each use (D. Canant, personal communication, April 29, 2014).

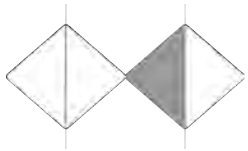
As Nigel Whiteley, author of *Design for Society* claims, "change is possible, but to make it happen there has to exists the overall awareness of the current situation" (Whiteley, 1993, p. 37), and I couldn't agree more. People need to be aware of the possible consequences to their health if they are holding their bladder for too long, they may get urinary tract infections because more germs are being made in the bladder. Educating people about it is the key factor that can change the perceptions over time and along with that, also the behaviors. Young and old alike need to be aware to be able to make smart decisions which wouldn't affect their bodies in a negative way.

With the increasing number of environmental activists all over the world, environmentally-friendly and sustainable products have now the potential to acquire a widespread acceptance when more and more people learn about the sustainability and the ways how they can give their contribution to decreasing their carbon footprint.

As Chris Dixon, an investor at the venture capital firm Andreessen Horowitz said at Y Combinator Startup School 2013: “Good ideas will also look like bad ideas because they go against social norms” (Dixon, 2013), and this is also true in the sense of this thesis, where the issue I am against can be also called as a social challenge.

The proposed solution should be the stepping stone of changing people’s perceptions, when educating them and making them aware of the possibilities where they might end up one day and find themselves in those situations where they desperately need to urinate. Because as soon as people acknowledge the fact that this is where they might end up in one day, they can be prepared for those events and prevent it in advance, so that the urge to urinate wouldn’t be even happening to them, because they know they are prepared and ready to relieve themselves when they need to.

6. DEVELOPMENT OF CONCEPT IDEAS



As Kelley brothers referred in their recently published book about creative confidence, they agree with the Nobel laureate Linus Pauling who famously said: “If you want a good idea, start with a lots of ideas” (Kelley & Kelley, 2013, p. 79).

In order to develop an initial concept proposal, lots of ideas were generated and iterated, putting the emphasis on the insights and possibilities gathered in the research phase.

To solve the urge to urinate, it could be done so by offering a product with which people could collect their urine so it could be recycled and used as a fertilizer. As it is already being implemented in various regions in developing countries, then this solution wouldn’t meet the barrier of acceptance there, but transferring it to the developed world may become an obstacle since people are too convenient to drastically re-think and re-build the existing canalization and wastewater treatment system. In developing countries on the other hand, people could be easily collecting their urine and selling it to local entrepreneurs who are active in agriculture if they have a user-friendly way to collect their liquid body waste.

In fact, I am tempted to argue that if we approach those sanitation issues from the grass-root level and improve sanitation in areas where it is currently non-existent, the education of the people could increase which could in turn decrease the size of families and people’s reproduction rate which in turn could slow down current population growth in the world and that in the end could decrease global warming. It is uncertain if all of that could really influence all of the parts in the system in such a grand manner, but it’s a provocative thought nevertheless.

It could be also possible to implement this concept of collecting urine in refugee camps. As women go to the restroom area due to security issues in bigger groups already today, there could be a distinctive shipping container near the restrooms that transported these personal urine collectors to the location in the first place, but the shipping container could be specially adapted to collect the urine. It could also embody a disinfectant system where people could clean their personal urine collectors. This could be like a communal activity and people could be more aware of their health situation when they have the change to open up more easily and discuss about their health concerns and personal issues when they are on their way to empty their personal collectors. And when the shipping container gets full, it can be transported to the nearby agricultural land to be used as fertilizing the land and increasing the food productivity along the way.

When people communicate with each other, share their thoughts and feelings about whatever it may be in their minds, it joins them and makes the community stronger and hopefully makes people’s life in refugee camp a little bit brighter too.

As NASA is able to filter drinking water from urine, this could be another way to go when proposing a concept. This could be done in a smaller scale when every person could have their own product of urine filter which filters it into drinkable fresh water. As the technology what NASA is using, is currently still too expensive, then as all of the technologies are getting cheaper and cheaper over time, this is something what could be done at some point in the future. According to the scenario, when the water reservoirs have dramatically decreased due to global warming, this could be the one way we could get our daily water from. This approach could also fit the needs of desert hikers who doesn't want to carry that much water on their backs, but take less water with them along with the product which could filter their body waste to fresh water. It would be definitely something for a niche market at first, but extreme hikers and mountain climbers are definitely the type of people who could be seen as early adopters for this kind of a solution.

