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Anastasiia Kisurina

GAMIFYING SUSTAINABILITY: MOTIVATING PRO-ENVIRONMENTAL BEHAVIOR CHANGE THROUGH GAMIFICATION. CASE OF JOULEBUG.

1st supervisor: Dean, Professor Sami Saarenketo

2nd supervisor: Associate Professor Lasse Torkkeli

ABSTRACT

Author: Kisurina, Anastasiia

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Living in the world that faces severe environmental problems makes people consider and adjust their actions. Researchers have been trying to address the issues of behavior change in a variety of studies, although there is still little knowledge about the applicability of gamification in the context of environmental sustainability. For this reason, the main objective of the present mixed-method research is to explore the process of gamification for motivating pro-environmental behavior change. The study takes abductive approach and focuses on creating a theoretical framework, based on existing data and empirical findings.

The theoretical part of the research provides insights on the topics of gamification, motivation, behavior change, and pro-environmental being and defines the main theories and models, utilized for the formation of the framework. In the meantime, the empirical part involves the description of the case study - mobile application JouleBug, and the findings on the users' gamified experience. Combined together, obtained theoretical and practical data open up the discussion that serves as a solid basis for answering the stated research questions.

The research results suggest that gamification as such is a staged process that consists of much preparation, analysis and ideation work in order to design successful and useful project that would benefit both the developers of the gamified experience and its users. In order to address behavior change, it is essential to evaluate the possible behavioral factors and motivation techniques, as well as major barriers and motive to perform pro-environmental behavior. The study provides the set of potentially significant influential factors, identifies the possible outcomes of gamifying sustainable behavior, thereby as a valid theoretical foundation for further research and practical implementation.

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1 INTRODUCTION

We all live on one planet with its scare resources being consumed at the levels that are much higher than they should be. Everything we do either produces or reduces the waste, with the former process, taking place faster than the latter one. Putting this idea in numbers, nowadays we use the equivalent of 1.5 planets. In case of continuing the current way of behavior with growing population and consumption tendencies, it is suggested that by the year 2050 we will need three planets, while actually having only one. (Footprint Network, 2015.) The same idea is expressed in "The Limits to Growth" (Meadows et al., 1972), where the researchers predict the exponential growth of world's population, industrialization, resource depletion, increasing pollution concurrently taking place with only linear abilities of technologies to raise the resource availability on the planet.

Thereby, the rational question that appears in mind is "What should be done?" Luckily, scientists have already started to address this issue and work on the improvement of the current situation, maintaining different researches on imminent ecological crisis and ways of solving it (Garner, 2011). This is where the concept of sustainability comes on stage.

The first emphasis on global sustainability or sustainable development that involves environmental, economic and social aspects, was put in the report of the United Nations World Commission on Environment and Development "Our Common Future", also called the Brundtland Report, which publication dates back to 1987. According to this document, sustainability is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). Definitely, sustainable development is an important process to consider. However, it does not correlate only with its three main pillars, but also involves the psychological aspects in it (Manning, 2009).

No doubt, currently the society faces a variety of environmental problems that undermine the carrying capacity of the planet to sustain growing population, and the cause of the majority of these problems are human actions (Gardner & Stern, 2002). Thereby, greater understanding of the factors that affect and formulate human behavior is advantageous to solve the ecological problems (Penn & Mysterud, 2009). The majority of sustainability-oriented programs in their depth possess the idea of changing the behavior of people into more pro-environmental, and while being based on the models of behavior change, these programs unsurprisingly face resistance to change (McKenzie-Mohr, 2000). That is why,

despite over 30 years of enormous effort, “the human system failed to solve the environmental sustainability problem” (Harich, 2010).

Although the psychology of sustainable behavior works on understanding the reasons why people choose to behave unsustainably and resist the change (Manning, 2009, 3), there is also an opinion that previous studies “lack the integrity” necessary to understand human behavior within the ecological frames (Penn & Mysterud, 2009). Therefore, another subsequent question appearing from this situation is “How to change people’s attitude and behavior into pro-environmental manner?”

