SCHOOL OF DESIGN

MSc in Design and Engineering

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Design for Behavior Change and its Ethical Dimensions

Master of Science Thesis

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Abstract

In the recent years there was vast development of a new subfield of Design called Design for Behavior Change. It aims to influence and alter the human behavior in order to achieve various moral goals. Areas in which design for behavior change is most commonly applied include environmental sustainability, health and wellbeing, safety and social issues as well as crime prevention. Design for Behavioral Change uses different multidisciplinary base knowledge to facilitate personal, behavioral and environmental characteristics as drivers for behaviour change.

Many new opportunities for economic development come in the face of technological innovation, automation, artificial intelligence which can establish a new vision to the world, but their implementation in the society raises many ethical questions and considerations. The ethics aim to analyse the moral aspects of technology and design in a systematic way. One of the aspects that should be taken into account is the social impact that the technology and design itself will have when they enter the society. Recent researches show that technologies can profoundly influence the behaviour and experiences of the users. Therefore, the designers are responsible to conceptualize and to anticipate the ethical dimensions in their design projects.

This thesis aims to overview, analyse and organize the different approaches of design for behavior change and their ethical dimensions. The thesis purposes systematization of the main design for behavior change approaches and their interconnections with the ethical issues in the form of a framework which can help the designers in better understanding that new field of design and be more prepared in their projects. Furthermore, the value of the purposed framework lies in its potential to help the designers to achieve more ethical, moral and good projects for the society and the planet. The research shows for sure that there is space for design for behavior change in the design process. Moreover, this understanding will be very important in the near future, since many countries plan to switch to Circular economy, and this could become an essential tool for the designers, companies and governments.

Keywords: Design, Design for Behavior Change, Ethics, Design Process, Sustainability, User Behavior, Ethical Dimensions, Technology, AI (Artificial Intelligence), Psychology, Design principles, Transformation Economy.

Abstract (Italian)

Negli ultimi anni c'è stato un vasto sviluppo di un nuovo sotto-campo di design chiamato Design for Behaviour Change con lo scopo di influenzare e modificare il comportamento umano al fine di raggiungere diversi obiettivi morali. Le aree in cui il Design for Behaviour Change è più comunemente applicato comprendono la sostenibilità ambientale, la salute e il benessere individuale e collettivo, la sicurezza e le questioni sociali, nonché la prevenzione della criminalità. Il suddetto campo di design utilizza diverse conoscenze di base multidisciplinare per facilitare le caratteristiche personali, comportamentali e ambientali come fattori guida per il cambiamento del comportamento.

L'innovazione tecnologica, l'automazione, l'intelligenza artificiale creano nuove opportunità per lo sviluppo economico creando una nuova visione del mondo e del nostro modo di vivere. Ma la loro attuazione nella società solleva molte questioni e considerazioni etiche. Il lato etico mira ad analizzare gli aspetti morali della tecnologia e del design in modo sistematico. Uno degli aspetti da prendere in considerazione è l'impatto sociale che la tecnologia e il design stesso hanno quando entrano a far parte della società. Ricerche recenti dimostrano che le tecnologie possono influenzare profondamente il comportamento e le esperienze degli utenti, pertanto, i designer sono responsabili di concettualizzare e anticipare le dimensioni etiche nei loro progetti.

Questa tesi si propone di analizzare, sviluppare e organizzare i diversi approcci di progettazione per il cambiamento del comportamento e le loro dimensioni etiche. La tesi ha come obiettivo la sistematizzazione degli approcci al design con la finalità del cambiamento comportamentale e le loro interconnessioni con le questioni etiche sotto forma di un quadro che può aiutare I designer a comprendere meglio questo nuovo campo del design ed essere più preparati nella loro attività. Inoltre, il valore della struttura proposta risiede nel suo potenziale per aiutare i designer a realizzare progetti più etici, morali e validi per la società e il pianeta. La ricerca mostra con certezza che c'è spazio per la progettazione per il cambiamento del comportamento nel processo di progettazione. Inoltre, un maggiore livello di consapevolezza sarà molto importante nel prossimo futuro, dal momento che molti paesi prevedono di passare all'economia circolare e questo potrebbe diventare uno strumento essenziale per i deigner, le aziende e i governi.

Parole chiave: Design, Design for Behavior Change, Etica, Design processo, Sostenibilità, Comportamento degli utenti, Dimensioni etiche, Tecnologia, Intelligenza artificiale, Psicologia, Design principi, Economia di trasformazione.

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Introduction

After the Industrial, Experience and Knowledge Economy, which brought many new challenges and peculiarities, the Western world proceeded to the Transformation Economy which tries to transform the economic model and society for a better world. Transformation Economy is facing different local and global incidents (pollution scandals, financial crises, climate change, health issues, food scares, public revolts etc.) that emphasize on the social, economic and environmental problems which the world faced in the recent years. Because of the scale of these problems, they are difficult to be solved by just one stakeholder. A new approach is needed which should tackle the problems systematically. The companies in the transformation economy realize that behavioural change is needed for supporting the sustainability and well-being of the society.

This led to the creation of Design for behavior change which intends to influence or develop specific user behavior. Design for behavior change uses multidisciplinary techniques and these approaches have been applied in a number of sustainable and social contexts proving their credibility and positive effect in different scenarios. It is very important that the behavioural change is not applied only on individual but also on societal level which also raises different ethical considerations. Ethics in design concerns moral behavior and responsible choices in the practice of design. As designers incorporate new knowledge of physical and human nature as well as new forms of technology and Artificial Intelligence into their products, people are increasingly aware of the ethical considerations and consequences of design for individuals, societies, cultures, and the natural environment.

This responsibility is becoming an essential part of the skill of the designers who operate in the Transformation economy. However, there are plethora of approaches and tools for influencing and changing the user`s behavior which are not systemized. Moreover, in the scientific papers there is a gap between the design for behavior change approaches and their ethical dimensions. This makes it difficult for the designers to be aware of the consequences of the technology and design when it enters the society.

This thesis work purposes a better understanding of the Design for behavior change approaches, the possibilities of their implementation, and the benefits for the society. The thesis explores the ethical dimensions of these approaches and purposes a framework for designer which can help them to realize better and ethical projects, ensuring that their work is good for the society and the planet. The implementation of Design for behavior change and its ethical dimensions in the design process has many benefits for the project since it can help the designers and stakeholders better understand the users, their intentions and habits and therefore this can contribute to more precise and better products and services which fulfil the real needs of the users and the planet.

Methodology

It can be identified that to derive a precise overview of the field a research must be done on three very broad topics: Economy; Design for Behavior Change and Ethics in design. All of these topics are studied extensively through current scientific articles and books, and they are presented in the thesis in a structured way that covers the subject of the work. The gathered information is organized and systemized in a way that can derive a clear overview of the topics covered. Since design and more specifically Design for behavior change uses a multidisciplinary approach, it was made a research about the connections with economy and psychology and more precisely which psychological tools can be used to influence and change the behavior of the people.

The systematization criteria was performed for the different Design for behavior change theories and tools and therefore was created a diagram which illustrate the systemized data. The field of Ethics was studies on base philosophical level but also it was made a research on the fields of Ethics in technology, Ethics in design and Ethics in Artificial Intelligence to better understand the scale of the application and possible consequences for design. Diagrams were created to illustrate the possible ethical issues connected with design. Accordingly, there was performed evaluation of the possible ethical consequences of the selected design for behavior change approaches and they were illustrated in different diagrams showing the interconnections. The interconnections between Design for Behavior Change tools and Ethical Issues were selected through investigation of different examples and case studies connected with the selected approaches. The Illustrative case studies were applied on a merged diagram of the design for behavior change approaches and ethical issues to better depict the practical implementation of the diagrams.

Outline of the Thesis

The thesis is structured in three main parts. The first part is dedicated for Design for behavior change. There is an overview of the main paradigms in economy and their connection with design and sustainability. Accordingly, there was made research about the history of design for behavior change and the development of different tools and approaches, and their connection with the field of psychology. The thesis continues with the systematization of the main different approaches divided into Multifield and Specific tools (which include Sustainability, Health, Social, Crime prevention methods). The part one finishes with a description how to implement the design for behavior change in the design process.

The second main part of the thesis explores the Ethics and its connection with Design. Firstly, the research is focused on the general Ethics and how it is defined by philosophy. After that, the thesis follows the connection between Ethics and Design and there are presented different views from scholars. Subsequently, there is an overview of the different dimensions of the Ethics in Technology and Ethics in Artificial Intelligence and possible ethical issues which must be considered by designers and stakeholders.

The third part investigates the connections between Design for behavior change and its ethical dimensions with the presentation of diagrams. There are four case studies which also illustrate the practical implementation of the purposed framework. The thesis finishes with a conclusion.

Part I
Design for Behavior Change

Chapter 1
Design and Social Responsibility

1.1. Overview of our society (type of economies)

Design discipline developed around one hundred years ago. It is a relatively young discipline which excessively changed our world for such a short period of time. During this span Western societies advanced in many fields and faced tremendous socio-cultural, technological and economic transformations (Brand & Rocchi, 2011). Brand and Rocchi created classification of the four different economies which evolved from 1950`s till nowadays: the industrial, experience, knowledge and transformation economies. Each economy represents the combined effects of the changes which happened. The categorization is helpful to better understand the principles of economy and the main related issues which the design discipline tried to solve and therefore this led to the development of the discipline itself.

The industrial economy witnessed the industrialization of the Western countries, the raise of the big companies which organized labour and made the mass-production and standardization a common thing. The mindset of the society changed with the technological transformation – the beliefs and grand vision was focused to the future and the human progress.

The experience economy faced a problem - the Western market was flooded with identical mass-produced items which made the customer question the mass production and realizing the need for something which will make the user stand from the crowd. The owner identity became very important since the customers wanted to show their unique taste. This was most evident in the fashion sector. In the experience economy the market faced segmentation and plethora of new brands which were ready to satisfy the customers' needs.

During the knowledge economy the users witnessed the rise of interactive web 2.0. People started to use social networks, internet banking, online shopping, smartphones and other innovative products which allowed them to do many things from the screen. All this technological advancement affected the skills and behaviors of people using them. The digital technologies changed every sector of people`s lives, economy and society. New business

online platform allowed the users to became authors on the internet, have followers and influence the crowd sharing their own thoughts and ideas.

In the transformation economy the Western society realizes the problems connected with the previous three economies. The world faces many environmental problems, social inequality, health problems and financial uncertainty. The people want positive change and real acts from the companies and the governments. This economy faces many new type of businesses, social-aware companies, fair-trade practices and many others which try to resolve aforementioned problems. (Brand & Rocchi, n.d.)

Transformation Economy is marked with many local and global incidents (pollution scandals, financial crises, climate change, health issues, food scares, public revolts etc.) that emphasize on the social, economic and environmental problems which the world faced in the recent years. The social websites created a platform where people can freely share news, thoughts and ideas and this led to a more transparency for these issues and overall the society became more knowledgeable about the world`s problems.

People also became aware that the big multinational companies have substantial influence on the social, environmental and economic problems. They want from these multinational companies more responsible behaviour and also their change towards a more conscious production in all stages of the product lifetime. The western society realised that overconsumption and mass production may be good for the economics but overall have negative impact and consequences on the planet and distribution of the wealth. Many other issues on a social and environmental level are also rising in the western societies such as obesity, psychological problems, stress, malninutrion, education, air pollution, climate change, rising prices. These problems are difficult to be solved by just one stakeholder. A new approach is needed which should tackle the problem with a systematic approach. The concept of better quality of life is raising in many developed western economies where the better living conditions, work-life balance, and personal fulfilment are becoming important everyday topic.

The transformation economy is facing many new business models, start-up companies, advanced clean technologies which aim is not only to fulfil the customer need and desires but to create a better quality of life for the customers and the planet. This leads to the beginning of a new paradigm in which a new economic value is created through social innovation. The new economy will be based on multiple stakeholders who will collaborate to create value for the customers, also meaningful proposition based on profitable, ethical and fair business practices (Rampino et al., 2018).

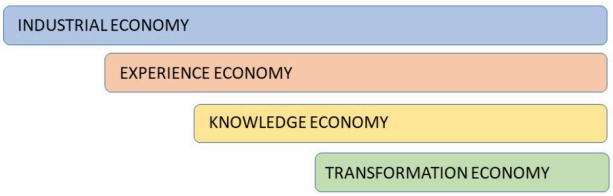

Figure 1: The Four Economies (Rampino et al., 2018)

During the Transformation economy people are encouraged by the big companies to modernize their life with the access to technological applications, social-based web platforms and a plethora of smart products. These social platforms provided the people with the tools to create and share ideas, communicate with the world and add their own value. This free and constant connection with the others fulfilled specific basic human needs but also made people focus on socio-environmental issues which gain much more attention than before on the social media website.

This unity of the people across such problems created interest and awareness also amongst the big business, entrepreneurs and design stakeholders to act together on rising global issues such as climate change, energy efficiency, malnutrition, aging society, psychological problems and etc. Many top managers saw the opportunity to develop their business and flourish it through adopting the philosophy of “doing good”. New competences should be developed to tackle these issues, also a new systematic approach should be created to develop new ways of creating business and engaging stakeholders. Many big companies adopted new type of business models which are more sustainable to address different specific socio-economic or socio-environmental issues (Brand & Rocchi, 2011).

In the transformation economy people are partaking in the customer experience the companies offer but they are interested in achieving something more than a nice memory, received from a product, service or experience. People are searching for transformation services which provide them a long-term improvement of their health, emotional development, professional and financial well-being. These new business models provide something more desirable than the experience itself, which was the main focus of the experience economy (Pine & Gilmore, 2013). In transformation economy, the economic offering of a business company is to change the individual person. With transformation, the customer is the product. That change is provoked from the customer and the company serves that need. The economic offering of the company is neither the material it uses nor the artefacts it produces. It is neither the process it executes nor the encounter it creates. When the company is creating economic model within the transformations, the offering is the individual. (Pine & Gilmore, 2013)

The companies which want to survive in the transformation economy have to realize that behavioural change is needed for supporting the sustainability and well-being of the society. It is very important that the behavioural change is not applied only on individual but also on societal levels (Brand & Rocchi, 2011). Achieving balanced sustainability should happen on multiple scales – the government efforts should be linked with non-governmental organisation, market players, engaged citizens in pursuit of real change for good in the western society (GIBSON, 2006).

In the industrial economy the dominating idea was the "expert" Western knowledge can deal with any problem in all parts of the planet, while in the transformation economy this belief changed and faced the new realm. The local communities now have the core responsibility for their own domestic problems, development of their culture, health, environment and justice. Several scholars are trying to convince that the transformation economy will need to change the shift from globalization society to a more systemic approach empathizing on local solutions. (Rampino et al., 2018)

In the transformation economy the design expands in almost every sector of our lives and especially in the social sector. It is trying to resolve different problems within complicated socio-technical systems. It is vital for designers that they understand in details previous methods, models, and frameworks but also focusing their attention on the relevance of the emerging social theory (Forlano, 2017).

The human-centred design framework is based on the belief that human beings should be understood as individuals. In the new social perspective, humans are facing a new connection with the natural world and the emerging socio-technical systems now are trying to change that prior understanding (Tromp, Hekkert, & Verbeek, 2011). Also the focus of design is changing – before the design emphasized on the connection between the artefact and its individual user and finding the best solution for it; now the design is trying to find a right balance in each project, understanding the society as a whole system (Rampino et al., 2018).

The Figure 2 presents the Economic Relationships during the four economies. Commodities are only material components of the products in which they are comprised. Goods are physical embodiments for the services that deliver. Services are temporal activities for the experiences they create. Experiences are memorable events for the transformations they enable. It can be also represented with the four- stage evolution of the birthday cake. In the agrarian economy, mothers made birthday cakes from scratch, mixing the basic ingredients (flour, sugar, butter and eggs) which are very cheap itself.

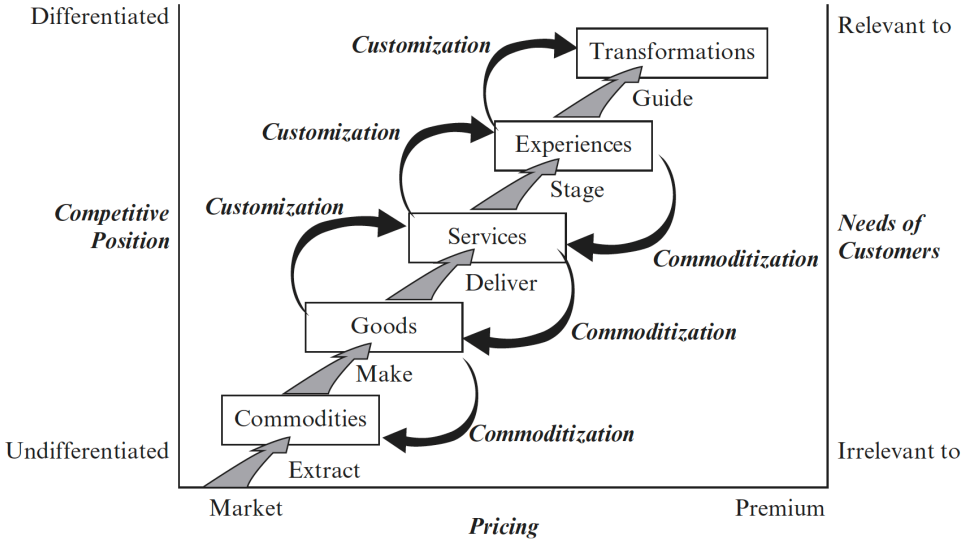

Figure 2: The Progression of Economic Value (Pine & Gilmore, 2013)

As the goods-based industrial economy advanced, moms paid a higher price for pre-mixed ingredients from which they baked the cake. Later, when the service economy took hold, busy parents ordered already baked cakes from the bakery or grocery store which cost ten times as much as the packaged ingredients. In today's experience economy, parents less and less make the birthday cake – or even throw the birthday party. Instead, they pay an admission fee of $100 or more to "outsource" the entire event to a Chuck E Cheese's, McDonald's, museum, farm or some other business that stages a memorable event for the kids – and often throws in the cake "for free" (Pine & Gilmore, 2013).

1.2. Four Perspectives in Product Design

It is important to discuss the role of the design during these four economics. Simultaneously with the development of the four economies, the design also developed to satisfy specific needs of the stakeholders and the users. The product design utilized a specific focus or a dominant perspective during every economy. During the work process of the designers, they apply this perspective to the whole process of design, taking in mind the specific needs of the economy. The history of design represents not only history of the design artefacts but also their story and the changing views of subject matter created by designers who ideated, planned and produced these artefacts as a declaration of those views (Buchanan, 1992).

Each one of the mentioned economies there are specific design discourses. The designers had to develop and learn new design skills, design methods and design process to be prepared for the situation.

During the industrial economy one of the main concerns for product designers was the standardization and simplification of the product. This was very important in order to satisfy the demands of the mass production. Moreover, a great deal of attention is devoted to the internal functioning of products and how products' visual forms express such functioning (Buchanan, 1992).

The experience economy made the product aesthetics the central point of the design. Product designers direct the communicative aspects of material object, evoking consideration of products` semantic and rhetorical aspects (Buchanan, 1992). Also, the shift of the design focus was present – from the product itself to the user.

In the knowledge economy, the product designers investigate material objects as parts of bigger, interconnected systems, which brought many new questions and practical concerns. Issues include smart and dynamic products and the impact of digital fabrication technologies (Buchanan, 1992).

The economy we are experiencing now – the transformation economy, made designers to be concerned about the overall effect of the products they create. These days the designers should be aware about many different perspectives of the lifetime of the products – from an environmental point of view, social, ethical and ensuring that the product should fulfil all these needs.

For every mentioned economy there is always one main perspective that can be identified because it dominates the design discourse. The design is used by societies to represent and express their values during this period of time. Therefore, design's norms are shaped by economic and social conditions. The four dominant perspectives adopted in these economies are as follows: technical (in the industrial economy), human (in the experience economy), digital (in the knowledge economy), social (in the transformation economy) and multifaced perspective (combining all). Normally, each perspective focus on some features of the design discipline and clears some aspects but at the same time it makes other aspects less clear and other features less important (Rampino et al., 2018).

The Technical Perspective

The focus of the technical perspective is clearly on the product and its technical aspects. The interaction between the human individual and the product itself is not yet considered. From this perspective the industrial designers and engineers are trained in manufacturing and assembly design. The complexity of the product is eliminated and the consciousness about the final cost is taken into big consideration (Rampino et al., 2018).

The first definition of the industrial design profession, given by the International Council of Societies of Industrial Design (ICSID) in 1957, well describes this perspective: An industrial designer is one who is qualified by training, technical knowledge, experience and visual sensibility to determine the materials, mechanisms, shape, color, surface finishes and decoration of objects which are reproduced in quantity by industrial processes. The industrial designer may, at different times, be concerned with all or only some of these aspects of an industrially produced object (ICSID, 1957).

The Human perspective

In the human perspective emerged the product-centred focus and the technical perspective shifted to a concern about the users and their experience. This led to the discovery of the user-centred design movement and also it reflected to a whole new design process. Also a new pragmatic philosophy emerged – the Schön's pragmatism in which he questions the objectivity and rationality of science as applied to the intellectual professions in general and design in particular, focusing the attention to the designers and the study of design thinking (Oxman, 2007).

The Digital Perspective

In the 21st century the industry faced very important technological shift which profoundly affected and changed product design – there was the shift from analogue to digital technologies. Since the advent of design, the manufacturing technologies determined the product shape and form, whereas the product technologies concerned the functioning of the product itself. In the digital perspective, the digital fabrication enables the designers to explore advanced and complex shapes, which are impossible to achieve with the mass production fabrication. The artefacts created with digital perspective are packed with many sensors, processors and new technologies which converts them into smart gadgets with computer-power. This led to more dynamic and interactive products. (Djajadiningrat, Wensveen, Frens, & Overbeeke, 2004)

The Social Perspective

With the extended spreading of the digital technologies, there are many social and ethical concerns which are raising among the customers. These concerns are affecting the design discipline, which was always involved in creating the artificial world we live in and how we behave in it. Before the designers` social responsibility was considered as something in the background, which now moved to the foreground and has to be considered as one of the most important priorities of the profession.

New subfields of design emerged which evaluate the potential for fostering more sustainable user behavior and also evaluating the ethical issues related to the new smart products which become so advanced that they can take autonomous decisions. A clear sign of this shift in design discourse interest is offered by the official change in ICSID's name (The International

Council of Societies of Industrial Design) to World Design Organization on January 2017, exactly sixty years after its foundation. The new name acknowledges the association's social perspective, today focusing on addressing local challenges with global relevance (i.e. rapid urbanization, climate change, and migration) through design (Rampino et al., 2018).

A Multifaceted perspective

These perspectives did not develop at the same time in all parts of the world, social classes and industries. Also, many of the firstly developed perspectives are still used by designers and do not use their value. They are not necessarily changed by more modern perspectives. (Gardien, Djajadiningrat, Hummels, & Brombacher, 2014). This led to the multifaced perspectives which today exist in the product design. It can be also said that the changes in the perspectives is a matter of the focus: from the product itself to a wider focus including the users, stakeholders, products, systems, and considering the society as a whole. The design focus changes accordingly to the change of the socio-cultural change and the people`s perception of what establish value changes. (Rampino et al., 2018)

1.3. The Three Pillars of Sustainability

Sustainability or Sustainable Development is the organizing principle which ensures meeting the human development goals while simultaneously it sustains the ability of natural systems to provide the natural resources and ecosystem services upon which the economy and society depends.

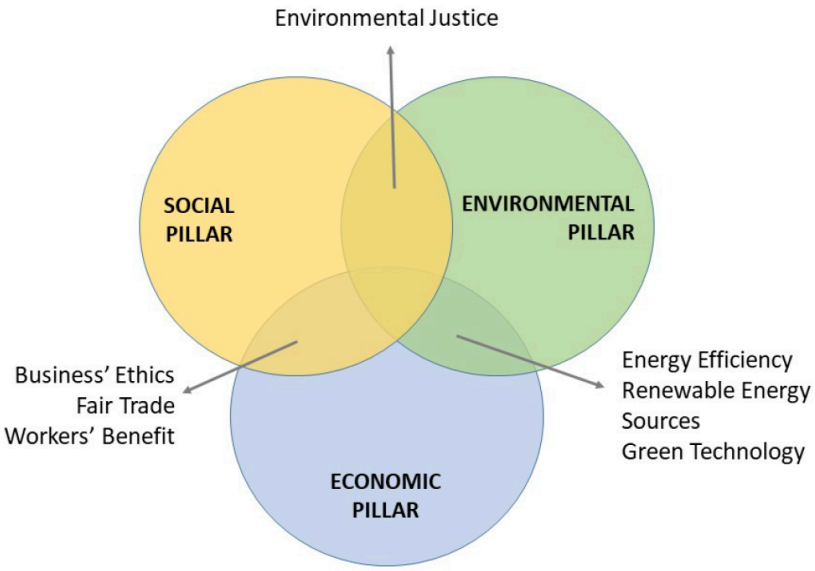

Figure 3: The three overlapping pillars of sustainability (Rampino et al., 2018)

The desired final result is a new type of society where all living conditions and resource use continue to meet the human needs without interrupting the integrity and stability of the natural system. Sustainable development can be classified as development that meets the needs of the present without compromising the ability of future generations (Emas, 2015).

These interrelated domains are often referred to as the three pillars or triple bottom line of sustainability (Elkington, 1997). The model shown in Figure 3, found in the sustainability literature, represents these domains and their interrelations using three overlapping circles – Social, Economic and Environmental. In the intersection between Social and Economic pillars there is the rise of specific issues connected with business ethics, fair trade and workers` benefits. Consumers are starting to look for and appreciate products that ethically produced and traded. In the intersection of the Economic and Environmental pillar there are the issues connected with energy efficiency, green technology and renewable energy. This area of sustainability usually is closest to the work of product designers since they are responsible for creating more efficient and recyclable products or encourage the users towards specific sustainable behaviors. In the final intersection between Environmental and Social pillars there is the concept of environmental justice. Environmental justice is a movement which grew from the recognition that a disproportionate number of environmental burdens fall on poor communities as does the importance of working to ensure a healthy environment for all. (Rampino et al., 2018)

In general terms, sustainability is a process's ability to remain indefinitely stable and productive. The first defined sustainability concept was the environmental concept. It is still popular concept these days and is the leading one. Its aim is to ensure the stability of the whole ecosystem, preserving the environmental processes and biodiversity. After that, the concept developed to encircle the economic and social spheres, providing a broader definition, according to which the environmental, economic and social sustainability triumvirate together contributing to well-being and progress.

This complex view of sustainability was first presented in 1987 by the World Commission on Environment and Development (Brundtland Commission) which defined the sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own need". Gibson believes that this concept of sustainable development proposed by the Brundtland Commission is becoming very popular despite the fact some critics call it an oxymoron or an illusion. The genius of the concept is that it recognize combating poverty (which is not just economic) and protecting the environment (which is not just biophysical) were necessary to each other and both were likely to fail if not addressed together (GIBSON, 2006).

Today, the Post-Brundtland sustainability is even more complex and widely understood as an indefinable (Moldan & Dahl, 2007) and multi-dimensional integrated concept (GIBSON, 2006) consisting of three interlinked pillars: economic, environmental and social. If any one of these pillars is weak then the system as a whole is unsustainable. During the 2008 recession a good

example emerged – the weakness of the economic pillar directly affected the environmental pillar in a negative way: when the finances are cut down, the governments postpone stricter environmental laws or investments. The same happens with the Social pillar: when there is a war, the environmental sustainability is neglected (Rampino et al., 2018).

Further step in the development of a more sustainable economy is the Circular economy. The concept of the Circular economy has been presented by the European Union and China as a solution that will allow countries, firms and consumers to live in balance with the natural environment and close the loop of product lifecycle (European Commission, 2015). Circular economy is an economic model in which there is ideally no use - or in any case an extremely reduced use - of virgin raw materials. This goal is achieved by applying existing approaches and techniques, which contribute to a sustainable innovation for the environment, whose impact is strongly enhanced by new technologies and digitisation. This type of economy is becoming a priority for many Western countries and their aim is to achieve it by 2030 year.

The Circular economy creates a restorative and regenerative economic model as a solution for the world`s environmental disbalance and the tendency for economic growth. This cycle considers governments, companies, and user as a whole system in which industries take resources from the environment to transform them into products and services; consumers use the product/service, and the Circular economy aims to redirect the waste and return it to the environment or the industrial process (Prieto-Sandoval, Jaca García, & Ormazabal Goenaga, 2016).

This is achieved by different methods and tools including specific sub-categories of design which are created in order to answer that need. Sustainable design strategies have the potential to assist the transition to more circular business models through encouraging customers to engage with products in a way which contributes towards the design aims of slowing and closing resource loops. Also, there is specific need in the context to alter the users` behavior in order to achieve these goals. (Wastling, Charnley, & Moreno, 2018)

1.4. Development of Sustainable Design and Eco Design

After the Brundtland sustainability view, the world slowly started to focus its attention to the sustainability and environmental problems which are emerging on the planet. Victor Papanek said in his influential book “Design for the real world” (1971) that: “there are professions more harmful than industrial design, but only a very few of them”. Maybe this was one of the first statements which made the designers think about the consequences of their work through the products they made. In his book, Papanek clarified that socially responsible designers must arrange their work outside the mainstream market which main aim is only to flourish with mass production items and unnecessary products with limited lifecycle (Margolin & Margolin, 2002). Although, Papanek statement was ignored during these years, because of the dominant market design perspectives (technical and human ones), some

alternative group of designers proposed different socially responsible solutions such as the needs of developing countries, the special needs of poor, elderly and disabled people (Morelli, 2007).

During the next decades, within the design community, there was a conscious progression – from focusing on a single, often environmental problem towards a greater awareness of the interconnected nature of sustainability. This was also marked with the transition from Green Design" to "Eco Design" towards "Sustainable Design" (Bhamra & Lofthouse, 2007). Research shows that the decisions made during the design process can influence up to 80% of environmental impacts over the life cycle of the products (Graedel, Allenby, & Comrie, 1995).

Sustainable design considers all the three main pillars - economic, social and environmental impacts staged throughout the product lifecycle from design to manufacture through distribution, sales, use and disposal. The design activities in the field of sustainable design historically focused on reducing the environmental impacts of manufacturing and disposal. In the research communities the focus is shifting from issued connected with production to those connected of consumption (Peters & Hertwich, 2006). The sustainable consumption research started to focus on the behaviour of the users rather than the use of the product.

In 2009 there was the introduction of the Ecodesign for Energy using Products (EuP). The EuP Directive establishes a framework for setting eco-design and minimum energy efficiency requirements for energy using products (EuP), imported into or sold in the European Union. The EuP legislation are largely referred to as environmental concerns, which have been considered within the manufacturers remit. The social impacts of product use, however, appear to have been largely overlooked by designers beyond concerns regarding the ethical sourcing of materials, fair-trade, liability and safety (Peters & Hertwich, 2006).

The governments are prioritizing the legislation and improvement of energy efficiency control, combating climate change and reducing the greenhouse gases. However, research shows that the most significant environmental impact of most electronic products can be achieved during their use and this can be achieved predominantly by the behaviour of the customers (Rodriguez & Boks, 2005). Different NGO and government sustainability campaigns did not lead to improved and sustained behaviour change. Even though the many adverts and campaigns about adopting more environmentally conscious among the users, they are using more energy than ever before (Barr, 2004). The governments are starting to perceive design as an important tool for influencing consumer actions and behaviors. (Secretary of State, 2005). Many producers of electrical appliances have chosen to change their production lines towards reducing energy use through technological interventions to improve efficiency and reduce CO2 emissions. However, the success of technological interventions is often dependent on consumer compliance and increased consumption of goods and services often overrides benefits derived from eco-efficiency initiatives (Calandra, Mauro, Cutugno, & Martino, 2001).

The limitation of information campaigns and the undertaken technological interventions in achieving sustained behaviour change to reduce the impact of use, prompted the exploration of a new field of enquiry in design. 'Design for behavioural change' is the collective term which describes a new field of enquiry exploring how design could influence user behaviour to reduce the negative social and environmental impacts of products during use (Bhamra, Lilley, & Tang, 2011a). During the last decade the design-led research in the field of behavioural change is growing and the attention of the scholars is increasing. However, the research to date has predominantly focused on tackling environmental impacts associated with the use of electrical products and the energy and water consumption. Fewer researchers have explored how design could reduce the negative social impact caused by product use since this is rather new field to explore. It could be useful to mention what is negative social impact: "Any action enacted or facilitated by the product or resulting from the behaviour of the user in the use of the product which diminishes the health, wellbeing, social equity or quality of life of others affected by the use of the product". (Lilley, 2009)

Within the transformation economy a new design fields emerged connected with sustainability, environmental preservation, green technologies and social innovations: Design for Sustainability, Eco Design, Design for Behaviour Change, Social Design, Respectful Design, Post-human design:

Design for Sustainability

Sustainable design (also called environmentally sustainable design, environmentally conscious design, etc.) is the philosophy of designing physical objects, the built environment, and services to comply with the principles of ecological sustainability. The intention of sustainable design is to "eliminate negative environmental impact completely through skilful, sensitive design"

Manifestations of sustainable design require renewable resources, impact the environment minimally, and connect people with the natural environment. (McLennan, 2005). Sustainable design must create projects that are meaningful innovations that can shift behaviour. A dynamic balance between economy and society, intended to generate long-term relationships between user and object/service and finally to be respectful and mindful of the environmental and social differences. (Ramani et al., 2010)

One of the first attention on sustainability in the design field was in 1967, when the industrial economy was at its peak. The architect Buckminster Fuller, who was presenting his geodesic dome in the U.S. pavilion during the World Expo in Montreal, made the following important statement:

"[…] people think it's a flat Earth, which makes them think its resources are infinite, and if they just understood it is a sphere, and therefore finite, they would treat everything differently" cited in (Needham, 2016).

Today due to the many industrialization downsides, the design with its subfield is focusing its concerns towards the sustainability of the planet. In the transition economy the success of the companies will be closely linked with the ability of resolving local issues (Morelli, 2007). In this situation the users are no more outside of the equation, but instead they play a key role in the value chain and are rather part of a value creation constellation. In this scenario, the designers must develop abilities and knowledge how to contribute to the local problems and solve them with the approaches and tools borrowed from the industrial production.

A good example is Design Thinking for Social Innovation which uses the design thinking approach to generate enhanced solutions to a number of social challenges in different developing countries in the world such as safe water distribution in India to the distribution of mosquito nets in Africa. Non-profit organization are also starting to use design thinking in order to develop better solutions to social problems. Design thinking crosses the traditional boundaries between public, for-profit, and non-profit sectors. Design thinking enable all stakeholders to work tightly together and achieve high-impact solutions. (Brown & Wyatt, 2010)

However, prototyping is one of the tools which is necessary to adapt the design thinking to social challenges in the developing world. The prototyping phase helps to ensure that there the designed solution is not too difficult to achieve since there is lack of infrastructure, retail chains and communication networks. Also, newer design perspectives are built on the already existing design perspectives, for example the social perspective can borrow from the already well-developed human-centred perspective and develop further useful knowledge. Today, several design fields are dealing with one or more of the three pillars of sustainability. Each field is known by a specific label. The following is an overview of the most important:

Eco Design

The development of Eco Design started back in 1990s when the big companies started to emphasize on the creation of more eco-efficient production technologies and products. The design became important tool as a way of diminishing the environmental impact companies made. The main aim of eco-design is to eliminate or considerable reduce the negative environmental effects with the use of renewable resources, recycled or recyclable materials, enhancing product efficiency and durability, long product life and designing for easy recycling. Usually, the eco design take care of the product`s full lifecycle. In this approach the environmental impact is considered across every step of the manufacturing of the product – from the extraction of the raw material through the disposal. At the beginning of 2000s, the eco design became regarded as too narrow in scope and it evolved into a wider concept in which design for the sustainability, environmental concerns with social and economic perspectives are considered as a one whole problem.

The big tech companies are realizing that eco-friendly branding could help them to promote sustainable development and motivate consumers to make more sustainable consumption decisions. Brand eco-friendliness means that the company does not harm the environment, and also manufacturers have eco-friendly production processes and consumers' consumption habits are eco-friendly (Phipps et al., 2013). The branding is one of the most important tools of marketing to sell products to consumers and the brand itself is one of the most important purchase selection criteria among consumers (Young, Hwang, McDonald, & Oates, 2010). The brands reflect the company`s reputation and business success in the mind of the customers and also including the environmental perspective as a consumer choice for a purchase on a product (Grimmer & Bingham, 2013). The corporate image has an important impact on the appreciation of the company by the stakeholders and the customers and it can be built on the way a company manages its social and environmental responsibilities. The corporate image and reputation is also used to differentiate how the different companies commit themselves to being sustainable (Dyllick & Muff, 2015).

Since the last twenty years the smartphones, computers and other tech devices changed the world and our everyday lives in incredible ways. The sad truth is that behind the 21st-century technology lie supply chain and manufacturing processes which still rely on 19th-century sources of energy, dangerous mining practices, hazardous chemicals and poorly designed products that exist the Earth`s resources and leave a negative effect on the environment. This hidden reality stands in stark contrast to the forward-thinking, environmentally conscious image most IT companies project. (Cook & Jardim, 2017)

Yearly reports such as the Greenpeace`s "Guide to Greener Electronics 2017" is really helpful for all stakeholders and customers to be informed about the technological brands they use every day and what is their footprint on the environment (Table 1). This focus the attention of the society on very important issue about the sustainability and the downsides of the tech mass production, helping the customers to choose a more environmentally conscious company. The guide is focused on measuring three critical impact areas tied to product design and responsible supply chain management across the electronics sector: Energy - Reduction of greenhouse gases through efficiency and renewable energy; Resource Consumption - sustainable design and use of recycled materials; Chemicals - Elimination of hazardous chemicals from both the product itself and manufacturing. Within each impact area, companies are graded on transparency, commitment, performance and advocacy efforts. The Greenpeace`s guide focuses on the largest electronic device brands (smartphones, tablets, and personal computers) in East Asia, North America, and Europe. (Cook & Jardim, 2017)

Overall Grades		ENERGY	RESOURCES	CHEMICALS
FAIRPHONE	B	B	A-	B-
	B-	A-	C	B
DELL	C+	C+	B-	C+
hp	C+	B	B-	C+
Lenovo	C-	C	C	D
Microsoft	C-	D+	D+	C
acer	D+	C-	C-	D
LG	D+	D	C-	D+
SONY	D+	C-	C-	D
Google	D+	C-	D	C-
HUAWEI	D	D	D+	D
ASUS	D	D	D	D+
SAMSUNG	D-	D	D	D-
amazon	F	D	D-	F
oppo	F	F	F	F
vivo	F	F	F	F
mi	F	F	F	F

Table 1: Guide to Greener Electronics (Greenpeace, 2017)

As we can see from the Table 1, sustainability is a complex, multi-dimensional, integrated concept. An interesting example which is on the top of the Greenpeace`s eco sustainability brand chart is the Fairphone brand. Fairphone is a Dutch company which makes ethical cell phones and addresses all three pillars of sustainability. One concept of the phone is very different from all the other mass products on the market – the devise uses modular design in order to be easy to repair. For instance, replacing the screen is a simple operation that end users can even do themselves. Moreover, Fairphone declares that all its materials are fair trade. Also, the company`s one of the primary concerns' is the labour conditions of the workers involved in the making of the smartphone (all based in China). Also, to be considered fully sustainable and ethical fair company, all Fairphones are recalled at the end of their lifecycle to be recycled correctly, in order to decrease the electrical waste. The phone is prebooked by each user and after that is produced and shipped directly to the customer in order to satisfy the exact need of the market. (Rampino et al., 2018)

Design for behavioural change

Design for behavioural change is the collective term which describes a new field of enquiry exploring how design could influence user behaviour to reduce the negative social and environmental impacts of products during use (Bhamra et al., 2011a). During the last decade the design-led research in the field of behavioural change is growing and the attention of the scholars is increasing. However, the research to date has predominantly focused on tackling environmental impacts associated with the use of electrical products and the energy and water consumption. Fewer researchers have explored how design could reduce the negative social impact caused by product use since this is rather new field to explore.