Last but not least, the concept of a camouflaged bottle-container for collecting urine which looks like a regular stainless steel water bottle which are very popular among people in the United States and growing popularity all over the world. As these metal bottles are perceived as water bottles, using the same already existing shape and perception about a product could offer the clever way of a disguise when carrying around and emptying something that you wouldn't want everyone to know that this what you are doing – carrying around a bottle containing of body waste liquid. This disguise gives one the freedom of using it in private, but emptying it in public, since a liquid is a liquid when is would be poured out from the bottle.

The re-usable bottle-container could consist of a flexible inserted part made of medical polymer which can be pulled out, adjusted to the right position and used for urination. After the activity is done, the insert could be inserted back inside the bottle and then sealed with a cap and emptied at the convenient time and location. When emptying and washing it, the flexible insert could be removed and re-inserted, so the whole product could be re-used again and again. It could be also possible to wash all of the parts in a dishwasher. If the polymer insert breaks, it could be possible to order a new one to be inserted again.

After identifying that women tend to struggle more with the urge to urinate and that there are more than 200 000 female truck drivers in the United States alone, this could be a concept proposal for them at first and once they are satisfied, they will most likely recommend the product to their friends and relatives and so the circle of people who would want to use this product would get gradually bigger and bigger.

As this product could be used by female truck drivers in their vehicles, it offers them cleanliness, safety and no possibilities of being sexually harrassed by male truck drivers. These are the aspects psychotraumatologist Diana Canant also emphasized during our interview that these conditions have to be fulfilled. This could be the way how female truck drivers could relieve themselves and not be afraid or suffer humiliation, harrasment and even raping, which in fact is or can be currently the part of those females' life when they are making stops at the rest stops where male truckers are also taking their time off. Female truck drivers' dignity and safety could be assured when they didn't have to leave their trucks in the first place in those unfamiliar locations.

This is the concept idea which Kertu-Lilli Meerbach was adopting quickly as well, when she said during our conversation that she would urinate into a container and empty it as soon as it is possible and re-use it later if it turns to be necessary. She would even be willing to wash it in a dishwasher (K.-L. Meerbach, personal communications, April 23, 2014), proving that the concept idea would have it's first potential customer.

For testing the latter concept idea, I created an early rapid prototype, which consisted of a plastic cup with a lid, a tube and a baby feeding bottle nipple, which I used upside-down inside the tube and tube inside the plastic lid with a hole in the middle. After testing out this early prototype, it was clear that the idea works in principle and I decided to continue working on it.

Figure 42. Early rapid prototype for initial concept testing

Furthermore, 3D model of this concept idea was made which offered the possibility to quickly visualize the concept idea.

Figure 43. Side view of the concept bottle. Side view of the inside of the bottle. All of the 3D modeling and rendering credits: Kristjan Meister

Figure 44. Top views of the concept, where the insert is inside and out of the bottle

Figure 45. Side view of the parts: stainless steel bottle, flexible polymer insert, a cap