Behavior change has been central to the idea of a sustainable future. Previous researches have fostered sustainability with the application of information-intensive campaigns that were ineffective at adopting the desired behavior, but served more as an advertising of the environmental issues and need for change (McKenzie-Mohr, 2011; Schultz & Kaiser, 2012). Other studies focused on designing human-computer interaction (HCI) eco-feedback technology (Froehlich et al., 2010) or developing frameworks, like community-based social marketing (McKenzie-Mohr & Schultz, 2012). This work takes a different approach and intends to provide some insights on the process of developing and applying gamification to facilitate the pro-environmental behavior change.

Getting popular in 2010s, gamification is now attracting a lot of attention from practitioners and researchers (Deterding, 2011; Huotari & Hamari, 2012). However, the data about the utilization of gamification for motiving environmental behavior are limited. Therefore, the intention of the research is to combine the existing theories and models of behavior change, motivation and gamification within the environmental context and to create a valid theoretical foundation for further research and practical implementation.

The singularity of the study lays in the analysis and combination of two contemporary, extremely “hot” topics not only in business world, but also in other spheres of action – sustainability and gamification, where the latter one is assumed to be a tool for influencing people’s views and actions on sustainable life-being. The ideas of gamification as well as sustainable development have been of raising popularity within the recent time. (Woodruff et al., 2008.) Nevertheless, there is still deficiency of theoretical knowledge as well as scare empirical findings that would provide frameworks and strategies of effective promotion of

behavior change with little or no motivation (Hardcastle et al., 2015) through gamification (Reiners & Wood, 2015, 24).

When approaching the problem of behavior change, it is important to consider that many psychological theories identify motivation as a significant behavioral determinant (Dixon, 2008, 6). Therefore, the research addresses the factors of motivation that have effect on behavior, as well as purely behavior influencing aspects, identifies the existing barriers and motives to pro-environmental behavior and evaluates the effects of utilizing gamified systems on supporting intrinsic and extrinsic motivation.

More information about the research questions and methodology, as well as literature overview, theoretical framework and delimitations are presented in the following chapters.

1.1 Research objective and questions

Gamification is greater than a technical process of applying animation, points and badges to the system. The development of gamified applications include theories and principles from multiple disciplines, such as social, behavioral, cognitive, and psychological science. (Schoech et al., 2013, 206.) However, finding a conceptual framework that would describe the process of gamification aimed at pro-environmental behavior change through motivation has been a challenge for the researcher. Considering this fact and the existence of behavior change and motivation theories as a solid starting basis for the investigation, the following research objective of the study is identified as follows:

> *To explore the process of gamification from the pro-environmental behavior change perspective and to formulate the theoretical framework that would describe this process, basing on the theoretical and empirical findings.*

Considering this objective, the research intends to provide contribution to both theoretical and managerial implications and, the main research question goes as follows:

> *How to formulate the gamification process in order to motivate the pro-environmental behavior change?*

As the question involves several complex concepts and processes, the following research sub-questions are developed to provide necessary theoretical and practical insights and allow answering the main question of the research.

1. What are the drivers and challenges of applying gamification to motivate people to change their behavior?

Researchers have been investigating the impact of gamified system on motivation and behavior change as well as practitioners have been applying gamification for these aims (e.g. see Katzenbach et al., 2011; Rao, 2013; Morford et al., 2014). However, as Garter predicted in 2012 that the majority of companies that applied gamification would fail in doing so, the answer to this question is aimed at identifying the motives and obstacles of applying gamification. Thereby, on the early stage of gamification project development, companies may consider these factors and make a proper decision on whether gamification is applicable or not for their purposes, in particular, for motivating users change their behavior patterns.

2. What are the possible internal and external factors that affect human motivation and behavior change during the application of gamification?