Design for behavioral change examine the way the design can shape and influence human behaviour. The areas in which design for behavioural change are mostly applied are health and wellbeing, environmental sustainability, safety and social context and crime prevention. In the intersection between the environmental and social pillar there is a sub-category of design for behavioural change – design for sustainable behaviour. This is an emerging area which deals with reducing the environmental and social impact by moderating how users interact with them. (Bhamra et al., 2011a)

Design for behavior change intends to influence or navigate the user`s behavior. The idea that people`s behavior can be influenced by the product design is not completely new. Norman described how perceived affordances in products can influence how people interact with them (Norman, 1988). The designers are intentionally or not shaping the user`s behavior when they create products. The basis of the Design for behavior change is that consideration and especially the focus is on the use phase of the product development process which can allow the designers to better understand and influence the consumer`s behavior and therefore reduce the negative externalities (Wastling et al., 2018). Design for behavior change has the potential to assist the transition to more circular business models through encouraging customers to engage with products in a way which contributes towards the design aims of slowing and closing resource loops. These techniques are also used in many government and non-profit organisation to facilitate specific behavior among citizens.

Social Design

Social Design can be defined as a design process that aims to improve the human well-being and budget. This type of design focuses on a small niche parts of the population which are not specific interest of the big companies either because they are not economically profitable or because they are too small segment on the market. This is more altruistic type of design since some designers do the design work for free within the charitable principle since the people for which the design is aimed for, cannot effort the product. (Manzini, 2015). This makes the social design focused only on the social sustainability pillar and be outside of the

economic one. This means that the social design should be paid by someone and this could be the big companies, governments or NGO organization.

Respectful Design

The Respectful design is a relatively new field in design which was developed by OCAD University in Toronto. This type of design is focused on the social pillar and it appreciates different values and different approaches in the design education. Respectful design recognized that one of the main problems in the European design education is the prioritization of the western perspective in the overview of the design discipline. This creates limited vision of the design problems among students, so they can not consider the "big picture" and be prepared to fully understand the cultural implication of what they are designing (Tunstall, 2013). The western values are used to describe and understand the "others" instead integrating people`s own self-definitions. This creates a hierarchy in which universal, scientific, rational and civilized Europeans occupy a dominant position as compared to the local, subjective and primitive "indigenous" people (Forlano, 2017).

Design for Social Innovation

Design for social innovation is a sub-field of design in which designers are applying different methodologies in order to find solutions for complex social problems such as poverty, climate change, food insecurity, social inequality, human health and others. Manzini explains that the design for social innovation is not a new discipline, because it should be the design norm today. Design for social innovation should be prime tool for expert designers to activate, sustain and orient different processes of social change towards sustainability (Manzini, 2015). Manzini also focus on the fact that design for social innovation is a large field including the entire range of social innovation phenomena but also different multiple forms that the design profession takes on today.

Post-Human Design

In 2017 the idea of Post-Human Design concept was presented by Forlano in her journal article. In the recent years the development of the new technology was vast, and it deepen in our everyday life that this technological progress has blurred the lines between human and nonhuman, culture and nature, public and private – the examples are the driverless cars, wearable technologies and voice-activated personal assistants. Actually, post-humanism is not such a new field since many scholars have already discussed this issue in many different social, philosophical and technological fields. According to Forlano, post-human ideas are already being incorporated into the field of design, as is demonstrated by a number of discussions around decentring the human, non-anthropocentricism, and human/non-human relations (Forlano, 2017).

These new perspectives raise questions about what, how, and why we engage in the design of the so-called "artificial" world. In the past decades many social theories have developed

facing the idea of blurring the boundaries between existing models and merging them with hybrid, non-binary, relational modes of thinking about being in the world. This considerations of humanity's role in environmental and sociotechnical changes, and the ways these changes shape humans and the world, makes it possible to reflect of these hybridized notions for epistemology, ontology, and ethics. Moreover, as the development of understanding of human and non-human knowledge and its connection to the life on the planet, there will be more precisely develop corresponding design methods, frameworks and practices that better address the challenges our society faces (Forlano, 2017).

Chapter 2
Design for Behaviour Change

2.1. History and Development – Behaviour Design

In the resent decade a new very important sub-field of design had emerged, and it can be defined as a tool which has the power to change people`s lives, to control the environment, to shape people`s morality, and it is called Behaviour Design. Actually, behaviour design developed long time ago. In the literature we can find the name of B.J. Fogg who first mentioned the term Behaviour Design in 1993. But in reality, it evolved many years before that in the field of Psychology and more in the field of Behaviorism.

The Transformation Economy faced many local and global problems within the Western society. These problems are connected with the social, economic and environmental pillars (pollution scandals, financial crises, climate change, health issues, food scares, public revolts etc). The western society also realized that the overconsumption and mass production have many negative consequences on the planet and the distribution of wealth. Many other issues on a social and environmental level are also rising in the western societies such as obesity, psychological problems, stress, malninutrion, education, air pollution, climate change, rising prices. These problems are difficult to be solved by just one stakeholder. A new approach is needed which should tackle the problem with a systematic approach. The concept of better quality of life is raising in many developed western economies where the better living conditions, work-life balance, and personal fulfilment are becoming important everyday topic. (Rampino et al., 2018)

Design for behaviour change developed within the transformation economy because it is a systematic approach which can influence people and trigger real and productive behaviour in

the desired way. It is completely understandable why the Design for behavioural change developed within the transformation economy – in this period every aspect of the design chain is changing so also the customer should change and be learned in a good way how to be more conscious about the world problems. The customers should be aware that their everyday choices could have negative impacts on the planet and themselves.

Actually, Design for behavioural change is not a completely new sub-field in Design. It emerged and became popular in the last ten years, but its development was happening slowly in the decades before that, connected with many psychological and scientific researches. Design for behavioral change developed from work on design psychology conducted by Donald Norman who is a cognitive scientist and usability engineer. His book "The Psychology of Everyday Things" is about how design serves as the communication between object and user, and how to optimize that conduct of communication in order to make the experience of using the objects pleasurable. One of the main premises of the book is that although people are often keen to blame themselves when objects appear to malfunction, it is not the fault of the user but rather the lack of intuitive guidance that should be present in the design. Norman's book "Psychology of everyday things" introduced concepts from ecological psychology and human factors research to designers, such as affordances, constraint feedback and mapping. They have provided guiding principles with regard to user experience and the intuitive use of artefacts, although this work did not yet focus specifically on influencing behavioural change. (Norman, 1988)

Another very important person connected with the development of behavioural design is B. J. Fogg, who is a behaviour scientist and professor at Stanford University. He is also the founder and director of the Stanford Behaviour Design Lab. Fogg was the first scientist to articulate the concept of "Captology", or the study of how computers can persuade people. He started this research in 1993 and continued to spotlight the potentials and pitfalls of persuasive technology. In 2010, his research shifted away from persuasive technology into a more general study of human behavior, an approach he named "Behavior Design" (which is not the same thing as captology). Behavior Design comprises a set of models for understanding how human behavior works, as well as a set of methods he has created to help innovators create successful products.

The models that followed Norman's original approach became more precise about influencing behaviour, such as emotion design and persuasive technology. Perhaps since 2005, a greater number of theories have developed that explicitly address design for behaviour change. These include a diversity of theories, guidelines and toolkits for behaviour change (which will be discussed later in the thesis) covering different domains of health, sustainability, safety, crime prevention and social design. With the emergence of the notion of behaviour change, a much clearer discussion has also begun about the deliberate influence of design. Although, a review of this area from 2012 has identified that a lack of common terminology, formalized research protocols and target behaviour selection are still key issues.

Key issues are the situations in which design for behaviour change could or should be applied; whether its influence should be implicit or explicit, voluntary or prescriptive; and of the ethical consequences of one or the other.

Beside the two beforementioned scholars there are many others who explored the field of behavioral change through the prism of psychology. This happened some decades ago when the behavioral psychology was developing. Behavioural change theories are different attempts to explain why behaviours change. These theories cite environmental, personal, and behavioural characteristics as the major factors in behavioural determination. In recent years, there has been increased interest in the application of these theories in the areas of health, education, criminology, energy and international development with the hope that understanding behavioural change will improve the services offered in these areas. Some scholars have recently introduced a distinction between models of behavior and theories of change. Whereas models of behavior are more diagnostic and geared towards understanding the psychological factors that explain or predict a specific behavior, theories of change are more process-oriented and generally aimed at changing a given behavior. Thus, from this perspective, understanding and changing behavior are two separate but complementary lines of scientific investigation. (Morris, Marzano, Dandy, & O'Brien., 2012)

Behaviour change is currently a very important topic within many businesses and different organizations. Professionals including policy-makers, marketers, educationalists, environmentalists, international development practitioners, governance and justice campaigners, health promoters, city planners, sports psychologists and web designers, as well as individuals seeking to improve their own lives, are all looking for advice on how to change behaviour. (Aunger & Curtis, 2016)

Another school of thoughts is Behaviorism, also known as behavioral psychology. Behaviorism is a theory of learning based on the idea that all behaviors are acquired through conditioning. Conditioning occurs through interaction with the environment. Behaviorists believe that our responses to environmental stimuli shape our actions. According to this school of thought, behavior can be studied in a systematic and observable manner regardless of internal mental states. Basically, only observable behavior should be considered—cognitions, emotions, and moods are far too subjective. Strict behaviorists believed that any person can potentially be trained to perform any task, regardless of genetic background, personality traits, and internal thoughts (within the limits of their physical capabilities). It only requires the right conditioning.

As beforementioned there are myriad ideas about behavioral change within psychology, design, science and many other fields. Behavioral change now is used even in health industry, by economist and managers who have demonstrated a variety of ways of changing behaviour using specific aspects of human decision-making (Anand & Lea, 2011). Professionals from the Design and Marketing field also have practical techniques for improving sales, advertising and focusing the attention on the new products on the market. Each of these distinct fields has

its own theoretical foundations and standards of practice. But even many needs from different sectors of our society there is still not developed applied science discipline of behavioral change which can help develop many other interconnected sub-fields like Design for behavioral change.

An applied science needs both science and application. First, it has to be able to stay current with, and incorporate, the latest thinking in relevant scientific disciplines, and second, it needs access to the latest and best tools for applying this knowledge to real-world problems. In the case of behaviour change, the relevant scientific disciplines include the burgeoning field of the brain and behavioural sciences, as well as the social and ecological sciences. Practical tools for applying this science to behavioural problems are to be found in many places including in industry (in creative and PR agencies, with professional designers and marketers), in public sector organisations and, to a lesser extent, in academia. Unifying such diverse material requires a generic framework. (Aunger & Curtis, 2016)

2.2. Issues connected with Design for Behavior Change

Over the last decade, design for behaviour change has become increasingly recognised as a strategy for enabling social change and sustainable innovation. Design for behaviour change (DfBC) is now considered as a powerful tool to tackle some of the bigger problems in the world around us (K. Niedderer et al., 2016). There are many different examples which has impact on people, enabling them to recycle their garbage more efficiently. (Do Valle, Rebelo, Reis, & Menezez, 2005), (Sidique, Lupi, & Joshi, 2010). Other approaches empowered with behavior design tackle the problem of using the energy more efficiently (Darby, 2006), (Wood & Newborough, 2003). Behaviour design is also used to increase our exercise patterns through smart wearable devices (Fritz, Huang, & Murphy, 2015). Also it is used to change the way we think about social interaction (Kristina Niedderer, 2007).

However, despite the ability of design to change the human behaviour in a better way, overall the field of DfBC is still insufficiently understood. One of the main issues is that this field is very fragmented. Also, there are limited frameworks which can effectively implement the desired change in the professional and public sectors.

There are truly successful and inspiring examples of DfBC but they are not completely transparent, and this have led to a confusion of how DfBC methods can be applied in reality and overall not clearly understanding how to make this solutions effective. These methods and their understandings are very important, because it enables the designers to influence the management of the whole process and improve the overall influence of the design, since design can affect behaviour change among users both intentionally and unintentionally. Specifically, the unintentional changes of behaviour through design and their consequences are very common. (K. Niedderer et al., 2016)

Often designs are created with limited, specific focus which in many cases is the supportive function of the design to enhance the human abilities within the existing behaviour frame (to enhance travel from point A to point B, or to accelerate communication over distance). In these cases, the designers are not intentionally creating new type of behaviour of the users, since they are fitting inside an existing design model and this led to unknow field in which there is no information about what the consequences are or the "side-effects could be. However, without intention, they can create large-scale behaviour change with both positive and negative consequences which are not examined or considered by the designer.

For example, the creation of cars had profoundly positive impact on our society, enhancing the mobility of people and reducing many distances, enabling the cities and countries to develop. But of course, this led to other negative consequences such as poor air quality in the cities, many illnesses connected with that, stress among people, increased resource demand, many physical problems such as obesity because people just prefer the cars instead of walking or cycling. Similarly, the mobile phones and computers transformed the speed, social code and the way we communicate and do our everyday work. They made us more efficient and independent. This change is generally seen as positive but may also increase the stress levels, change social attitudes among people, make them asocial and isolated. Also, they unintentionally promote dangerous behaviour which can cause a nuisance (e.g. making private phone calls in public) or create a safety hazard (e.g. texting or talking on the phone, while driving) (Srivastava, 2005).

That is why designers should start to think about the consequences of the use of their products and also should take moral responsibility for the actions which are created with the everyday interaction with the designed artefacts (Jelsma, 2006). The field of DfBC considers this responsibility and tries to build on the history of design which intentionally try to create a positive change. One of these examples is the Kambrook`s Axis kettle designed through the Ecoredesign initiative at RMIT (1996). This kettle used double insulation and a temperature indicator which is created specifically to inform the user that the water inside is hot and prevent situations in which the user reboils the water and create unnecessary use of electricity. This clever method to alter the user behaviour reduces the use of energy and makes the product more sustainable.

Other interesting example from the field of Design for Behavioral Change is IDEO`s project "Coasting bike platform". This project addresses the fact that a large amount of the adult population in the US no longer use the bicycle. Despite the good memories connected with the pleasure of riding the bicycle in their youth, most adult people in the US these days feel confused and find the new modern bicycles too complex and advanced for their everyday life. Instead of focusing on the high-technological bicycle systems, IDEOS`s approach was to use the main archetype of the bicycle and bring everything connected with the bicycles back to basics, focusing on simplicity and ease of use to encourage large part of the US population to ride a bicycle again (Demircan & Moggridge, 2008). Even though the beforementioned

examples were not intended to specifically change the behavior of the users, with IDEOS`s design process which clearly addresses the design to create safe, easy to use experience, this facilitate behavioral change among the users.

This is a common issue. The research about behavioural change is tightly linked with psychology and other disciplines and rely on this useful knowledge to explicitly shift user behaviour (B. J. Fogg, 2003a), but the majority of DfBC case examples lack an explanation or detailed information with the principles and precise tools which are used by organisations in conceptualising their designs. Also, there are fewer studies which measure the impact of the design on behaviour of the users. One of the few examples which illustrates with real numbers the results of design shifting behaviour is the "World`s Deepest Bin" project which encourages people to collect up to 41kg more rubbish every day (Volkswagen, 2017) or a piano staircase that encourages up to 66% more people to prefer the stairs rather than using the escalator which encourages their physical activity.

The power to change the behaviour is not only in the hands of the producers but also in the users. It is essential for producers and all stakeholders connected with the creation of the product to be aware of their own processes and responsibilities but also to know in depth their customers. According to the customers, in order to create a real adoption of sustainable innovation, there should be a shift in the everyday behaviour of the people (Crocker & Lehmann, 2013). This can be accomplished through different mechanism such as motivation, education, prescription and different design tools (Lockton, 2008). There are many new initiatives in form of seminars, research, networks, publications which seek to promote the sustainable behaviour and innovation in the behaviour through design.

One of the main issues of Design for behaviour change is that is relatively young sub field of design and only in the last decade it has become increasingly popular as a strategy tool for enabling social change. Despite that fact, designers are far away from understanding its implementation and what impact it can have on the users. Another problem is the public and private sector which are also unware of the potential of the Design for behavioral change. This is illustrated in the study of Lilley (Lilley, 2009) in which she surveyed private and public sector stakeholders about their current knowledge and approach for behavioral change. The aim of the study was to highlight the challenges for professional stakeholders in understanding, accessing and implementing design for behavioral change. The results of the study clearly showed that there is a significant disconnection between the available theoretical knowledge on the topic and its practical implementation. Lilley points that the reasons for this include a lack of awareness and common language, also lack of evidence-based examples, lack of evaluation methods and inter-sector collaborations.

In the recent years the empirical development on Design for behaviour change was substantial but it is still unclear how the scholarly work around that field is applied by the design community and the SME (Small and medium-sized enterprises) (K. Niedderer et al., 2016). K. Niedderer performed an online research focused to gain in depth insight into the

current understanding of DfBC. The survey was focused on SMEs in the UK given the fact that SME`s account for 99% of European businesses (European Commision, 2016) but also was taken the information given from large organizations. The main interest was to gain an understanding of the relationship of innovation and behaviour change, find which theories and approaches on DfBC are being used, and asset what are the obstacles to implement this knowledge into the business world. The respondents` organization represented variety of sectors on the market - Health and Social Care, Digital and Creative, Consumer products, Consultancy and Education. The online survey showed that there is strong universal awareness of DfBC among the respondents with 93% of them having some awareness (very aware, aware and a little). Around one third of the respondents answered that they use Design for Behaviour change to inform innovation. Other 30% answered that they use this knowledge and methods but not in detail. And the left 30% don't use DfBC at all but are interested in implementing it inside the organisations. Also, the perception of the concept of Design for behaviour change varied between two main parameters – "design" and "behaviour change". Some of the participants thought that the designers need to understand the psychological drivers behind behaviours so they can design for the people`s needs while others reflected on it as the design itself is the change agent.

The survey also identified that the stakeholders from the private and public sectors used some DfBC guidance such as books and scientific articles, but they were limited to only the most popular ones. The methods and guides which were used, were more generic because the stakeholders were more focused on thinking about "change" rather than "behaviour" change.

The survey also provided information about the different approaches the SME`s use of innovation and behaviour change. The results showed that innovation was well understood in the sectors of service, processes and product innovation. The organizations which are using design for behavior change have the intent to influence health and well-being, followed by social sustainability, ecological sustainability and economic sustainability while mobility, safety and crime prevention were least concerned. The results also pointed that the companies concerned with behaviour change through DfBC were more ethically aware and focus on problems such as sustainability more strongly than organization which were not aware of DfBC. Also, the focus groups suggested that there is an urgent need for more explicit information and debate about the aims and benefits of DfBC to raise its level of recognition and importance among the society. The respondents pointed that there are no clear evaluation metrics for DfBC at present or were marked as very limited. One of the most important indications of the survey was that the SME`s are aware of the importance of design in driving innovation. The results showed that the smaller organizations are better informed of the benefits of DfBC and value it more than the larger ones.

In everyday life, there are indeed numerous situations in which the way people behave is intentionally designed by someone else. This often happens, for instance, in commercial enticements. It is widely recognized that retail environments are designed to tempt us to buy

things. For Redström (2006), this influence is valid in a more general sense: in the Western world, people are used to living in an artificial environment, made up of objects in which modes of use are inherent. As an example, Redström explains how chairs can be designed to influence the way people sit. A classic case in point is the Stokke Balans chair which requires users to sit partly on their knees to remain erect, which is intended to be beneficial to their backs. A completely different example, taken from the world of gam-bling is offered by Fogg (2003): a slot machine manufacturer features two characters (a cartoon orangutan and a monkey) which celebrate when gamers win, designed to encourage users to keep playing by providing a supportive audience, on its product interface. Of course, in all these cases, users are (almost) always given the choice between accepting and disregarding the way of doing things proposed. (Rampino et al., 2018)

2.3. Behaviorism and Psychological tools for Behavior Change

Many of the current methods and tools connected with design for behavioural change are somehow influenced by the psychology and specific school of thoughts called Behaviorism which was developed in the late 19th century. Behaviorism is a systematic approach in psychology which aims to understand and navigate the behaviour of people and other animals. Its goal is to promote the scientific study of behaviour and assumes that all behaviours are either reflexes produced by a specific stimulus in the environment or a consequence of individual`s history including especially reinforcement and punishment, together with the individual's current motivational state and controlling stimuli. Although behaviourists generally accept the important role of inheritance in determining behaviour, they focus primarily on environmental factors.

Behaviorism combines different knowledge from sciences such as philosophy, methodology and psychological theory. It started to develop in the late nineteenth century as a reaction to depth psychology and other traditional forms of psychology which often had difficulties to create predictions that could be tested experimentally. One of the first creators of Behaviorism is Edward Thorndike who created the law of effect. It is a process that involved the strengthening of behaviour through the use of different stimuli and reinforcement. (Burton, Moore, & Magliaro, 1996)

Between 1920 and mid 1950s, Behaviorism became the dominant school of thoughts in the field of psychology. Some people suggest its popularity grew because of the desire to establish psychology as an objective and measurable science. The researches focused on inventing new theories that could be clearly described with tools that empirically measure them. Also, these contributions were created with the idea to have a positive influence on the everyday human lives. (Cherry, 2018a)

This school of thoughts teaches that behaviour can be studied in a systematic and observable manner regardless of internal mental states. Behaviorism considers only observable human and animal behavior because it considers that emotions, cognitions and moods are too far subjective. Strict behaviorists believed that any person has the potential to be successfully trained to perform any task, regardless of genetic background, personal traits, and internal thoughts (within the limits of their physical capabilities). They believe that it only requires the right conditioning. (Cherry, 2018a)

John B. Watson was an American psychologist and he is considered as one of the fathers of Behaviorism. In his classic paper "Psychology as the Behaviorists Views it." it is best summed up by Watson`s quote:

"Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief and, yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors."

The beforementioned quote represents the vision of the strict behaviorists – they assume that all behaviours are the result of experience. Also, any person, regardless of his or her background, can be trained to act in a particular manner given the right conditioning. Behavioral psychology or Behaviorism is based on the idea that all behaviours are acquired through conditioning. Conditioning occurs when the person interacts with the environment. The behaviorists believe that our responses to environmental stimuli shape our actions (Cherry, 2018a).

There are two main types of conditioning in Behaviorism:

The first one is Classical conditioning. This is a technique in which a neutral stimulus is paired with a naturally occurring stimulus. After that, the neutral stimulus comes and evokes the same response as the naturally occurring stimulus, even without the presence of the naturally occurring stimulus. The newly associated stimulus is known as the conditioned stimulus and the new learned behaviour is known as the conditioned response. This technique is frequently used in behavioral training.

The second type of conditioning is called Operant conditioning. This is a method of learning that occurs through reinforcement and punishments. With the operant conditioning, an association is created between a behaviour and a consequence of that behaviour. When a desirable result occurs after an action, the behaviour become more likely to occur in the future. Responses followed by unfavourable outcomes, on the other hand, will become less likely to be repeated in the future.

What is the difference between operant conditioning and classical conditioning? In operant conditioning, a voluntary response is then followed by a reinforcing stimulus. In this way, the

voluntary response (e.g. studying for an exam) is more likely to be done by the individual. In contrast, classical conditioning is when a stimulus automatically triggers a spontaneous response.

Involuntary actions, also called respondents, are entrained using the classical conditioning techniques of the Russian scientist Ivan Pavlov, and after that developed by John Watson. The idea of classical conditioning helped behaviorist Watson discover the key mechanism behind how humans acquire the behaviors that they do, which was to find a natural reflex that produces the response being considered (Burton et al., 1996). In classical conditioning, the organism (human or animal) learns to respond to a stimulus that once prompted no response. The process begins with the identification of an unconditional stimulus (US) what automatically elicits an emotional or physiological unconditional response (UR). There is no need of prior learning or conditioning to establish that natural connection (e.g., US = food; UR = salivation). In classical conditioning, the neutral stimulus is introduced but initially it does not prompt a response from the organism (e.g. a tone). The intent is to eventually have the tone (i.e., the conditioned stimulus or CS). It elicits a response that very closely resembles the original UR (i.e., will become the conditional response or CR). The behavior is entrained using the principles of repetition (i.e. practise). In the repeated trials, the US and CS are introduced approximately at the same time. Gradually the US is presented less frequently with the CS, being sure to retain the performance of the UR/CR. Eventually, the CS evokes the CR without the need of the US. (Burton et al., 1996)

One of the most famous examples of Classical Conditioning is the fear Response experiment by John. B. Watson. In this experiment the fear response was conditioned in a boy known as Little Albert. Initially, the child showed no fear of a white rat which was presented to the boy. Eventually, the presence of the white rat was paired repeatedly with loud, scary sound which made the child be scared and made him cry. This made the Little Albert to be scared of the white rat every time he saw the rat, but also other fuzzy white objects. In this experiment the white rat was a neutral stimulus. The unconditioned stimulus (US) was the loud, changing sounds and the unconditioned response (UR) was the fear response created by the noise. By repeatedly pairing the rat with the unconditioned stimulus (US), the white rat (now the conditioned stimulus or CS) evoked a fear response (now the conditioned response or CR). (Cherry, 2018b)

This experiment illustrates how phobias can be created through classical conditioning. In many cases, a single pairing of a neutral stimulus (a dog for example) and a frightening experience (being bitten by the dog) can lead to a lasting phobia (being afraid of dogs) (Cherry, 2018b).

Many of people`s behaviours today are shaped by the pairing of different type of stimuli. The smell of a cologne, the sound of a certain song, or the occurrence of a specific day of the year can trigger distinct memories, emotions, and associations. When we make these types of associations, we are experiencing classical conditioning (Walinga, 2012).

Classical conditioning is a very powerful tool for entraining basic physiological responses (e.g., increases in blood pressure, taste aversions, psychosomatic illness), and emotive responses (e.g. arousal, fear, anxiety, pressure) since the learning is paired with reflexive, inborn associations. Classical conditioning is a major theoretical notion used in advertising, propaganda and related learning. Its importance in the formation of biases, stereotypes, etc, is of particular importance in the design of instructional materials and should always be considered in the design process (Burton et al., 1996).

The minor learning of these responses is a clearly a concern instructional settings and instructional design. Instructional design is the process by which learning products and experiences are designed, developed and delivered. These learning products can be online courses, learning software, instructional manuals, video tutorial, learning simulations, etc. Instructional designers are the “architects” of the learning experience and the “directors” of the Instructional Systems Design ISD process (Jordan, 2017). Behaviours such as test anxiety and “school phobia” are categorized as maladaptive and are often entrained without intent.

From a proactive stance in instructional design, a context or environmental analysis is very important key component of the assessment of the needs. Every feature of the physical (e.g. lighting, classroom arrangement, colours) and support (e.g. administration) environment are examined to ascertain positive or problematic factors that might influence the learner`s attitude and level of participation in instructional and learning events. Similarly, in designing software, video, audio, graphic and so forth, careful attention is paid to the aesthetic features of the medium to ensure maximal motivation and engagement. This is called Respondent learning and is form of the methodological behaviorism (Burton et al., 1996).

The term “Operant conditioning” was created by the behaviorist B. F. Skinner, who believed that one should focus on the external, observable causes of behaviour (rather than try to explore the internal thoughts and motivations). Operant conditioning can be described as a process that attempts to modify the human behaviour through the use positive and negative reinforcement. Through Operant conditioning, an individual makes an association between a particular behaviour and a consequence (David, 2015).

Examples for this type of conditioning can be the parents who reward their children with candy or some other prize when they receive excellent grades at school. Another examples can be the schoolteacher who awards the most calm and well-behaved students with extra points. Students eventually realize that when they voluntarily become quitter and better behaved, they earn more points.

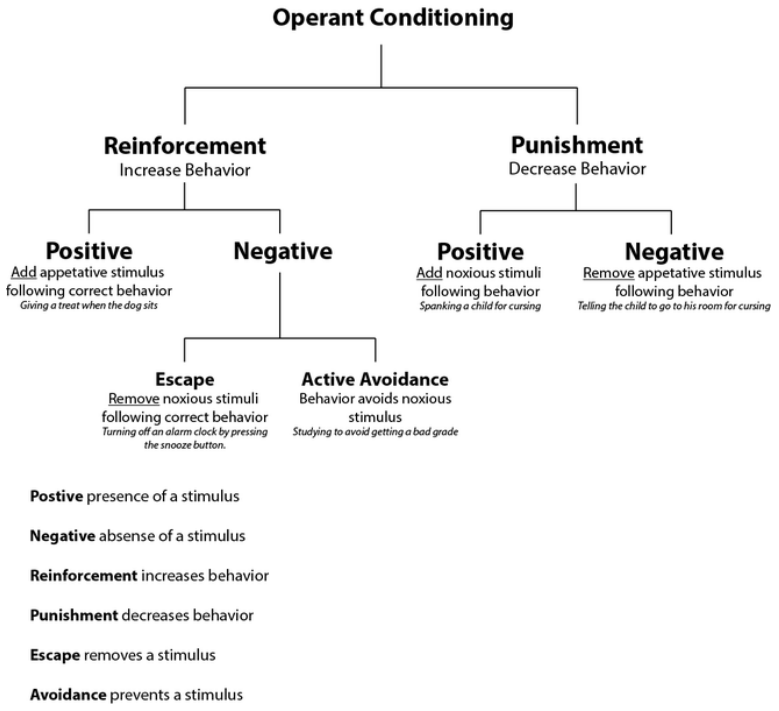

Figure 4: Examples of Operant Conditioning including Reinforcement and Punishment (https://en.wikipedia.org/wiki/Operant_conditioning)

This type of reinforcement comes in two forms: positive and negative (Figure 4). Positive reinforcements are pleasing events or outcomes that are awarded to the individual after the desired behaviour. This may come in the form of praise, rewards and others. Whereas, the negative reinforcers typically are characterized by the absence or removal of an undesired or unpleasant outcome after the desired type of behavior. A response is strengthened as something considering negative is removed. The goal in both positive and negative reinforcements is for the behaviour to increase.

There is also positive and negative punishment. The punishment, in contrast, is when there is increasing of something undesirable in attempt to cause a decrease in the behaviour. The positive punishment is when unfavourable events or outcomes are given in order to weaken the response that follows. In contrast, the negative punishment is characterized by when a pleasant event or outcome is removed after an undesired behavior occurs. The aim in both of the punishment cases (positive and negative) is for the behavior to decrease (David, 2015).

Operant conditioning can be very powerful tool for different real-life practises such as Behaviour Modification, Token Economy, Behaviour Shaping, Educational Applications and others. Behaviour Modification is a set of techniques based on Skinner`s operant conditioning. The main principle includes changing environmental events that are related to a person`s behaviour. For example, there is a reinforcement of desired behaviour and ignoring or punishing undesired behaviours. The positive reinforcements are different types depending on the desired change. Primary reinforcement is used when a reward strengthens

a behavior by itself. Secondary reinforcement is when something strengthens a behavior because it leads to a primary reinforcer (McLeod, 2018). Winning money from slot machines or on a lottery ticket is an example of reinforcement that occurs on a variable-ratio schedule. For instance, a slot machine may be programmed to provide a win every 20 times the user pulls the handle, on average. Ratio schedules tend to produce high rates of responding because reinforcement increases as the number of responses increases (Stangor, 2012).

Token economy is a system created on the base of operant conditioning in which targeted behaviours are reinforced with tokens (secondary reinforcers) and later exchanged for rewards (primary reinforcers). Tokens can be given in the form of fake money, buttons, pokers chips, stickers, and others. The rewards can range from snacks to privileges or activities. For example, the teacher in some schools use token economy at primary schools by giving young children stickers to reward the students with good behavior. The token economy can be powerful tool if it is implemented by the staff in big companies. The staff need to be trained to give tokens fairly and consistently, and also do not favour or ignore only certain people (McLeod, 2018).

Behaviour shaping is a useful tool based on operant conditioning. Skinner`s another important contribution is the notion of behavior shaping through successive approximation (1951). Skinner believed that the principles of operant conditioning can be used to produce extremely complex behavior if rewards and punishments are delivered in such a way as to encourage move an individual closer and closer to the desired behaviour each time. In order to do this, the conditions required to receive the reward would shift each time the organism moves a step closer to the desired behavior. Skinner assumed that most humans behavior (including language) can be explained as a product of this type of operant conditioning (McLeod, 2018).

Operant conditioning is also tool used in the educational applications. This type of conditioning is applied mainly to issues of class and student management. It is very relevant to shaping skill performance. A simple way to shape the behavior is to provide feedback on learner performance, e.g., compliments, approval, encouragement, or affirmation. A variable-ratio process produces the highest response rate for students learning a new task. Unwanted behaviors, such as tardiness and dominating class discussion can be extinguished through being ignored by the teacher (rather than being reinforced by having attention drawn to them). Knowledge of success is also important as it motivates future learning. However, it is important to vary the type of reinforcement given so that the behavior is maintained (McLeod, 2018).

Historically, the most significant distinction between versions of behaviorism is that between Watson's original 'methodological behaviorism,' and forms of behaviorism later inspired by his work, known collectively as neobehaviorism (e.g., radical behaviorism) which was created by B. F. Skinner.

In the first half of the twentieth century, John B. Watson conceived methodological behaviorism which rejected introspective methods and tried to understand behaviour by only focusing on measuring observable behaviors and events. Watson`s article "Psychology as the behaviorist views it" is often referred to as the "behaviorist manifesto", in which Watson (1913, p. 158) outlines the principles of all behaviorists:

"Psychology as the behaviorist views it is a purely objective experimental branch of natural science. Its theoretical goal is the prediction and control of behavior. Introspection forms no essential part of its methods, nor is the scientific value of its data dependent upon the readiness with which they lend themselves to interpretation in terms of consciousness.

The behaviorist, in his efforts to get a unitary scheme of animal response, recognizes no dividing line between man and brute. The behavior of man, with all of its refinement and complexity, forms only a part of the behaviourist's total scheme of investigation".

Stimulus-response behaviorism, that is behaviorism which emphasizes on the antecedent as the cause of the behaviour, is generally considered as methodological behaviorism. This type of behaviorism is connected with much of experimental psychology in which antecedents are the independent variables and the behaviours are the dependent variables. This transformational paradigm is much more different than the radical behaviorism created by Skinner which emphasizes the role of reinforcement of behaviors in the presence of certain antecedents or the selectionist position. (Burton et al., 1996)

In the 1930s, B. F. Skinner came up with a new idea. He suggested that private events, including thoughts and feelings, should be part of the same controlling variables as observable behaviour, which became the foundation of his philosophy called radical behaviorism (Schneider & Morris, 1987). While Watson focused the stimulus-response procedures of classical conditioning, Skinner evaluated the controlling nature of consequences and also the potential effect on the antecedent stimuli that strengthens behaviour, the technique which later became famous in psychology as operant conditioning.

The technique Radical Behaviorism created by Skinner was highly successful experimentally, discovering new phenomena with new methods, but Skinner`s scepticism about the theory limited its development. Radical behaviorism agreed with the assumption of methodological behaviorism that the goal of psychology should be to predict and control behaviour (McLeod, 2017). Theoretical behaviorism assumes that a historical system like an organism, has a state as well as sensitivity to stimuli and the ability to produce responses. Indeed, Skinner admitted the possibility of what he called "latent" responses in humans, however he neglected this idea to rats and pigeons. Latent responses constitute a repertoire, from which operant reinforcement can select (Staddon, 2000). The application of radical behaviorism known as applied behavior analysis is used in a variety of settings including different therapies, trainings, treatment of mental disorders, organizational behavior managements and others.

Skinner, like Watson, also recognized the role of internal mental events, and even though he agreed such private events could not be used to explain behavior, he proposed that they should be explained in the analysis of behavior.

Another important distinction between the two main types of behaviorism – the methodological and radical, concerns the extent to which environmental factors influence behavior. Watson's (1913) methodological behaviorism asserts the mind is tabula rasa (a blank slate) at birth. In contrast, radical behaviorism accepts the view that organisms are born with innate behaviours, and thus recognizes the role of genes and biological components in behavior (McLeod, 2017).

Behavioral psychology is different from other existing perspective in the psychology field. Behavior psychology has advantages since it is based on observable behaviors and this helps to quantify and collect data when conducting researches. Behaviorism include different therapeutic techniques such as intensive behavioral intervention, behavior analysis, token economies and discrete trial training. These approaches are often found very useful in changing nonadoptive or harmful behaviors in people. Behaviorism also has some disadvantages, for example, there are critics that believe that behavioral theories limit the interpretation of the human behavior. They argue that Behaviorism do not consider the free will of the person and other internal influences such as moods, thoughts and feelings. Also, they believe, that it does not account for other types of learning that occurs without the inclusion of reinforcement and punishment. Moreover, people can adapt their behavior when new information is introduced even if that behavior was established through reinforcement (Cherry, 2018a).

In the recent years, biological psychology has emphasized the power of the brain and the genetics, which can also play a role in determining and influencing human actions. This is the cognitive approach in psychology which is focused on the mental processes such as thinking, decision-making, language, and problem-solving. However, in both cases the Behaviorism neglects these processes and is influenced in favour of studying just observable behaviors.

One of the greatest strengths of behavioral psychology is the ability to clearly observe and measure human behaviors. Weaknesses of this part of psychology is the fact that it fails to address cognitive and biological processes that influence the human actions. These days, the behavioral approach might be not the dominant force it was once before, but it still has a major impact in understanding the human psychology. The conditioning process has been used to understand many different types of behaviors, ranging from how people learn to how language develops. But perhaps the greatest contributions of behavioral psychology lie in its practical applications. Its techniques can play a powerful role in modifying problematic behavior and encouraging more positive, helpful responses. Outside of psychology, parents, teachers, animal trainers, and many others make use of basic behavioral principles to help teach new behaviors and discourage unwanted ones (Cherry, 2018a).

2.4. Development and overview of different Behaviour Change Design tools

Design is a very powerful tool which penetrates in all areas of our life and it has one of the main abilities and responsibilities to facilitate change. Design can and should play a key role as a strategic tool in promoting sustainable change and innovation and joining the two (Jelsma, 2006). Therefore, the innovation and design have a natural connection that needs to facilitate sustainable change. The responsibility for that change is in the hands of the producers, designers and its users. It is essential that the designers are aware of their own processes and responsibilities as well as of those for whom they produce. Concerning the users, in order for sustainable innovation to be adopted by them , design for behavior change needs to facilitate a shift in the everyday behavior of the population (Crocker & Lehmann, 2013). This can be achieved through a number of mechanisms, e.g., motivation, education, prescription (Lockton, Harrison, & Stanton, 2008).There are increasing initiatives, in terms of research, networks, and publications, which seek to promote sustainable behaviour and innovation through design.

Design for behavior change analyses how design can shape or influence the human behavior and create sustainable innovation (Kristina Niedderer et al., 2014). The key areas of its application include sustainability, health and wellbeing, safety and crime prevention as well as the social field. To better understand the interaction with the artefacts and their influence on the people`s behavior, designers rely on different theories and guiding tools for behavior change (K. Niedderer et al., 2016).

There is a plethora of the different approaches available in the field and newly emerging ones, so it is important to choose a “lens” which helps to categorise the approaches. The first lens is connected with the scale of the intervention of the presented Design for Behavior change tools and theories. The second lens is connected with the approach it is used to facilitate that change among the users. The thesis purposes a graph with two axis – vertical and horizontal which illustrates the most prominent Design for behavior change tools and theories developed in the resent years. The horizontal axis divides the presented theories and tools to the opposition individual – community. There are tools which are focused to change the individual and some which operate on a bigger scale and aim to facilitate change within the society or community as a whole. There are also tools and theories which are in the middle ground and represent both, because their design is providing the context that seeks to affect the community through the change in the individual. The individual tools are aiming to change the individual`s behavior through cognition/attitude whereas the community focus approaches more commonly facilitate the change through external parameters such as policy or changed environment.