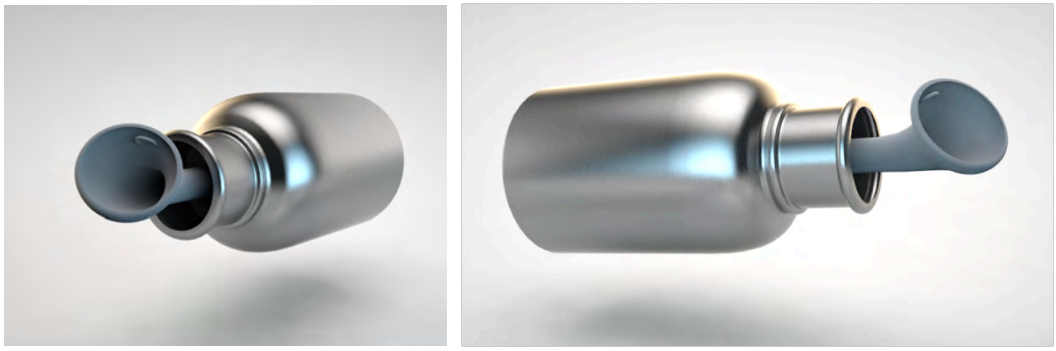


Figure 46. Side views of the usage situation of the concept

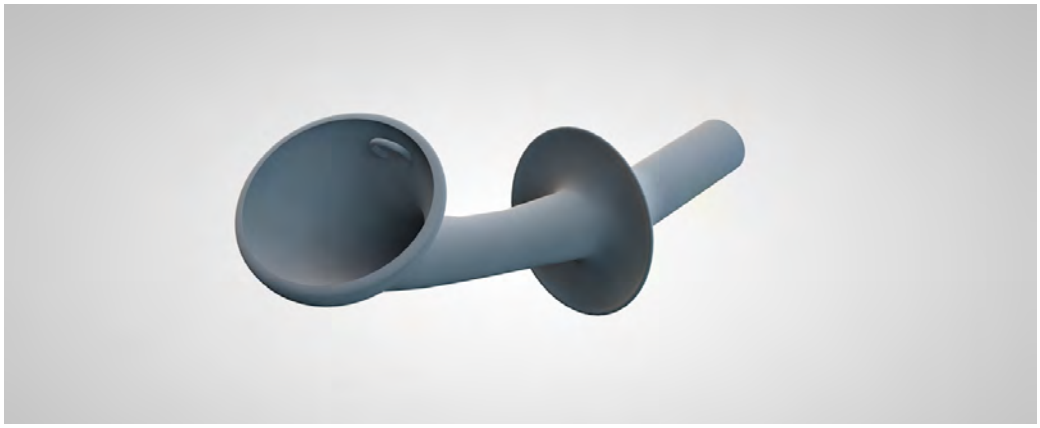
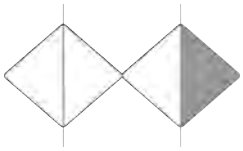


Figure 47. Side view of the polymer insert, bended in the usage situation

7. FUTURE DEVELOPMENTS



This master thesis gave me the chance to recognize the opportunity space for developing new product solution that would meet the needs of several user groups. Further development is needed and I plan to continue to do so after the defense of this thesis. I am interested in forming a product development team who would together be developing it into a functional product and hopefully we could start producing products which could be eventually used in various situations.

As Adam Braun, the founder and CEO of Pencils of Promise, a non-profit organization that builds schools and increases access to education for children in the developing world reminded one of the African proverbs, which states, “If you want to go fast, go alone. If you want to go faster, go together” (Braun, 2014, p. 218), this is why the next step of developing a concept further will be forming a team with whom to take these ideas to the next level.

Startup Garage who is organizing the event of Summer of Startups, which is a 9-week entrepreneurship program for early stage technology-based teams and business ideas to support and accelerate their development, has expressed their interest in the subject of this thesis, where they see an opportunity to develop it from the stage of the thesis into a startup and I am going to discuss it with them as a next step. Hopefully I will be able to take part in the Summer of Startups entrepreneurship program with this topic, which would be the beginning of the exciting next phase of the product development process.

One way or another, I hope this concept can be developed further into a working and functional product during the next phases, which in turn could be the first step towards a more sustainable future.

CONCLUSION

With this research and concept development thesis I intended to find out if it is possible to alter human behavior by design when the basic human need of having the urge to urinate strikes unexpectedly.

Through researching different situations when the event of having the urge could happen and understanding people's perceptions about it, also different ways how urine could be re-used and recycled, along with analyzing existing products in the market all gave the insights into proposing a concept solution that could be used for the purpose of solving this basic human need.

As several other product developments which carry stigmas have proved to be successful, I have no reason to believe that this human-centered design problem couldn't be solved. In this situation, people have to be educated about it so they could become aware of the different situations where they might end up in and need a product which could be used to solve their urgent pain. Because usually it happens that people don't think too much ahead of time and can't imagine finding themselves in these sorts of situations, but the matter of fact is that it can happen to them and more often these days as the traffic congestions are getting worse and worse.

As educating people about it is the first key factor, then cleverly developed positioning, marketing, branding and retailing are all big parts of making the message clear and through raising people's awareness and emphasizing the importance of relieving oneself for the health benefits and well-being, I am sure the message would get through eventually and people would be changing their perceptions about the urge to urinate and in turn it would influence their actions too.

Hopefully this thesis has offered the possibility of raising awareness about the different aspects of our bodily function and will contribute to more people thinking about this subject matter in order to move together to a more sustainable future. Our efforts in sustainability should be focused in solving the ecological problems we face today, because these are the long term investments what we do when we educate people and provide them with knowledge and opportunities to be aware of every aspect of their lives so they could make conscious decisions.

SUMMARY

Käesolev magistritöö on uurimis- ja tootearenduskontseptsiooni välja pakkuv töö, milles soovisin uurida võimalusi muuta inimkäitumist disaini abil, kui ootamatus olukorras tekib hädavajadus urineerida.

Läbi erinevate tekkida võivate situatsioonide ja inimeste suhtumise uurimise, erinevate uriini taaskasutamise ja ümbertöötlemise tehniliste võimaluste, turul olemasolevate toodete analüüsi kaudu pakkus tootearendusalane uurimistöö võimalusi ja sisendeid uue tootelahenduse väljaarendamiseks, mida saaksid inimesed kasutada olukorras, kui tuleb ootamatult lahendada inimfüsioloogilist vajadust urineerida.