Human behavior, as well as motivation, are affected by a great variety of intrapersonal and external factors that are addressed in theories like social cognitive theory (Bandura, 1986) and self-determination theory (Deci & Ryan, 2003). Consequently, these factors can influence the process of gamification. Thereby, the idea of answering this question is to understand and consider these aspects when addressing motivation to promote behavior change through gamified system. As the research objective involves pro-environmental issue, possible affecting factors are addressed from environmental sustainability perspective.

3. What are the barriers and motives to perform pro-environmental behavior?

Nowadays, the environment struggles with serious problems that are, in their majority, are rooted in accumulated human activities. Thereby, the change of current human behavior can contribute to solving the environmental problems. (Gifford, 2011.) Pro-environmental behavior, defined as the behavior that consciously tends to minimize the negative influence of one's actions on the nature and even bring benefits to the environment, is one of the solutions to these problems (Kollmuss & Agyeman, 2002; Steg & Vlek, 2009). However, the people are divided into those who really try to perform this behavior and those are not choosing pro-environmental acting, and the answer to this research sub-questions is purposed to bring the insights on what makes and stops people from making a pro-environmental behavior change. That, in turn, is advantageous for understanding the pre-sets of behavior change process in the context of environmental sustainability.

4. What are the potential outcomes of applying gamification for the purpose of pro-environmental behavior change?

Although the initial target of utilizing gamification in this research is based on reaching pro-environmental behavior change, it is obvious that gamification utilized as a strategy for a variety of purposes (Burke, 2014) can also lead to other results than the desired one. Therefore, it is decided to address this sub-question, as it contributes to the formulation of theoretical framework and enlarges the space and opportunities for further research.

1.2 Defining key concepts

Gamification is defined as the process of integrating game dynamics and mechanics in non-game systems, like business service or internal corporate processes, with an aim to drive participation and engagement of the target audience (Deterding et al., 2011b; Bunchball, 2016, 2). In the present study, gamification refers to the process of utilizing game design elements in non-gamified context in order to improve user experience and user engagement, to motivate people achieve their goals, and to promote desired behaviors by supporting users' overall value creation.

Behavior change refers to the process of transformation of human behavior that is guided by external and internal factors (McDougall, 1908; Lewin, 1947; Bandura, 1986). Among the most influential internal factors are initial intention and perception of a person toward the behavior, self-efficacy, motivational forces and beliefs, and expected outcomes of possible consequences (Fishbein & Ajzen, 1975; Bandura, 1977; Morris et al., 2012). Social norms, access in the community, and reinforcements relate to the external factors of behavior change (Wood & Bandura, 1989; McLeod, 2016).

Intrinsic motivation is the drive to do something without having an external reward for performing the action (Deco & Ryan, 2004; Buchbinder & Shanks, 2007, 24) It is connected to the primary propensity of an individual to engage in the activity, which is interesting to the person, and, thereby, develop and expand personal capacities and skills (White, 1959; Sansone & Harachiewicz, 2000, 16-17). The locus of control in case of intrinsic motivation is inside the person (Dailey, 2009). In order to promote intrinsic motivation, game systems should be more social, ought to offer unpredictability in the experience, and utilize meaningful choices and feedback (Chou, 2016, 110-115).

Extrinsic motivation takes place when a person is motivated to perform an action by obtaining some kind of incentive or external reward (Tanaka, 2013). The locus of control in this type of motivation is external to a person who is asked to take an action (Dailey, 2009). While some researchers highlight "the undermining effect" of external rewards on intrinsic motives (Deci & Ryan, 1985; Deci et al., 2001), it is also proposed that a person can maintain an action, starting from being extrinsically motivated and transferring their interests through intrinsic motives to ensure long-term engagement (Chou, 2016, 107).

Environmental sustainability is meeting the service and resource needs of current and future generations without compromising the health conditions of ecosystems that provide them (Morelli, 2011, 23). The concept refers to keeping the natural capital as a provider of economic inputs, like sources, and an absorber of economic outputs, like wastes (Pearce & Redclift, 1988; Goodland & Daly, 1996, 1008), and assumes its interconnectedness with social and economic aspects of sustainability that all together formulate the "three pillars of sustainability" (Kleine & von Hauff, 2009; Farley & Smith, 2014, 149).