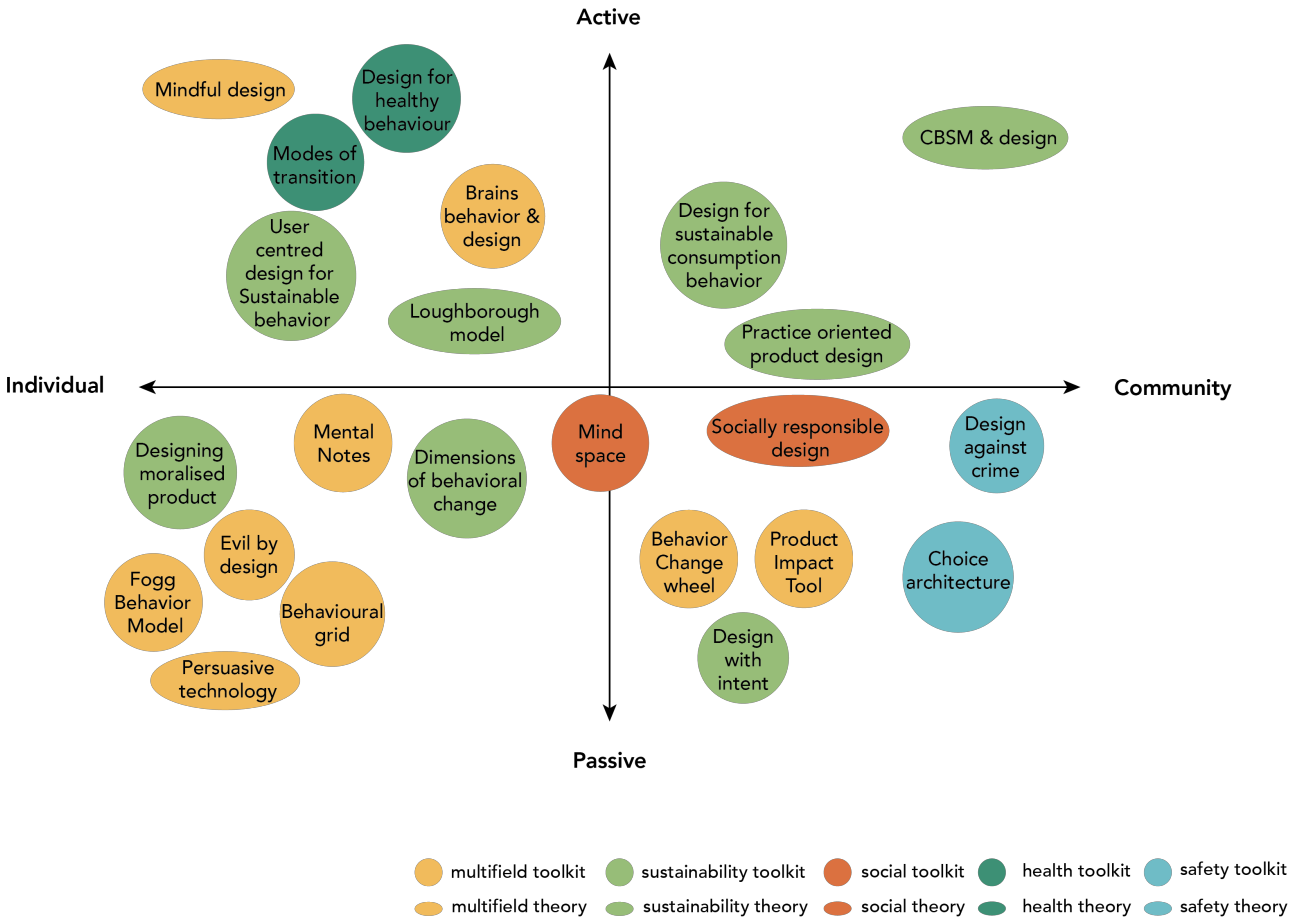

Figure 5: Systematization of main Design for Behavior Change theories and tools

The second axis (the vertical) represents the approach which is used by the designers to facilitate the change among the users. There is the opposition Active change – Passive change and it represents the way the designers influence the behavior change. The Passive change is executed mainly through persuasion or coercion and it is perceived by the user as an outer impulse to behave in particular way without the user to realise that (more unconscious). The Active change is perceived by the user as an inner impulse to behave in a certain way (more conscious). The designers` aim in that case is to educate the user about his unsustainable/wrong behavior and make him/her realise the consequences of that behavior and in that way help the user to change the behavior through conscious choice. There are also middle ground tools and theories which use both way of influencing the users.

Therefore, the graph represents the level at which the approaches operate. There are more theoretical one which include concepts, theories and theoretical knowledge. And also approaches which contain more practical knowledge such as tools, guidance, design methods. The theoretical approaches are presented with elliptical shape whereas the tools are presented with circle shape in the Figure 5. The graph systemizes the presented Design for

Behavior Change theories and tools according to their main sector of intervention and divides them into multifield, sustainability, health, social, and safety tools/theories.

Niedderer created a brief overview of Design for Behavioral Change approaches. The table 2 shows the selected theories and toolkits selected according to their agency divide. There are three main criteria for agency divide: Individual-cognitive, Middle-ground and Context. This is a simpler way of representing the available approaches, but it is still useful for better understanding the position of the approaches on the graph with horizontal and vertical lens. The two-axis graph was generated by using some of the approaches listed by Niedderer and also by synthesising independent literature reviews on existing approaches to Design for Behavior Change.

Agency	*Design for behaviour change models*
Individual–Cognitive	• Persuasive technology (Fogg, 2003) is concerned with how the performance of target behaviour or social response can be influenced or changed through the use of computing technologies, and more recently design (Hermsen et al., 2014) . • The Loughborough model (e.g., Bhamra, Lilley, & Tang 2008; Lilley 2009) uses mechanisms such as feedback, constraints, and affordances to promote individual's sustainable behaviours. • The design for healthy behaviour framework addresses the different stages of decision-making required to durably change people's health behaviour through design interventions (Ludden & Hekkert, 2014). • Modes of Transitions, another transitions-based model has been developed by Kursat Ozenc (2014). • The Designing moralized products model sees products as 'drivers of routine action'. It incorporates user logic (cognitive models) and responding 'scripts' into the design process to direct and encourage the desired interaction with products (Jelsma, 2006). • Anderson's 'Mental Notes' (n.d.) is a card-based reference and brainstorming tool for web-designers. It offers 50+ insights from psychology about stimulating behaviour change through positive and pleasurable interactions with objects or environments (Anderson, 2011). • 'Evil by Design' approaches seductive design from the opposite end. It reveals how people's susceptibility to persuasive techniques can be abused by companies (Nodder, 2013). • Design for Sustainable Consumption Behaviour develops behavioural solutions to reduce resource consumption in an industry context (Selvefors, Pedersen, & Rahe, 2011). • User-centered design for sustainable behaviour seeks to encourage industry to design products leading to more environmentally friendly user behaviours (Wever, van Kuijk, & Boks, 2008). • The Behaviour Grid map s 15 ways in which behaviour can change based on a combination of the three elements of motivation, ability, and trigger (Wendel, 2014). • The Brains, Behavior and Design Toolkit proposes a set of behavioural tendencies, such as Loss Aversion or Affective Forecasting Error, to be addressed through design (Pfarr & Gregory, 2010).
Middle–ground	• Mindful design seeks to encourage responsible user action and choice through raising critical awareness of the different options available in any one situation. (Niedderer, 2007, 2013, 2014). • Socially responsible design takes the point of the intended user experience, to encourage desirable and discourage undesirable behaviour (Tromp et al., 2011). • The Design with Intent toolkit combines multiple tools and techniques for enabling, motivating or constraining action to encourage desirable behaviour (Lockton et al., 2010), drawing on both cognition and context (Lockton, Harrison, Cain, Stanton, & Jennings, 2013). • The Community Based Social Marketing with Design model draws on prompts, norms, incentives, and the removal of barriers etc. to facilitate change (Clune, 2010). • Practice orientated product design presupposes that material artefacts influence the trajectory of everyday practices and uses this premise strategically to shift everyday practices over time (Kuijer, 2014; Scott, Quist, & Bakker, 2009). • The Dimensions of Behaviour Change Tool takes the format of a card deck to aid designers in specifying techniques for influencing environmental behaviour. (Daae & Boks, 2014). • MINDSPACE Model: aimed at informing policy design for affective behaviour change, this guide offers a checklist of behaviour influences for consideration (Dolan et al, 2009, 2012).
Context	• The Product-Impact Tool has been designed for evaluation of the impact of technical products on user behaviour, such as the Dutch RFID public transport e-payment system. (Dorrestijn, 2012). • Architectural design against crime aims to prevent crime through the revisualization of the environment and its management with regard to human behaviour (Crowe, 2000).

Table 2: Design for behavior change approaches by agency divide (Niedderer, 2016)

It can be made summarization about the available approaches in Design for behavior change. The structured information helps to better understand the different approaches grouped in the different lenses. There are no clear "natural" groupings because of the recent emergence

of the Design for Behavior Change approaches, but still the graphs and the table show some distinct patterns.

Firstly, the overview in the table shows that the majority of current Design for behavior change theories and toolkits are aimed for the individual. The middle ground approaches which seek to unite both areas of agency also have substantial presence. Therefore, the theories and toolkits that consider how design informs and shifts the environmental context are considered less.

The graph reveals also that on a subject level, the largest number of approaches are connected with ecological sustainability, several dealing with health, and rather few relating to social context or safety. There are many approaches categorized as “multifield” and not specifically dedicated to some of the subject because their affective aspect of the human-product interaction can be used in a various context. Also, there are several approaches which have developed from existing design methods such as user-centred design, experience design, or are practical syntheses.

Most of the presented Design for behavior change theories and tools facilitate passive change and their approach is to achieve this through persuasion, coercion or other external input which change the behavior of the user. Less theories and tools aim to facilitate active change or more mindful (conscious) state of choice of the user.

The graph represents theories from practically oriented guidelines and toolkits in relation to different knowledge levels, such as theories which teach more general understanding, as well as guidelines and toolkits which present how to apply the knowledge more directly. The guidelines and toolkits in the intermediate level of knowledge are more than those in the high level of knowledge, since the former ones are more strongly connected with real application and therefore need to be more specific and varied. However, this noticeable difference represents the still emerging field of Design for behavior change.

Also, it can be concluded that the selected approaches and toolkits are fairly new, mostly of them dating after 2008. Majority of them address the individual user, although in the recent time more holistic approaches are emerging in the middle-ground sector.

Chapter 3
Multifield tools and methods to influence users` behavior

In this section there are Mindful design, Persuasive technology, Fogg Behavioral Model, Behavioral grid, Product Impact Tool, Mental Notes, Brains behaviour & design and Evil by design. In these methods the human-artefact interaction can be used in various contexts. They developed from existing design methods such as user-centred design, experience design, or are practical synthesis from different science fields such as Economy, Psychology, Computer Science. They can be applied on an individual level as well for communities. They promote active and passive change among the users.

3.1. Mindful Design (Mindfulness)

Mindfulness is a concept from psychology, which has been used to change behaviors and also to regulate human emotions (Langer & Moldoveanu, 2000). Mindfulness teaches a new type of mindset dedicated to openness and alertness, it emphasizes on considering the information from different perspectives, pays attention to the specific context, in order to enable the creation of new categories (Langer, 2000). Mindfulness can promote behavior change, because it encourages the people to reconsider their actions and the causes of them, thus helping them to adjust more easily to new situations and challenges. The idea of mindfulness in design has been developed by Niedderer (Kristina Niedderer, 2007) to describe how design objects can be designed to facilitate mindful attention of the physical and social actions within which they are used and of the consequences of these actions.

Mindful design approach is based on a twofold process: firstly a mindful design object stimulate the awareness through a physical or symbolic disruption of its function, and secondly, mediation of this disruption through the user focuses their attention to the issue to be mindful (Kristina Niedderer, 2007). An example of this interaction of mindful design in an environmental context are the sustainable bathroom tiles, made by the Interactive Institute, Sweden, which discolour temporarily (this is a type of disruption) when the user showers for too long, in order to make the person mindful of the sustainable consequences of their actions. Other example of mindfulness in the social context is the “Brainball” game (Hjelm, 2003). This game requires two players to move a ball towards the other player to win. The ball is moved by the brain activity of the users, which is scanned using EEG. The ball can be moved if the player is more relaxed and calmer by his opponent. This type of social game questions our common human understanding that the faster/stronger has to win in a game.

The mindful design approach to behaviour change has a number of benefits: Firstly, while Tromp (Tromp et al., 2011) focuses on the assumption that design is for the unmotivated user, mindful design is able to accommodate the inability to predict the user response by

“delegating” responsibility on the user. This does not mean that there is no need for decisive design in certain areas where it is necessary to exclude human error and where therefore choice needs to be designed out (such as medical equipment). Therefore, it means that mindful design may have some benefits over coercive and persuasive design. A good example of how designing can encourage mindfulness is the example of a certain traffic junction in Drachten, The Netherlands. A junction with a high incident rate, which was not improved by additional signage, therefore the traffic planners finally decided to take away all signs. From a mindful design perspective, it is argued that this causes all traffic participants to actively think about how to navigate their environment and to take responsibility for managing the traffic system. The result was a clear improvement of the situation (K. Niedderer, 2013a) In this context, the removal of street signs and traffic lights disrupts these expectations, and directs traffic participants’ awareness towards the traffic, requiring them to take active responsibility both for themselves and for others. (K. Niedderer, 2013b)

Secondly, mindful design assumes that to create a lasting behavior within a person, he or she has to have a conscious attitude. This distinguishes mindful design from many other approaches in the design for behavior change field which offer externally motivated stimuli, whereas mindful design offers stimuli for internal motivation (Langer & Moldoveanu, 2000). Mindful design incorporates a process of conscious decision making by creating awareness of person`s own behavior and shifting the focus from external to internal locus of control through mindful reflection (as the example with the traffic junction). This requires proactive responsibility from the user, which is perceived by them as empowerment. (K. Niedderer, 2013b)

Thirdly, some approaches in design for behavior change, especially socially responsible design, assume that there is a divergence between individual and social aims which needs to be addressed through design. Common examples are social pressure to reduce smoking versus the individual`s desire to continue that habit, or the individual eagerness to own a car and be independent, which is in contrast with the global need to reduce the CO_2 emissions as well as material and energy consumption. These examples are very spread issues, and there is a second assumption, which needs to be questioned, and this is the statement that the social aims are the ones that are always desirable (K. Niedderer, 2013b).

In some cases, it can be demonstrated that the social aim is more important and “manipulating” the individual. For example, there are social pressures to own a car, because it is considered as a significant status symbol, and certainly in countries such as the UK or the US – people who do not own a car are considered as strange and outsiders. Social norms and expectations are not always benign and also, they can change over time. Mindful design questions assumed (social) authorities by making it explicit and at the same time exposing the balance of individual and social aims for critical reflection. For example, the “Brainball” game questions people`s belief of having to be stronger/faster to win, thus opposing this type of

game to the computer games which promote aggressive behavior, which is a point of debate these days (K. Niedderer, 2013b).

Mindful design deals with another issue – the aspect of emotions and connected social and cultural preconceptions, which influence our moral judgement. Mindful design aims to persuade reflection of the individual on their inner emotions, their actions and how these reflect personal and social beliefs, to examine them through the disruption of the physical or symbolic function of an object used in the context in question. Emotions can cause mindlessness and therefore provide the starting point for designing for mindfulness, but they can also be used to make certain actions and uses desirable by the users (K. Niedderer, 2013b).

3.2. Persuasive technology

Persuasive computer or persuasive technology is an interactive technology that changes a person`s attitudes or behaviors (Bj Fogg, 1998a). Fogg defines the word persuasion as "an attempt to shape, reinforce, or change behaviors, feelings, or thoughts about an issue, object, or action." Captology is a field which studies computers as persuasive technologies. It is a broad field which includes design, research, ethics and analysis of interactive computing products such as computers, mobile phones, smart devices, websites, wireless technologies, mobile applications, video games, etc. which are created with the purpose of changing people`s attitudes or behaviors (Figure 6). BJ Fogg derived the term captology in 1996 from an acronym: Computers As Persuasive Technologies = CAPT. (Stanford, 2010)

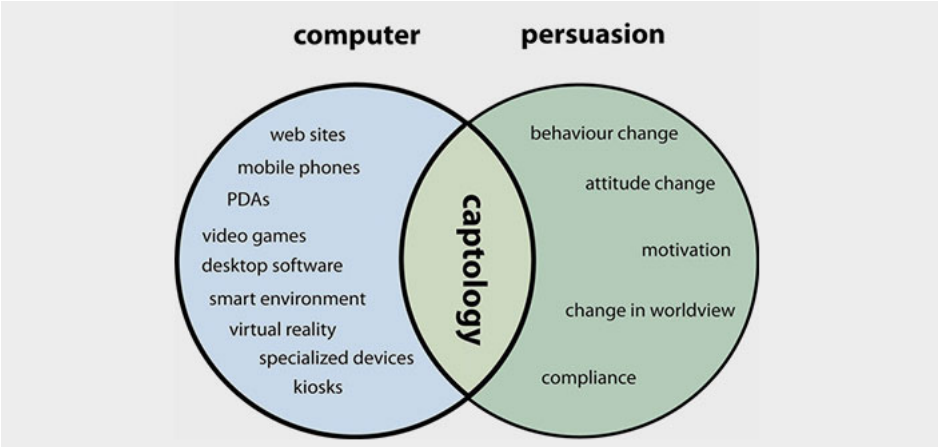

Figure 6: The fields of Computer, Persuasion and Captology (Bj Fogg, 1998a)

The field of Captology and persuasive technology is becoming very popular these days. Every day new computing and smart products are released on the market, new website and mobile application are released and their design is made to change what people think and do.

Captology is a way of thinking which aims to target behaviors and achieve the goal of the stakeholders using concrete technology. Captology is also a method with related tools for solving different problems. The idea is not only to persuade the people but also includes a framework which tries to help the people understand and measure what really matters to them. (Bj Fogg, 1998a)

The true persuasion implies an intent to change people`s attitudes or behaviors which means that persuasion requires intentionality. Not all behavior or attitude change is the result of persuasion. Fogg gives an example with a rain storm, which may cause the people to buy umbrellas, but the storm is not the persuasive event in this case, because it has no intentional association. However, if the umbrella manufactures could control the weather and cause a rain storm to happen, then the rain storm can be qualified as a persuasive tactic. Fogg shows this example to illustrate the nature of computers more simply. The machines do not have intentions, and it qualifies as a persuasive technology only when those who create, distribute or adopt the technology do this with an intent to affect human attitudes or behaviors. (Bj Fogg, 1998a). Fogg clarifies that the persuasive technology is not part of the computer as an object, to be classified as “persuasive” depends on the context of creation, distribution and adoption. Fogg purposes that if the intent to change users` attitudes or behaviors is a factor in the creation, distribution, or adoption of a technology, then that technology inherits a type of intent from the stakeholders of the project.

There are three types of intent in the field of captology – endogenous, exogenous, and autogenous. A computer technology inherits endogenous intent when a designer or producer creates a technology with intent to persuade users in some way. Exogenous intent is when one person provides another person with a computer technology in an attempt to change that person’s attitudes or behaviors. An autogenous intent is when a person chooses to use or adopt a technology in order to change his or her own attitudes or behaviors. These categories are not always precise, and they are not always mutually exclusive. It is possible that a give interactive technology may fall into more than one category. These categories help to understand better the range and roles of persuasive computing technologies. (Bj Fogg, 1998a)

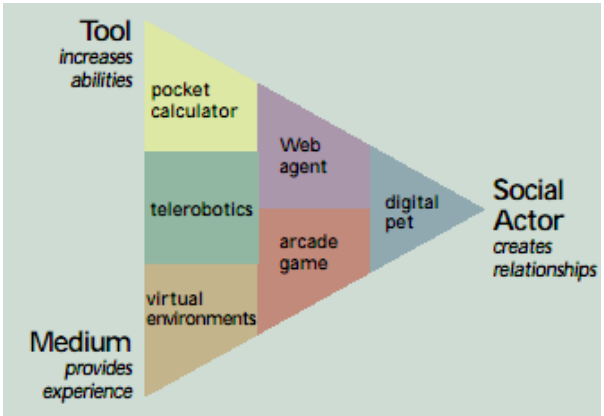

Figure 7: Classification of the persuasive technology (Bj Fogg, 1998a)

The persuasive technology can be classified into three main groups, according to its uses: a tool, media mot social actor (Figure 7). The Pyramid illustrates examples from the different groups. There are some applications or devices which have greater connection to a particular group and others which keep balance between the three functional triads.

The Functional Triad – Tool. This type of tool, for example a mobile application, can provide a platform for the users to perform a certain daily task more efficiently and conveniently. This can be executed by providing leading information or clearly guiding the users through a process flow. This allows people to do things they could not do before, or to do things more efficiently (Smids, 2011).

Function Triad – Medium. A mobile application as a medium provides symbolic content such as text or visuals. To increase the level of persuasion, the application can attempt to depict sensory contents, such as via virtualization of maps or providing an immersive experience through combination of audio and visual effects. Relating to the concepts of human-computer interaction, this type of persuasion technology can display the cause-effect relationship, and also instigating cognitive and behavioural rehearsals. For example, the computers also function as media – they can provide either symbolic content (e.g., text, data graphs, icons) or sensory content (e.g., real-time video, simulations, virtual worlds).

Functional Triad – Social Actor. Many of the persuasive technologies act as a social actor or they exhibit traits of social acting. The software interface of computers, the voice assistants of smart devices typically invoke emotions form the user. Users seem to respond to computers as social actors when computer technologies adopt animate characteristics (physical features, emotions, voice communication), play animate roles (coach, pet, assistant, opponent), or follow social rules or dynamics (greetings, apologies, turn taking) (Bj Fogg, 1998a).

Amazon is an excellent example of a website that utilizes Persuasive Technologies. Amazon is an online retail website that sells books, video games, clothes, electronics, and variety of different other products. Two main functional triads are deployed by the website. Firstly, Amazon arouses the senses of the user – its products in store often come with 360-degree view from any angle, and some come with videos that allow users to imagine them using the products.

Secondly, Amazon usage of social acting had helped the company to grow and make it one of top websites for online shopping. Its powerful “recommendation” feature feeds on people’s curiosity, and models how people behave in a physical store. By recommending similar products via sophisticated data mining algorithms, Amazon can tempt and persuade shoppers to buy more products.

3.3. Fogg Behavior Model (FBM)

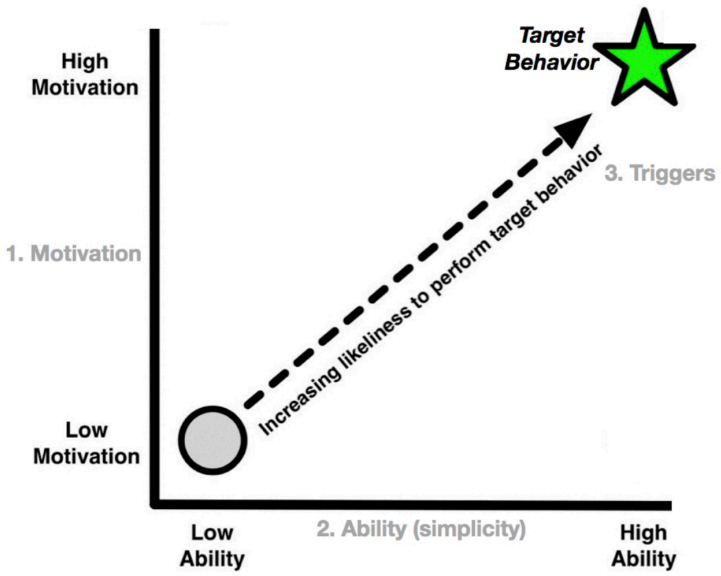

Figure 8: The Fogg Behavior Model (BJ Fogg, 2009)

Fogg Behavioral Model has three main principal factors dealing with the change of behavior. These are motivation, ability and triggers. The model shows that for a target behavior to happened there should be a person with sufficient motivation, sufficient ability, and an effective trigger (BJ Fogg, 2009). All the three factors must be present at the same time for the behavior to happen.

The Figure 8 shows the Fogg Behavior Model which has two axes. The vertical axis represents motivation. For example, a person who has no motivation to perform the target behavior will be registered at the low part of the vertical axis, whereas the person with high motivation will be placed high on the axis. The second axis is the horizontal one and it represents ability. A person who has low ability to perform a target behavior will be registered on the left side of the horizontal axis, whereas the person with high ability to perform the behavior will be placed on the right side of the horizontal ability axis.

The two axes define a plane. In the upper right-hand corner there is a star which is a symbolic symbol for the target behavior. This can be achieved when high motivation and high ability "meet" to perform the task. There is also an arrow which extends diagonally across the plane and it emphasizes the connection between motivation, ability and target behavior. It shows that if a person has increased motivation and increased ability, he or she will be more likely

to perform the target behavior. Also, on the figure there is the trigger factor which is placed near the star, to imply that the trigger must be present for the target behavior to occur (BJ Fogg, 2009). The star is not fixed, and it can change its position according to the motivation and ability of the users.

Fogg illustrates the Fogg Behavior Model with an example showing the relationship between motivation and ability. There is a website creator who wants to persuade the visitors of the website to sign up for a newsletter by entering their email addresses. The act of typing the email addresses is the target behavior. In the Fogg Behavioral Model this target behavior is represented with the star. This type of target behavior is simple for most people, so the star can be placed towards the right side of the horizontal axis for ability (users have high ability to perform this task since it is easy to type their email addresses).

However, when it comes to motivation, it is different situation. For most of the users, there will be no motivation to type in their email addresses. For them the star will be placed on the lower part of the vertical axis for motivation. This placement means that the ability is high, but the motivation is low. Of course, there will be also users who really want to subscribe for the free newsletter, so their motivation level would be high. So, the star will be positioned in the upper right-hand corner as in Figure 8. The users who are places in the lower right of the grid are unlikely to submit their email addresses on the website.

In contrast, the users in the upper right corner (those with high motivation and ability) are very likely to subscribe for the free newsletter. There should be also a proper trigger which ensures that the latter will subscribe. In the opposite situation, if the web creator decided to include a math puzzle on the entry for the email addresses. In order for the users to submit their email address, they have firstly to solve a math puzzle. In this scenario, not all of the users will complete the task. So, in this case, even if someone has a high motivation to submit the email address, their ability will be low. In this case, the star in the graph will be positioned in the upper left part of the Figure 8. Therefore, even if the website creator increases the motivation level, the behavior is still not likely to occur, because of the hard math puzzle which is difficult to solve from the users.

Fogg Behavioral Model shows that only the motivation nevertheless of its strength, may not get the target behavior from the users if they do not have the ability. For the designers this means that increasing the motivation is not always the right solution. In these scenarios often increasing the ability (making the behavior simpler) is the path for increasing the behavior performance. Motivation and ability can be sort of trade-offs. People with low motivation may perform a behavior if the behavior is simple enough (high on ability) (BJ Fogg, 2009). For example, if a customer has in general low motivation to buy a smartphone, but he is offered to buy it at 90% discount. His ability to pay the low price is high, so he or she would buy nevertheless of the low motivation.

In general, people have modest levels of motivation and ability, rarely they are at the extremes. These levels can be manipulated through persuasive technologies. They can boost either the motivation or the ability of the user (usually by simplifying the design). Also, other important part to change the behavior is the trigger.

The trigger is the third important factor of the Fogg Behavioral Model. Without a proper trigger, the behavior will not occur even if the motivation and ability are high. A trigger can be in many forms – an alarm that reminds, a text message, an announcement on the television, etc. The successful triggers have three main characteristics: the user has to notice the trigger, the trigger should be associated with the target behavior and the timing (the right time when the trigger is presented to the user) is one of the most important elements, which is often missing and preventing the behavior change to happen. When the combination of motivation and ability places the user above the behavior activation threshold on the graph, then a trigger will have a positive effect on the target behavior. If the user is underneath this threshold, then the trigger will not succeed with the target behavior. The activation threshold could be illustrated as a curved line sweeping across Figure 1, from the upper left corner to the bottom right (BJ Fogg, 2009).

Fogg gives an example with the computer systems which often trigger behavior through spam, pop-ups ads, remining emails and other artefact which are triggers. But they annoy the users rather than convert to targeted behavior because the users have low motivation to do what it is asked from them. When the motivation is low for that behavior, the trigger is felt distracting by the users. Conversely, when the motivation to perform the behavior is high, but the ability is low, the users feel frustrated. This can cause negative emotions among the users and not achieving the target behavior.

3.4. The Behavior Grid

The Behavior grid is a table which contains 15 ways of behavioral change. The table is created to help the designers and other stakeholders involved in the projects to think more clearly about the behavior change (Table 3). Each of the 15 behavior types uses different psychology strategies and persuasive techniques. This method is created by B.J. Fogg and his team at Stanford University. The Behavior Grid matches target behaviors with solutions for achieving those behaviors. It is a systematic way of thinking about behavior change (B. J. Fogg, 2018).

The graph consists of three rows depending on the desired period of time for behavioral change (one time, extended period, or lifetime). There are five columns depending on the type of behavior change (new behavior, do familiar behavior, increase behavior, decrease behavior, or stop existing behavior).

	GREEN Do new behavior	BLUE Do familiar behavior	PURPLE Increase behavior intensity	GRAY Decrease behavior intensity	BLACK Stop existing behavior
DOT One time	GREEN DOT *Do a new behavior one time*	BLUE DOT *Do familiar behavior one time*	PURPLE DOT *Increase behavior one time*	GRAY DOT *Decrease behavior one time*	BLACK DOT *Stop behavior one time*
SPAN Period of time	GREEN SPAN *Do behavior for a period of time*	BLUE SPAN *Maintain behavior for a period of time*	PURPLE SPAN *Increase behavior for a period of time*	GRAY SPAN *Decrease behavior for a period of time*	BLACK SPAN *Stop behavior for a period of time*
PATH From now on	GREEN PATH *Do new behavior from now on*	BLUE PATH *Maintain behavior from now on*	PURPLE PATH *Increase behavior from now on*	GRAY PATH *Decrease behavior from now on*	BLACK PATH *Stop behavior from now on*

Table 3: The Behavior grid (B. J. Fogg, 2018)

The designer and the stakeholders choose the period and the desired type of behavior they want to achieve and match the column with the raw. According to this model there are 15 different behavior strategies.

Green Dot Behavior is for creating a new behavior just one time. Green Dot behaviors are often used in the beginning stages of complex behavior inductions. Examples include: Health: Introducing quinoa for the first time in someone`s diet; Environment: Convince the user to install solar panels on a home; Commerce: Online registration for a new car insurance policy. To achieve a Green Dot Behavior, three elements must come together at once – correct trigger, motivation and ability to perform the desired behavior.

Blue Dot Behavior is for creating a familiar behavior just one time. This type of Behavior is easy to achieve because the user is already familiar with this type of behavior and they know how to perform it. Examples include: Health: Convince the person to go on a run; Environment: Planting a tree; Commerce: Buying a book on Amazon. Again, the three elements must be present to achieve this type of behavior – the person should have sufficient motivation, ability to perform the behavior and trigger which is created at the right moment.

Purple Dot Behavior aims to increase the intensity or duration of behavior just for one time. Examples include: Health: Exercising for 30 minutes longer for today only; Environment: Buying more fruit and vegetables at the store just for today, instead of meat; Commerce: Putting user`s pay check into savings, just for this one pay check. Purple Dot Behavior can be achieved with altering at least one element from the Fogg Behavior Model – increase the ability to perform the behavior (make it easier to do) or strengthen the motivation with awards for the users.

Grey Dot Behavior aims to reduce the behavior not forever but just for one time. Examples include: Health: Eating less food at dinner, just this one time; Environment: Taking a shorter shower, just one morning; Commerce: Spending less on clothes during concrete shopping trip. Grey Dot Behavior can be successfully achieved by altering at least one element from the Fogg Behavior Model but in a negative way.

Black Dot Behavior is used to stop a behavior just one time. Examples include: Health: Not eating dessert this evening; Environment: Turning off the air conditioning for one day; Commerce: not renewing user`s mobile phone contract. Black Dot Behavior can be achieved if all successful interventions work by altering at least one element from the Fogg Behavior Model but again in negative ways: The trigger that leads to the undesirable behavior should be removed; The ability to perform the behavior should be reduced (make the act harder to perform).

Green Span Behavior is aiming to change the behavior for a period of time. Examples include: Health: Committing to use new toothpaste for a week; Environment: Sharing a car ride with co-workers for a month; Commerce: Signing up for a six-month video-streaming subscription service. For achieving a Green Span Behavior there must be boosted motivation, and specifically presented trigger when the ability and motivation is high.

Blue Span Behavior can make the people to perform a familiar behavior for a period of time. Examples include: Health: Eating vegetables at dinner for two weeks; Environment: Biking to work each day for two months; Commerce: Logging into Farmville each day for the next six months. Blue Span Behavior can be achieved if three elements come together at once (ability, motivation and trigger) over a period of time. Since success itself is motivating, it is most important to design the motivation-inducing elements of the BlueSpan strategy into the initial part of the intervention. Once the behavior has been performed at least once, it is necessary to be included a reminder (to trigger the behavior) throughout the desired period's duration.

Purple Span Behavior is made to increase the intensity or duration of existing behavior for a period of time. Examples include: Health: Increasing person`s mindfulness over the next month; Environment: Increasing days spent walking to work for a concrete month; Commerce: Increasing the number of cold-calls made this week. Purple Span Behavior can be achieved through altering at least one element from the Fogg Behavior Model: Increasing the number of triggers leading to the desirable behavior; Enhancing the ability to perform the behavior (simplifying the steps to perform an action); Amplifying motivation for doing the behavior with intrinsic and extrinsic motivators.

Grey Span Behavior aims to reduce a behavior for a period of time. Examples include: Health: Eating fewer foods with corn syrup during 40-day program; Environment: Driving a car less often for a concrete month; Commerce: Spending less on lunch in a concrete week. Grey Span Behavior can be achieved if all successful interventions alter at least one element

from the Fogg Behavior Model: Removing the trigger that leads to the undesirable behavior; Reducing the ability to perform the behavior (including complexity); Replacing motivation for doing the behavior with de-motivators: pain, fear, or social rejection

Black Span Behavior is made to stop a behavior for a period of time. Examples include: Health: Not eating dessert in a concrete week; Environment: Not using the bathtub in the next month; Commerce: Not buying anything in Farmville for 40 days. Because the behaviors being stopped are often negative, and sometimes addictive, the Black Span is one of the most challenging behaviors to induce. Black Span Behavior can be achieved through removing or diminishing one of the variables in the Fogg Behavioral Model.

Green Path Behavior seeks to create a new behavior for a long term. Examples include: Health: Agreeing to consume flax seed oil each morning, from now on; Environment: Always using fluorescent light bulbs; Commerce: Buying a new brand of toothpaste from now on. Green Path Behaviors imply a life change. Green Path Behaviors are the result of three elements: Motivation, Ability, and Triggers. It is needed to boost motivation, enhance the ability by making the commitment act simple.

Blue Path Behavior aims to create a familiar behavior for a long term. Examples include: Health: Drinking two bottles of water each day from now on; Environment: Taking public transportation from now on; Commerce: Buying specific brand computers from now on. To achieve a Blue Path Behavior, three elements (motivation, ability and the right trigger) must come together at once. This combination must be repeated, as the habit gets created or strengthened. Blue Path Behaviors are the most valuable of all 15 behavior types. Health, happiness, and wealth come from the right set of Blue Path Behaviors

Purple Path Behavior aims to increase the intensity or duration of behavior forever. Examples include: Health: Exercising 10 minutes more each day, from now on; Environment: Eating more fruits and vegetables each day into the future; Commerce: Saving 10% more of personal pay check each month forever. For achieving Purple Path Behavior, it is necessary to alter at least one element from the Fogg Behavior Model: There should be an increase of the number of triggers leading to the desirable behavior; Enhancing ability to perform the behavior (simplifying it); Amplifying motivation for doing the behavior with intrinsic and extrinsic motivators.

Grey Path Behavior is used for reducing the behavior for the long term. Examples include: Health: Eating less often at restaurants; Environment: Using less water when showering from now on; Commerce: Buying less products which are not needed in order to reduce waste. Grey Path Behaviors are common in interventions for health (“eat less”), environment (“consume less”), and personal financial security (“spend less”). Grey Path Behavior can be achieved if all successful interventions work by altering at least one element from the Fogg Behavior Model in a negative way: Removing the trigger that leads to the undesirable behavior; Reducing the ability to perform the behavior.

Black Path Behavior make it possible to stop a behavior for a long term. Examples include; Health: Stop smoking permanently; Environment: Never throwing trash out the car window; Commerce: Not buying anything from a concrete brand ever again. A Black Path is the permanent cessation of a behavior. Because the behaviors being stopped are usually negative, and often addictive, the Black Path is one of, if not the, hardest behavior types to induce. For achieving Black Path Behavior, the variables in the Fogg Behavioral Model, should be removed or diminished (B. J. Fogg, 2018).

3.5. The Behaviour Change Wheel (BCW)

The Behaviour Change Wheel (BCW) provides a structured approach to designing or updating behaviour change interventions and strategies (Michie, S Atkins, L West, 2014).

Its purpose is to promote a systematic and comprehensive analysis of the available options using behaviour change theory and the available evidence. The Behavior Change Model facilitates application of behavioural science to ensure that all the component parts act synergistically. The activities for designing an intervention strategy in the Behavior Change Model include:

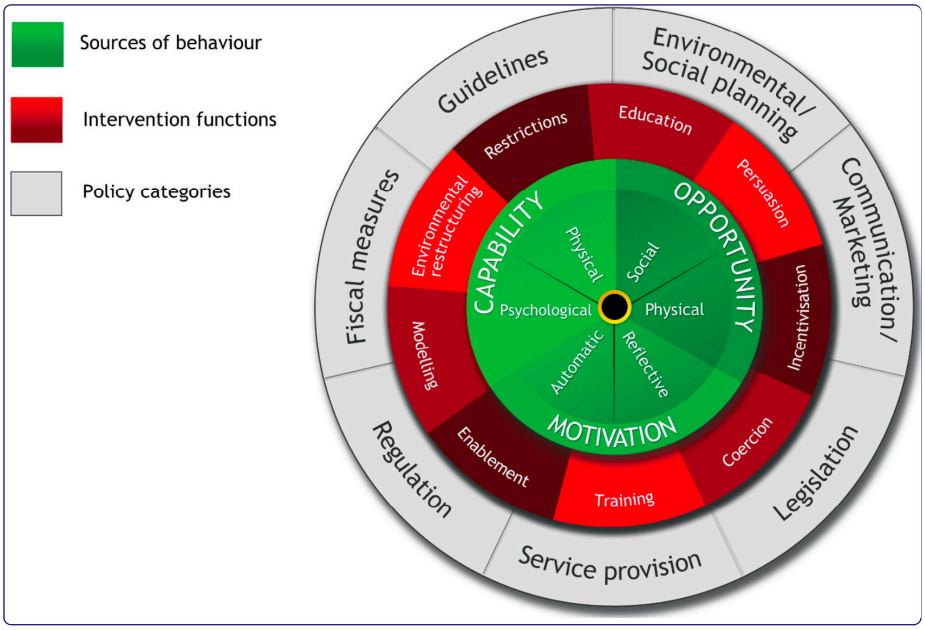

Figure 9: The Behaviour Change Wheel (Michie, S Atkins, L West, 2014)

Its purpose is to promote a systematic and comprehensive analysis of the available options using behaviour change theory and the available evidence. The Behavior Change Model facilitates application of behavioural science to ensure that all the component parts act

synergistically. The activities for designing an intervention strategy in the Behavior Change Model include:

Behavioural target specification aims to identify the precise goal of the intervention in terms of behavior categorization. The identification includes what needs to be changed, to what degree it should be altered and who are the exact receivers of that behavior change.

Behavioural diagnosis is used to find out what need to be changed in the current behavior in terms of Capability (psychological and psychological) and Motivation (reflective and automatic) in the target population, group or individual.

Intervention Strategy selection is used in the behavioral diagnosis to decide type of intervention function should be applied: Education, Persuasion, Incentivisation, Coercion, Training, Restriction, Environmental restructuring, Modelling, Enablement.

Implementation strategy selection is used to choose from a range of policy options in order to support the long-term implementation. These policies include: Fiscal policy, Legislation, Regulation, Environmental planning, Communications, Service provision, Guidelines development.

Selection of specific Behaviour Change Technique aims to develop a detailed intervention plan which includes specific behavioral change techniques (elementary components of interventions such as goal-setting, providing rewards etc).

Drafting the full intervention specification is used to create the specifications of the detailed innervation with all aspects of content and delivery structured around the chosen behavior change techniques. The sequencing of these activities will depend on the context and goals of the key stakeholders.

The Behavioral Change Model can be used to start a project from a blank state with using all of the implementation options or can be used to update an existing strategy. In most of the cases it will be necessary to cycle back and forth among the presented activities which aim to refine and improve the intervention strategy. The APEASE criteria (Acceptability, Practicability, Effectiveness/cost-effectiveness, Affordability, Safety/side-effects, Equity) are applied on the innervation strategy and its implementation in a given context. These criteria should be applied in a structured way with expert judgement combined with using available evidence.

The constraints on the development process (budget, timescale, human resources) will show much time and effort should be spent on the development process itself. The development process can take few days or weeks but sometimes a more thorough development process is possible which can take more time. There should be also monitoring and evaluation of the performance of the behavior change innervation since of the complexity of human behavior in it ever-changing nature and contexts (Michie, S Atkins, L West, 2014).