Kuna paljud teised tootearendusprojektid, mida samuti peetakse üldiselt tabuteemadeks on tõestanud, et neist teemadest on võimalik rääkida ja probleeme lahendada, siis ma ei näe mingit põhjust uskuda, et sellist inimkeskset disainiprobleemi poleks võimalik lahendada. Selles situatsioonis tuleb inimesi valdkonna suhtes laiemalt harida, et nad võiksid olla teadlikud erinevatest situatsioonidest, kuhu nad võivad sattuda ja vajada vastavat tootelahendust, mis nende hädavajadust saaks rahuldada. Tavaliselt juhtub nii, et inimesed ei mõtle pikalt ajas ette ja nad ei kujuta ette end leidmast sellisest situatsioonist, aga tõsi on täna see, et hädavajadus urineerida võib tekkida igal ühel ja üha rohkemates olukordades seoses liiklustiheduse kasvu ja liiklusummikute arvu suurenemisega.

Inimeste harimine ja nende teadlikkuse tõstmine on esimene oluline factor, samuti on vajalik nutikas tootepositsioneerimine, turundamine, brändi loomine ja toote müümine, mis on kõik olulised osad, et tuua selge sõnum laiema avalikkuse tähelepanu alla ja tõstes inimeste teadlikkust ja rõhutades iga inimese urineerimise olulisust nende tervisele ja heaolule, ma olen kindel, et see sõnum jõuaks lõpuks inimestele kohale ja nad hakkaksid muutma oma arusaama tänasest urineerimisega seotud tabuteemast, mis omakorda mõjutaks ka nende käitumismustreid ja tegusid.

Ma loodan, et käesolev magistritöö on pakkunud võimalust tõsta inimeste teadlikkust ühe meie kehalise funktsiooni erinevatest aspektidest ja annab panuse sellele, et rohkem inimesi hakkab mõtlema sellele teemale, nii et me saaksime liikuda koos jätkusuutlikuma tuleviku suunas. Meie kõigi jätkusuutliku arengu püüded peaksid olema suunatud fookusega lahendada maailma ökoloogilisi probleeme, millega me täna kokku puutume, sest need on pikaajalised investeeringud, mida me teeme, kui me harime inimesi ja pakume neile teadmisi ja võimalusi olla teadlikud oma elu iga tahu suhtes, et me kõik saaksime teha teadlikumaid valikuid.

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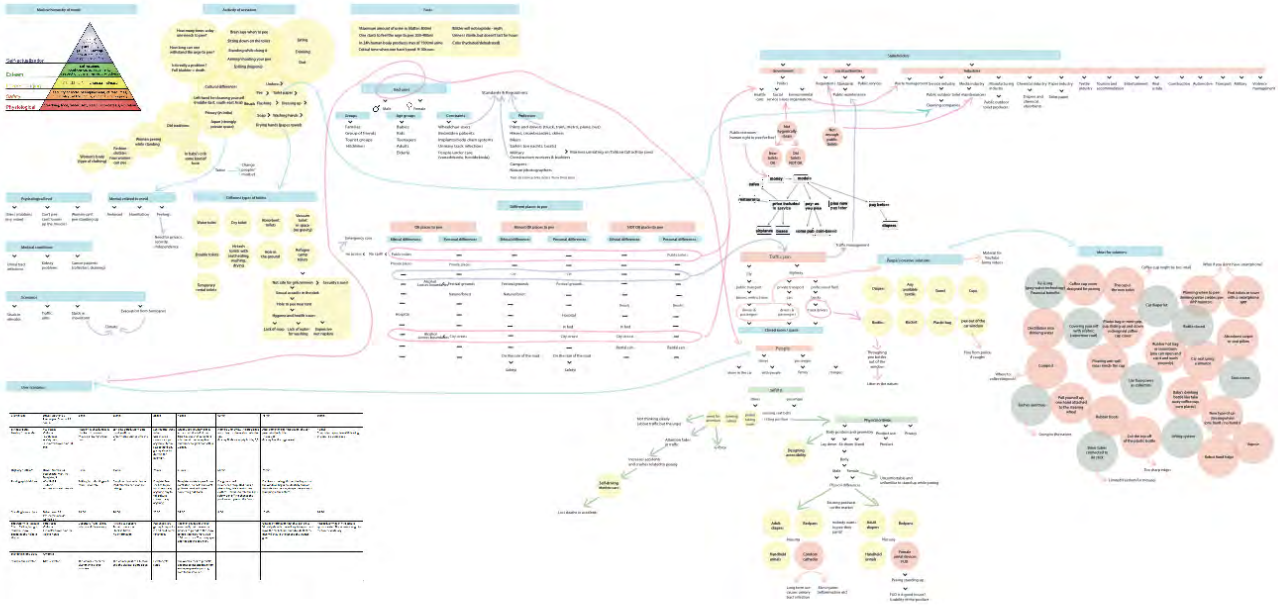
APPENDIXES