Pro-environmental behavior is the behavior, which improves the quality of the environment and decreases the environmental influence of human beings (Kollmuss & Agyeman, 2002). The objective of this behavior is by taking conscious actions to minimize negative impacts of human actions and maximize positive effects on the planet that can achieved as a result of accumulating single case behaviors into society-wide pro-environmental actions (Stern, 2000; Jensen, 2002; Steg & Vlek, 2009).

1.3 Literature overview

The theoretical part of the study is divided into three main chapters: gamification; motivation and behavior change; and pro-environmental behavior. Importantly, two latter segments are also considered from the perspective of gamification.

The first chapter opens up the discussion on what gamification really is, by providing a brief overview of concept formation and defining its unique features, areas of appliance and game design elements. It also addresses the process of developing gamification and identifies its core stakeholders. Additional important sub-chapter of the introduction to gamification provides the reader with a set of drivers and challenges that a developer and enterprise can face when pondering on whether to utilize gamification as a strategy.

Being a popular topic among researchers and practitioners for the last ten years, gamification is generally defined as a process of integrating game design elements into the non-game contexts (Deterding et al., 2011b; Werbach & Hunter, 2012, 26). In practice, it means that gamification can be applied in a variety of spheres like education (Lee & Hammer, 2011; De Marcos et al., 2014), service marketing (Bunchball, 2016), healthcare (Mak, 2016) and sustainability (Chou, 2013; Swan, 2014) to reach corporate objectives, by creating value to the user and supporting their goal achievement (Burke, 2014; Huotari & Hamari, 2017). Its major elements involve game mechanics, dynamics and emotions that can create and broaden the gamified experience for different players (Dixon, 2011; Robson et al., 2015).

Gamification development process consists of several stages: preparation, analysis, ideation, design, implementation, evaluation and testing, and monitoring (Morschheuser et al., 2017). However, in order to decide whether gamification is a suitable strategy to apply, the evaluation of possible challenges and drivers of the process should take place. Among the most visible drivers, scholars emphasize the multiple variations of using the tool (Burke, 2014; Brigham, 2015), its ability to create interaction between people (Dale, 2013) and to target basic human needs of social belonging, reward, self-expression, recognition, and fun (Chou, 2016). However, practitioners emphasize that gamification can be hard to design; it is also a time- and effort-consuming process. Others also point out the complexity of communicating the necessity of using gamification as a strategy, and state that most of the companies are not just getting the overall process right. (Gartner, 2012; Nicholson, 2012; Prakash & Rao, 2015; Reiners & Wood, 2015.)

The second theoretical part combines the outlook of the theories of motivation and behavior change, applicable for the research from the gamification perspective: self-determination theory (Deci & Ryan, 2000), social cognitive theory (Bandura, 1986), transtheoretical model (Prochaska & DiClemente, 1983), and behavioral model (Fogg, 2009). It also includes the literature on motivation and behavior change through gamification and strives to identify the solutions for overcoming resistance to change.

Self-determination theory identifies three main types of motivation – amotivation, intrinsic and extrinsic motivation (Ryan & Deci, 2000). The fundamental idea of gamification is to utilize the motivational power of games with the application of gamification elements that are claimed to decrease users' intrinsic motivation and lead to no engagement with the

application (Hense & Mandl, 2012; Seaborn & Fels, 2015). Meanwhile, there is also an argument that well developed and designed elements can improve the intrinsic motivation by satisfying the basic psychological needs, defined by self-determination theory as autonomy, competence, and relatedness (Francisco-Aparicio et al., 2013; Pe-Tran et al., 2014). The higher the degree of autonomy, the more motivated the person is (Gagné & Deci, 2005; Ng el al., 2012). Through gamification it is possible to address these needs by providing shared goals and possibilities of shared experience (Antin & Churchill, 2011), including different challenge levels, points as an immediate positive reinforcement for players (Zhang, 2008, 146), and offering competition, meaningful choices and stories to raise interest and engagement (Ryan et al., 2006; Sailer et al., 2013). Previous researches present a close connection between autonomy satisfaction, intrinsic motivation, and the experience of play (Bleumers et al., 2012). They also suggested that in order to succeed in gamification, it is necessary to include game elements that can motivate people both extrinsically and intrinsically (Brigham, 2015; Chou, 2016).