3.6. Product Impact Tool

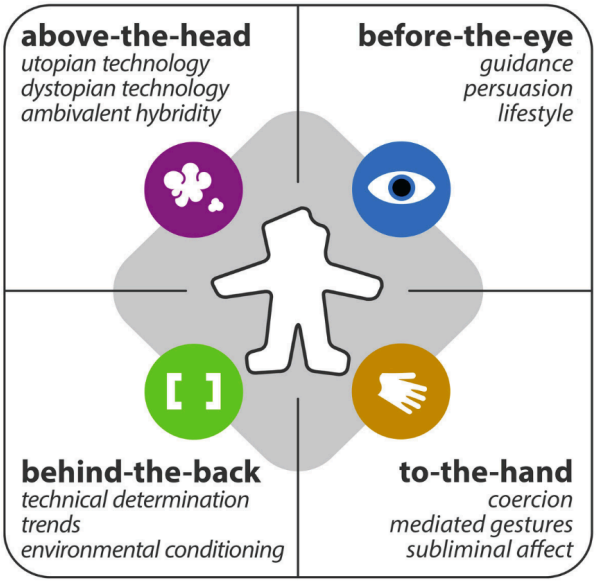

Figure 10: Product Impact Tool (Dorrestijn & Eggink, 2014)

Product Impact Tool is a model for altering behavior through translation of theories of behavior influencing technology into design practice. It is also providing examples of the effects of technology on people which helps to analyse and redesign the technical products (Dorrestijn & Eggink, 2014). The core of the Product Impact Tool consists of four main perspectives on the effects of technology and its interaction (Figure 10).

The four different modes of interaction with the technology tries to answer the question how the technology affects the users and from which side. In this way, four different modes of interaction can be distinguished, which are represented on the diagram: before-the-eye, to-the-hand, behind-the-back, above-the-head. These modes are more corresponding to the field of design rather than exact science: they examine the cognitive, physical, background and abstract. The modes of interaction visually are framing a repertoire of effects of technology and design. The categorization of three types of effects in every quadrant of the model tries to clarify the connection between technology and design.

Before-the eye is the mode of interaction with technology when is addressed the user`s cognition. In this case the technology is used as a mediator of information. The products offer signs that alter our decisions in making faculty. These could be sounds, signals, shapes such as buttons or handles. In this model the eye is the main symbol for connection with the technology, but other senses can be also involved as receivers. Before-the-eye influences guidance, persuasion and lifestyle. In design, this effect is addressed through product semantics such as forms and colours of the product (Norman, 1988). The influence on the

human behavior and action can be guided also with persuasion through design such as the "persuasive technology" (Smids, 2011). In this case the technology not only guides the user to a proper use but also changes their behavior as in the case of pop-up banner on website or mobile application which persuades people to buy or subscribe for a service. In both cases, the technology addresses the human decision-making process. The third type of effect aims to express people`s self-image or lifestyle through the design. Products such as clothes, cars, technology allow people to express their identity. The mechanisms in this quadrant of the graph are shaped through the intersection of behavioral sciences and design. These insights have widespread application in the current practice of design (design for usability, branding, social design) (Dorrestijn & Eggink, 2014).

To-the-hand interactions include physical contact or affecting the senses. These most obvious influences of technology are caused by the physical connection with the products and they directly affect the human body and behavior. The hand is the symbol which represents the interaction mode. The effects in this quadrant are coercion, embodied technology, and subliminal effect. This is one of the most obvious impacts of technology. The coercion is for example a fence which control the people`s access or a speed bumps for limiting the car`s velocity. The embodied technologies include skills which should be learned for handling the products. For example, riding a bike, playing musical instrument. These activities are not possible to happen without the associated artefact, they also require much practice in order to learn to perform the activity. Subliminal effect includes attraction from the user by only half-conscious sensations. For example, marketers advise the supermarkets to include the smell of fresh bread and coffee to enhance the customer`s buying mood. Influences by physical interaction such as fences, locks, etc. can be more intrusive compared to product impacts that address the user`s cognition. The upsurge of interfaces based on touch and gestures shows that physical interaction remains very important in the era of information technologies (Dorrestijn & Eggink, 2014).

Behind-the-back studies the influences created by technology in the wider environment or background which work indirectly to the user. These include historical, geographical and sociological insights about technology. In this quadrant are positioned side effects, background conditions and technical determinism. Technologies and designs commonly have side effects. The product can function well, but in second instance the advantages of the primary function of the product can be faded by disadvantages on another level. Also, the successful functioning of a product often is depended on background conditioning.

The product may require specific infrastructure for maintenance or concrete knowledge and skills for using the product. Technical determinism can create or transform human values and needs since the technologies often are not responding to existing needs because they have their own dynamic of use. Because this type of influence is indirect, and the environment is changing it is impossible to simply apply behind-the-back effects. However, the acknowledging can help the designer to measure and control the risk. The combination of

system engineering and product service design is a good example for approaching the product and its wider context (Dorrestijn, 2017).

Above-the-head quadrant summarize general views on technology. These philosophical and ethical ideas are not connected with the physical connection with the body rather as an above-the-head ideas in the model. These effects include utopian technology, dystopian technology, and ambivalent technology. It is not clear if we consider all of these factors together, what is the meaning of the technology as a whole. There are ethical questions such as: Does it liberate or control humanity? Is it desirable or dangerous to develop behavior influencing products? These claims on the interpretation of the current technology are very diverse and often contradictory.

The utopian technology has very optimistic belief by means of technology which is the typical view in modernity. Dystopian technology refers to the opposite view where arise the fear of domination (like the nuclear bomb and ecological crisis). The ambivalent technology view is the main view in the contemporary philosophy of technology.

For example, the hybridity between humans and technology is not evaluated as either euphoria or despair but is always something ambivalent. The use of these generalized ideas is not to materialize them in design. However, they help the designer think clearer about the technology and drawing future scenarios. The views in this quadrant create often controversies about technology and this makes the quadrant particularly helpful for reviewing ethical reflections (Dorrestijn & Eggink, 2014).

3.7. Mental Notes

Mental Notes is a toolkit made by Stephen Anderson. This toolkit tries to merge psychology and design in game-inspired way. Mental Notes includes 52 cards which represented different insights from psychology. Each card defines a concept, explains how it applies to human behavior and suggests ways of merging this knowledge with design (Shedd, 2010).

Mental Notes can be used for a wide variety of purposes. Anderson suggests that they can be design starters used at almost any stage of product development and can help find creative solutions to problems. Since psychology and design are by nature highly intertwined fields, it is important to understand the behavior and motivation of the user to effectively design. Mental notes help the designers to consider psychological factors that may contribute to the interaction with the product. The cards also show what motivates people at a more micro level. The mental notes cards successfully incorporate psychological concept into the design thinking field.

Some of the Mental Notes generate more high-level engagement ideas, whereas other are focused on more micro level ideas. They can be used for different purposes such as during

design briefs for generating new ideas and design strategies; for getting stakeholders and team member excited about designing for human behaviour; When looking for patterns in research data; As a way to find inspiration and bust out of design blocks; Understanding how design decisions may have implications of how people use the product (Shedd, 2010).

3.8. The Brains, Behavior and Design Toolkit

The Brains, Behavior and Design is a toolkit created to be both informative and actionable. It helps designers to integrate the latest research in human behavior into practice. The toolkit consists of five specific tools which aim to help the designer apply findings from filed of behavioral economics to their practice in order to provide new strategies for solving users` problems.

The toolkit includes: Reference Cards (behavioral economics research finding organized and described); Concept Ecosystem Poster (The relationships between concepts); Irrational Situations Guides (when people act irrationally and how to design for these situations); Strategy Cards (ways to design for the irrational mind); Loss/Gain Worksheet (understanding and designing for trade-offs) (Pfarr & Gregory, 2010).

There are many findings in behavioral economics and cognitive psychology devoted to exploring the cognitive biases of the human mind. Many of these findings suggest that there is connection between what people think, like and want and this connection is particularly relevant to design research field (Pfarr & Gregory, 2010)

The previous studies have focused on the application of this knowledge to domains such as market research, consumer decision making and product appraisal. Pfarr argues that these findings have more relevant connection to the domain of design research: cognitive biases not only provide insight into participants' decision - making behavior, but they can inform how we attempt to elicit and understand participants' preferences.

Pfarr organizes seven behavioral tendencies which are illustrated in the Table 4. These tendencies are widely known in the behavioral economics discussions but also they are particularly relevant to the design research (Pfarr & Gregory, 2010).

Loss Aversion is behavior tendency in which people evaluate options in terms of the result - gain or loss relative to a starting refence point. Losses are seen as more impactful than gains of equal value and because of that people tend to avoid outcomes that involve loss.

The Endowment Effect is related to loss aversion in the sense of loss associated with giving up an item is greater than the sense of gain associated with receiving the same item. Ownership increases the perception of value.

Behavioral Tendency	Description	Sources
Loss Aversion	Tendency to avoid options that result in a loss relative to one's current reference point, and to perceive losses as more impactful than gains of equal value	Kahneman & Tversky (1979); Tversky & Kahneman (1991); McNeil, Pauker, Sox & Tversky (1982); Tversky & Kahneman (1986); Wertenbroch & Dhar (2000)
Endowment Effect	Tendency to attribute increased value to an owned item or entity	Thaler (1980); Kahneman, Knetsch & Thaler (1990);
Status Quo Bias	Tendency to select a default option when one is present	Samuelson & Zeckhauser (1988); Madrian & Shea (2001)
Affective Forecasting Error	Tendency to inaccurately predict future emotional states	Loewenstein & Schkade (1999); Simonson (1990); Gilbert et al. (1998); Loewenstein (1996)
Context-Dependent Preferences	Tendency to change one's preferences based on context, including how many options are being compared and the nature of their comparison (joint or separate)	Simonson & Tversky (1992); Tversky & Simonson (1993); Hsee & LeClerc (1998)
Affective-Cognitive Decision Making	Tendency to be more influenced by affective reactions than cognitive reactions when cognitive resources are limited	Shiv & Fedorikhin (1999)
Introspection and Consideration Override	Tendency to alter one's preferences when prompted to analyze them	Wilson & Schooler (1991); Amir & Ariely (2007)

Table 4: Summary of relevant behavioral tendencies (Pfarr & Gregory, 2010)

The Status Quo Bias is behavior tendency in which people overwhelmingly tend to select a default option when one is available.

Affective Forecasting Error is type of prediction about the future emotional states. Numerous experiments have found that people`s predictions of their future emotional states tend to be inaccurate even in the short term. When people make long-term decisions, they tend to favour more variety than they actually want when the future outcome occurs.

Context-Dependent Preferences is a type of behavior tendency which illustrates that when there is present a number of options this can alter the decision-making scenario and influence the preference.

Affective-Cognitive Decision Making is a tendency which represents that when cognitive resources are limited, people are more likely to be influenced by their affective rather than cognitive reactions, when making a decision.

Introspection and Consideration Override is tendency showing that what people think they like, need or want can change depending on whether or not they are instructed to analyse their preferences. In most cases this appears to result in more rational decision making, by overriding cognitive biases like loss aversion (Pfarr & Gregory, 2010).

3.9. Evil by Design

Evil By Design is a toolkit created by Chris Nodder. The book “Evil by Design” represent list of seven sins which illustrate the fundamental human behavior. Each chapter in this book addresses one of these sins. The 57 patterns described in this book are strong mechanisms for persuasion. They can be used in digital and physical products to increase customer loyalty or to attract new customers. Nodder points that starting with evil helps understand human behavior from that darker side and in understanding these psychological principles it can help to design better products.

In the book the described patterns converge psychology, marketing, and design concepts to show why people are vulnerable to certain persuasive techniques. In the book there are applicable patterns and design techniques which can be translated to the design process. They are organized by seven sins which includes: Pride (using social proof to position the product in line with visitors' values); Sloth (building a path of least resistance that leads users where the designer want them to go; Gluttony (escalating customers' commitment and use loss aversion to keep the users there); Anger (understanding the power of metaphysical arguments and anonymity); Envy (creating a culture of status around the product and feed aspirational desires); Lust (turning desire into commitment by using emotion to defeat rational behavior); Greed (keeping users engaged by reinforcing the behaviors the designer desire).

Chapter 4

Specific tools and methods to influence users` behavior

4.1. Sustainability tools and methods

The majority of the Design for Behavior Change tools and theories are aiming behavior change connected with sustainability. These include Community Based Social Marketing and design, Loughborough Model, Practise oriented product design, Designing moralised product, User-centred design for sustainable behavior, Design with intent, Dimensions of behavioral change, Design for consumption behavior. Most of these tools facilitate behavior change actively through education of the user. They are applied on large, middle and small scale projects by governments, institutions, companies and designers.

4.1.1. Community Based Social Marketing CBSM and design

Community Based Social Marketing (CBSM) aims to create a starting point for prompting people towards more sustainable behaviors. This is achieved by applying psychological principles of behavior change. In CBSM the design is not considered as a centre point for behavior modification, but it is implicit in the process since it often helps to minimize the unsustainable behavior (Clune, 2010). CBSM has been developed to effectively execute socially based marketing campaigns. However, Clune points that there is a strong correlation between industrial designers` skill sets and the four main steps of CBSM. CBSM explores the psychology of behavioral change. MacKenzie-Mohr suggests that "most programs to foster sustainable behavior continue to be based upon models of behavioral change that psychological research has found to be limited." (MacKenzie-Mohr, 2000).

There are often large-scale government advertising campaigns that attempt to promote sustainable behavior among the nation in western countries. They are created with the assumption that raising awareness alone will lead to substantial behavioral change (Clune, 2010). However, MacKenzie-Mohr proposes psychology for behavior change which challenges this assumption. He claims that there is a profound difference between what people know and what they actually do. This is supported by the recent design literature which recognizes discrepancy between what one knows is right and what one does in everyday routines. MacKenzie-Mohr claims that people need practical assistance in order to change habitual behaviors. There is a critical connection to be made in design since it can support both unsustainable activities but also it has potential to make people`s default actions more sustainable (MacKenzie-Mohr, 2000).

The process of Community Based Social Marketing requires a clear directive from the project leader (designer) as to what behaviors are to be targeted. Clearly defining the concrete problem of unsustainability is a good starting point from which the development should emerge. The more specific the targeted behaviors, the easier it is to tailor an intervention. MacKenzie- Mohr's system of CBSM involves four stages: (1) identifying barriers and benefits; (2) designing effective strategies; (3) piloting; and (4) evaluating.

Stage one: Identifying barriers and benefits

MacKenzie-Mohr present an approach which identifies why desired behaviors are not achieved. This approach involves identifying the barriers and benefits of the desired behavior. There are three steps in this approach: literature review, participatory research and survey. The review of academic literature, government reports and magazines can provide insights about why the desired behavior is not happening. It is also recommended to include a participatory research using focus groups. The observation from the focus groups can give helpful information about people`s perception of the desired behaviors, and the observation can also confirm whether their actual actions match their stated beliefs. The final step of stage one is a survey which can identify whether the gathered results are more likely to be applied

widely scale or in a narrower local scale. The first stage can be also executed through numerous context-specific design research activities which can help identify the core barriers to and benefits of particular behavior. In the first stage, designers can also use assisting familiar methods as those embodied in the IDEO`s method cards (MacKenzie-Mohr, 2000).

Stage Two: Designing Effective Strategies based on effective tools

The second stage of Community Based Social Marketing uses effective psychological strategies to enable behavioral changes by focusing on the benefits of positive behaviors and eliminating the barriers which were identified in the first stage. Three of the psychological strategies are very close to the field of industrial design and these are: “prompts”, “norms” and the removal of external barriers. “Prompts” involve the principle that people should be reminded in the right time how to act. It is important for prompts to be noticeable by the user, self-explanatory and near the point of action, in order to encourage the desired behavior. Prompts provide the most promising strategy for design activity (Clune, 2010). Donal Norman discusses the importance of prompt-like tools in the interface of products which he calls affordances. These affordances “provide strong clues to the operations of things [e.g.,] plates are for pushing, knobs are for turning, slots are for inserting things into.” (Norman, 1988). When the affordances are well designed, they navigate the user to the correct use of the product, ensuring that the desired behavior is the default option. The prompts could be visual or verbal reminders in the product. For example, the Kambrook’s Axis Kettle incorporates a temperature indicator to encourage appropriate user behavior – In this case the users who had boiled a water once and forgot about it will not reboil it second time since the indicated temperature is high.

The next strategy is connected to the practical activity of the industrial designers and it involves the concept of the “norm”. A norm is a visual representation of “normal” or appropriate behavior. For example, when people visit a house if they see shoes outside the door, this indicates a norm that the occupants do not enter the house with shoes so this will prompt the people also to take their shoes off. As standards of living improve, the standards of normality also change. MacKenzie-Mohr suggests that to enable norms for behavioral change, the designers should make sure the new norms are visible. This means that the hidden, but positive actions that promote sustainability should be became popular and desirable as social norms that can be followed. Creating norms through visualizing possible futures is a strategy that can be used in industrial design (MacKenzie-Mohr, 2000).

The final strategy is the identification and removal of “external barriers”. External barriers are usually constraints that make it difficult to complete desired activity. These barriers can happen for different reasons such as safety, distance, cost and others. The removal of external barriers is not always possible. However, the removal of the external barriers could be probably the most significant contribution the designers can make, as the design has the capacity to change the physical environment. A good example is the Paris Vélib which is a bike-share scheme with purpose-built bikes and stands located throughout the city. The

system seeks to overcome, by design, barriers such as convenience, theft, maintenance, and parking. It is easier, cheaper, and more convenient to make the sustainable choice to ride for short distance travel instead of opting for motorized transport. The system thus seeks to make sustainable actions the default ones.

Stage Three: Piloting the strategy

MacKenzie-Mohr suggest plotting the design concept on a small scale. In this way it will be easier to refine the prototypes and achieve the desired result and then the concept could be implemented on a full scale. The cost of trialling a concept it will be smaller compared to a large but ineffectively implemented concept. In many cases this stage is overlooked, yet it has the potential to increase the adoption of sustainable behaviors. In the case of Paris Vélib, the system was performed firstly on a smaller scale in Lyon (Vélo'V), prior to full scale implementation on the streets of Paris. This enabled the creators to refine specific details about the Paris Vélib byke system which is much larger on scale (Clune, 2010).

Stage four: Evaluating

The last stage includes the evaluation of the implemented project. This often is poorly executed, according to MacKenzie-Mohr. One of the main reasons for this is the lack of critical reflection in current industrial design literature which makes it difficult to learn from others` mistakes and build on their success. This also restricts the intellectual growth of the discipline. The monitoring and evaluating the strategies over time may be facilitated by new regulatory requirements for managing products over their entire lifecycle.

The Sustainable design cannot be achieved through one simple solution, because it has to adapt over time through continual reflection and social learning process. Sharing and learning from reflection on sustainable design (both successes and failures) is an important step in building knowledge of this emerging discipline (Clune, 2010).

4.1.2. Loughborough model

The Loughborough Model is design for behavior change model which aligns closely to behavioral economics, using mechanism such as feedback, constraints and affordances as well as persuasive technology (Lilley, 2007), (Lilley, 2009), (Bhamra et al., 2011a). This is a model dedicated to product designers and majority of its examples include that type of projects relating to feedback on energy and water consumption, and feedback devices helping the users manage their everyday consumption. According to Lilley, design should respond to: The users level of compliance; The gravity of the consequences of actions taken; The context in which the interactions takes place (It is acknowledged that it is difficult to know where to position interventions and this is a challenge for designers) (Lilley, 2009). The investigations of the authors identified seven main strategies which can be applied within the

design. Their main tool was to examine literature which provided them with deepen understanding of the psychological and behavior factor of behavior change and this helped them to identify the seven main steps:

Eco-Information – design-oriented education. The aim of this step is to make consumables visible, understandable and accessible to inspire consumers to reflect upon their use of resources. This works through the product which expresses the presence and consumption of resources such as water, energy. Also, the product encourages the users to interact with the resource use. Example is the Power Ware Cord create by Swedish Interactive Institute. The Power-Aware Cord embeds wires around a power cable that pulse light in relation to how much electricity is being drawn off the grid. The more current, the brighter and faster the blue light spirals.

Eco-Choice – design-oriented empowerment. The aim of this step is to encourage consumers to think about their use behavior and to take responsibility of their actions through providing the consumers with options. This is executed through allowing the user to have a choice with a product which enables sustainable use to take place. A good example is the Domestic Energy Display which is household level system showing the users their energy consumption in a simple, easy to understand way (Tang & Bhamra, 2008).

Eco-feedback – design-oriented links to environmentally or socially responsible action. The aim of this step is to inform the users clearly about their actions and create conscious mind into consumers about environmentally and socially responsible decisions through offering real-time feedback. It works through a product which provides tangible aural, visual, or tactile signs as reminders to inform users of resource use. Example: Wattson – wireless energy monitor which raises awareness of energy used in the home made by Energeno.

Eco-spur – design oriented rewarding incentive and penalty. The aim of this step is to inspire the users to explore more sustainable usage provide rewards to “prompt” good behavior or penalties to “punish” unsustainable usage. This is executed through products which show the user the consequences of their actions through ‘rewarding incentives’ and ‘penalties’. Example is the Flower Lamp made by Interactive Institute which rewards energy behaviors. The lamp ‘blooms’ – changing its shape and thus lit expression – when energy consumption in a household has been low for some time, thus reflecting the cycles of local energy use. In order to make the lamp more beautiful, a change in behaviour is needed.

Eco-steer – design-oriented affordances and constraints. The aim of this step is to facilitate users to adopt more environmentally or socially desirable user habits through the scripts and constraints embedded in the product design. This works through products, which contains affordances and constrains encouraging users to adopt more sustainable habits or reshape existing unsustainable habits. Example: Unilever Powder Tablet – Counteracting excessive amounts of washing powder consumption by prescribing correct dose for washing.

Eco-technical intervention – design oriented technical intervention. The aim of this step is to restrain existing users` habits and persuade or control users` behavior automatically by design combined with advanced technology. This is executed with products which combine advanced and persuasive technology at the same time to alter user behavior automatically. Example is the Energy Curtain made by Interactive Institute which is made of smart fabrics collecting sun light and using it as an energy source to interact with daily light cycles.

The last step is the Clever design. Its aim is to automatically act in sustainable or social way without raising awareness of changing user behavior but using only innovative product design. In this way the product`s design solution decreases the environmental impact without changing the user`s behavior. For example, the integrated toilet and washbasin automatically decrease water usage by re-using the water for hand washing to flush the toilet. (Bhamra, Lilley, & Tang, 2011b)

4.1.3. Practice oriented product design

Practice-orientated product design is an emerging area in design that is attempting to apply understanding of Social Practice Theory to design, that would ultimately shift everyday practices over time. Social Practice Theory (SPT) acknowledges material artefacts (designed products) influencing the trajectory of everyday practices (Scott, Quist, & Bakker, 2009). An example of this is the reintroducing the personal heating system as an alternative to the dominant space heating program.

Practice-oriented approach in design was born from discussion about the conceptual and practical relevance between practice theory, studies of consumption and product design. One of the advantages of the practice theory is that it can provide better framework for understanding issues of consumption (including both purchase and use), and this knowledge can be applied in different design approaches in order to create more sustainable and effective modes of consumption among the users (Scott et al., 2009).

The practice-oriented approach is aiming to guide the design process more broadly and not focusing only on the individual products and users, but also considering the integrated routines, materials, bodies, meanings, functions, and abilities that make up everyday practices. This approach prioritizes the role of conventions, habits, and conceptions of normality in order to shape user`s behaviors and make the products and user behaviors more efficient. Therefore this approach is considered to be a systematic one and it can help design for sustainability and tackle concrete problems such as the rebound effect and user acceptance issues (Scott et al., 2009).

An important lesson from the practice orientation is that ‘consumer demand’ is a static interpretation of the dynamic mechanism connecting past and future contexts of practice (consumer behavior). This counters the assumption that consumer demand should be treated

by the designer as something static or given, instead it should be seen as an evolving structure which is constantly changing. The focus is also changing to ideas about what is 'normal', how definitions of normality emerge, and how these definitions change and influence the expectations and behaviors of consumers.

Practice-orientation views the system innovation as a social event made by tiny, distributed but inter-related acts of routine, change and design. Therefore, the system innovation is not dependent on system scale intervention but on systems thinking in design. This created new paths of working for design and enables the evolution of sustainable patterns of consumption through 'innovations in practice' (Scott et al., 2009).

4.1.4. Designing moralised product

Designing moralised product is method created by Jaap Jelsma. This method enables "inscribing" morality in technological objects, primarily directed at environmental impact. His method is built on the idea that the human behavior not only results from "attitudes, values, and intentions" but is also "embedded in habits and routines", which Jelsma believes are "patterns of unconscious actions guided by material infrastructures" (Jelsma, 2006). With adaptation of these material infrastructures, the designers can direct the patterns of action in a desirable direction by using the "script" approach developed by Akrich and Latour. Jelsma demonstrates that this concept links the context of design and use. Scripts can be designed into technologies and also help to shape the patterns of behaviors (A. P. Verbeek, 2016).

In Designing moralised product there is a distinction between the "user logic" and "script logic". Scripts in technologies often aim particular behavior-influencing effects, but it these do not correspond to the users` practices and interpretations, there will be unintended outcomes as a result. Designing "inscriptions" is not an easy task because it should involve the share that both technologies and users have in producing behavior. Jelsma has developed and eight-step design method for doing this, focusing primarily on the redesign of appliances and devices. In his method, the existing scripts are reviewed, analysed and at the end "rewritten", considering the users and how they interact with the redesigned device.

The method was used also from other stakeholders for redesigning dishwashers. It helped to identify interesting mismatches between the logic of the user and the script logic. In the observation of the standard use of the dishwashers it was noted that many people rinse their plates with hot running water before placing the plates in the machine, even though the that was part of the machine`s task. This mismatch helped to create several ideas for rewriting the "rinse script" of the dishwasher. The ideas included different triggers such as adding a rinse button which highlights that the machine can do the rinsing itself or having built in display which shoes a message when it is rinsing, or even making the front panel transparent in order for the rinsing process to be clearly visible.

Jelsma`s method offers an interesting application of the script theory to the field of design. Even though his method has limitations. It does not include moral reflection on the desirability and quality of the operative scripts in technology and design. The method is still useful as it can present a different point of view with the everyday interaction with the products (Jelsma, 2006).

4.1.5. User-centred design for Sustainable Behavior

User-centred design process can be used to improve the quality of the human-product interaction. Most design processes use the basic design cycle which consists of an analysis phase (the designer tries to understand the problem and the aspects that play a role), a synthesis phase (the solutions are generated), a simulation phase (the solutions are simulated), and evaluation phase (the evaluation of the solutions. At the end of this cycle the design is confirmed or the cycle is repeated again to the earlier phases to evaluate if the analysis and synthesis were evaluated correctly (Wever, van Kuijk, & Boks, 2008).

It is not always necessarily to involve the users in the design cycle, when the stakeholders solve design problems. For example, when an automobile company designs a new diesel engine, it can examine the analysis and the performance of the new engine without including the users in the process. However, if the company wants to know how the users feel about different characteristics of the new engine, such as the sound, the company should include a user-centered design process and ensure that the users will be involved in each of the design steps. This is visualized in Figure 11. During the first phase (analysis), the designer is not only considering the technological aspects and business dimensions of the product, but also involves the primary user needs, user behavior and preferences. This happens with specific techniques for collecting user information, such as context mapping or contextual inquiry. (Wever et al., 2008)

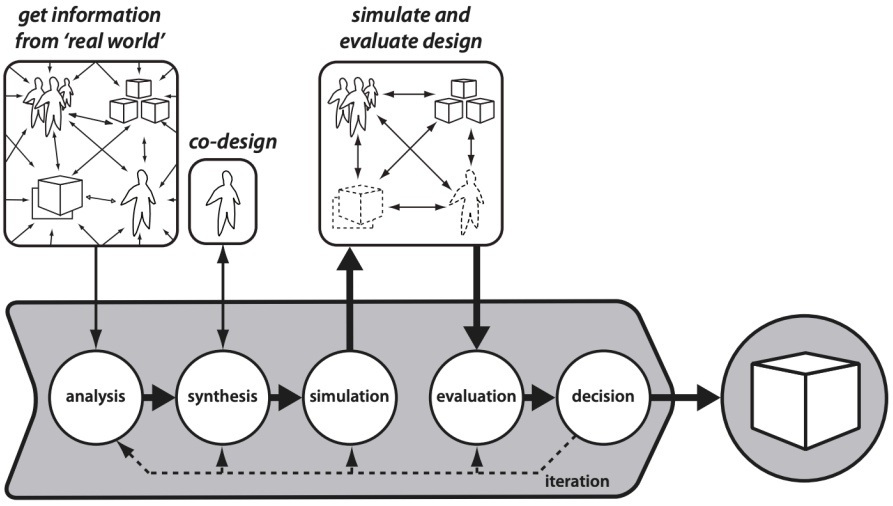

Figure 11: The user-centred design cycle (Wever et al., 2008)

Users can be actively involved during the design phase to generate ideas and concepts. The generated concepts can be tested through simulations with different levels of sophistication. After the simulation has been built, the users can directly evaluate the usability of the solution with test. Each phase has its own appropriate toolbox of user-centred design or evaluation methods. The concepts created with users and the human-product interaction help to better understand the interaction process for a concrete product, and assuming unwanted side effects of product use. Also, the concepts help the designer give an overview of different factors that play a role in product use, understand the causes of side effects of product use and provide measurements to evaluate the product interaction. The user-centred design process is very useful because it enables the designer to include the users in the design process and therefore creates specific solutions that fit the user and evaluate these solutions with effective measurements (Wever et al., 2008).

Design for sustainability has emerged from technical disciplines, such as mechanical engineering, and therefore is focused mainly on the supply side of a product. Traditional eco-design tools such the Life Cycle Design Strategies, or LiDS wheel focus on different aspect that designers should consider reducing the impact of the product they design. For example, the LiDS wheel`s fifth strategy aims to reduce the impact during the use phase. This strategy should consist of both a technical component and a psychological aspect. (Brezet, Diehl, & Silvester, 2001). Wever purposes to combine this design approach with user-centred design in order to implement the psychological part more efficiently. He creates steps to achieve this:

Firstly, there is the possibility to adapt the product better to the actual usage of the consumer and in this way to minimize the negative side effects. This should be achieved through steps which ensure eliminating the mismatches between delivered functionalities and desired functionalities. Wever calls this approach functionality matching. The mismatch between delivered and desired functionalities is unsustainable twice because the redundant functionalities have an unnecessary impact, whereas missing functionalities of the product can trigger unpredicted behavior with subsequent unsustainable side effects.

Secondly, there is the possibility to influence user behavior through product design (Lilley, 2009). This can happen similarly to sustainable approach such as eco-feedback. In this way the user is presented with specific information about the impact on his or her current behavior and relate this information with the current behavior in order to adapt it and change it. This can also happen through special type of product scripting in which the product prompts the user with created obstacles for unsustainable use or the opposite way - make the sustainable use very easy to be performed so it will be used as the default option. These types of forced-functionalities of the product can be referred to either intelligent products that adopt automatically to changing environments, or to designing products with strong obstacles which prevent the unsustainable behavior of the users (Wever et al., 2008).

4.1.6. Design with intent

The Design with Intent toolkit created by Lockton aims to help designers and stakeholders explore the different behavior design concepts through presenting examples and insights from different disciplines in a relevant design pattern format (Lockton, Harrison, & Stanton, 2010). This process can lead to idea generation, through suggesting particular tool to direct a form of brainstorming, or it can be used as an exploratory, teaching tool. The toolkit was developed through different workshop with students and designers in which the iterative, participatory process helped to understand how to be correctly used and structured with useful content. The Design with Intent toolkit extract practice and particular patterns from different disciplines connected with altering human behavior. The main focus of the tool is to be used in sustainability context, but Lockton has developed it also to be in favour of interaction designers and be used also in that field.

The toolkit utilizes 101 design patterns for influencing behavior which are structured into eight different lenses. These lenses are Architectural, Error proofing, Interaction, Ludic, Perceptual, Cognitive, Machiavellian and Security. The lenses provide different multidisciplinary 'worldviews' on behavioral change. This can challenge the designers to think 'outside of the box' and consider the design brief in broaden way. This toolkit can be used to trigger multiple viewpoints in the process of ideation. The patterns inside are recurring problem-solution examples, which can help the designer to recognise a new problem situation which can be similar to situations encountered before but in a different context and in that way manage these problems more easily. This makes the toolkit very useful format for cross-disciplinary projects.

The Design with Intent tool, developed by Lockton, was primarily developed to support Design for Sustainable Behavior but it can be generally applicable to any design aiming to change behavior of the users. The 101 patterns or principles for influencing behavior are presented on a separate card, and consists of a title, a question pointing out the function of the pattern, and an example of an application of the pattern with a short description and a picture. The Design with Intent toolkit is proposed to be used in different ways. It can be used by the designers to get some inspiration, they can analyze existing behavior change solutions, frame the projects' problems, building models of the user. The targeting of the users is a type of categorization which uses three different main types of users, presented on an additional card (Lockton et al., 2010).

The categorization of the users considers that they can be targeted as either 'Pinball' (the type of users who do not think much but are easily directed), 'Shortcut" (the users who want to get things done as easy as possible and with the least effort), and 'Thoughtful" (the users who think analytically about their actions).

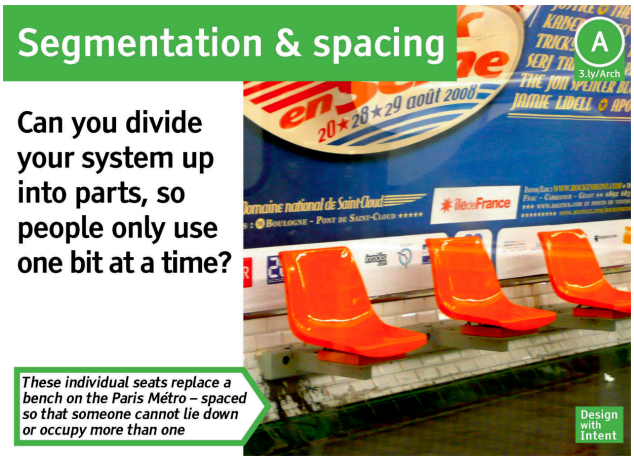

Figure 2.3. Example of a Design with Intent pattern card (Lockton et al., 2010b)

Figure 12: Example of a Design with Intent pattern card (Lockton et al., 2010)

The Design with Intent Tool has been tested through a number of different workshops and applications in diverse type of projects. The evaluation of the many users indicated that the toolkit successfully supports generation of large amount of ideas and improves the understanding of how design influence behavior. One example of a project created with Design with Intent Tool is the Paris Metro seating platforms, which are spaced intentionally (Figure 12). The spaced seats provide only one individual place, providing that nobody can lay down and occupy more than one space (Lockton et al., 2010).

4.1.7. Dimensions of behavioral change

Dimensions of behavioral change helps the designers to create products that are used by the users in a more sustainable way. This is achieved by learning the designer to make more informed decisions about which behavioral change principle they apply in their products. When the designers are informed about their decisions, they use their insights about the user and the context to determine more precisely which principles are more likely to achieve the desired behavior and be accepted by the users (J. Daae, 2014). It is not always possible to connect exactly particular characteristics of the user or the context to particular design principles and the behavioral change outcome. However, this method provides the designer advantages and disadvantages for each user and context and helping to choose the more suitable design principle. Dimensions of behavioral change tool aims to help the designers to navigate in the complex universe of parameters. The tool does this by presenting 16 different types of design principles and describes them according to one of the 9 dimensions, which the tool suggests that the principles can be adjusted inside. Also, the tool provide a brief information to the main behavioral factors that social psychology has identified to affect the human behavior and gives information about the main effects of the dimensions on the behaviors (J. Daae, 2014).

The tool Dimension of Behavioral Change was created through different workshops with designer practitioners. There were involved also a number of behavioral dimensions which were found in the recent academic literature. This resulted in the identification of 55 variations of how to affect users` behavior, which were categorized into nine main dimensions. They cover both already existing dimensions but also add new ones which contributes into creating new perspectives for the designers to understand how the design for sustainable behavior can be successful (Z. Daae, 2014). The tool helps designers consider more aspects of how to affect behaviour through design and the significant potential of obtaining designing products that makes people use them optimally in a environmental way.

The tool, Dimensions of Behaviour Change, consists of one card presenting the distribution of control and 16 different design principles which are relative to how much control they allow the user during the interaction. There are eight cards which are presenting the other dimensions separately and two cards presenting the tool and directions for its use. Each dimension is presented as a line spanning between two extremes. There is an example for each extreme and for the area between (Figure 13). Each example is presented by a photo of a product that may affect the user by the specific state of dimension, and a brief explanation how the product can affect the user`s behavior. There are also advantages and disadvantages which are presented for each extreme of the dimension and this helps the designers understand the potential consequences. The goal of this tool is to help the designers create more sustainable behavior among the users. However, the creators assume that it can support also other types of behavioral changes as well (Z. Daae, 2014).

Besides the positive behavior changing effect of the Dimensions of Behavioral Change, it may have also other positive effects on the design project. The tool can be also helpful for the designers to consider the way the users interact with the product from several different perspectives. The designers could be not consciously aware of some of these perspectives and the tool can provide arguments why the particular design is a good solution. The tool can also function as a reminder of the most important behavioral factors and shows the possible consequences of different choices. Also, Dimensions of Behavioral Change can be used as an inspirational tool with his many examples and different approaches (J. Daae, 2014).

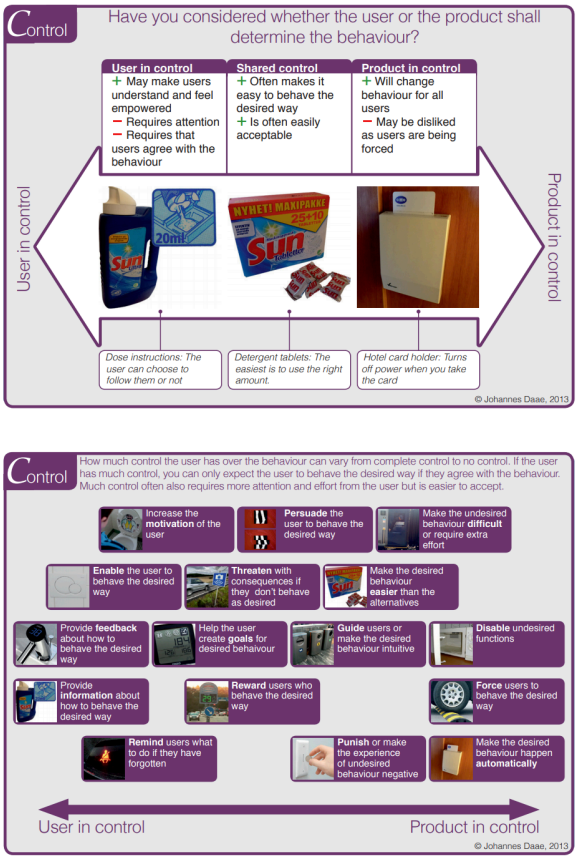

Figure 13: Dimensions of Behavior Change card (J. Daae, 2014)

4.1.8. Design for sustainable consumption behavior

The Design for Sustainable Consumption Behaviour approach explores how it can stimulate innovative solutions for a decreased consumption of resources through combination of user-centred design methodology, studies of consumption behavior and categorized behavior intervention strategies (Selvefors, Pedersen, & Rahe, 2011). It can be regarded as an exploratory tool which has the potential to help companies to integrate a behavioral perspective within their existing product development process by providing guidance and an overview of available intervention strategies. The approach has been proven to generate sustainable innovations within companies and it is focused specifically on reducing resource consumption during the product usage phase.

Design for Sustainable Consumption Behavior is meant to help designers and stakeholders gain inspiration for new promotion in product development. This can happen through incremental innovation and continuously developing existing products in the company product portfolio; or strategically implementing disruptive innovation and finding new business opportunities (Selvefors et al., 2011). The purpose of the approach is twofold: to facilitate a resource consumption perspective in the user-centred design process and to

provide an overview of suitable behavioral intervention strategies to create solution aiming at promotive environmentally sustainable effective habits among users. The approach is summarized through a six-step process that integrates user studies and behavioral intervention strategies in the conventional product development process.