Appendix I

Gigamap by Systems Oriented Design



Appendix II

Interviews conducted (in chronological order)

With Tiina Lihtne and Hille Saar, hospital nurses, January 28, 2014 in the hospital of Kuressaare, department of nursing care. Discussing and reviewing current medical products used in the hospital, problems and possibilities in the field, went through together with carers the morning routine of cleaning patients in the nursing care department.

With Juhan Nemvalts, head of nursing care department, January 28, 2014 in the hospital of Kuressaare, department of nursing care. Discussing different problems in the hospital, finding possible solutions to existing problems, identifying possibilities for improvement.

With Janno Mõru, owner of a landscape and sports ground construction company, has been partly paralized and hospitalized, February 3, 2014 in Rakvere. Understanding the life of paralized, hearing stories from traffic jams in Russia, discussing construction workers situation when they need to use the restroom while they are on the construction site (small portable toilet in the van).

With John Usher, registered nurse, February 18 and April 4, 2014 through email communications; April 19 - May 6, 2014 in San Francisco and in San Diego, California. Discussing problems in hospitals, possible improvements, hospital system and nursing care in the United States, possibilities for product solution and marketing to truck drivers and long distrance drivers, traffic situations and personal stories of going and coming back from hiking trips.

With Ülle Pellis, consultant at Invaru shop, February 25, 2014 in the Invaru shop in Rakvere. Discussing problems of disabled people and elderly, learning about different products (bedpans, handheld urinals, diapers, condom catheters) and how to use them according to the manual and instructions, suggestions for improvements.

With Toomas Vernik, serviceman twice in Afganistan, March 30, 2014 in Kiviõli. Product sample examination of what servicemen use while they are on the mission (Disposa-John). Understanding of how those disposable toilets are being used in hot climate situations, different solution for urination (tubes inserted inside the ground at 45 degrees). Stories of cultural differences, local customs and traditions.

With Gina Metsalu, design studies coordinator in Haapsalu, March 31, 2014 in Tallinn. Personal story of recent experience with having the urge to urinate while driving from Haapsalu to Tallinn.

Email correspondence with Sameer Pawar from Mumbai, India, April 8 and April 18, 2014. Discussing cultural differences, public urination problem and traffic congestions in India, differences of men and women. Personal story of experiencing the urge to urinate.

Inna Grozdova, member of Eesti Seljaajusonga ja Vesipeahaigete Selts, April 10, 2014 in Tallinn at disability fair. Problems of disabled people, various situations where problems occur, understanding the life of a mother of disabled child.

With Karl Duesterberg, environmental scientist and amateur pilot, April 21, 2014 in San Francisco, California. Personal story of experiencing the urge to urinate while driving with shorter distance train in Germany. Understanding the situation in small planes, possibilities of using urine as fertilizer in developed countries, female truck drivers in the United States, possibilities for marketing additional products, possible market size and business opportunity analysis.

With Kertu-Lilli Meerbach, student of Engineering Materials and Marketing in Tallinn University of Applied Sciences, April 23, 2014 in San Francisco, California. Personal stories of having experienced the urge to urinate, solutions to those situations, urination problem in big events held in the city and outside of the city, personal willingness to use a re-usable product.

With Rommi Linnik and Meeli-Ann Linnik, family from Estonia living in San Franciscco Bay Area, April 24, 2014 in Albany, California. Personal stories of traffic situations, kids and their problems, possibilities of implementing a fertilizer system in developed countries, eco-cat litter as urine absorbant, cloth diapers.

With Robert Thompson, working in video game industry from Irvine, Orange County, April 29, 2014 in the train from Los Angeles to San Diego. Perceptions of cleanliness, traffic situations and congestions in Los Angeles area, changing of everyday routine due to traffic congestions, possibilites of using urine as fertilizer in developing countries, expectations for hygiene when going hiking.

With Diana Canant, psychotraumatologist currently focusing in the arena of global mental health and specifically displaced communities, living in California, but originally from Southern Africa and England, April 29, 2014 in the bus from San Francisco to Los Angeles. Discussing socially responsible entrepreneurship, global conflicts, natural disasters, human relationships and needs, taboos and perceptions, mental health issues, re-usable products, smart materials, edible water bottle membranes, constraints for product solution.