Behavioral psychologists propose that motivation as well as other situation variables contribute to the implementation of behavior change. Both implicit and explicit motives have an impact on behavior. (Rabideau, 2005; Keller, 2011.) However, on the way to the change a person faces challenges and barriers that might cause resistance to change (Hultman, 2003). Apart from the environmental factors that determine behavior, Bandura (1986) also identifies cognitive and behavioral aspects. The first group refers to such aspects as knowledge, attitudes and personal expectations; while the second one addresses skills, practice, the concepts of self-efficacy, self-control and emotional coping (Glanz et al., 2002; Snowman & McCown, 2015). Self-efficacy as a concept often seen in the majority of theories on motivation and behavior change is defined as individual's confidence in the ability to perform a particular behavior successfully (Bandura, 1977).

Bandura (1986) also emphasizes the importance of reinforcements that can either decrease or increase the likelihood of continuing the behavior (McLead, 2016). Other internal and external factors that cause change resistance or help to overcome it towards the behavior change are widely analyzed in a variety of practical and theoretical works (Kottler, 1996). Transtheoretical model, in turn, suggests the staged framework of change and relates a set of processes to each stage. By utilizing this theory, it is possible to assess the initial conditions of person's behavior (Prochaska & DiClemente, 1983; Velicer et al., 1998). This

process is fitting well the analysis stage of gamification process, where the target audience should be defined (Werbach & Hunter, 2012; Morschheuser et al., 2017).

One of the aims of gamification is behavior change (Burke 2014), that can be achieved by addressing both intrinsic and extrinsic motivation, utilizing special triggers – sparks, facilitators, and signals – and considering external and internal factors that affect both motivation and behavior change, like lack of resources or social regulations (Fogg, 2009). In order to build a habitual, i.e. automatic and routine, behavior, it is also necessary to gradually guide participants from more simplified toward more complex actions and repeat the processes until they are adopted (Dorling & McCaffery, 2012; Burke, 2014).

It is especially significant to approach behavior change that would lead to the improvement of the environmental conditions or at least would diminish the negative effects of human actions. That is the idea behind pro-environmental behavior, which is defined as the behavior that minimizes negative impacts and/ or maximizes positive effects on the planet. (Stern, 2000; Steg & Vlek. 2009.) However, as every behavior might face interpersonal and intrapersonal obstacles, pro-environmental behavior adoption is also challenged by a variety of barriers, which are well formulated by Kollmuss & Agyeman (2002).

Apart from external factors like infrastructure, social and economic aspects, and internal factors that refer to knowledge, values, feelings and other issue, the researchers emphasize the old behavior patterns as a barrier to pro-environmental acting. Other scientists (Yamazaki et al., 2006; Welsch & Kühling, 2010; Quimby & Angelique, 2011; Kaida & Kaida, 2017) express similar ideas. On the contrary, scholars also provide the techniques that are meant to motivate pro-environmental behavior change, among which are information (Steg & Blek, 2008), feedback (Froehlich et al., 2010), rewards and incentives (Valente & Schuster, 2002), social diffusion (McKenzie-Mohr & Schultz, 2012), comparison (Siero et al., 1966), and goal setting (Locke & Latham, 2002).