Step one consists of choosing a product or resource consumption situation. The company should identify a product or situation in which is needed to reduce resource consumption by encouraging less wasteful actions. This product or situation is then chosen for analysis, and the Cycle of Consumption (Figure 14) is used to identify expected user behavior and consumption action related to the product or situation.

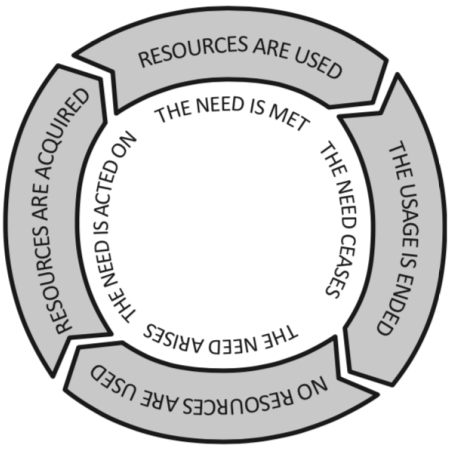

Figure 14: The Cycle of Consumption (Selvefors et al., 2011)

Step two aims to investigate user actions through an in-depth user study. The expected user behavior and consumption actions, identified in Step one, are used as a basis for analysis, in which they are analysed through a user study. The collected information can be visualized in the Cycle of Consumption to provide a better overview of the different aspects which influence the actual consumption.

Step three consists of identifying wasteful resource consumption. The identified consumption and user actions are further analysed from a resource-saving perspective in order to find specific situation where the consumption could be reduced. Some of the asked questions during this step should be: Is it an active or passive consumption? Is the consumption due to a habit or due to an active action based on an actual need? What prevents the user to end the consumption? Depending on the answer of these questions, the potential for reducing consumption can be defined in relation to the Cycle of Consumption. It can be assumed that there is high potential for reducing interventions in the cases where there are discrepancies between the expected and actual consumption in regard to users' actions.

Step four aims to choose focus and target behaviour. The identified situation with high potential for reducing consumption of resources is chosen for further investigation. The choice will set the strategy for the product development work. It can either influence a current user behavior or create a completely new behavior that can replace previous non resource efficient behavior.

Step five is for identifying suitable intervention approaches. The suitable intervention approaches can be identified by comparing the chosen focus and critical situation identified in the Cycle of Consumption with the four behavioral intervention strategies (Figure 15).

Step six aims to develop product innovations through the use of intervention triggers. The suitable intervention approaches identified from Step five can be further studied and the creative triggers can be defined based on the intervention strategies and the chosen consumption situation. The triggers can be used in the creative development process. This can happen through discussions and brainstorming or creative process which aims to find solution to motivate efficient behavior (Selvefors et al., 2011).

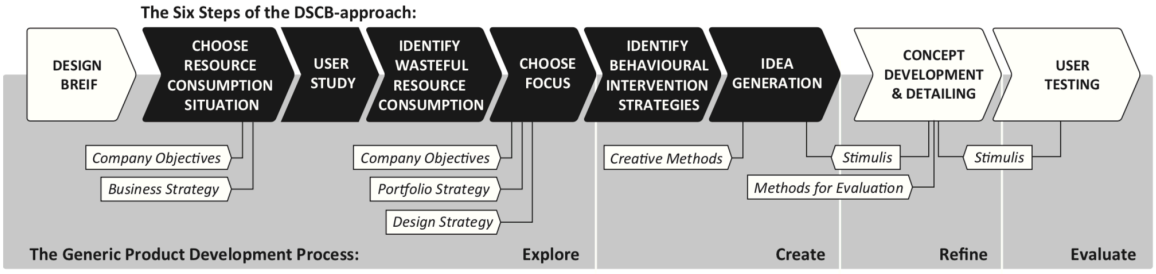

Figure 15: The DSCB-approach in relation to the generic product development process

4.2. Social methods and tools

The other methods for Behavior change in design are categorised in the Social criteria. These include Mind space and Socially responsible design.

4.2.1. Mind Space

The ability to influence behavior in central key areas such as health, finance and climate change is central to key policy changes. The usual approach to changing behavior in economics and psychology attempts to 'change the mind' by influencing the way people think through information and incentives. However, in the recent years there is increasing evidence

suggesting than “changing the contexts” by influencing the environment in which people act (in automatic ways) can have substantial important change on behavior (Dolan et al., 2012). The MINDSPACE method gathers nine most robust effects that influence people`s behavior in mostly automatic (rather than intentional) ways. The framework is used by policymakers and other governmental structures around the world.

MINDSPACE includes examples on the nine most robust effects on behaviour (Messenger, Incentives, Norms, Defaults, Salience, Priming, Affect, Commitment and Ego). The collection of the examples is derived from the judgement of the authors of the literature of behavioral influences and there is no special significance to the order of the categories. Also, some of the effects from one category could be overlapping with effects from another (Table 5).

The MINDSPACE framework for behavior change.

MINDSPACE cue	Behaviour
Messenger	We are heavily influenced by who communicates information to us
Incentives	Our responses to incentives are shaped by predictable mental shortcuts such as strongly avoiding losses
Norms	We are strongly influenced by what others do
Defaults	We ‘go with the flow’ of pre-set options
Salience	Our attention is drawn to what is novel and seems relevant to us
Priming	Our acts are often influenced by sub-conscious cues
Affect	Our emotional associations can powerfully shape our actions
Commitments	We seek to be consistent with our public promises, and reciprocate acts
Ego	We act in ways that make us feel better about ourselves

Table 5: The MINDSPACE framework for behavior change (Dolan et al., 2012)

Messenger effect is evaluating how people perceive information. People often rely on the automation reaction created when they receive information from the authority of the source of information – the ‘messenger’. Particular signals from the authority can generate similar behavior even when such behavior is stressful or harmful. Dolan gives examples from studies which show that nurses unconsciously follow doctor`s instruction, even if they are wrong or foolish. Other studies show that people are more likely to act on information when the messenger has similar characteristics to themselves. Indicators of prestige (such as luxury car) have been observed to create greater deferential behavior than when the indicators are absent. The examples from these studies is intersecting with other disciplines such as psychology and they try to understand the human behavior and how it can be altered when the authority is present.

Incentives is very important part of the economics, because people respond to incentives such as high or low prices and sales and other. Incentives can be used also to encourage people to a healthier lifestyle such as eating healthy food, taking more exercises, drinking less alcohol or quitting smoking. The impact of incentives clearly depends on factors such as the type, magnitude and timing of the incentive (Dolan et al., 2012).

Norms are part of our society which represent social and cultural behavioral expectations. They are something like standards or ideal form of behavior to which individuals or social groups try to conform. The social norms can influence behaviour within individual because they take their cues from what other do and use their perceptions of norms as a standard against which they compare their own behaviors. The operation of social norms is partly conscious because people can choose to follow the behavior of everybody else or trying to establish their own behavior (Dolan et al., 2012).

Defaults are options of most decisions, or they are the options that will come into place if no active choice is made. Defaults can apply influence on the individuals since they regularly accept the default settings even if it has significant consequences. Many public policy choices have a no-action default imposed when an individual fails to make a decision. Defaults have been related to different factors such as hyperbolic discounting, loss aversion, and presumed 'suggestions' that imply a recommended action (Dolan et al., 2012).

Salience is effect which represents the fact that information is taken into account from the user when it is salient. The individuals can focus on the behavioral cues when they are salient and attentional or cognitive resources are restricted. Studies show that when the cues are enough attention-grabbing and salient, people are more likely to respond to different behavioral changing domains and restrain from bad habits like smoking, junk food or aggression (Dolan et al., 2012).

Priming is connected with activation of any sort of knowledge in the memory. It makes it more accessible and therefor more influential in processing new stimuli. Priming shows the people behavior can be altered if they are first exposed to certain sights, words or sensation. People behave differently if they have been 'primed' by certain cues firstly. Priming acts outside of the conscious awareness of the users.

Affect or the act of experiencing emotion is a powerful force in decision-making. People can experience behavioral reaction when they have emotional responses to words, images and events before they realise are reacting to and before cognition takes place. It has been argued that all perception contains some emotion. For example, when people are choosing to buy a house, they firstly categorize it by their emotion – it can be a handsome house, an ugly house, or a pretentious house. This means that buying decisions in many cases are altered because of the emotional side of the client and usually people buy houses not because of floor size or location, but because of the visceral feeling they get when walking through the front door (Dolan et al., 2012).

Commitment is the next effect which Dolan describes as a behavior changing. Many people are aware of their bad habits such as overeating, smoking or overspending and try to use commitment to achieve long-term goals. The act of commitment is reflection action which operate on the automatic system. For example, people have automatic fear of being excluded

from the group if they do not achieve their commitments and are afraid of reputation damage.

Ego is the last effect in the MINDSPACE method. People tend to behave in a way that supports the impression of a positive and consistent self-image. When the things go well in individual`s life, the person attribute it to him/her, but when they go badly, the person blames the other people or the situation itself. This effect is called 'fundamental attribution error'. The desire of the people to have positive self-image often create tendency to compare themselves with the others and make 'self-evaluation'. This often make the people to believe that they perform better than the majority (Dolan et al., 2012).

The MINDSPACE framework can be used in different public policy aims to change or shape people`s behavior. The framework can be applied whenever behaviour change is being considered, including when considering how best to enforce existing or new legislation.

MINDSPACE aims to give policy makers a better understanding of how people respond to incentives and which types of information is salient. The framework also enables policy-makers to understand the ways in which government actions may be changing citizen`s behavior unintentionally. It can also be applied to improve the process of policy-making itself (Dolan et al., 2012).

4.2.2. Socially responsible design

Social issues involve behaviors that play a crucial role in initiating a desired change and design has the power as deliberate means to change human behavior. From social perspective, designing product that influence behavior, also realizes desired social implication. This is illustrated on Figure 16. The framework represents behavior forms which are intermediate stage between social implications and the user-product interaction and respectively between collective and individual concerns. The latter explains, respectively, the reason for influencing and the way of influencing (Tromp et al., 2011).

As an example, the size of a plate appears to influence our eating behavior. Experiments show that people who use a small plate serve themselves less food and therefore eat less compared to people who use a big plate. The act of serving less, does not yet create social implications. However, the eating activity that follows, contributes to obesity, and this from social perspective, might be a concerning factor. By understanding the relationship between serving and eating habits, designing a product that changes the way of serving food can influence people`s eating behavior.

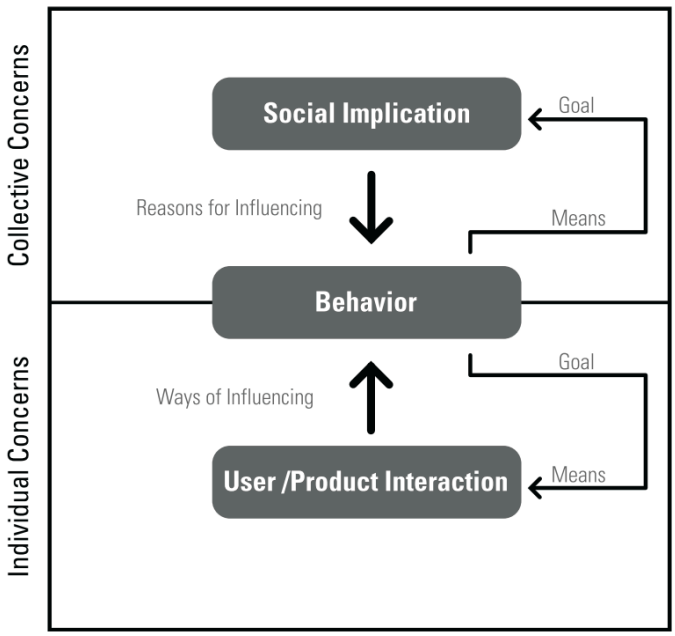

Figure 16: The framework of the Socially responsible design (Tromp et al., 2011)

For example, If the designer is concerned with obesity, one of the starting points to alter people`s eating behavior, should be to change the amount of food which the individual consumes. Other possible way is to design attractive food packages for healthy type of food which can promote more healthy diet and influence the individual`s purchase choice. Both of these perspectives of human-product interaction influence people`s eating behavior but they address different individual concerns. People who interact with the small plates can put themselves small amount of food because of an automatic response, or because they feel embarrassed in public to overload their plate.

The attractive and good appealing food packages may be addressing concerns about aesthetics and status. None of these influential designs try to address the collective concerns directly with the user; instead; they are triggering different individual concerns to stimulate the behavior that is desirable form a social perspective.

The distinction between social implication, behavior and human-product interaction is important because when designers create products that intend to change behavior, evidently there are reasons why the desired form of behavior is not automatically performed. The possible disparity between which behavior is desired from a social perspective and how people actually behave shows a conflict between the collective and individual concerns. What is best for the collective (and usually also fort the individual) is not always experienced as best for the individual or is easily overruled by other conflicting concerns (Tromp et al., 2011).

An example from the sustainability fields – from a social and long-term perspective it is not difficult to connect the collective concerns with the corresponding desirable behavior (e.g. travelling to work by bike or public transport instead of using the car). However, this type of

behavior conflicts with a lot of individual concerns such as desire for comfort and efficiency. The power of design lies in the potential to bridge these concerns.

What behavior is desired from a social perspective can be defines from the desired social implication, based on collective concerns. The designer`s task is to be aware and find the individual concerns in interaction with the product to elicit this behavior. For designers is important to understand the relationship between collective and individual concerns, whenever they collide or coincide, because this helps to identify what type of influence and strategies can be effective in altering the behavior (Tromp et al., 2011).

4.3. Health tools and methods

The other methods for Behavior change in design are categorised in the Health criteria. These include Modes of transition and Design for healthy behavior.

4.3.1. Modes of transition

Mode of transition is a design framework which includes different lenses helping the designer to better understand the user. The sensitizing lenses represent ways of understanding and ways of acting on a transition situation, within the design process, and it focuses on the transition of the individual and its well-being. The framework follows a design process of three stages: understanding, conceiving and refining and assessing. It provides analytic and synthetic methods at each of these stages for designers to use to comprehend and help move people along through transitions (Ozenc, 2012).

Modes of transition is a practical design framework which focuses on how an individual act with agency to compose a harmonious transition. The framework has been used in different design project with promising outcomes. Usually the existing design frameworks rely on two distinct perspectives: one on the traditions of design and another focused on the traditions of social science. The design tradition is aiming to analyse a situation and synthesize a solution in the form of a product or service, whereas the social science perspective suggests a structured and flexible framing for analysis and synthesis. Modes of transition structures the analytical and synthetical design process, providing a framework for “guided doings” to balance the level of agency both in understanding and acting on transitions and it tries to merge the two perspectives in one useful frame.

It offers a flexible structuring on human-centred design methods to analyse and understand transitions, combines them with scenario-based design to provide a means of action, and also suggests building talk-back prototypes by using research-through-design methods. This is illustrated in Figure 17.

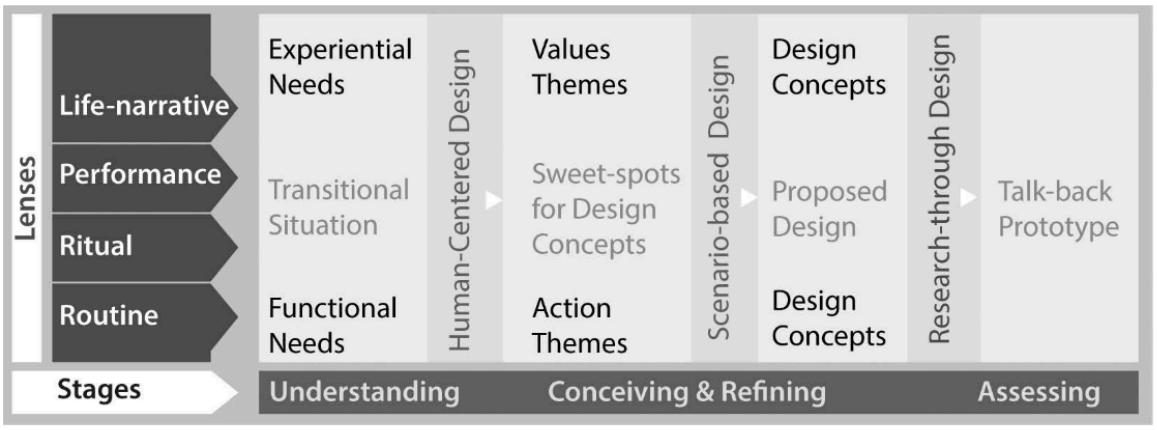

Figure 17: Modes of Transitions framework, with lenses for a three-stage design process: structuring human-centred design methods, scenario- based design, and research through design (Ozenc, 2012)

4.3.2. Design for healthy behavior

Design for healthy behavior is a framework based on transtheoretical model of behavior change (TTM), by Prochaska and di Clemente (1992). In the framework there are represented processes of change, stages of change, design strategies, and their relationships. The processes of change include behavior change that follows a series of stages. The designers may use different processes to design interventions for different stages. In Design for healthy behavior framework there are four types of design strategies that lead to four different design aims: 'raising awareness', 'enabling', 'motivating', and 'fading out' (Ludden & Hekkert, 2014). The design strategies spread over multiple stages (Figure 18).

The design strategies for 'raising awareness' aim to move people into a process of behavioral change. These strategies help the people to evaluate the choices they have already made and place them in a new perspective. This should help them to move into a mode of preparation stage because they are ready and feel the need to change. The design strategies for 'enabling' aim to characterize interventions that support people in making the right choices.

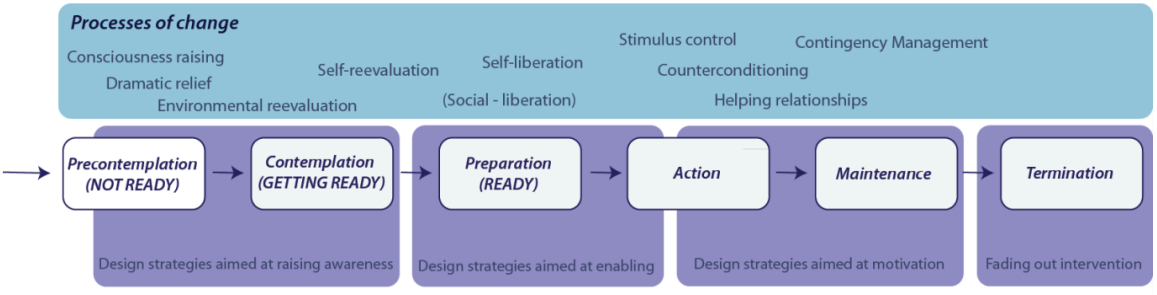

Figure 18: Preliminary framework for stage-matched interventions (Ludden & Hekkert, 2014)

These choices should lead them to a healthier lifestyle. These interventions should incorporate different strategies that empower people to create their own plan and encourage them to follow it. In this strategy one of the main aim is to keep the motivation high, since people already changed them and need to be supported to maintain that change in a longer period of time (Ludden & Hekkert, 2014).

In the termination stage, right before the durable behavior change is reached, the design interventions should incorporate a fading out phase. In the clinical trials there is clear evidence that people experience a negative effect on behavioral change when the personal counselling, social support and social monitoring were stopped suddenly. The gradual fading out phase ensure the withdrawn is happening gradually and ensure that the design interventions will support the people as long as they need them (Ludden & Hekkert, 2014).

The Design for healthy behavior framework explains the relationships between health behavior change and design interventions. Each type of the presented four types of design strategies help the people progress in their behavioral change through different stages. These strategies may come in different variations. Ludden explains that in the current design interventions many new strategies for motivation people have been explored, but also that there is a need for more research to be done in order to explore the various possible strategies and the effectiveness of them. There is also not much information what happens if an individual moves through various stages at once and what will be the effectiveness of the intervention in that case.

This can lead to a non-effective intervention since the person at some point decide to move beyond a particular stage. In this case the person should adopt a different type of intervention addressing a new aim, or the intervention should be adapted to the stages. Ludden explains that this type of dynamic intervention has not yet been explored. Also, the problem with the retention (adherence) of the users through the various stages and strategies needs further exploration (Ludden & Hekkert, 2014)

4.4. Safety/Crime tools and methods

The last methods for Behavior change in design are categorised in the Safety/Crime criteria. These include Choice Architecture and Design against crime.

4.4.1. Choice Architecture

Choice Architecture is closely related to Behavioral Economics and is also focused on systems change that leads to individual`s decision. It is based on the effect of “defaults” or the selection made when there is the absence of alternatives. The design of a product or service can shape the choice architecture of a person`s decision, while it always can allow them to

not follow that choice. The default choices can be very powerful since in many cases it is possible to eliminate the problem through design rather than changing any behavior (Kristina Niedderer et al., 2014). For example, many printer producers set the default printing setting to be double sided, in that way they create specific default behavior among users which enables more sustainable use of paper.

Choice architecture illustrates on the challenges raised by behavioral change frameworks and its ethical dimensions. This is particularly evident in programs, implemented by the governments as they may have effect on people`s rights, control, responsibility or free will choice. The true nature of these programs aims to make people better (in particular way) according to their own judgement, while providing the freedom to quit if they choose. A public investigation opinion on behavior change campaigns related to smoking, unhealthy foods, savings, and living in an environmentally sustainable way, showed that majority support all types of intervention, even if the unwanted behavior was decreased with "force" (Branson, Duffy, Perry, & Wellings, 2012). Therefore, the choice architecture model may play an important role within design fields since it has the power to create default type of behaviors among the users (Kristina Niedderer et al., 2014).

4.4.2. Design against crime

Design against crime is an approach to social innovation which emerged between 1999-2009 at the University of Arts London. One of the main aims of Design against crime approach is to reduce the incidence and the adverse consequences of crime through design interventions in products, services, communications and environments. Other aims include equipping the designers with the cognitive and practical tools and resource to design out crime; prove and promote the social and commercial benefits of designing out crime to the companies, government and society; to reduce crime and increase the wellbeing of individuals and communities , by applying "design questioning" and models of "design thinking" to social problems (Press, Erol, Cooper, & Thomas, 2000)

Design against crime adopts a multi-disciplinary approach for solving problems. The approach unites together designers, design catalysts, researches, multi-disciplinary research teams, criminologists, crime scientists, anthropologists, engineers, manufacturers, police and other stakeholders to design out opportunities for crime and to commercialize Design against crime ideas. The approach sometimes is trying to find out the "right questions" rather than "problem solving". Design against crime also uses design thinking to look at the wider social context or to help to enable stakeholders and partners to be involved in the whole process and create innovative ideas. Since the emerging of Design against crime in 1999, this approach became more common to the design field and has been used and modified for other purposes and with other names – "transformation design", "co-design" and "participatory design".

They all incorporate one of the main ideas in Design against crime – transforming thinking and creating design exemplars with multiple stakeholders (Press et al., 2000).

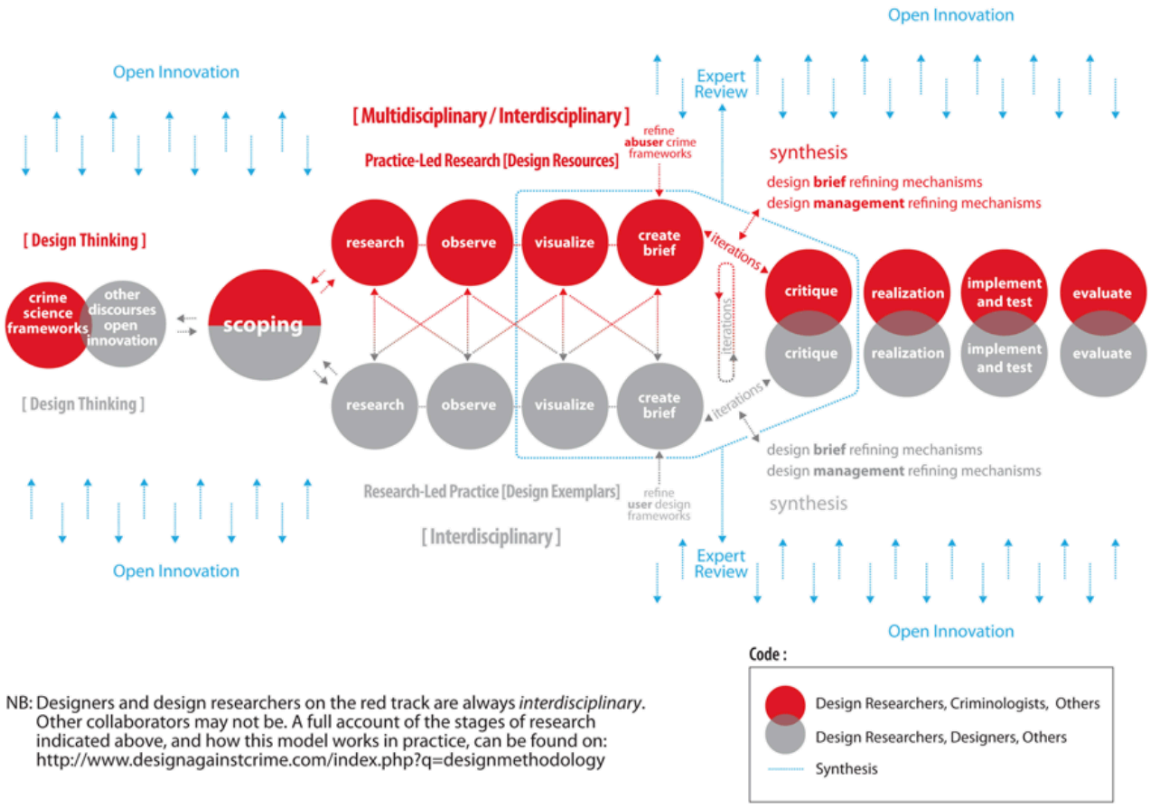

Figure 19: Design against crime model – Evolved Twin Track Model of the Iterative Design Process (Press et al., 2000)

Design against crime is a unique approach because it extends the concept of 'user driven innovation' to that of 'user/misuser and abuser driven innovation'. The aim of this approach is to ensure the efficacy of solution prior to advocacy and market introduction. The interdisciplinary researches review scenarios from different perspectives in order to ensure safe ideas and catalyse the creation of products, environments and service that make the life of individual and communities easier and safer. In the process there is a lot of research consultation, design visualization to ensure that the stakeholders from different fields can understand effectively and because of that the visualization techniques are one of the keys to the success of the whole process. The approach is delivered using a series of: 'research and create' 'create and consult' 'create and test' iterations.

The Design against crime approach include gathering and management of a lot of interdisciplinary information and visual materials which after collection are synthesised and

used as a multi-disciplinary input. The approach includes: Open sources of information as part of the multi-disciplinary approach; Visualization of design issues and crime issues; Visualization of human and user-cantered ideas and issues; Visualization of abuser unfriendly ideas and issues; A practice led approach to research investigation. The scheme of the approach can be viewed in Figure 19 (Press et al., 2000).

The Stages of Design against crime include: Design Thinking (the teams searches for crime problems that can be relevant to address with a design responses); Scope (this stage includes finding information about the problem in different books, scientific articles); Research (multi-disciplinary researches gather information from diverse sources); Observe (This stage includes ethnographic observations, observation of the people, user information and in this stage the whole team in involved in order to identify the user and abuser issues); Visualize (The research is then visualized to allow the multidisciplinary approaches to be synthesizes around main theme which is understandable for the whole team); Create Design Brief (The designers who create the brief may also redefine it to their own remits. There are many iterations of the design brief by the whole research team); Critique (this is the stage where the team starts to make decisions about how best to realize the prototypes), Realize (the team finalize decisions about how best to realize the prototypes); Implement (small batch production allows the team to test and involve the user and abuser feedback in the finalization loop) and Evaluate (the team engage with many different types of evaluation, including design evaluation, crime science evaluation).

Chapter 5
Integrating Behavior Change in Design

5.1. Summary

In order to synthesise a robust behavioral design process it is necessary to consider both theoretical and operational aspects of design for behavioral change. The theoretical aspects include behaviour change strategies, interventions and cues. Whereas the operational aspects include the executional aspects of the design for behavioral change (Cash, Hartlev, & Durazo, 2017).

Behavior can be described in terms of different types of strategies antecedent (trigger) strategies; behaviour strategies and consequence strategies, following the path: antecedent

(trigger) > behaviour > consequence (result) (Lehman & Geller, 2005). Antecedent strategies use interventions that occur before a particular behavior to happen, influencing it in a desired direction. The consequence strategies use interventions that occur during or after a performed behavior (e.g. using a reward, feedback, etc.). Consequence strategies rely on the subject reflecting on their actions. Strategies can be further divided into informational and structural ones. Informational strategies include most current design and persuasive approaches (e.g. priming, role models, social support) (Abrahamse, Steg, Vlek, & Rothengatter, 2005). Structural strategies aim to prevent behavior by limiting access to products that enable that behavior. Also, strategies can influence the user in a number of ways from coercion to seduction. Although, coercion and the removal of freedom of choice can be effective in altering the behavior, they are often connected with negative consequences such as poor user experience and change of the intended behavior (Tromp et al., 2011) .

Design interventions can target the conscious or unconscious system of thought. Unconscious interventions target the associative reactions to situations and use intuitive and automatic processes. Whereas, conscious interventions target the reflection and explicit reasoning processes (Lehman & Geller, 2005). Although both have been demonstrated as effective, unconscious processes enable more passive interventions in behaviour, whereas the active or conscious processes create more active interventions (Cash et al., 2017).

Cues aim to change the environment and the context of a behavior and also provide a trigger for change. Cues can be presented to the user in a different way targeting the conscious and unconscious decision making. Figure 20 demonstrates the different available paths when designing for behavior change. Each path highlights a different strategy coupled with a different behavioral (antecedent-consequence) and cognitive target (conscious-unconscious). These paths can be further modified according to the means of exerting influence and the type of artefact which is used. This shows that design for behaviour change presents a multidimensional problem with different interacting elements which are culture and context dependent (Cash et al., 2017). Implicit cues can be delivered through many different artefacts which are linked to a number of psychological constructs. For example, priming is widely used in this domain. Priming is an effect where exposure to a stimulus influences the automatic response to subsequent stimuli. However, the effects on priming are highly dependent on the individual`s sense self in the social context (self-construal) (Lockton et al., 2008). Self-construal affects the way people relate to others and how they see themselves with respect to the social context. Therefore, the impact of priming, delivered though cues is mediated by the individual`s perception of self and social norms (Cash et al., 2017).

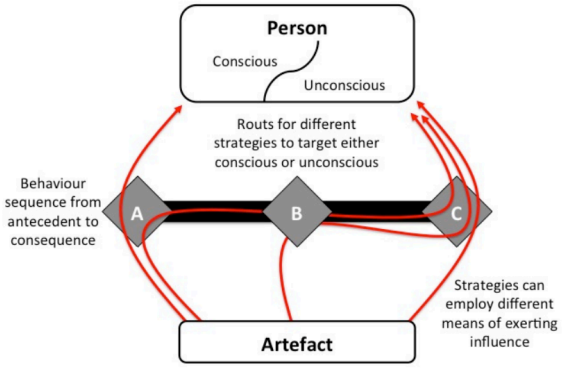

Figure 20: Elements to consider in design for behavior change (Cash et al., 2017)

The designers should be aware that these strategies have a complex mix of factors that can influence the realization of their project in practice. Also, due to this complexity, the behavioral design process must be robust across all a range of strategies, interventions types, and contexts if it wants to succeed.

The operational aspect of Behaviour Change in design includes active conscious strategies which are broadly implemented in persuasive design (BJ Fogg, 2009). Fogg uses the technology as a platform for launching the intervention and altering the user`s behavior. Persuasive technologies usually support motivation or ability and also provide an active trigger to accomplish a certain target behavior. The operational aspect of the unconscious strategies uses subtle environmental cues to influence automatic behaviors (for example Choice Architecture, Socially Responsible Design). These strategies can influence feelings, decisions and behaviors that are subconsciously processed and automatically created, which result in a powerful behavior change (Cash et al., 2017).

In the psychology domain many researchers have focused their attention on understanding behavior and thus offering theoretical guidance for strategies and intervention in practice. However, most of these models and recommendations do not describe stages or activities associated with realising this knowledge through design. For example, The Transtheoretical model by Prochaska and di Clemente (1992) describes an individual`s decision-making process in terms of six stages, from pre-contemplation to action and maintenance (Cash et al., 2017). Subsequently, some researches and design teams use this knowledge to build new models and develop more design-oriented approach. For example, Design for healthy behavior is a framework based on transtheoretical model of behavior change (TTM). In the framework there are represented processes of change, stages of change, design strategies, and their relationships. Bringing together operationalization efforts in the psychology domain and combining them with design practice approach can elaborate in the creating of useful design for behavior change frameworks.

In the design domain the existing frameworks are more focused on behaviors linked to technical artefacts. These frameworks and approaches are typically focused on active conscious strategies. Also, they are focusing more on the mindset and framing tools rather than operational process stages and activities (Cash et al., 2017). For example, Socially Responsible Design (Tromp et al., 2011) guide the designers to create a behavioral design project, contextualizing the design effort and establishing behavior-focused mindset, but it offers little direction on the process stages which should be followed. Contrary, The Design for Sustainable Consumption Behaviour (Selvefors et al., 2011) offers generic characterisations of design processes targeting behavior change, but these processes are executed with little empirically supported guidance as how to be implemented. More practically oriented tools are MINDSPACE (Dolan et al., 2012) and the Behaviour Change Wheel (Michie, S Atkins, L West, 2014) which provide frameworks related to specific activities, but they lack integration between the activities they propose and the wider process. This reduces their ability to be integrated in product design teams (Cash et al., 2017). In this way of thoughts, it is not very clear which stages and activities are associated with successful behavioral design projects.

5.2. Synthesis of the Behavioural design Process

The Behavioral Design process can be illustrated with the stage-gate process sequence, moving from divergent (the stage in which the designer explores and defines behavior) to convergent (where it is achieved the effect of the behavior) elements. The first elements in the Explore and define behavior part include Behavior mapping and Field work, while the second main stage Affect Behavior contains the Intervention development driven by iterative testing and development (see Figure 21) (Cash et al., 2017). The overall process includes structured sequence of stages, which have iterative activities within each of them. Each stage is named with respect to the generic design process terminology. The process links different aspects with a number of conscious models. The model is build and developed form similar models suggested by Fogg, Lilley and Selvefors (BJ Fogg, 2009), (Lilley, 2009), (Selvefors et al., 2011).

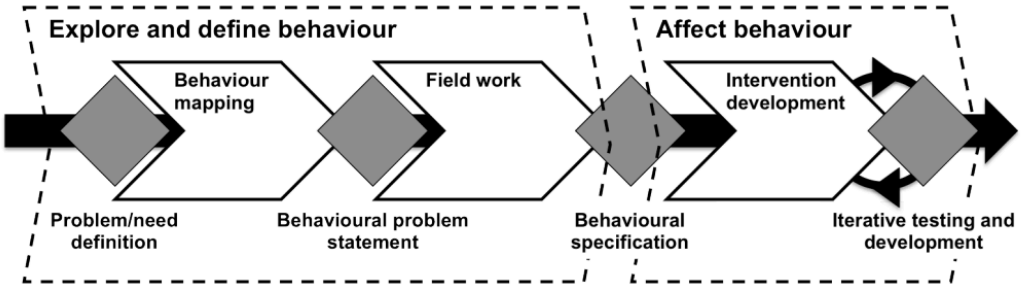

Figure 21: The Behavioral Design process synthesising the theoretical and empirical results (Cash et al., 2017)

In comparison to the conscious strategies, the unconscious ones require the creation of more rigorous behavioral mapping and more specific testing of the behavioral hypothesis. Additionally, the testing and iterative refinements stage is essential for both conscious and unconscious approaches and ensures that the created interventions operate as desired. An important part of the whole process is the focus on creating a design process which is based on a deep scientific assessment of the problem and essential psychological concept (Cash et al., 2017). This should be applied in all type of facilitated behaviors, not only the technologically ones and is a key to successful project. This knowledge is complementary to both the underlying behavioral theory and the real aspects of behavior such as ability or motivation. The effective integration of the theory allows the designers target different mediating factors such as social norms, identify extent data which is useful for ideation and analysis. Although, the effective integration of theory is an open approach and the theory which is most appropriate for a given problem should be used as the foundation for the execution of the design.

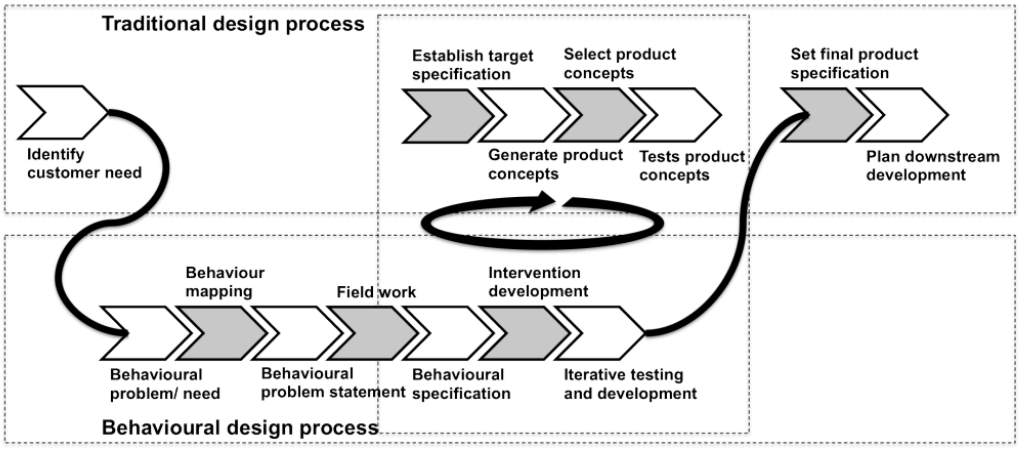

Figure 22: The behavioral design process in relation to traditional design process stages (Cash et al., 2017

The behavioral design process is compatible with the traditional product development process and methods in design. It can be incorporated in to the product development as part of the stage gate process described by Ulrich and Eppinger (Ulrich & Eppinger, 2003). Behavioral design provides an alternative path through the “Concept Development” phase. The behavioral design can also interact with more traditional design processes as visible from Figure 22. Also, behavioral design can be aligned with different high-level processes in order to be applicable in domain outside of the product development such as integrating it with systems design process (Cash et al., 2017). The behavioral Design Process includes these stages:

Problem/need Definition

The starting point for behavioral design is the right definition of the behavioral problem or need. This takes place subsequent to or in parallel with the wider definition of the customer need in the traditional design process. The output of this gate is the initial aim and scope of investigation with respect to the target problem. In this stage it is important to be identified the behavior or specific sequence of behaviors that form the focus on the initial research. Also, at this stage the selection of scope should focus on the ability to influence the behavior through the planned artefact.

Behaviour Mapping

In this stage the designer systematically details the elements associated with the behavior problem identified in the previous stage (problem/need definition). These could be social norms, environment, social context, and personal factors. This is made directly on the research-based processes found in the psychology literature such as assessment of trends, meta-analysis, user profiling. The effective behavior mapping requires integration of numerous sources of information dealing with all aspects of the behavior. This is particularly important step because human behaviors are considered to be complex and contextual and therefore they require mapping for each new intervention. Also, other key activities on that stage include multifaced behaviour mapping, the development of behavioral frameworks and linking these to implicit design features.

Behavioural Problem Statement

The outcome of this gate is the behavioral problem statement which is used for further exploration of the target behavior in the next stages. In this gate the design team need to formulate a hypothesis related to the core elements of the behavior and intervention which are linked in the behavior framework. The aim of the hypothesis is to define and test the assumption underpinning the causes of the behavior with respect to cues such as environmental cues, social norms, context, personal perceptions. These elements define the baseline data and are essential before proceeding with that stage. This gate is useful to clarify and agree the key features of the project and it is also important for clarifying the role of the intervention within the wider strategy of the design team.

Field Work

The main aim of this stage is to extend the general understanding of the target behavior and also create baseline data for further comparative testing. The created hypothesis in the Behavioral Problem Statement stage are resolved at this stage and the team knows what is causing the behavior and what might influence it. Additionally, a combination of qualitative and quantitative techniques is recommended. Qualitative studies give detailed information about the user perception and attitudes, whereas the quantitative studies allow the design team to directly measure the behavior and influences through observation and testing. The

combination of qualitative and quantitative elements is a key distinguishing feature of behavioral design. This is very important because unconscious behavior are highly context dependant and therefore need to be made connection between laboratory testing and the real world. These studies should also be used to refine the behavioral mapping and define real criteria about the efficacy of the interventions.

Behavioural Specification

In this gate the design team works on the specification and product conceptualisation activities related the traditional design development process. The behavioral specification is a distinct additional activity which is ensuring the project success. The outcome of this gate should be the selection of defined target behavior accompanied with baseline data from the field work. This gate also creates the foundation for subsequent intervention and product testing. The behavioral specification describes the specific factors that the intervention must consider form both the behavioral and technical product perspectives.

Iterative Testing and Development

The iterative gate is the final one and it is passed when the design team is satisfied with the proposed intervention and it is effective and ethical. In this gate the combined product and intervention strategy should fulfils the behavioral requirement specification and after that the final concept is ready for further development. The final proposal should be validated experimentally in situ, but it can be also tested in a controlled setting. Therefore, the iterative testing process is a key to refine the overall design and to ensure the ethical and behavioral compliance. The aim is to establish how the solution works with respect to the target behavior, audience and context (Cash et al., 2017).

Part II

Ethics, Technology and Design

Chapter 1

General Ethics

1. Ethics – according to Philosophy

Ethics is also known as moral philosophy and it's a branch of philosophy that involves systematizing, defending, and recommending concepts of right and wrong conduct. Ethics along with aesthetics concerns matters of value, and they both create the branch of philosophy called axiology (Fieser, 2010).

Ethics is dealing with resolving questions of human morality and trying to define which concepts are good and evil, right or wrong, virtue and vice, justice and crime. As a field of intellectual inquiry, moral philosophy also is related to the fields of moral psychology, descriptive ethics, and value theory.

Ethics is a system of moral principles which affects how people make decisions and lead their lives. The term is derived from the Greek word 'ethos' which can mean custom, habit, character or disposition. Ethics is also concerned with what is good for individuals and society and it covers important philosophic dilemmas such as: what is considered as a good life; the rights and responsibilities of people; the language of right and wrong; moral decisions – what can be defined as good and bad (BBC, 2014). The main concepts of ethics have been derived from religions, philosophies and cultures. They inspire debates on topics like abortions, human rights and professional conduct.

Philosophers today usually divide ethical theories into three general subject areas: metaethics, normative ethics, and applied ethics. Metaethics investigates where people`s ethical principles come from and what is their meaning. It questions statements like people`s ethics and if they are merely social inventions or if people`s ethics are more than expression of the inner emotional states. Metaethics try to answer these questions focusing on the issues of universal truths, the will of God, the role of reason in ethical judgements and the meaning of ethical terms themselves (Fieser, 2010).

Normative ethics deals with a more practical task, which aims to regulate moral standards and their perception of right and wrong conduct. This could involve the good habits people acquire, the duties they follow, or the consequences of people`s behavior on the others. Applied ethics involves the examination of specific controversial issues such as abortion, infanticide, animal rights, environmental concerns, capital punishment and others. The discussions in applied ethics try to resolve these controversial issues by using the conceptual tools from metaethics and normative ethics. However, the lines of distinction between metaethics, normative ethics, and applied ethics are often blurry. For example, the issue of abortion is an applied ethical topic because it involves a specific type of controversial behavior. But it also depends on more general normative principles, such as the right of self-rule and right to life. This issue also is following the metaethical questions such as "where do rights come from?" and "what kind of beings have rights?" (Fieser, 2010)

4.1.1. Metaethics

The term 'meta' means after or beyond and in the case with metaethics it includes the 'bird`s' eye view of the entire project of ethics. It can be defined that metaethics is the study of the origin and meaning of ethical concepts. In comparison to the normative ethics and applied ethics, the field of metaethics is the least precisely defined area of moral philosophy. It covers different issues from moral semantics to moral epistemology. Two issues, though, are prominent: metaphysical issues concerning whether morality exists independently of humans, and psychological issues concerning the underlying mental basis of our moral judgments and conduct (Fieser, 2010).

4.1.2. Normative Ethics

Normative ethics deals with the moral standards that regulate the perception of right and wrong conduct. It can be said that the normative ethics is persuading the ideal proper behavior. The Golden Rule is a classic example of a normative principle: People should do to others what they want others to do to them. For example, if someone does not want his/her car to be stolen, then that person should not steal any car; or if the person wants to be fed when he/she is starving, then that person should feed the starving homeless people. Using this reasoning, theoretically can be determined if any particular action is wright or wrong. The Golden Rule is an example of a normative theory that establishes a single principle against which we judge all actions. Other normative theories focus on a set of foundational principles, or a set of good character traits.

Normative ethics involves arriving at moral standards that regulate right and wrong conduct. In a sense, it is a search for an ideal litmus test of proper behavior. The Golden Rule is a classic example of a normative principle: We should do to others what we would want others to do

to us. Since we do not want our neighbours to steal our car, then it is wrong for us to steal their cars. Since we would want people to feed us if we were starving, then we should help feed starving people. Using this same reasoning, we can theoretically determine whether any possible action is right or wrong. So, based on the Golden Rule, it would also be wrong for us to lie to, harass, victimize, assault, or kill others. The Golden Rule is an example of a normative theory that establishes a single principle against which we judge all actions. Other normative theories focus on a set of foundational principles, or a set of good character traits. The key assumption in normative ethics is that there is only one ultimate criterion of moral conduct, whether it is a single rule or a set of principles (Fieser, 2010).

4.1.3. Applied Ethics

Applied ethics is a branch of the ethics and it aims to analyse specific, controversial moral issues such as abortion, animal rights or euthanasia. In the resent years applied ethical issues have been divided into subcategories dealing with different contemporary issues such as medical ethics, business ethics, environmental ethics, etc. There should be present two features for one problem to be considered as an "applied ethical issue" (Fieser, 2010). Firstly, the issue or the problem should be controversial and there should be significant groups of people standing both for and against the issue. For example, driving drunk and causing incidents is not an applied ethical issue because everyone agrees that this practice is immoral. By contrast, the issue if the people should be allowed to drive cars in the future or this activity should be executed only by smart driving systems (since their incident rate is much lower than the human initiated incidents) can be an applied ethical issue because there are significant groups of people for and against it.

The second requirement for an issue to be considered as an applied ethical issue is that it must be a distinctly moral issue. Usually, the media presents many sensitive issues such as affirmative action policies, capitalistic versus socialistic business practices, public versus private health care systems, energy conservation and others. Even though these issues are controversial and have an important impact on the society, they are not all moral issues. Some of them are issues connected to the social policy. The aim of the social policy is to help the society to run efficiently, whereas the moral issues are more concern with universally obligatory practices such as the duty of the people to avoid lying, and these are universal principles connected no only to an individual society. Frequently, the issues of social policy and morality overlap (Fieser, 2010). For example, the murder is both socially prohibited and immoral. However, the two groups of issues are often distinct. For example, some social policies forbid the residents in certain neighbourhoods from having yard sales. But there is nothing immoral if the residents perform a yard sale, as long as the neighbours are not offended. This, to qualify a specific issue to be considered as an applied ethical issue, it should be more than just social policy issue: it must be morally relevant as well.

In theory, resolving a particular applied ethical issue should be easy. However, in reality there are many constants which create difficulty in evaluating the right choice. For example, in the case with the issue about abortion, it should be determined its morality by consulting the normative principle of choice such as act-utilitarianism. If a given abortion produces greater benefit than negative consequences, then according to the act-utilitarianism, it would be morally acceptable to perform the abortion. But unfortunately, there are many other normative principles which show the opposite conclusion. Therefore, it is difficult to determine a specific moral issue because sometimes there are many conflicting theories in normative ethics dealing with one particular issue. In these cases, the usual approach is to consult several representative normative principles for a given issue and after that to see where the weight of the evidence lies (Fieser, 2010).

Chapter 2
Ethics in Technology and Design

2.1. Ethics in Technology and Design

Since long time ago people`s lives were influenced by the technology in many different ways. For the most part the technology`s effect on the human attitude and behavior has been incidental, even accidental. For example, automobiles and highways helped create the American suburbs, but they were not invented with the intent of persuading tens of millions of people to commute to work every day (Berdichevsky & Neuenschwander, 1999). Early computers were developed and helped the people to have more calculating abilities, but nowadays they are used for cyberattacks and stealing personal information and bank accounts, without their designer`s assuming this could happen.

In our society there have always been human persuaders who are oratory masters and are capable of changing people`s minds and their behaviors. The examples of such persuaders include leaders, mothers, salesmen. Teacher are also persuaders, but they can be categorized as slow persuaders, because they alter student`s attitudes day by day. In the recent years there was developed one really important persuader in our society, and this is the technology which can persuade in its own right through many artefacts primarily created to change the attitudes and behaviors of its users. The study of such technologies is called “captology” (Bj Fogg, 1998b).

B.J. Fogg defines the scale of the penetration of the persuasion technologies in our lives: “We can now create machines that can change what people think and what people do, and the machines can do that autonomously. Persuasive technologies are here, and more are coming…” Persuasion is perceived as an intentional effort to change attitudes or behavior through technology and its abstract ideas. There are passive and active technology persuaders. The passive ones such as megaphones or billboards create persuasion without altering their pattern of interaction in response to the actions of the persuaded party (the people). Whereas, active persuasive technology is in some way under the control or at least responsive to the persuaded party. The appearance of control may create a persuasive experience, but if this appearance is not backed up by reality, the designer will not complete his/her task and the smooth user experience will be questioned. Between the passive persuasive technology and active persuasive technology is positioned ‘structural persuasive technology’ which are type of passive persuasive technology but not in the media field such as car pool lanes (Berdichevsky & Neuenschwander, 1999)

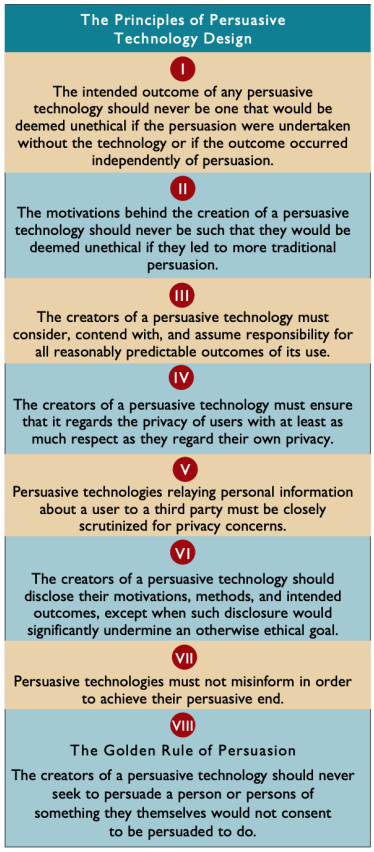

Figure 23: Ethical principles of persuasive design (Berdichevsky & Neuenschwander, 1999)

Ethics is a rational, consistent system for determining right and wrong, usually in the context of specific actions or policies (Fieser, 2010). The creation of persuasive technologies is that

kind of action. There are many different systems of ethics, but more concretely the applied ethics is dealing with ethics of persuasive technology and ethics of captology. Captology is the study of persuasive technology (Bj Fogg, 1998b) (Figure 24). Captology and Persuasive technology is neither ethical nor unethical, because it depends what is the particular application of these technologies and if they are causing troubling ethical implications (Berdichevsky & Neuenschwander, 1999).

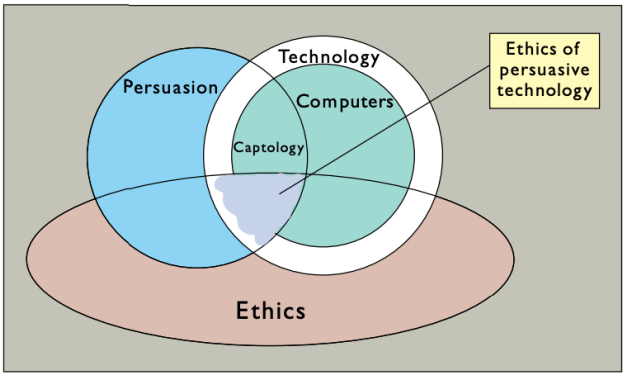

Figure 24: Convergence of ethics, persuasion and technology (Berdichevsky & Neuenschwander, 1999)

The analysing of the ethics side of specific persuasive technology needs a systematic approach, consisting of a breakdown of the standard persuasion and eventually encompassing persuasive technologies as needed. Berdichevsky proposes a framework for analyzing the acts of persuasion according to their motivations, methods and outcomes, whenever they are intended or unintended. The framework begins with the basic relationship of a persuader and the person who is persuaded (Figure 25). In this examples, the persiader may still use passive persuasive technologies such as megaphones or billboards to mediate the persuasive message and the framework is focusing on examples where the two parties have shared responsibility. However, the focus is on technologies which are created with the intention to persuade or "endogenously persuasive technologies". They are also active persuasive technologies because they actively create persuasive intermediaries between the persuader and persuaded person. Also, there is interactive and dynamical action with the artefact and the persuader (Figure 26).

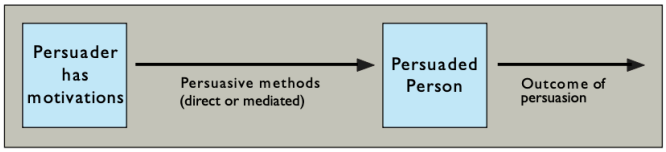

Figure 25: Framework for evaluating the ethics of a persuasive interaction in a traditional persuasive context. (Berdichevsky & Neuenschwander, 1999)

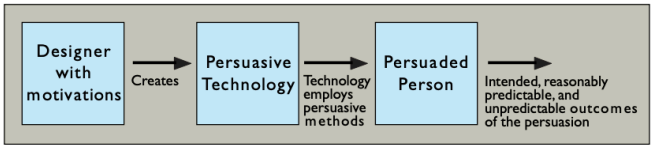

Figure 26: Framework for evaluating the ethics of the more complex interaction of persuader, persuasive technology, and the party of parties being persuaded (Berdichevsky & Neuenschwander, 1999)

The framework of motivation, methods and outcomes can be applied in evaluating the ethics of persuasive act in the case of active or passive persuasive technology, but the introduction of an actively persuasive technology requires the separate attribution of motivation to the designer and the persuasive intent of the technology itself. Interestingly, the technology in this case is both the method and the direct executor of persuasive methods. There should be also consideration whether the technology alters or shares in the distribution of responsibility of the intent methods and the end result of the persuasive act (Berdichevsky & Neuenschwander, 1999).

To illustrate this possibility there is an example from the field of computer ethics. In 1991, an autotomised factory of Volkswagen unexpectedly increased the speed of the production line and moved the cars with speeds that the machines could not handle and this ended with many cars smashed into one of the walls in the factory. In this case there is a question who is in charge for the problem – the machine which caused the damage or the person who created it. It should be noted that the human beings are free moral agents and are influenced by biology. In many cases they act predictably, but this is not always true, because of the intentionality and the free will of choice. In contrast, computers have demonstrated neither the ability to create their own intentions nor the ability to make their own choices (Berdichevsky & Neuenschwander, 1999). This means that the computers are not free moral agents and that means when the computers make serious mistakes, the first to blame are their creators (designers, programmers, engineers), after that the users (who operate the machine) and after that the Mother Nature.

Similarly, it could be not attributed realistically responsibility for the persuasive act to the persuasive technology. If there is a slot machine with compelling multimedia and design which entices people to gamble away their savings, the machine itself does not have a fault. Nor the machine itself deserves credit for making the user experience and gambling more entertaining. The responsibility for the persuasive technology built in the slot machine and its motivations, methods and outcomes falls to its creator and the purchasers (users) who choose to play on it (Berdichevsky & Neuenschwander, 1999).

2.2. Berdichevsky & Neuenschwander ethical principles

There is a difference between the motivations underlying a persuasive act and the intent of that act. To explore the motivation of a persuader, people should ask themselves why the person is persuading them. For example, there are three people who have a similar intent to persuade a stranger to eat more fruit and vegetables. The first one could be motivated to do this because of a desire to increase the stranger`s quality of life. The second one could be interested to increase the income for the family farm. However, the third one could have a secret hope that the person will eat a spoiled food and become sick to the stomach (King & Tester, 1999). The persuasive intent is the same within the three people, whereas their motivation varies in ethically relevant way. The firs one has really good ethical intent which is in contrast to the problematic ethical intent of the third one. The second one is more neutral since it neither has the intentions of the first or the third person. It is also important to notice the methods through the persuader persuades the people. If the persuader convinces a stranger to eat more fruits by manipulation with exaggerated fears, this method is still unethical, even if the motivation is praiseworthy.

The methods which persuasive technology uses are similar to those employed by the example with the three persuaders above. For example, people can persuade other people using flattery. However, researches show that computer can flatter too and in that way achieve persuasion (B. J. Fogg & Nass, 1997). Other tactics of people to persuade include conditioning, rewarding or punishing desirable and undesirable behaviors, but this can be done also by the computers. Moreover, the technologies embed these methods in a new and compelling context which can make them even more successful. For example, humans can persuade through a basic role-playing model, whereas computers create a virtual reality to achieve unprecedented complexity, realism and persuasive potential. These differences between traditional persuasive methods and the newly emerged which are embedded in technology, should be reconsidered on ethical level and its implications in the people`s daily life.

There should be evaluation on the ultimate outcome of the persuasive act and the ethics of the persuasion and what are the consequences of this persuasion within the people`s mindset. There are raised different ethical situations. For example, if the designer considers something as unethical to be done of his/her own volition, is it ethically this designer to create the same type of persuasion for the user of the product? Also, there are many unintended outcomes. Coming back to the beforementioned example with the three people who persuade the stranger to eat fruits – if they persuade the stranger to eat a mango for example and if the person has a severe allergic reaction to it and die after eating the mango, who will be responsible for this? Few people are allergic to mangos, so this situation is unfortunate but unintended outcome which is not considered reasonably predictable. However, if the allergic reaction to mangos was something common, this changes the outcome to reasonably predictable, so in that case the persuader would be responsible for the outcome. This simple example illustrates the fact that the designers of persuasive technologies should be held

responsible only for the reasonably predictable outcomes. This is illustrates in the Figure 27 (Berdichevsky & Neuenschwander, 1999)

Also, there should be taken into account that not only the designers are responsible for the persuasion, but also the real creator of the persuasive code in technology – the programmers. For example, in the passive persuasive technology such as the media and the billboards, the director of the company hires an artist to create and paint the billboard. In that case, the artist in a similar position as the programmer who is contracted to create a persuasive program. In in that way of thoughts, the programmers are even more accountable than the designer for the persuasive methods they create, because their work is in the core of the creation of the active persuasive agents.

Programmers should never do a project if they do not share the responsibility for it. That is one of ACM Code of Ethics (Association for Computing Machinery). The Code is designed to inspire and guide the ethical conduct of all computing professionals, including current and aspiring practitioners, instructors, students, influencers, and anyone who uses computing technology in an impactful way (Brinkman & Carter, 2017). The General ethical principles include: Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing; Avoid harm; Be honest and trustworthy; Be fair and take action not to discriminate; Respect the work required to produce new ideas, inventions, creative works, and computing artifacts; Respect privacy; Honor confidentiality.

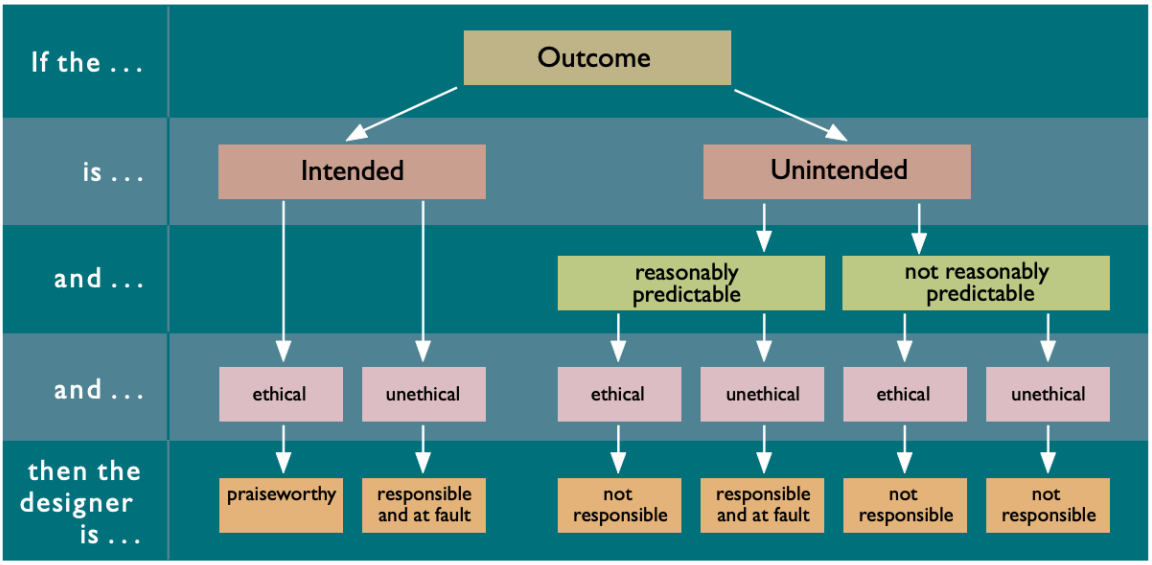

Figure 27: Flow chart clarifying the levels of ethical responsibility associated with predictable and unpredictable intended and unintended ethical consequences. (Berdichevsky & Neuenschwander, 1999)

Berdichevsky establish similar principles for persuasive design considering this framework of motivations, methods and outcomes. They include: The intended outcome of any persuasive technology should never be one that would be deemed unethical if the persuasion were undertaken without the technology or if the outcome occurred independent of persuasion (Figure 27). The motivations behind the creation of a persuasive technology should never be such that they would be deemed unethical if they led to more traditional persuasion. The creators of a persuasive technology must consider, contend with, and assume responsibility for all reasonably predictable outcomes of its use (Berdichevsky & Neuenschwander, 1999). In the recent years the technologies developed so fast that certain acts of persuasion are not practical or difficult to achieve without the technology. For example, it would be difficult to persuade someone through conventional means to maintain the proper pulse rate during exercise, but a smart monitoring device can intervene successfully and generate proper persuasion. However, these types of implementations (where conventional persuasive techniques are difficult to achieve) should be monitored more strictly and have a higher ethical control.

Ethics of Computers that persuade

Ethics is very important perspective in the field of computer and persuasive technology. Its adoption is vital to this domain and the ethical perspective should be a main one in creating technology. Persuasion raise both important concerns about ethics, morals and values. Especially when there is the merge between persuasion and computer (as they do in captology) and this merge create ethical issues which play a crucial role (Bj Fogg, 1998b). Fogg is giving examples with some ethically questionable technologies and also proposes ethical responsibilities for designers of persuasive technology.

Persuasive technologies can widely promote concepts of the ‘good’ but surely there are persuasive technologies with serve dishonourable purposes. The designer should be aware of the ethical questions these technologies raise and also should be aware of the outcomes of the artefact he creates. Table 6 contains examples of persuasive computing that may be ethically questionable, along with a brief gain/loss analysis for stakeholders (which is highly subjective) (Bj Fogg, 1998a).

All of the examples in the Table 6 are ethically questionable. In the cases above the companies aim to gain profit or information while the individuals lose their money, privacy, or freedom. The persuasive technology should be created in a way that provides gain for both sides – the companies and the users. If this is achieved by the stakeholders creating the product, that could mean that the product is not ethically questionable.

Summary of persuasive technology in question	Stakeholder analysis
A computerized slot machine uses animation and narration to make the gambling experience more compelling.	**gain:** manufacturer and casinos **loss:** individuals (money, time)
A computer system records employees' activities on the Web.	**gain:** company **loss:** employees (privacy, trust)
A computer system monitors restaurant employees' hand washing behavior after using the restroom.	**gain:** restaurant patrons **loss:** employees (privacy, trust)
A software installation seems to require registration with the company in order to complete the installation. The software automatically dials company to download personal information.	**gain:** company **loss:** individual users (personal information)

Table 5: A simple stakeholder analysis of some persuasive technologies

Table 6: Simple stakeholder analysis of some persuasive technologies (B.J. Fogg, 1998a)

The designers of persuasive technologies can experience similar ethical implications to other persuaders in the society (e.g., sales people, coaches, counsellors, religious leaders, etc.). It is true that values can vary widely depending on many factors, therefore there is no single and uniform ethical system or set of guidelines which can serve in all cases. The key for designers of persuasive technology and products is to gain sensitivity about the ethical implications of their creation (Bj Fogg, 1998b). High-tech persuaders should base their design according to a strong and legitimate ethical standard. There should be core ethical values which apply to all persuasive technologies such as avoiding deception, respecting individual privacy, and enhancing personal freedom. Also, other important recommendation for designers is to be educated well about the field of persuasive technology and captology. According to B.J. Fogg this is the best approach regarding the ethics of computers. The designers should have increased knowledge about persuasive technology, and this will give them more opportunity to adopt these technologies in ethical way in their products and therefore help to enhance the live of the users they are designing for. Also, for designers is important to gain that knowledge, because this will help them recognize when technologies are using tactics to persuade the users and avoid this in their designs.

2.3. Fogg: methods of technological persuasion and stakeholder's analysis.

Fogg's approach to "the ethics of persuasive technology" is very similar to the approach of Berdichevsky (Berdichevsky & Neuenschwander, 1999), but additionally it gives focus on the ethical concerns which are specific to technological persuasion and also presents the method of stakeholder analysis for "systematically examining the ethics of any persuasive technology

product". The human to human persuasion can involve very symmetrical relationship but also there are cases of asymmetrical ones. For example, sometimes consumers feel confused after buying a product from very skilled salesperson who sold them a product which they don't need. In the technological persuasion this asymmetry between human and persuasive technology are also similar (especially for persuasive technology which promote social influence) (Smids, 2011). Fogg discusses several of those sources of asymmetry that are specific to the persuasive technology and he grouped them:

First asymmetry is about the persuasive technology and their control of the interaction. Persuasive technology is programmed by the designers in a way that limits the interaction possibilities that the users have. In the human to human persuasion, each of the parties can stop the interaction and have clarifications at any stage, whereas the current persuasive technologies are limited in their capabilities for two-directional interaction. Also, the persuasive technologies can be proactive and persistent because unlike human, they don't get tired, and they don't feel emotions of feeling guilty about the persuasion. These technologies can continue its persuasion until the user accepts it (in a moment of weakness or unawareness). Another asymmetry in the persuasive connection between humans and persuasive technology is that the computers are not able to have emotional interaction with the users, but they can be programmed to express fake emotions which can be powerful mean of persuading humans (Smids, 2011).

The second main asymmetry, described by Fogg, is connected with the great capacities the persuasive technologies have. They can store, access and manipulate massive quantity of data which enables them to provide the right information on the right place and time in order to achieve the persuasion. Many e-commerce websites such as Amazon.com store specific information about the buying behaviors of their users which can make suggestions for products that are tailor made. Beyond this, by gaining knowledge of which persuasive strategies are most effective for specific customers, and by even sharing this knowledge with similar commercial websites, persuasive technologies enable so-called persuasive profiling (Kaptein & Eckles, 2010). Once successful persuasive strategies are developed, their application potential can be multiplied with the power of computers and their many modalities including audio, video, text, graphics, animations and hyperlinks which can be used simultaneously in order to achieve the target persuasion.

The third main asymmetry is the wider range the persuasive technologies have. They can go to places where the humans cannot go (in the car, bathroom) and this makes them very suitable to enable the persuasion at the right time and place. Also, persuasive technologies allow certain anonymity which bypass some of the social barriers which exist in the human-human persuasion (Smids, 2011)

The beforementioned factors can create asymmetrical human-persuasive technology relation. If the user perceives that asymmetry, this can alter the user experience and make the user experience the persuasive technology as a powerful persuader and even coercion

which can change his/her manners and create reactance. For example, the registration part of many programs requires multiple steps including delivering sensitive user information and the user cannot proceed to further use the program unless he/she provide all that information. In these steps the ethical aspects may assess that this part of persuasive technology is better categorized as coercive. Contrary, if the asymmetry connection create effective persuasion even without the users to notice it, this can be called manipulation, which is also ethically questioned (Smids, 2011). According to Fogg, not only the methods, but also the intentions of the persuader should receive ethical attention. This can be done through stakeholder analysis which follows the steps: 1) list all stakeholders and 2) what each has to gain, and 3) has to lose. Subsequently 4) evaluate which stakeholder has the most to gain, and 5) which has the most to lose, and, finally, 6) "determine ethics by examining gains and losses in terms of values". In doing so, 7) the person that carries out the stakeholder analyses should be sensitive to which values and assumptions serve as input (B. J. Fogg, 2003b).

It is preferable that every designer of persuasive technology performs a stakeholder analysis to focus his awareness of the possible ethical issues connected with the project. However, this analysis does not fully enable the designer to decide on the moral acceptability of a given persuasive technology, but still Fogg presents a substantial insight on the ethical evaluations of the persuasive technology.

2.4. Verbeek` technological mediation view: framework with mediation analysis.

Verbeek develops similar theory and view to Berdichevsky on the ethics of persuasive technology. This theory emphasizes that the technological artefacts are not just functional instruments, but "….active mediators in the relations between humans and reality" (P. P. Verbeek & Slob, 2006). Verbeek focus on the idea that the persuasive technologies are mediators which humans use as tools to reach their goals and enhance their lives and they: "…help to shape how reality can be present for human beings, by mediating human perception and interpretation; second, technologies help to shape how humans are present in reality, by mediating human action and practices". Also, Verbeek categorizes the persuasion under the umbrella of mediation, and he views the technological persuasion as specific form of technological mediation.

As an example, Verbeek points the FoodPhone, which is persuasive technology based on mobile telecommunication with the idea to persuade the users to develop a healthy eating pattern and eventually loss weight. In this case the persuasive function is seen as a form of mediation, because it shapes the user`s interpretation of what they eat. However, even if the desired outcomes are achieved, there could be different forms of mediation which are less desirable outcomes – e.g. the eating can become a stressful activity, and the fact that the

users have to constantly take picture of their food can change the social atmosphere and change the practice of eating (P. P. Verbeek & Slob, 2006)

Verbeek identifies three points of application for moral reflection connected with the use of technology. The first one is about the intended persuasion and if it is morally justified. The second one is connected with the mediation itself and the method of persuasion: if the used methods are implicit forms of mediation and if they are morally acceptable. And the third point is connected with the outcomes of the mediation and if the consequences of the mediating role of persuasive technology are morally justified (P. P. Verbeek & Slob, 2006).

Verbeek discusses how a stakeholder analysis could be done for each of these three points of application. Regarding the third point or the outcomes of mediation, the tool of mediation analysis needs to be used "with the help of moral imagination, an inventory has to be made of all possible mediating roles of the technology in both human experiences and human actions" (P. P. Verbeek & Slob, 2006). Also, Verbeek claims that the stakeholders should take into account also the non-persuasive forms of mediation which always arise when the technology artefacts are used. According to him, the persuasive technology can be forcing or seducing. For example, the speed bumps force the users to slow down and they limit the freedom of the user whereas other artefact such as Eco Feedback devices which allow the user to monitor his/her resource consumption at home can seduce the user and invite specific actions without forcefully exacting them.

Verbeek claims that designers should materialize morality in the artefacts they create and especially when technologies are inherently moral entities. Usually, the act of "doing ethics" happens in implicit way in technologies. If these technological artefacts are not moralized explicitly, then the designer has the responsibility to create the technological mediation. There are two possible ways to take technological mediation into account during the design process. In the first the designers should assume whether the product they are designing will have undesirable mediating capacities. In the second possibility the designers could try to build specific forms of mediation which are considered as desirable. In that case the morality becomes part of the functionality of the product. To build in specific forms of mediation in technologies, designers need to anticipate the future mediating role of the technologies they are designing. This is a complex task since there is no direct relationship between the activities of designers and the mediating role of the technologies they are designing. Also, the mediation role is complex and constantly evolving because of the interaction between the technology and the users (P. P. Verbeek & Slob, 2006)

2.5. Spahn`s ethical guidelines: discourse ethics applied to Persuasive Technology.

Spahn points out that the Persuasive technology is not neutral tool, but helps to achieve moral goals like health, safety, sustainability. However, this way of "moralizing" technology raises many ethical concerns. Since Persuasive technology do not convince the user to change his

behavior or attitudes, but persuade him to do so, there is confusion about where to position the fine line between persuasion and manipulation (because persuasion conflicts with the ideal of a free and autonomous choice of the individual) (Spahn, 2012).

Spahn develops ethical guidelines for use and design of PTs by applying two elements of discourse ethics to PT: the idea that communication is an inherently normative activity, and the distinction between 'communicative' and 'strategic rationality'. His focus is on the different methods of persuasion and not so much on the issues connected with moral acceptability of the target behavior change. According to him, the persuasion is an act of communication and every persuasive attempt can be seen as a speech act which are summarised in the following way:

1) Comprehensibility: The user should understand the utterance in a simple way. For persuasive technology this means that there should be incorporated in the design of the artefact understandable feedback backed up by simple cues (such as red or green light) and they should be expressed in a simple and easy to understand way by the users.

2) Truth: the information provided to user from the Persuasive technology should be true and not manipulated in order to change the behavior of the user.

3) Truthfulness: because the persuasive technologies do not have mental states like humans, the truthfulness cannot be guaranteed in a strict way. Therefore, the truthfulness should be enhanced by different mechanisms which ensure the reliability and accuracy of the persuader and the information which the persuasive technologies exchange with the users.

4) Appropriateness: there is arising of the question if the employment of Persuasive technology is an appropriate for achieving a particular aim. To efficiently answer this question an additional ethical theory should be included.

These four criteria can be applied in a meaningful way to Persuasive technology, but they are on an abstract level and thus they could not lead to concrete rules what is allowed and what is not allowed in the context of persuasion. Therefore, Spahn positions the persuasive rationality between the strategic rationality (finding the adequate means for an end) and the communicative rationality (aimed at a common search for insight on the basis of good arguments). From the discourse of ethics, the communicative rationality is the ethical ideal, and Spahn proposes three guidelines for the design of Persuasive technology which should bring the persuasive rationality closer to the communicative rationality (Spahn, 2012).

First, "persuasion should be based on prior (real or counterfactual) consent". Second, "ideally the aim of persuasion should be to end the persuasion". Third, "persuasion should grant as much autonomy as possible to the user" in order to approach the ideal of communicative rationality which is centred around autonomy. The idea of Spahn is to position the persuasive technologies more closely as convincing technologies with respect to the user.

The four normative criteria and the three guidelines described by Spahn help to shape the Persuasive approach into convincing technologies. However, this depends on the situation and whether the stakeholders choose to use convincing, manipulating or coercion for changing the person`s behavior. By implication, there are also situations in which persuasion is the proper method. Therefore, without knowledge about the context and the aim of the project, the stakeholders and designers cannot crate the symmetrical communicative rationality between the technologies and the user (Spahn, 2012).

Chapter 3
Ethics in AI Technology

3.1. Artificial Intelligence (AI)

Artificial intelligence (AI) is part of the field of computer science, sometimes called machine intelligence, and it represents intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans and other animals. Computer science defines AI research as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals (Ligeza, 2003). Also, Artificial intelligence (AI) refers to complex systems, designed by humans, given a specific goal so the systems can act in the physical or digital worlds by perceiving the environment, interpreting the collected data, reasoning on the knowledge derived from the data and deciding the best actions to take to achieve the given goal. AI systems can also be designed to learn to adapt their behaviour by analysing how the environment is affected by their previous actions (EUCommission, 2018). Artificial intelligence is a scientific discipline and it includes several approaches and techniques such as machine learning (of which deep learning and reinforcement learning are specific examples), machine reasoning (which includes planning, scheduling, knowledge representation and reasoning, search, and optimization), and robotics (which includes control, perception, sensors and actuators, as well as the integration of all other techniques into cyber-physical systems).

3.2. Ethics in AI (Draft Ethics Guidelines for trustworthy AI)

Artificial Intelligence can improve people`s quality of life through different approaches. For example, this can happen through personalised medicine or more efficient delivery of healthcare services. It can help us to achieve sustainable development goals and fight the

climate change, optimize the transport structure of big cities, improve the mobility of people and ability to monitor progress against indicators of sustainability and social coherence. These days the western countries consider AI as a tool to increase the individual and societal well-being. European Commission wants to achieve this through Trustworthy AI. Trust is one of the main prerequisites for people and societies to develop, deploy and use Artificial Intelligence. Artificial Intelligence should be demonstrably worthy of trust otherwise its adoption by citizens and consumers could be hindered and hence undermining the realisation of the vast AI`s vast economic and social benefits. The idea of the European Commission is to foster the innovation in AI and ensure its trustworthy through the use of ethics which will ensure trustworthy development, deployment and use of AI (EUCommission, 2018)

The trust in the AI systems should be achieved in steps through the trust in the technology, the way it is built and used by humans, trust in the rules, laws and norms that govern the AI. Trustworthy AI has two components: (1) its development, deployment and use should respect fundamental rights and applicable regulation, as well as core principles and values, ensuring an "ethical purpose", and (2) it should be technically robust and reliable. Therefore, even the stakeholders with good intentions and purpose can cause unintentional harm to the users if they lack the needed technological mastery. The compliance with the fundamental rights, principles and values ensures that these will be duly operationalised and implemented through the design, development and deployment of AI technology. These implementations can be achieved through technical and non-technical methods. The European Commission Guidelines for Trustworthy Artificial Intelligence offers a framework that tackles all those aspects (EUCommission, 2018).

3.3. The Role of AI Ethics

The achievement of Trustworthy Artificial Intelligence is heavily depended on the field of ethics. Artificial Intelligence Ethics is a sub-field of applied ethics and technology and focuses on the ethical issues raised by the design, development, implementation and use of AI. One of the main goals of AI Ethics is to identify how can AI advance or raise to the good life of individuals whether in terms of quality of life, mental autonomy or freedom of living in a democratic society. One of the main issues and concerns are connected with diversity and inclusion (with regards to training data and the ends to which AI serves) and also issues of distributive justice (who will benefit from AI and who will not). Even though the creation of domain-specific ethics code in AI which is well developed it can never function as a substitute for ethical reasoning itself which should always be used to the contextual and implementational details that the general Guidelines cannot capture (EUCommission, 2018)

The EU's Rights' Based Approach to AI Ethics

The High-Level Expert Group on AI ("AI HLEG"), part of the European Commission, believes that the Fundamental Rights of the EU are the stepping stone to identify abstract ethical principles and to specify how the ethical values can be operationalised in the context of AI.

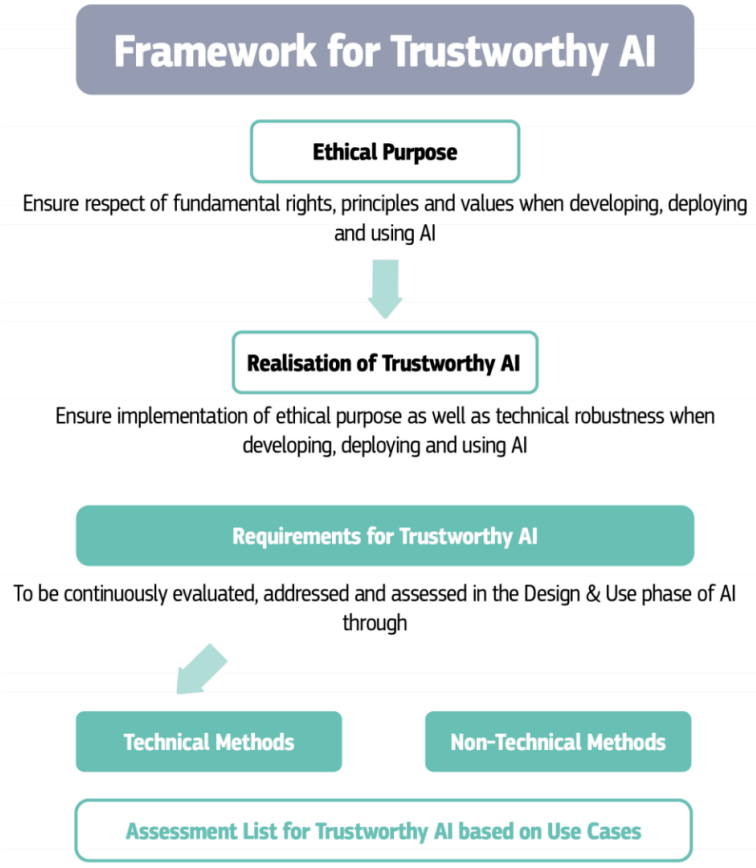

Figure 28: The Guidelines of a framework for Trustworthy AI (EUCommission, 2018)

These Fundamental Rights include constitutional commitment to protect the fundamental and indivisible rights of human beings, ensure respect for rule of law, foster democratic freedom and promote the common good. Additional instruments further specify this commitment like the General Data Protection Regulation (GDPR) law. The Fundamental Rights can also inspire the development, use and implementation for the AI systems (EUCommission, 2018).

The field of ethics aims to protect individual rights and freedom, while at the same time maximizing wellbeing of society and the common good. The ethical insights help to understand how the penetration of technologies within the society rise considerations to the

fundamental human rights and how this could affect the further development and application of AI. These insights should navigate on what have to be done with technology in the future and how to ensure relevant ethical protection. In that vein, ethics is the foundation for, as well as a complement to, fundamental rights endorsed by humans.

The fundamental rights are the base for the formulation of the ethical principles. Those principles are abstract high-level norms that developers, designers, other stakeholders and users should follow in order to achieve human-centric and Trustworthy AI. The value also provides more concrete guidance on how to embrace the ethical principles in consideration with the fundamental rights. The relationship between Rights, Principles and Values is represented in the Figure 29.

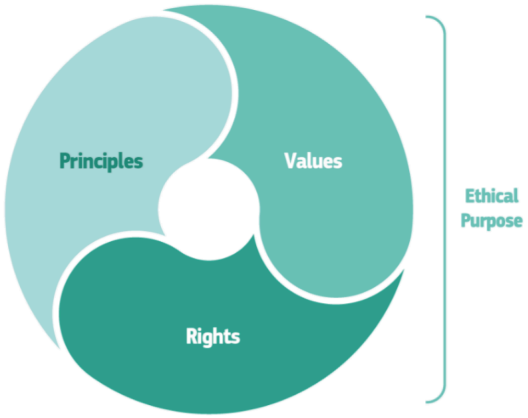

Figure 29: Relationship between Rights, Principles and Values – respect for which constitute Ethical Purpose (EUCommission, 2018)

3.4. Ethical Principles in the Context of AI and Correlating Values

The High-Level Expert Group on AI "AI HLEG" summarised five main principles based on the EU Treaties and the EU Charter of Fundamental Rights. These include beneficence (defined as 'do good'), non-maleficence (defined as 'do no harm'), autonomy (defined as 'respect for self-determination and choice of individuals'), justice (defined as 'fair and equitable treatment for all' and the fifth is the principle of explicability. These principles clarify the end results of them and most importantly, they provide guidance in the operationalisation of the core values. These five principles must be observed to ensure that AI technology is developed in a human-centric manner (EUCommission, 2018).

The Principle of Beneficence: "Do Good"

The design and development of AI systems should aim towards improving the individual and collective wellbeing. AI systems can help in that way with generating prosperity, value

creation, wealth maximization and sustainability. Also, AI systems can contribute with the achievement of a fair, inclusive and peaceful society by helping to increase citizen's mental autonomy, with equal distribution of economic, social and political opportunity. AI systems can balance the three pillars of economic development, social equity and environmental protection through protection of democratic process and rule of law; the provision of common goods and services at low cost and high quality; data literacy and representativeness; damage mitigation and trust optimization towards users; achievement of the sustainability goals. AI can be a tool for achieving a better world and tackling one of the world`s greatest challenges.

The Principle of Non maleficence: "Do no Harm"

The AI systems should not harm the humans in any way. The design of such systems should not be executed in a way that enhances existing harms or creates new harms for the individuals. Harms can be physical, psychological, financial or social. These systems should protect the liberty, privacy, safety and security of human beings. Also, the AI systems should not threaten the democratic process, freedom of expression, freedoms of identity, or the possibility to refuse AI services. The collected data from the AI technology should be only used to improve the existing AI algorithms and not for other purposes such as discrimination, manipulation, or negative profiling. The AI technology should be designed with inclusion and diversity in mind spreading across cultures, genders, ages, life choices. The design process should ensure that through testing, validation and other methods which are appropriate for the aim. Avoiding harm can be also in other means such as environmental harm, or harm to the animals. In either case it is necessary to ensure that the research, development, and use of AI are done with an eye towards environmental awareness.

The Principle of Autonomy: "Preserve Human Agency"

The autonomy of human being should be preserved in a way that the AI systems do not create coercion or subordination to humans. The interactive process between humans and AI technology should ensure that people keep full and effective self-determination over themselves. This should include the rights of users to decide to be subject to direct or indirect AI decision making, a right to knowledge of direct or indirect interaction with AI systems, a right to opt out, a right of withdrawal. AI systems should ensure responsibility and accountability and always protect the fundamental human rights.

The Principle of Justice: "Be Fair"

The development, use, and regulation of AI systems must be fair. Developers and implementers need to ensure that individuals maintain freedom from bias, stigmatisation and discrimination. Also, the AI systems should ensure that the positives and negatives resulting from the usage of the technology, are distributed equally and creating opportunity in terms of access to education, goods, services and technology amongst human beings, without discrimination. Justice also means that the AI systems should provide compensation to

humans in cases where the harm occurs, or data practices are no longer aligned with the human preferences.

The Principle of Explicability: “Operate transparently”

Transparency is a key factor in building and maintaining the trust in AI systems among people. From an ethical standpoint, both technological and business model transparency matter. Technological transparency ensures that AI systems are auditable, comprehensible and intelligible by human beings. Business model transparency includes that humans are aware and informed about the intentions of developers and the possible technological implementations of the AI systems. Explicability is a precondition for achieving informed consent from individuals interacting with AI systems. Explicability also requires accountability measures be put in place.

3.5. Implementation of Trustworthy AI

The realisation of Trustworthy AI includes ten requirements which need to be implemented in when developing, deploying and using AI systems and technology. The ten principles created by the High-Level Expert Group on AI “AI HLEG” are derived from the rights, principles and values which were discussed above. The ten requirements include: Accountability; Data Governance; Design for all; Governance of AI Autonomy (Human oversight); Non-Discrimination; Respect for (& Enhancement of) Human Autonomy; Respect for Privacy; Robustness; Safety; Transparency.

1. Accountability

The good AI governance should include mechanisms which enable diverse accountability according to the specific goals. These mechanisms can range from monetary compensation to fault finding or reconciliation. The choice of the accountability mechanisms depends on the nature and weight of the activity.

2. Data Governance

The users` data should be handled in a privacy preserving way. However, there are requirements connected with the high quality of the AI systems. The gathered data will inevitably contain biases, but the collection of data is also important for improving the algorithms inside the AI. Therefore, it must particularly be ensured that anonymisation of the data is done in a way that enables the division of the data into sets to make sure that a certain data is used only in the testing stage. For example, the AI systems learns to recognise a person by samples of his images in the test stage, but these images do not end up (or are used for other purposes) in the final stages of the development. Feeding malicious data into the system may change the behaviour of the AI solutions. To trust the data gathering process, it must be ensured that such data will not be used against the individuals who provided the data. Instead, the collected data should be used to look forward and lead to better processes

and instructions – improving the AI system and enable it to offer better solutions for the people.

3. Design for all

The design of the AI systems should ensure that it allows all citizens to use the provided products or services, regardless of their age, disability or social status. The AI products and services should not include one-size-fit-all approach, but rather consider user-centric approach and employ the whole range of human abilities, skills and requirements. Design for all implies the accessibility and usability of technologies by anyone at any place and at any time, ensuring their inclusion in any living context.

4. Governance of AI Autonomy (Human oversight)

The AI systems must apply with the law and ethical conformity and must assure the safety, accuracy, adaptability, privacy, explicability, and compliance with these rules. The level of autonomy of the AI system depends on different details such as use case, area of application, level of impact on individuals or society. The greater the degree of autonomy of an AI system, the more extensive testing and stricter governance is required. In some cases, human oversight is also required when there are many AI application, and when the AI systems need to take decisions for individuals or societies (algorithmic decision support). This means that in some cases the human interventions are allowed and can deviate the chosen or recommended path by the AI system.

5.Non-Discrimination

Discrimination is concerning the variability of AI results based on individuals or groups of individuals that can be considered intentionally or unintentionally (for example ethnicity, gender, sexual orientation or age). The direct or indirect discrimination through the use of AI systems can negatively impact such individuals or groups. The people who are in control of such AI systems can use them to intentionally manipulate data to exclude some groups from the algorithms. Discrimination on the AI context can also happen unintentionally due to different problems in the systems such as data, incompleteness or bad governance models. The collection of data can create some biases which later can reflect unintentionally to the end results. Therefore, there should be identification of the possible biases and this approach should be built in the development of the AI. Also, the AI technology itself can be trained to support awareness training of biases and assist the people in making less biased decisions.

6.Respect for (& Enhancement of) Human Autonomy

Nowadays people are increasingly willing and delegating decisions and actions to technology (e.g. recommender systems, search engines, navigation systems, virtual coaches and personal assistants). Systems that take control of such actions must provide explicit support to the user in compliance with the user`s preferences and setting the limits of the system intervention,

ensuring that user`s wellbeing is central in the system functionality. Therefore, the AI systems should be designed to protect human rights, values and principles, enhancing a plurality of human values.

7.Respect for Privacy

The privacy and the data protection must be guaranteed in all stages of the life cycle of AI systems. The all data provided and generated by the users must be explicitly preserved and in compliance with GDPR law and other applicable regulations. The organisations which control the AI systems must be mindful about how sensitive the digital records of users could be, and they must ensure the full data and privacy protection.

8.Robustness

The execution and algorithms of AI systems must be secure, reliable and robust enough to deal with different errors during of all of the stages of the AI life cycle including the design, development, execution, deployment and use phase. Reproducibility is also important step in ensuing robustness, and it means the accuracy of the results can be confirmed and reproduced by an independent evaluation. Reproducibility is essential to guarantee that results are consistent across different situations, computational frameworks and input data. Other important feature of robustness AI systems includes resilience to attacks. Hacking the system is a serious threat to the data and its connection so in these cases the AI system`s behavior must be automatically changed in order to preserve the information or to shut down the whole system.

9. Safety

Safety of the AI systems must ensure the normal working conditions of the technology without harming the users, resources or the environment. In case of unintended errors, the system must minimise the consequences of these errors without affecting the humans in any way. There should be developed formal mechanism which measure and guide the adaptability of the AI systems and ensure that these mistakes are decreased to a feasible minimum.

10. Transparency

The AI systems should provide in a clear and safe way information about the requested data including capability to describe, inspect, and reproduce the mechanism in which the AI systems made the decisions. The explicit and open provision of data is essential in the development process and in all models where human data is involved or have other significant moral impact (EUCommission, 2018).

3.6. Methods

Achieving Trustworthy AI through Technical and Non-Technical methods

The requirements which were described above can be achieved through technical and non-technical methods which can be employed at all levels of the development process – including analysis, design, development and use (Figure 30). The evaluation of requirements and the methods which are employed to implement the requirements, the reporting and justifying changes to the processes should happened constantly. The AI systems are continuously evolving with the change of the environment and achieving a trustworthy AI is a continuous process which should adapt to the development of the AI technology. Figure 30 presents the impact of rights, principles and values on systems' development processes. The continuous adherence to the principles and values, evaluation and justification is essential, given the fact that the AI systems are adaptable and dynamic. These processes are central to the development process of the AI systems.

The technical methods can be incorporated in design, development and use phase of the AI system. The methods include the main technical approaches which ensure trustworthy AI. These include: Ethics & Rule of law by design (X-by-design), Architectures for Trustworthy AI, Testing & Validating, Traceability & Auditability, Explanation (XAI research)

The non-technical methods also ensure trustworthy AI and they should be evaluated on an on-going basis. These include (Regulation, Standardization, Accountability Governance, Codes of Conduct, Education and awareness to foster an ethical mind-set, Stakeholder and social dialogue, Diversity and inclusive design teams).

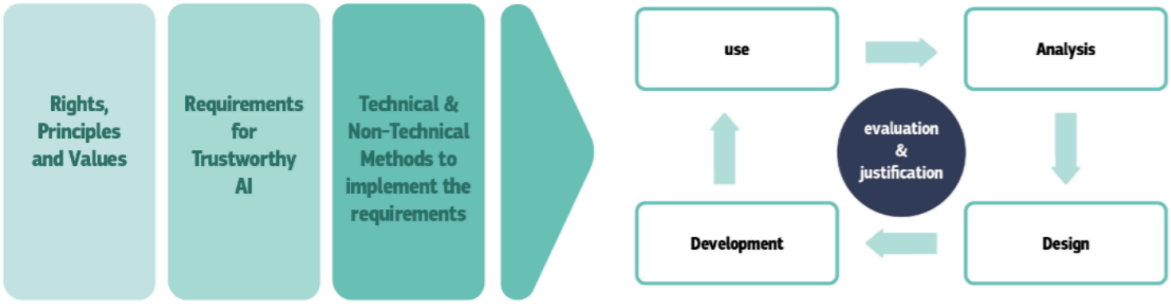

Figure 30: Realising Trustworthy AI throughout the entire life cycle of the system (EU Commission, 2018)

3.7. Main Ethical Issues relevant to the design field

The following diagram presents the main ethical issues connected with the field of design (Figure 31). The designers should be aware of them in every step of the developing process of the product – the analysis, design, development, and use. The selection of the ethical issues was made according to the literature and articles research which were used in the thesis. On the horizontal axis there is the opposition between issues which are more relevant to the individual or ones which are more connected with the society or community. The vertical axis represents the opposition between more active or more passive issues. The active issues are more directly connected with the human being itself and his/her freedom to act in its own way, whereas the passive issues present the norms and laws created by the society and they have more indirect (passive) connection with the people.

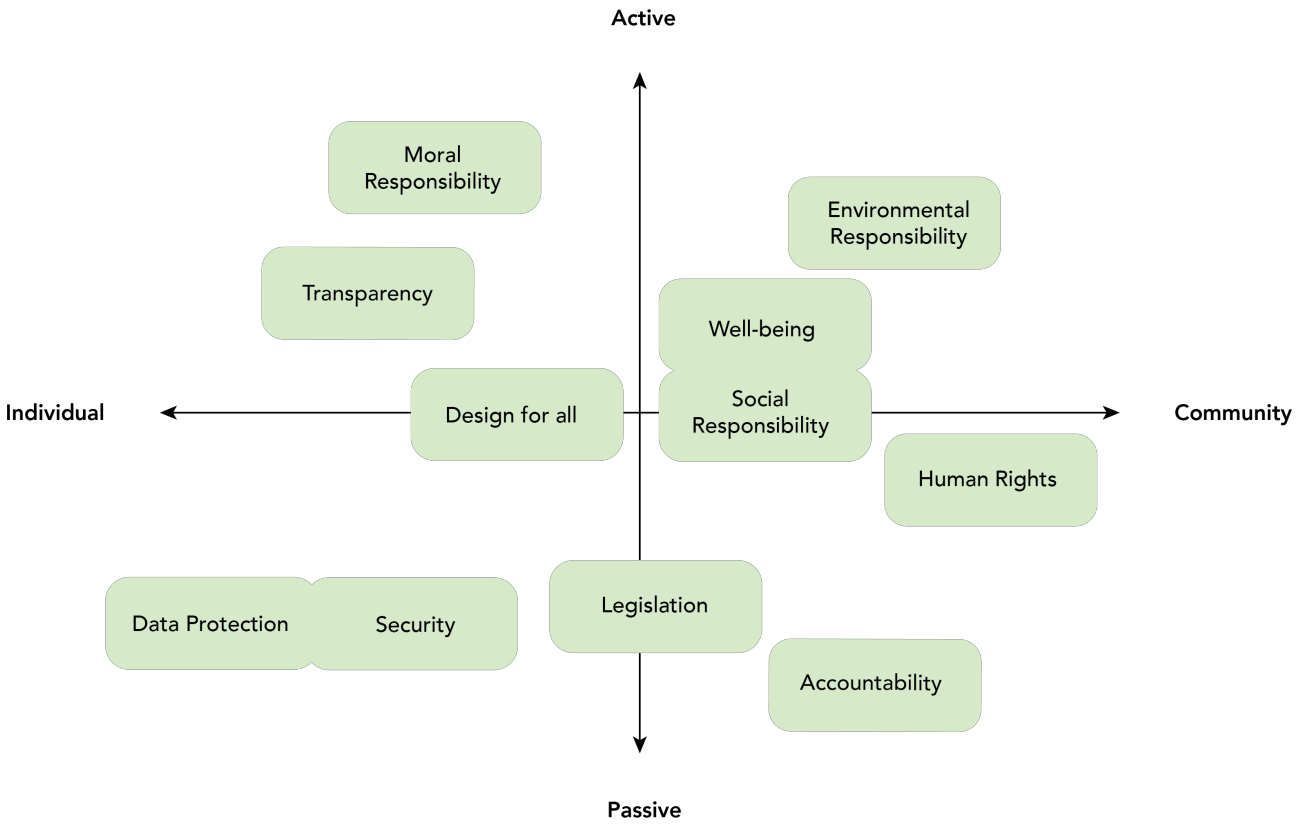

Figure 31: Systematization of Ethical Issues connected with Design discipline

Human Rights

The human rights can be described as a clear standard in the international law system which ensures individual`s wellbeing and freedom. The human rights interpretations can change over time, but the designer should stick to a unilateral basis of creating ethical products since they can affect human`s emotions, data, and overall wellbeing. The design should respect and fulfil human rights, freedoms, human dignity and cultural diversity. The human rights are placed in the diagram in the right part since they ensure people`s wellbeing and are defined as more passive ethical issue.

Environmental Responsibility

The environmental ethics is concerned with the company`s responsibility to protect the environment in which it operates. The designers should also comply with the environmental responsibility as well as the individual users. The environmental responsibility for the user is still more an active issue since the user's attitude and everyday choices directly affects the consequences for the environment and sustainability. For example, the users can choose to buy bottled water in a plastic bottle or instead to buy a refillable metal or glass bottle which is more responsible for the environment. Environmental Responsibility is more active, and more community based ethical issue.

Data Protection

The data a user submits in technological or non-technological system should be protected and safe. The data provided by a user can include his/her name, identification number, pictures, videos, e-mail, messages and others. The protection of this data is an essential human right. It is ensured by international laws and in Europe one of this particular legislation is the GDPR law. The data protection is more connected with the individual since in most cases an individual submits the data and it is manipulated by the laws (more passive) and therefore it is positioned in the down right corner of the Ethical issues diagram.

Well-being

Well-being is defined as encompassing human satisfaction with life and the conditions of life as well as an appropriate balance between positive and negative affect. This definition is based on the Organization for Economic Co-Operation and Development's (OECD). In the recent years the focus of the designers and the artefacts they produce, is to enhance people`s quality of life, enhance the overall well-being of the society through increasing the value the customers receive from the products they use (IEEE, 2018). Since well-being is connected with the overall quality of life on a societal level it is placed in the right part of the graph and it is also defined as more active issue since it is directly connected with people`s quality of life.

Accountability

In ethics and the design field, accountability is the acknowledgement and assumption of responsibility for actions, products, services, decision, and policies including the administration, governance and implementation with the obligation to report, explain and be answerable for the resulting consequences. The institutions and society need clarity around the manufacture and deployment of technological innovations (such as AI systems) to avoid potential harm and fear in the general public (IEEE, 2018). Since the accountability issues are more concerned with the society as a whole, it is placed in the right part of the diagram and because it is more connected with legislations ensuring accountability from the companies and designers, this issue is placed in the lower right corner in the Ethical issues diagram.

Transparency

Transparency is an ethical concept which deals with distribution of information. It is about the ability of the user to have full access to the information he/she wants, not just the information the company is willing to provide. Transparency embodies honesty and open communication. For the user, transparency is important because it provides in a simple way the understanding of the product, system or service he/she uses and the possible consequences of the use and after-use phase. The lack of transparency is dangerous for the user because of the increased risk of physical or psychological effort or harm (user does not understand the technology (product), service which is used). Transparency is placed in the left corner because its concept is connected directly to the user and his/her interaction with the product and therefore is also perceived as an active ethical issue.

Social Responsibility

Social responsibility is an ethical framework which ensures that the companies and designers are creating products or services that benefit the society as a whole. This responsibility also includes not to engage in socially harmful acts and involving in activities that directly advance the social goals. Social responsibility must be inter-paradigm since the actions of one paradigm have consequences on those following. The social responsibility is built on a system of ethics and therefore all decision connected with the subject must be ethically validated before processing before implementing them in a product, technology or service. If the action or decision causes harm to society then it would be considered to be socially irresponsible. Social Responsibility is placed in the right side of the Ethical Issues diagram because It is a framework connected with the society as a whole but also it is also more abstract according to legislation (depending on the country – for example in USA the child labour is not allowed but in some countries it is, and therefore it is placed in the middle between active and passive issues.

Security

Security and ethics aim to create a safe technological experience for the users. With the vast development of high-technologies such as autonomous machines, robots, cars, and other physical artefacts that are programmed to control themselves without the need of human intervention, there is constant need to improve and ensure safe factors and their ethical dimensions according to the way people use them. The security ethics try to protect people from different treats such as cyber-attacks, cyber theft, internet piracy and other. Security is placed in the down right corner of the Ethical Issues diagram since it is connected with different law legislations ensuring the user`s safety and is perceived as more passive.

Moral responsibility

The design is not value neutral. The way a technology, product or service is designed determines its possibilities, which can for better or for worse, have consequences for the way an individual behave and perceives the world. People`s everyday choices are largely influenced by the design of the products they use. Therefore, the designers should intentionally design products in a way that lead to responsible and moral behaviour. Design teams should include moral values and stakeholder values in an iterative process in the technologies and products they develop (Roeser, 2012). For example, the development of the smart devices made the people virtually connected as never before, but this happens with the cost of different problems such as anxiety, stress, asocial behavior among the users, which was unintended effect by the designers of the technology. Moral responsibility directly affects the individual`s wellbeing and because of that its position is on the upper left corner of the Ethical Issues diagram.

Design for all

This ethical principal ensures that the created product, technology or service will be available to all citizens, regardless of their age, sex, disability or social status. The products and services should not include one-size-fit-all approach, but rather consider user-centric approach and employ the whole range of human abilities, skills and requirements. This includes also the preservation from discrimination which can be based on individuals or groups of individuals and can happen intentionally or unintentionally (for example ethnicity, gender, sexual orientation or age) (EUCommission, 2018). Design for all is placed in the left side in the Ethical Issues diagram since it is an issue representing individuals' characteristics and its dimensions can be perceived as active and also passive and therefore it is positioned in the middle of the vertical axis.

Legislation

The designers and involved stakeholders should consider other ethical dimension which is connected with legislation of design and connected issues. Designing a product should be executed with compliance of certain rules ensuring that the design is original and not copied.

These rules ensure the originality of the product, technology or service and are registered design, patents, utility patents, copyrights, trademarks. For example, A US design patent covers the ornamental design for an object having practical utility. An object with a design that is substantially similar to the design claimed in a design patent cannot be made, used, copied or imported into the United States without the permission of the patent holder. The copy does not have to be exact for the patent to be infringed. It only has to be substantially similar. The utility patent protects the way an artefact is used and work, while the design patent protects the way an artefact looks (Nowatorski, 2013). The non-legal copy of products can confuse the users, deceive them with the buying of the non-original product, and thus resulting in non-satisfactory user experience. The legislation issue is positioned in the lower side of the Ethical Issues diagram since it is directly connected with laws and its dimensions are more passively connected with the users or the community.

Part III

Design for Behavior Change and Ethics

Chapter 1

Interconnections between Design for Behavioral Change and Ethics

Multiple ethical questions arise when developing design projects. In many cases the designers and the stakeholders are not fully aware of them or they cannot realize the interconnection between the design approach they use and the possible ethical consideration which arise. The thesis purposes diagrams with linear interconnections and an overlapping diagram which illustrates the most developed and known design for behavior change approaches and what is their connection to specific ethical issues.

The first three diagrams (Figure 32, Figure 33, Figure 34) examine the possible ethical issues of different Design for behavioral change theories and tools. The first diagram presents the possible ethical issues with the Multifield Design for behavior change approaches. The second one is dedicated to the Ethical issues with the sustainability theories and tools. The third diagram depicts other theories and tools for Design for behavior change and their ethical connections and more specifically social, health and safe/crime approaches.

The overlapping diagram (Figure 35) represents the connected ethical issues with every design for behavior change tool and theory and the ethical areas it tackles. Therefore, the diagrams help the designers to better understand the strengths and weaknesses of those methods when utilizing design for behavior change approaches in the design project.

The interconnections were selected through investigation of different examples and case studies connected with the selected approaches. The possible ethical issues can arise both intended or unintended ethical considerations after the application of the design project. However, they can be foreseen and in that way the designers and stakeholders can be better prepared for the possible consequences. It can be said that some approaches arise more ethical considerations than others because of the scale of their application (some have more specific field in application) than other approaches. For example, the Persuasive technology usually raise ethical considerations connected with Data Protection and Security, but also there can be issues connected with the Accountability, Transparency and Social Responsibility.

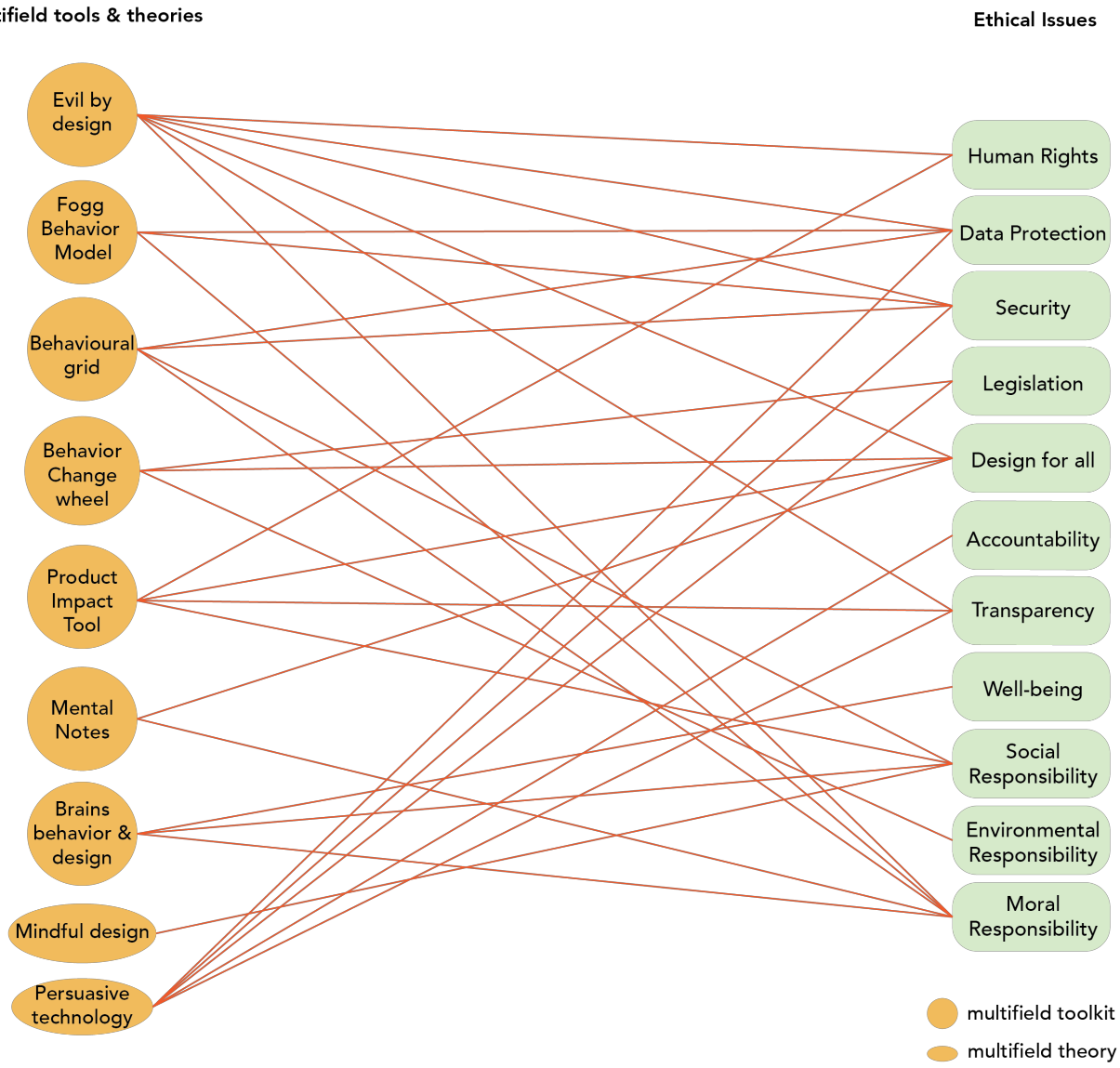

Figure 32: Interconnection between Multifield Design for behavior change tools and theories and relevant Ethical Issues

From the first diagram (Figure 32) it is visible that the Multifield Design for behavior change theories and approaches have interconnections with all main ethical issues. More specifically these approaches mainly raise ethical consideration with Data Protection, Design for all, Social Responsibility and Moral Responsibility. It can be said that Persuasive technology and Evil by Design raise the most Ethical Considerations. For example, Persuasive Technology can raise ethical considerations about the management of sensitive data provided by the users, but also it can deal with Transparency and the distribution of information among its users.

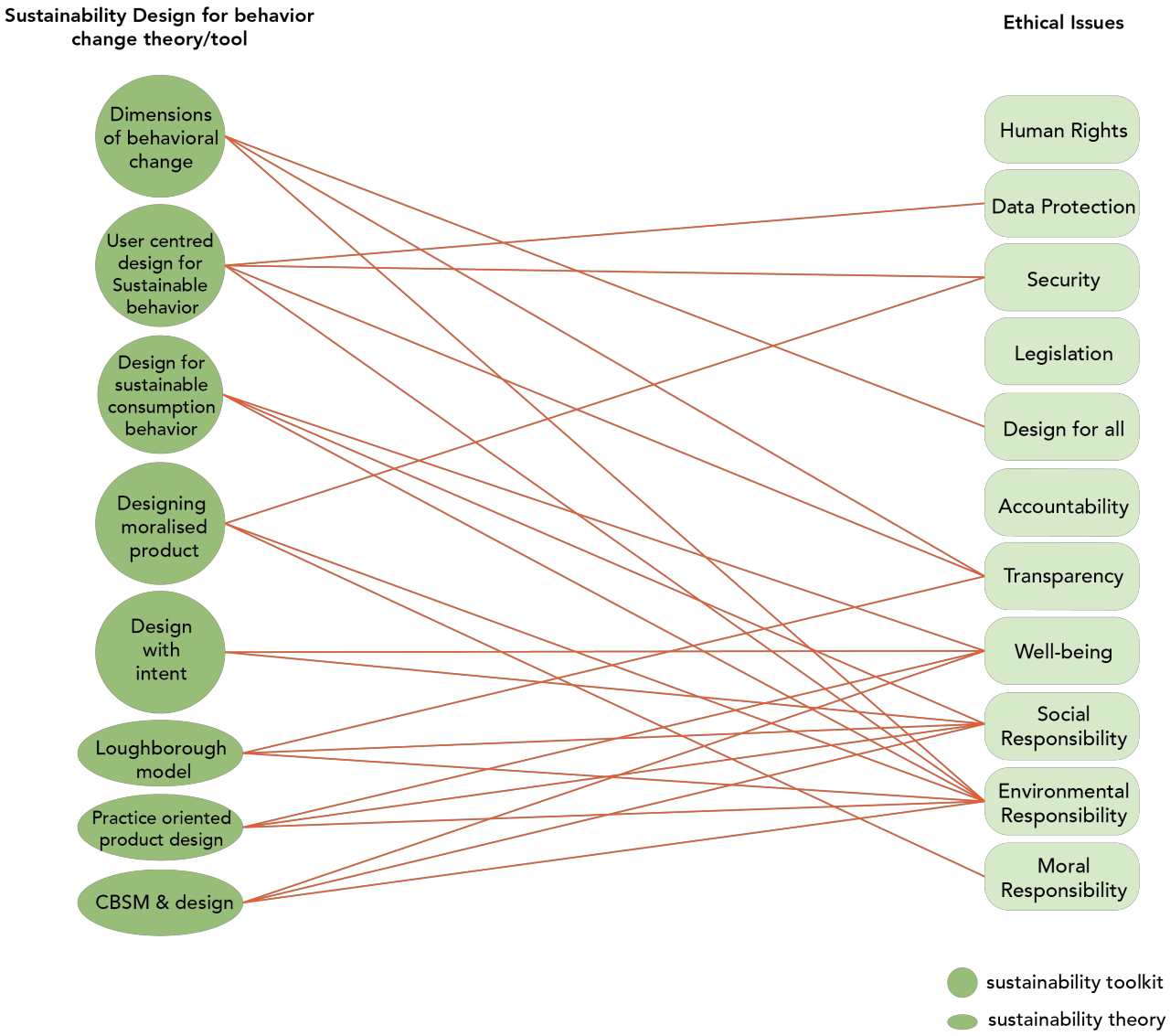

Figure 33: Interconnection between Sustainability Design for behavior change tools and theories and relevant Ethical Issues

From the second diagram (Figure 33) it is visible that the Sustainability Design for behavior change theories and tools do not have interconnections with every ethical issue. More specifically these approaches mainly raise ethical consideration with Transparency, Social Responsibility and Environmental Responsibility. It can be said that User centred design for Sustainable behavior raise the most Ethical Considerations. For example, the Community Based Social Marketing projects can have intended ethical Environmental Responsibility consideration but in the same time this can conflict with the Moral Responsibility or the Social Responsibility which can be unintended ethical considerations within the project.

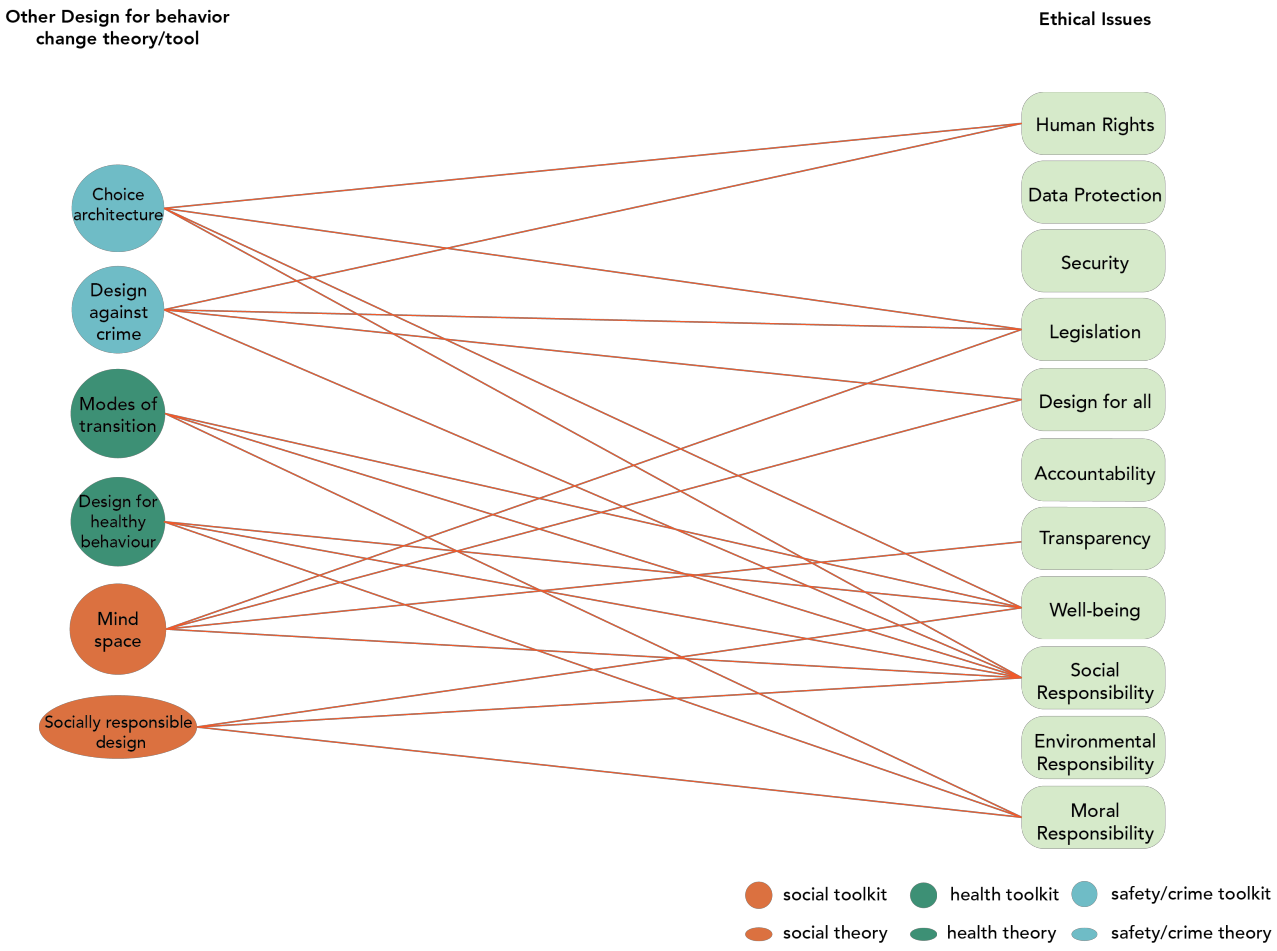

Figure 34: Interconnection between Other Design for behavior change tools and theories and relevant Ethical Issues

From the third diagram (Figure 34) it is visible that the Other Sustainability Design for behavior change theories and tools (Social, Health, Safe/Crime) do not have interconnections with every ethical issue. More specifically these approaches mainly raise ethical considerations with Well-being, Social Responsibility and Moral Responsibility. It can be said that Choice architecture, Design against crime and Mind space raise the most Ethical Considerations.

These approaches are never neutral, and they influence people`s attitudes and behaviors in one way or another and the designers should be aware of the power it exercises over its users. The goal of these diagrams is to address the ethical considerations in designing products or services which influence people`s behavior. It can be useful tool for the designers since it stresses on the ethical areas where there is needed more attention to be focused. The diagram can be used vice-versa in direction. After the designers have chosen specific design for behavior change tool they can stress and think on the connected ethical issues or according to the ethical problem they want to develop or resolve, they can choose specific design for behavior change tool or theory.

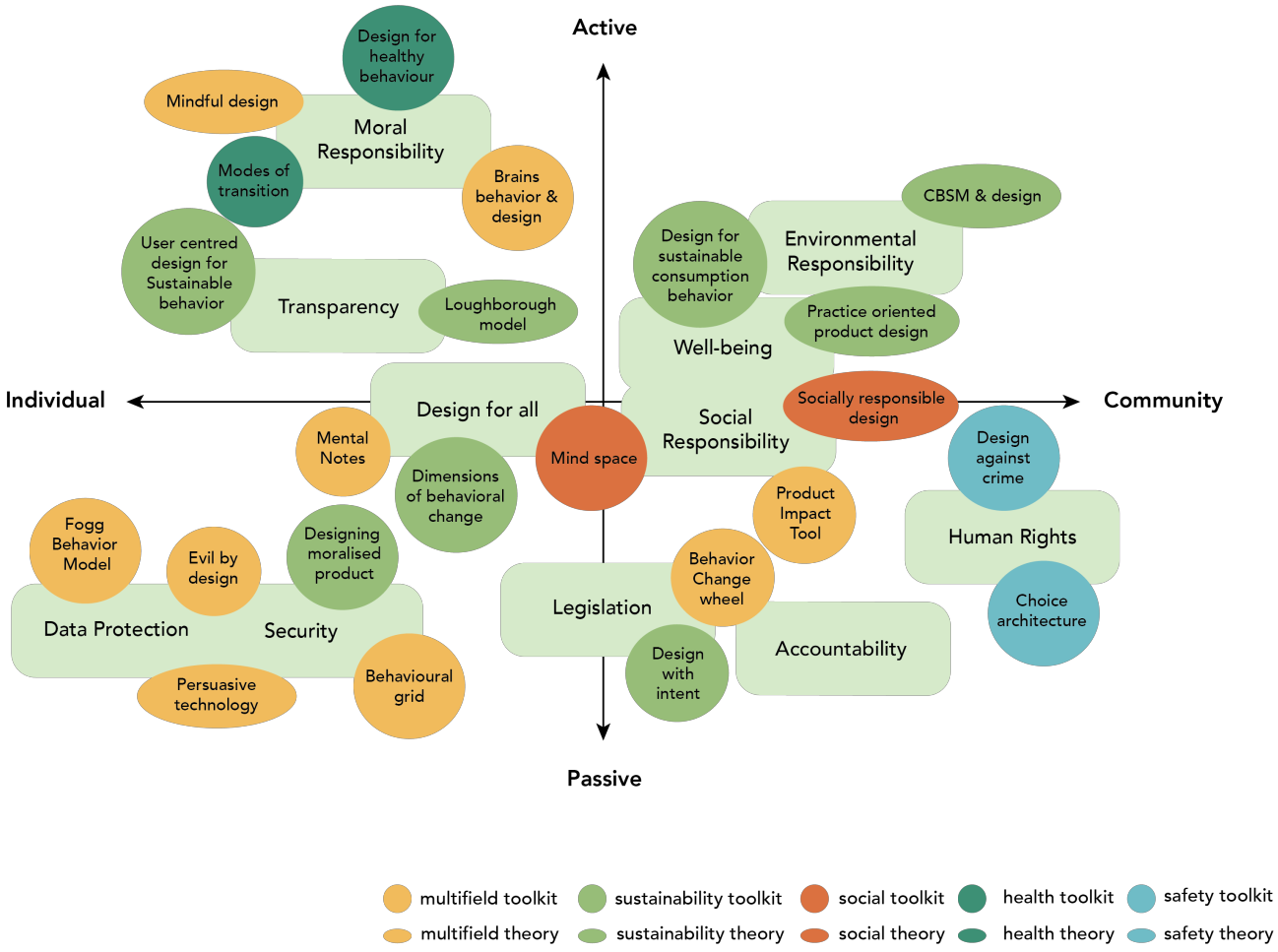

Figure 35: Diagram presenting the Design for Behavior change theories and tools and their main Ethical Issues.

The diagram (Figure 35) shows interesting patterns and connections between the main ethical issues and the design for behavior change tools and theories. The Multifield design for behavior change tools and theories such as Persuasive technology, Behavioral Grid tackle ethical issues in the field of Security and Data Protection. The sustainability design for behavior change tools and theories are logically connected with environmental responsibility but also, they exploit the Well-being among users. The social tools are connected with Social responsibility and Design for all issues, whereas the health tools and theories are linked with the Moral responsibility. The safety/crime design for behavior change tools and theories tackle the Human rights ethical issues. In general, the most exploit ethical issues are the Environmental responsibility, Moral and Social responsibility. The presented design for behavior change tools and theories can raise other ethical issues, but they are connected with the most prominent one for the particular tool/theory.

Case studies

Design for behavior change has powerful impact when it is applied systematically. The presented case studies illustrate this application in different levels. There are four case studies exploring different scale of penetration unified by one main topic (promotion of using tap water in Europe and reducing the usage of bottled water instead). The case studies are not created by one stakeholder and they are not envisioned as sequence of steps to achieve a specific aim, but rather they are picked to show how one main aim can be achieved using different areas of design for behavior change following the ethical considerations. The presented studies are plotted to the diagram presenting the Design for behavior change tool and theories and their ethical dimensions (Figure 35) to better illustrate them. In that way it is illustrated how a behavior change can be achieved in systematic level – government, institution, society, individual.

1.1. Case Study 1

European Commission's plan to promote drinking tap water (Government)

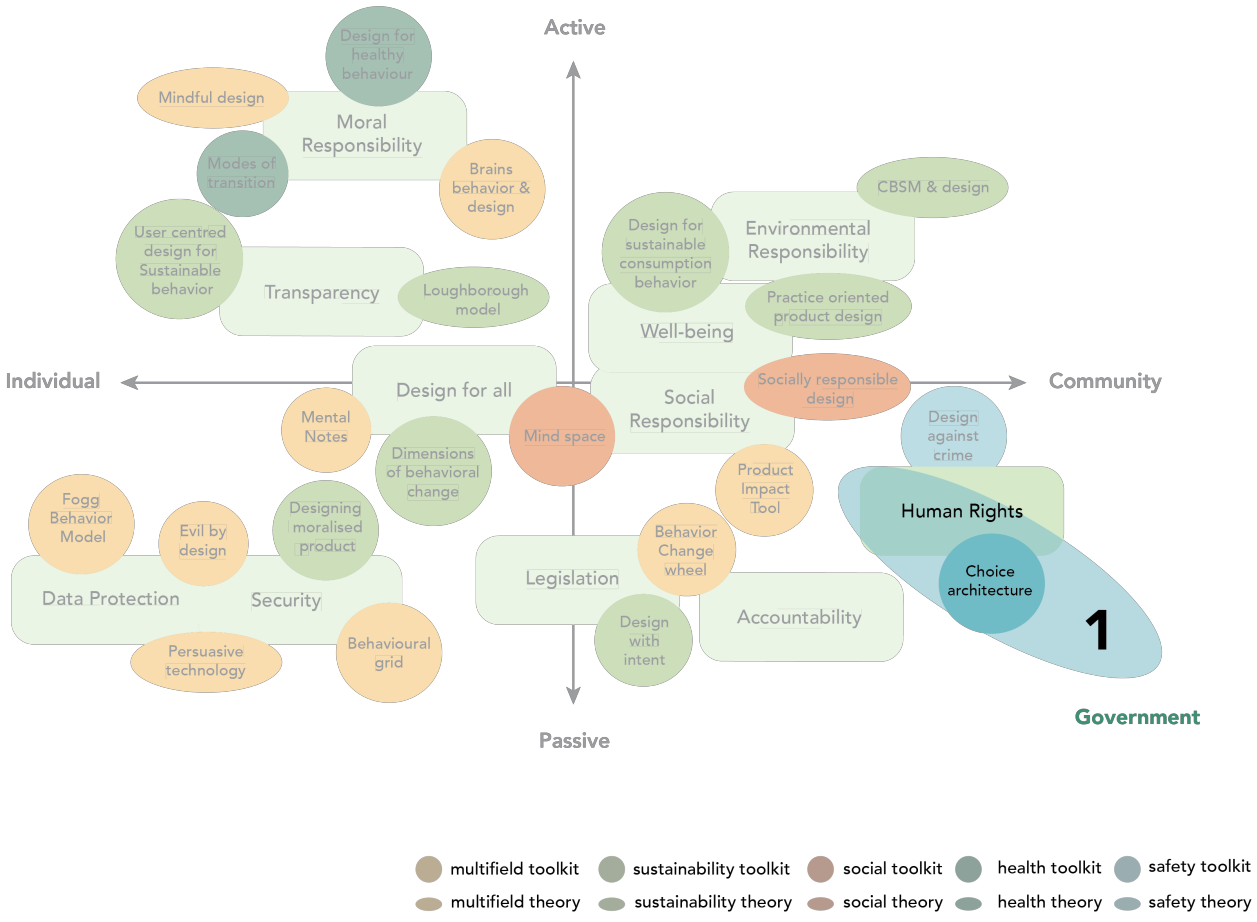

Figure 36: Diagram presenting the Position of the first Case Study

Preliminary Research

Despite tap water being freely available and safe in many countries, bottled water is widely consumed around the world. This has negative effects on the environment, including water wastage and pollution. From 1990 to 2005 the rate of bottled water consumption increased more than 400%, and some estimates state that around 200 billion bottles are now consumed every year. This high level of consumption is contributing to several environmental problems.

It takes on average 3 litres of regular water to produce just 1 litre of bottled water. Based on 2011 consumption rates, that equates to over 100 billion litres of water wasted every year – an important concern given that fresh water is becoming increasingly scarce across the globe. Bottled water production, including packaging, transportation, and refrigeration, also generates CO2, contributing to climate change. Furthermore, the majority of water bottles are not recycled, instead ending up in landfill or littering the natural environment with plastic waste (van der Linden, 2015).

Most people in the EU have good access to high quality drinking water. According to a report by the European Environment Agency (2016), more than 98.5% of tests carried out on drinking water samples between 2011 and 2013, met EU standards. The EU Drinking Water Directive sets minimum quality standards for water intended for human consumption (drinking, cooking, other domestic purposes), in order to protect the citizens from contamination.

Concept Description

At the end of 2018, European Commission adopted a plan to further improve the quality of tap water and access to drinking water for all people and reduce plastic waste from water bottles. This will be achieved through different steps and rules to increase consumer confidence and encourage the drinking of tap water. All EU Countries will be obliged to "promote universal access" to clean water for everyone, especially vulnerable groups with no or only limited access.

The plan is using different behavioral change strategies including choice architecture. One of the steps to achieve this plan is to further increase tap water quality by tightening the maximum limits for certain pollutants such as lead (to be reduced by half), or harmful bacteria and introduces new caps for certain endocrine disruptors. Levels of microplastics will also be monitored. The new rules would also increase transparency and provide consumers better access to information (EUROPEAN Commision, 2018).

"With this proposal we facilitate the transition to a circular economy, helping Member States manage drinking water in a resource-efficient manner. It implies reduction of energy use and

unnecessary water loss. Thanks to increased transparency it will also empower consumers and push them towards more sustainable choices, for example using tap water."

Vice-President of the European Commission - Jyrki Katainen

Drinking tap water is cheap and environmentally friendly. Members want measures such as installing free drinking fountains in public places - including shopping centres and airports - and encouraging the provision of free tap water in restaurants.

Most people living in the EU enjoy very good access to high quality drinking water. This results from long standing EU legislation protecting Europeans ensuring that they have access to high quality drinking water. The Commission wants to make sure that this high quality is preserved in the long run. The rules which the Commission proposes to update today will improve water quality and safety by adding new and emerging substances to the list of criteria for determining water safety (such as legionella and chlorate). These additions take account of the latest scientific knowledge and recommendations of the World Health Organisation.

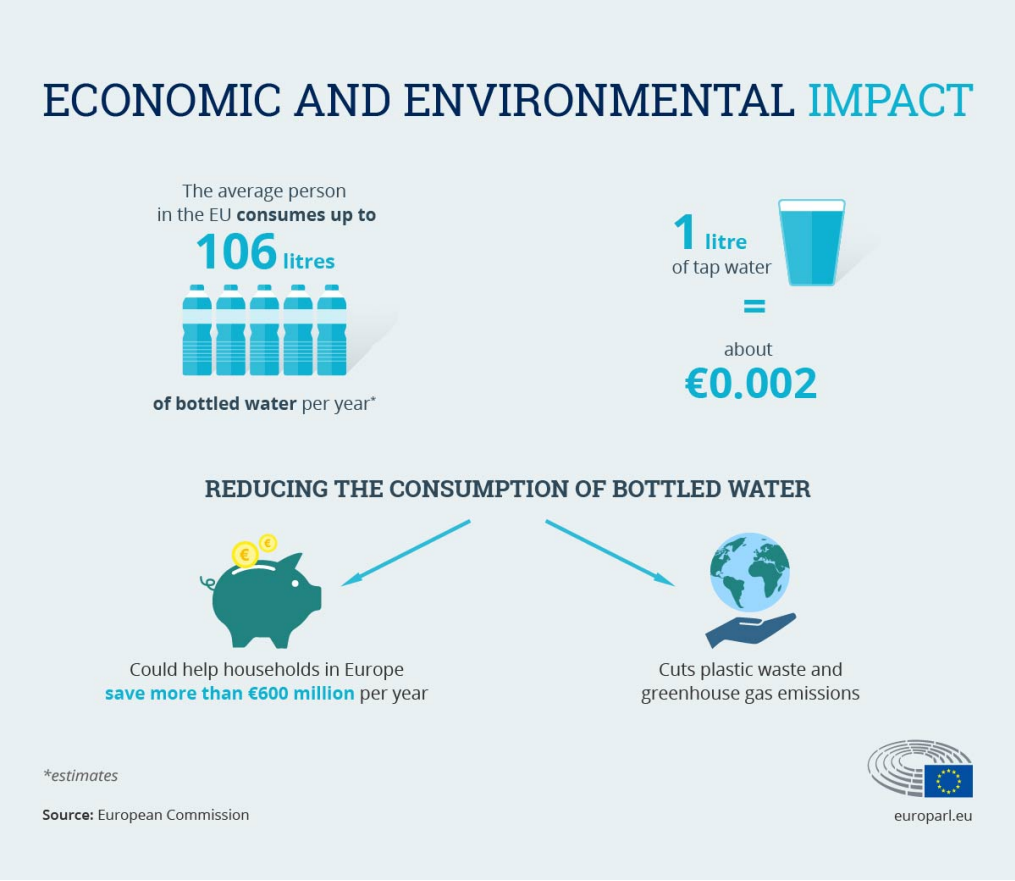

Figure 37: Infographic presenting the benefits of switching to tap water (European Commission 2018)

The new rules will require Member States to improve access for all people, especially for vulnerable and marginalised groups who currently have difficult access to drinking water. In practice, that means setting up equipment for access to free drinking water in public spaces, launching campaigns to inform citizens about the quality of their water and encouraging administrations and public buildings to provide free access to drinking water (EUROPEAN Commision, 2018).

Another important change in the legislation will give the public easy, user-friendly – including online – access to information about the quality and supply of drinking water in their living area, improving confidence in tap water`s characteristics. The information systems must provide information to all water customers in terms of water sources used, water quantity, water price and components of water pricing, types of treatment, overall performance of the system in terms of efficiency, leakage rates, energy use, etc., impacts of measures previously taken for improving performance, measures and actions proposed for improving performance, additional tips and advice on how to reduce consumption. Sharing this information is expected to lead to a change in consumer behaviour that will in turn make the water supply companies more efficient.

Results

According to the European Commission, access to better quality water could reduce bottled water consumption by 17%. Less bottled water would help people save money and also have a positive impact on the environment, by reducing CO2 emissions and plastic waste

Lower consumption of bottled water can in addition help households in Europe save more than €600 million per year. With improved confidence in tap water, citizens can also contribute to reducing plastic waste from bottled water, including marine litter. Plastic bottles are one of the most common single use plastic items found on European beaches. With the update of the Drinking Water Directive, the Commission takes with an important legislative step towards implementing the EU Plastics Strategy presented on 16 January 2018. According to estimates, the new measures would reduce potential health risks associated with drinking water from 4% to below 1%. (EUROPEAN Commision, 2018)

Better management of drinking water from Member States will avoid unnecessary loss of water and contribute to lowering the CO2 footprint. The proposal will therefore make a meaningful contribution to reaching the 2030 Sustainable Development Goals (Goal 6) and the Paris Agreement objectives on climate change. The new risk-based approach to safety will help to carry out safety checks in a more targeted manner where risks are higher. In parallel, the Commission will also accelerate work on standardisation to ensure that construction products in the water sector across the EU's internal market, such as pipes and tanks, do not pollute drinking water.

The ethical considerations are mainly connected with Human rights and more specifically the essential human right to have access to clean drinking water which leads to the realization of all human rights. The right to sufficient, safe, acceptable, physically accessible and affordable water in all European union countries should be fulfilled by the European Commission in order to achieve its plan for promoting tap drinking water. However, if these recommendations are not applied equally to all EU countries and in some states the water is not with the expected drinking quality, this can lead to a negative impact and moreover mistrust in the government and its plans.

1.2. Case Study 2

University of the Basque Country`s attempt to switch to tap water (Institution)

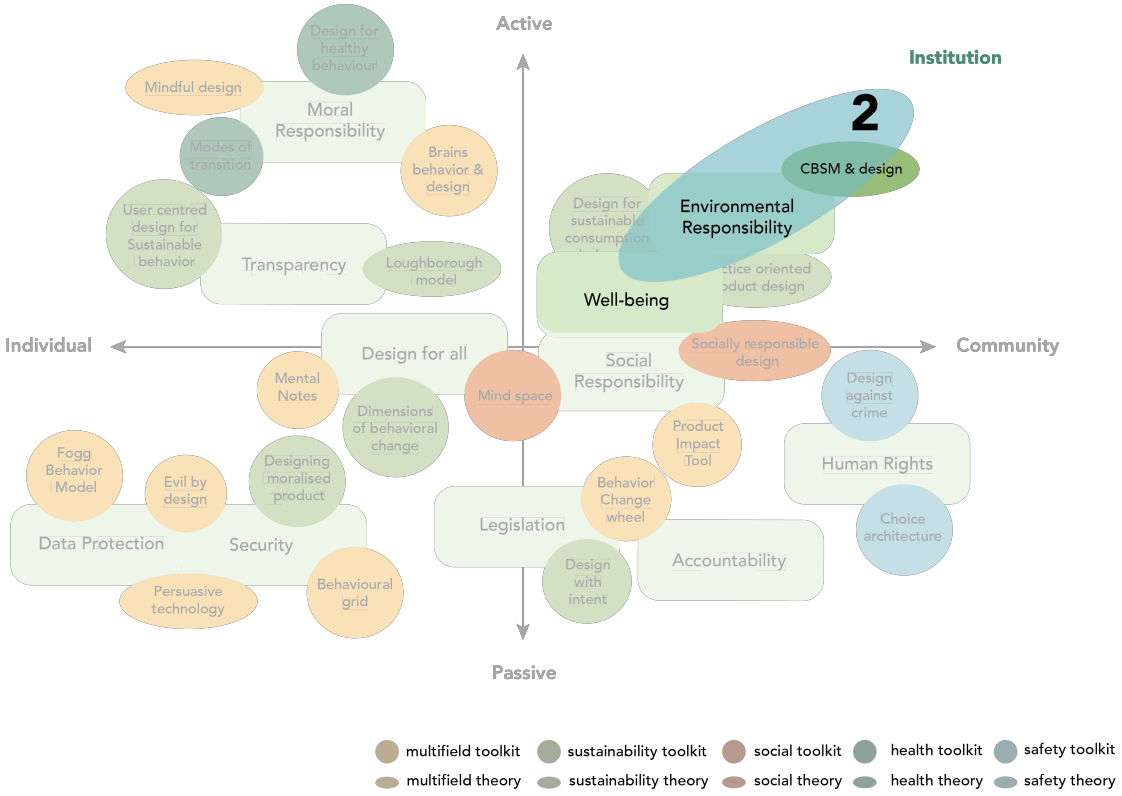

Figure 38: Diagram presenting the Position of the second Case Study

Preliminary Research

An increasing number of universities worldwide are adopting sustainability approaches to manage their facilities and holistic approaches that explicitly link research, educational, operational, and outreach activities because the environmental issues that must be tackled in public institutions are complex and multifaceted. Moreover, there is little doubt that to achieve a high quality of life, protecting the environment and maintaining natural resources are key elements of sustainable university management. The University of the Basque Country (Spanish: Universidad del País Vasco) in the North of Spain is an institution with 45,000 students, 5000 academic staff, and three main campuses located in each province of the Basque Autonomous Region (Díez, 2018).

Despite being one of the most straightforward practices along with reducing fossil fuel emissions and waste management, consumption of bottled water continues to be a pressing issue in this and other Spanish universities. In this sense, single-use plastic bottled water is available in nearly all facilities at the university, and it is an example of how available this commodity is in our society. In fact, the consumption of bottled water continues to increase.

There is little doubt that bottled water consumption has a clear cumulative impact on the environment, from the accumulation of plastic in landfills and oceans to the pollution generated during its production and distribution. In recent years, the transfer of chemicals, such as Bisphenol A or antimony, from the plastic to the water has become another matter of concern. In contrast, there is overwhelming evidence to support tap water consumption, due to its energy efficiency, its contribution to reduce plastic litter and greenhouse gas emissions, and to its positive impact on climate change mitigation and the environment as a whole.

Pioneering examples are found at the city of Bundanoon in Australia, which banned the sales of bottled water in its city in 2009 and, more recently, the city of San Francisco (USA) banned the sale of single-use bottled water on city properties, followed by Hong Kong and Montreal. With regards to North American higher education institutions, both banning of bottled water sales and increasing access and availability to tap water has been on agendas through campaigns such as “Ban the Bottle”, which advocates bans on one-time-use plastic water bottles in many colleges/universities and public organizations.

Concept Description

The recent move towards sustainability education led by many universities implies that these institutions play an active role in providing students and academic and clerical staff with a broad understanding of sustainability issues, both environmental and social. Targeting the university community can help to understand the perceptions and choices towards drinking

water and reduce bottled water consumption at the university but it can also serve as a catalyst to promote practical change in a wider sphere towards a more sustainable future.

The University of Basque used multifaced approach with combination of different design for behavior change tools – theory of planned behavior and community based social marketing (Díez, 2018). In general, the Community based social marketing involves identifying the barriers to a behaviour; developing and piloting a program to overcome these barriers; implementing the program across a community; evaluating the effectiveness of the program.

Firstly, the university examined the students` environmental perceptions towards bottled and tap water through an exploratory survey. The research also included examination of tap and bottled water availability in university premises and also the distribution of water sales in the university`s main restaurants, as well as the quantity of sales volume of plastic water bottles from vending machines in the university.

The study showed that the majority of the students use plastic bottles (ranging from 1 to 6 per week) and also many of the students refill their single use plastic bottles. Also, the data showed that nearly 72% of the respondents agreed with the statement that drinking from reusable non-plastic water bottles is safer than drinking from plastic. This suggests that, as consumers, the respondents are aware of problems regarding the release of toxic materials, such as antimony or Bisphenol A, from polyethylene terephthalate (PET) bottles. The data showed that, in general, there was an agreement with statements related to the quality and convenience of tap water, and about local and global environmental implications of consuming tap water, such as contribution to reducing personal CO2 emissions or oil consumption. The survey showed that in general, the students are aware of the consequences of using plastic bottles which means that the transition to better behavior could be easier (Díez, 2018).

The measures taken to promote using tap water instead of bottle water in the university include different steps. Multiple public water awareness campaigns were made as well as online campaigns which promote behavior change. The university installed free water sinks in dining areas, as well as cafeterias and small water fountains with drinking water. The staff of the university received free glass reusable bottles for tap water. The plan of the university includes installation of many new water bottle refill stations in all of the campuses and removing the plastic bottles from the vending machines and the restaurant. Some of the restaurants in the university banned the plastic bottles and instead they serve free tap water in glass jugs for every meal.

Results

Since The program for promoting usage of tap water instead of bottled water in the University of the Basque Country is planned to be spread till 2021, the final results could not be obtained at this point. Yet, the program is showing good embracing of the idea to switch to tap water among many students and staff of the university. The benefits of these campaigns include

beneficial shift of behavior among the young people which will then spread this type of behavior among their family and friends. Also, the university as institution has the power to promote and educate social and sustainable behavior in real environment showing a good example to other institutions and strengthen its good reputation as place for innovation and forward-thinking.

The ethical side of the project is connected with Environmental responsibility – in this case the university has the responsibility to implement this system and create real measurable benefits for the society and the country. Moreover, this project has an educational purpose not only to increase the use of tap water but also to prepare the students to be aware of more sustainable lifestyle choice in their daily life. However, if the educational program is not performed properly it can be understood poorly by the staff and the students, making them not interested and prepared for future similar sustainability programs.

1.3. Case Study 3

Smart water bottles (Society)

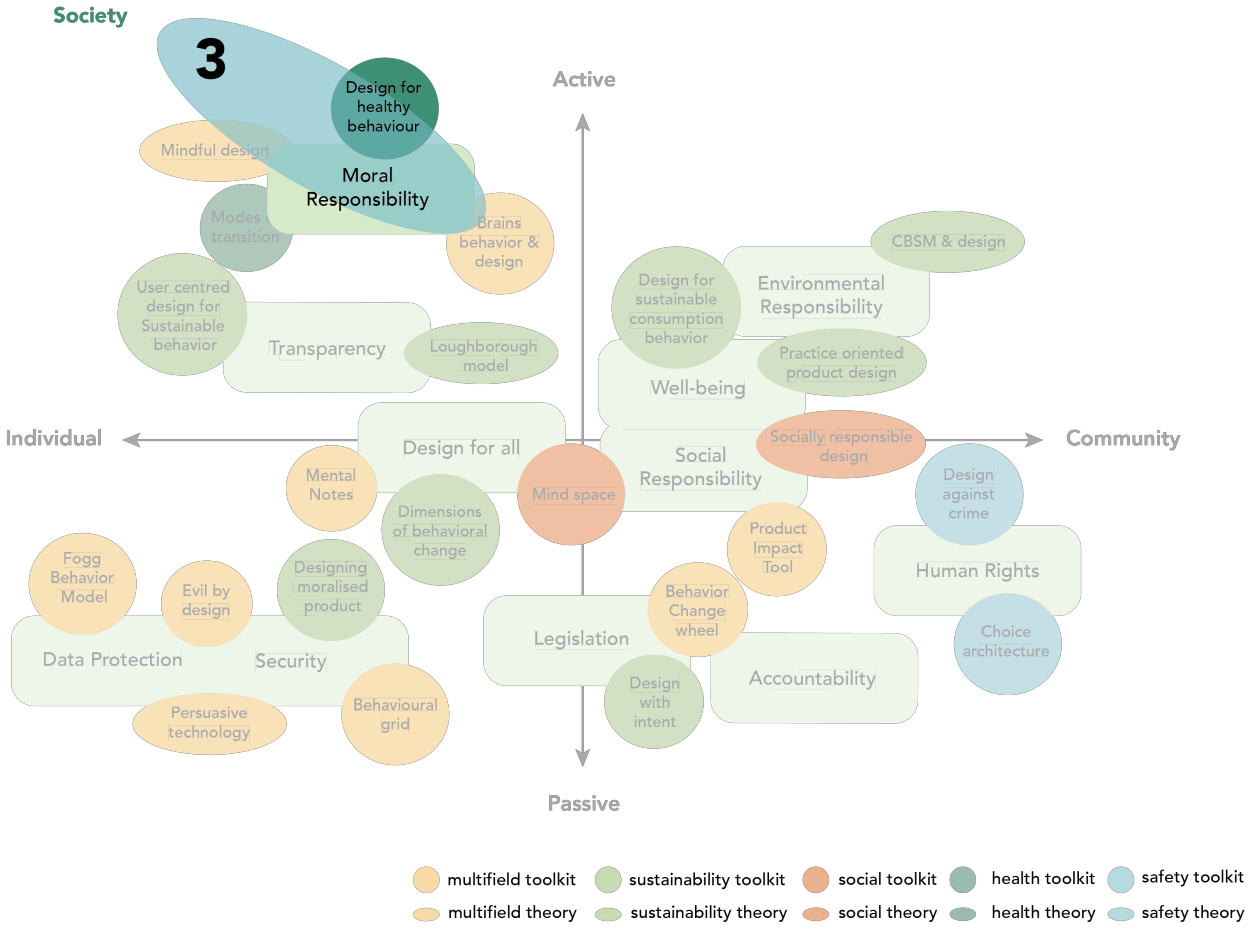

Figure 39: Diagram presenting the Position of the third Case Study

Preliminary Research

Drinking water is essential to human health. The amount one should drink varies from person to person based on gender, age, height, weight, physical activity, sweat levels, metabolism level, body temperature, humidity levels, external temperature, altitude, quantity and quality of food intake, quantity and quality of other fluids' intake and host of other details. When people don't get enough water there is a loss of nutrients such as electrolytes, including sodium, potassium and chloride, which are essential to human body's functions. Fatigue, lethargy, headaches, inability to focus, dizziness and lack of strength are all signs of dehydration. Nature has given humans a powerful alert system – thirst. But in the busy chaotic lives people often ignore it and forget to drink water (Damani, 2018).

Designers have increasingly used the capacity of design to influence human behavior and consequently to address the challenges that our society faces. One of these challenges is the rise of 'lifestyle diseases', such as obesity and diabetes. A change towards a healthier lifestyle could in many cases prevent or diminish such diseases, which would reduce demands and costs in care. The designers need to consider the different stages that people go through to durably change their behavior and achieve Health Behavior Change (Kristina Niedderer et al., 2014).

Concept Description

Damani performed an experiment evaluating the people`s drinking habits. The experiment was performed in an office in the administration department of a company. In the office all employees had regular plastic water bottles on their desks. The test included the change of these water bottles with the same appearance bottles, but in their cap was fitted a chip which recorded the number of times the water bottle was opened. There was created also a second version of the cap which also recorded the number of times the water bottle was opened but in addition, the cap glowed and beeped once after every two hours of the water bottle being opened. If the bottle wasn't opened, then the cap would glow and beep after an hour. When the water bottle was opened, the cap would sense it and stop glowing. In both versions the chip was hidden inside the caps (Damani, 2018).

There were 35 bottles which just recorded the number of times the water bottle was opened, and 35 which record but also remind the employees to use the bottle with sound and light notifications. In the first week the employees received the first version of the plastic water with the first version of the cap with recording chip hidden in it. In the second week the bottles were replaced with the "smart" bottles which had the caps with the second version of the cap (including the recording chip with the glow and beep). Then the data was recorded and compared to see how many times the water bottle was opened in the first week compared to the second week when there was also input for behavioral change. The results clearly showed that employees in the second week used the bottle nearly 20% more times compared to the first week when there was no reminder in the cap (Damani, 2018).

Ozmo is a company which produces smart water bottles. They incorporate the facts that people`s behavior should be altered in order to be more aware of their hydration throughout the day. They utilize that type of behavior change which aims Health Behavior change through the product that facilitate a positive change in the lifestyle and health habits. Ozmo Active is a smart water bottle made from BPA-free plastic. The reusable bottle reminds the user to stay hydrated with vibration, LED lights and sounds. Ozmo Active has detectors inside the bottle which can scan the quantity of water and it can detect if the users are drinking coffee or water. For example, the user can be reminded that is drinking too much coffee and the bottle can recommend switching to water instead. The users can choose the type of reminder and notification (vibration, LED light or sound) according to their preferences. There is also a mobile application which helps the user to be more informed about their water intake.

Figure 40: Ozmo Active Smart Water Bottle (Ozmo.io)

Results

The Damani`s study clearly showed that employees used the product nearly 20% more times when they were reminded and, in that way, their behavior was changed. It means the employees were not sufficiently hydrated with regular water bottles even though they were kept on their desk right in front of their eyes. The simple Behavioural Design of glow and beep water bottle caps got employees to drink nearly 20% more frequently than without the Behavioural Design nudge. Therefore, Ozmo`s smart refillable water bottles promote healthy habits among the society. But also, this promotes overall awareness of the healthy lifestyle.

These habits can contribute to a healthier choice and less consummation of sugar filled beverages.

The designers and stakeholders should consider the Ethical issues connected with Moral responsibility. The reminders through the smart water bottles can become stressful for the users and therefore the act of drinking water itself can become tense experience. Moreover, the increased awareness of the water intake statistics can contribute to rigorous thinking about other lifestyle choices and make the user too dependent from such technologies. Since the water statistics how much water an individual should drink throughout the day are just "recommendations" not backed up by real studies, this guidance can be unhealthy for some individuals and this can contribute to unintended health consequences.

1.4. Case Study 4

Mobile applications for measuring daily water intake (Individual)

Fitbit, Ozmo Water App, Apple Health

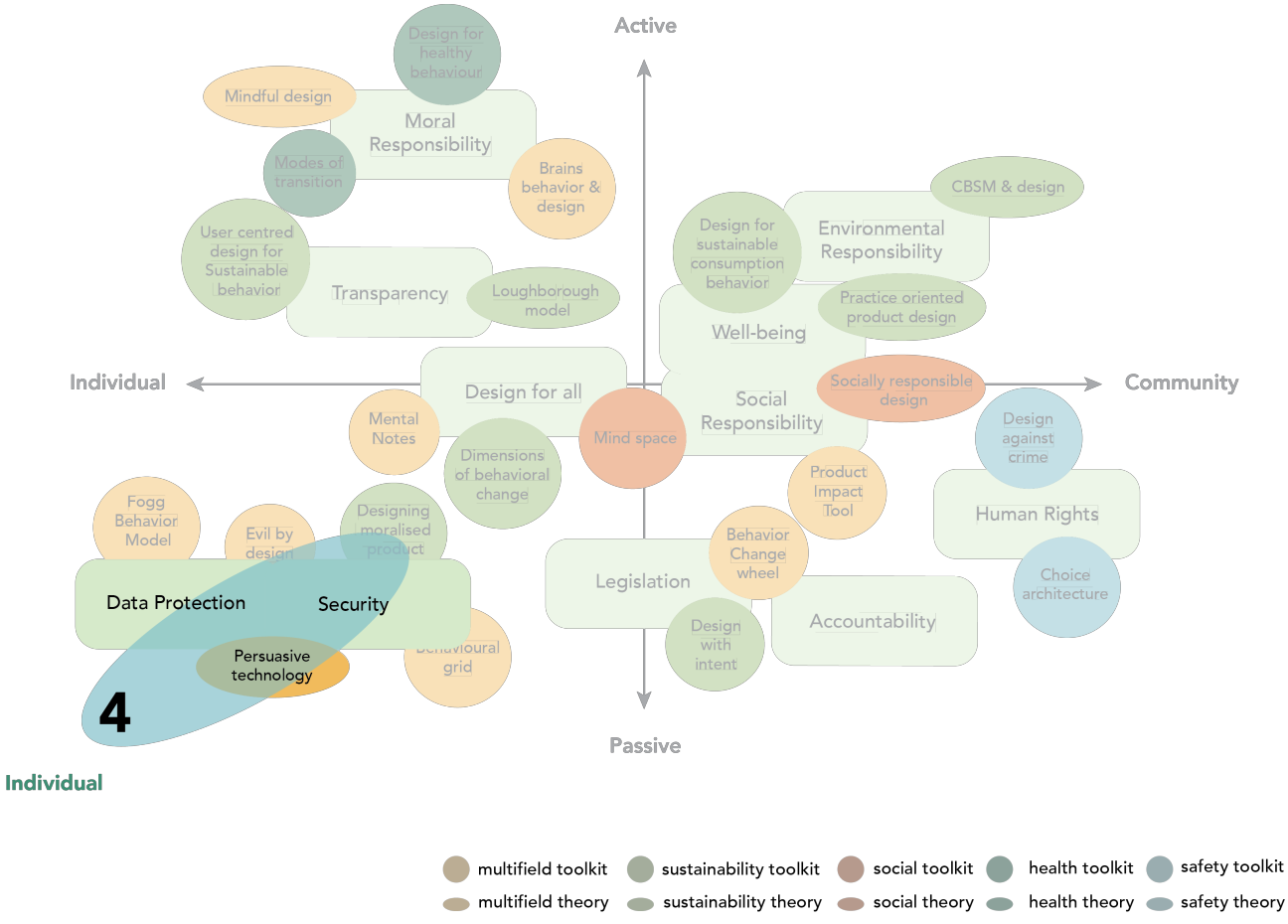

Figure 41: Diagram presenting the Position of the fourth Case Study

Preliminary Research

Most of the classic recommendations suggest that people should drink everyday around 8 glasses of 250ml of water. However, this classical recommendation is valid, but still oversimplified. Actually, still there is never been a landmark study showing exactly how much water the human body should receive every day. Physicians recommend the 8 glasses (or 2000ml) recommendation to be the bare minimum for everybody (Duffett, 2017).

The current recommendation from the National Institute of Medicine in U.S. actually is significantly higher – the daily water intake for women is 2.7 litres and 3.7 litres of water for men which translates from 11 to 15 cups of water per day. These numbers are also dependant on many other factors such as age, height, weight, physical activity, sweat levels, metabolism level, body temperature, humidity levels, external temperature, altitude, quantity and quality of food intake, quantity and quality of other fluids intake. Most of the people do not track their water intake, thinking that they receive enough water which in most cases is much lower than the recommended quantity. Systematic dehydration has numerous negative impacts on human health including digestive problems, headaches, fatigue, depression, even certain types of diabetics. Studies show that roughly 75% of people suffer from chronic dehydration which they do not realise until more severe symptoms start to rise (Bohren, 2018).

Concept Description

Persuasive technology in mobile applications can be used to influence the behaviour of users. In this case it is used to remind the users to drink enough water through the day and also it offers the ability to track the water intake and to store it in the calendar and receiving other useful recommendations for a healthy lifestyle. There are different mobile applications in the sector, but most widely used are Fitbit, Ozmo Water App, Apple Health. The user should provide a lot of personal information such as gender, height, weight, date of birth in order to receive the right levels for his/her recommendation levels.

These apps are designed to help individuals set drinking water goals and track the volume of water they are drinking on a daily basis. These apps allow for schedule reminders and offers a basic statistical analysis of the amount of what you have consumed over the course of a day, week or month with average daily statistics.

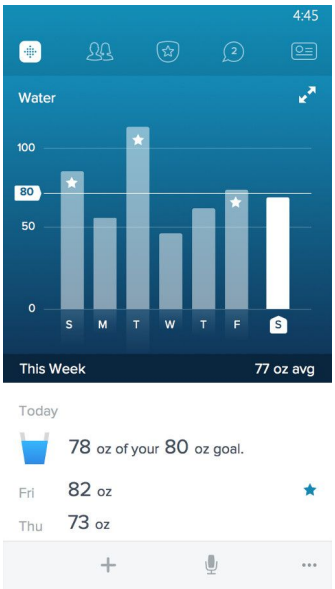

Figure 42: Interface of Fitbit`s mobile application showing the screen for weekly water consumption of the user. (The user is "awarded" with a star in the days in which he/she drunk more water than the average level).

The application is used as a Tool and Medium which is categorization based on persuasive technologies from the Fogg`s Functional Triad. The application is categorized as a tool, because it provides a platform for the users to perform a certain daily task more efficiently and conveniently. It is executed by providing leading information and clearly guiding the users through a process flow. This allows people to do things they could not do before, or to do things more efficiently (Smids, 2011).

The application is also categorized as a Medium because it provides symbolic content such as text, visuals and data. To increase the level of persuasion, the application attempts to depict sensory contents, such as virtualization of data and providing an immersive experience through combination of audio and visual effects. This type of persuasion technology can display the cause-effect relationship, and also instigating cognitive and behavioural rehearsals.

Results

Since these technologies are newly introduced to society there not completed and presented scientific researches showing the results of these persuasive technologies. However, different users of the Fitbit ecosystem report that after they started to measure their water intake, they consumed more water and were feeling more energised and in better overall health.

The Ethical considerations connected with this case study include the responsibility of user`s data protection, consent and management of sensitive personal biodata and personal habits connected with their lifestyle choices. The security side should ensure that these records stay

inside the users` smartphones and are not used for other purposes or if used, the user has to be informed about it.

1.5. The Case Studies Combined

The presented case studies use different approaches to alter or influence the behavior of the people. They are united by the idea to act sustainable, reduce the usage of bottled water and therefore increase the intake of tap water through interventions of different stages. The case studies are not created simultaneously, neither they follow idea to be connected. The case studies are not created by one stakeholder and they are not envisioned as sequence of steps to achieve a specific aim, but rather they are picked to show how one main aim can be achieved using different areas and scales of design for behavior change following the ethical considerations.

The case studies are collected in order to present the understanding that design for behavior change should be implemented systematically and in every level of society, to have a maximum impact. In the presented four case studies this happens in the levels of Government, Institution, Society and Individual (Figure 43).

Figure 43: Diagram presenting the connection between the four Case studies

Conclusion

The thesis has generated a broad cross-sectional theory review of existing theories and approaches for Design for behavior change and their ethical dimensions, covering emerging and current theories and tools and their application in diverse practical contexts. The theory review has drawn on the literature review and searched for multidisciplinary connection with different fields and sciences in order to better understand and show the tools through which this new field in design operates. The systematization of these theories and approaches helps the designers to be more aware about their practical implementation and their limits.

The review found that there are many benefits and good perspectives of incorporation design for behavior change in different design projects. It can offer economic benefits for the company and/or society. It can increase the reputation of the company through promoting ethical and sustainable approaches. Design for behavior change is transformative which means it can be implement in different scale projects nevertheless of the chosen design process. Also, design for behavior change has the power to educate social responsibilities and norms which can contribute to a better society.

The thesis revealed the gaps between the existing design for behavior change approaches and their ethical dimensions. Also, it showed that interconnections between design and ethical consideration are important part of the application for behavior change approaches since the technological development and new design projects raise many ethical questions within the society. The created framework revealed the overlaps between the design for behavior change approaches and their interconnections with ethical issues. This mapping is important and helpful because it elicits possible ways of how to take design for behavior change forward and strengthen its role in driving better projects for society such as sustainable innovation, social, health, crime/prevention project.

The presented case studies illustrate how design for behavior change can be applied on different scale projects simultaneously having one main aim. This systematic approach shows that designers need to understand human behavior in different contexts to fully fulfil the design requirements of the specific project and make it effective.

Since design for behavioral change is a new sub-field of design, it is expected in the next years to develop more. The stated plans of western countries to embrace the Circular economy in the near future for sure shows that Design for behavior change will grow and it will have a centre point in dealing with diverse, multiscale projects and thus there will be increased need more designers to understand and incorporate these tools in their everyday practice.

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