Gamification has been ranked among the top sustainability related trends, assuming that game mechanics are a beneficial tool to utilize in order to offer “rewards for making good, green choices” (Makower, 2012). The scholars even speak about the development of “green gamification” that utilizes games to make sustainability rewarding and fun (Kamal, 2013). Meanwhile, there are those who think that green gamification can only be a short-term

solution (Froehlich, 2015) or undermine the intrinsic motivation by providing external incentives (Deci et a., 2001). On the contrary, there are different variants of how gamification can contribute to pro-environmental behavior adoption. It can raise the awareness of environmental issues (Matthews, 2016), educate people on the possible solutions to these problems (Xi, 2011), and actually make people act by providing external rewards concurrently satisfying the internal motives of the individuals (De Young, 1996). Szaky (2016) also identifies the great incentive of utilizing gamification for environmental sustainability in its ability to create reward systems and maintain user involvement and engagement, by facilitating competition and constant flow of communication among users.

Summarizing the existing theoretical findings, it is possible to suggest that gamification of pro-environmental behavior change is the process that involves many factors that should be considered by the developers. The objective of this research is to define these factors, by gathering the already present knowledge and analyzing the gamified corporate case from the users' perspective. Additional contribution of this research is in its mixed-method approach that provides findings resulted from both qualitative and quantitative data, as many earlier researches on gamification used quantitative methods (Hamari et al., 2014).

1.4 Theoretical framework

The core of the research theoretical framework (Figure 1) is based on the gamification process defined by Morschheuser et al. (2017), with the only difference that initially separated design and implementation, as well as evaluation and monitoring stages are put in two larger steps of the development. The decision behind this is that the research is focused on providing theoretical and practical outlooks on the issues that should be considered during the planning, analysis and ideation phases of gamification process, rather than on creating the pilot version and evaluating its effectiveness. This theory on gamification is selected due to its up-to-date content, which serves as a unification of the previous theories and models on developing a gamified experience.

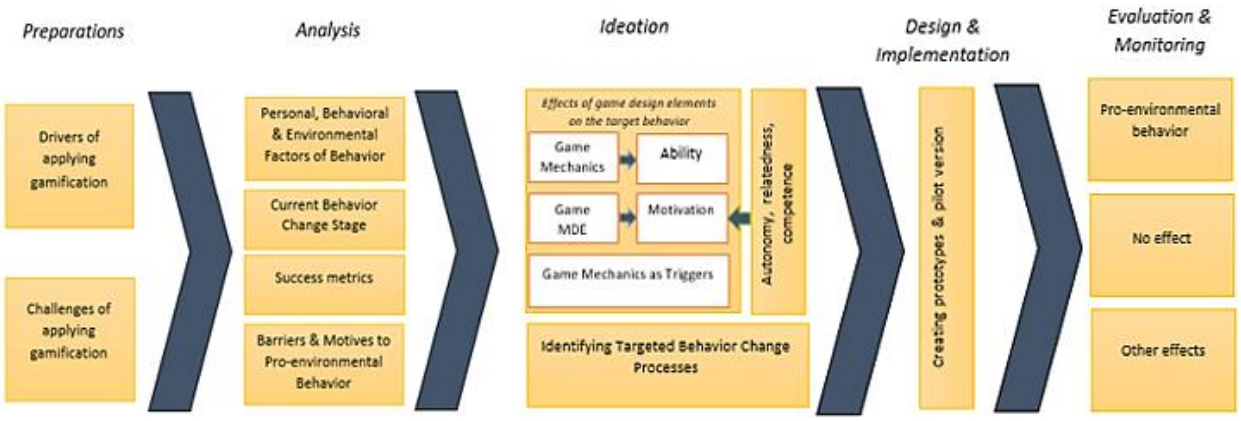

Figure 1. Ex-ante theoretical framework. Gamifying pro-environmental behavior

The first stage of the gamification process is the *preparation stage*, where the aims of the project should be identified (Burke, 2014, 90; Klevers et al., 2015). However, it is assumed that determination of the drivers and challenges of gamification should also take place at this stage, as this information can contribute to the understanding whether gamifying the experience is actually suitable for the targeted corporate objective, in particular case, for the motivation of pro-environmental behavior change. Only after that, it is possible to move to the *analysis stage*, where the target audience as well as success metrics are defined and characterized (Werbach & Hunter, 2012). Considering the delimitations of the research, the target audience is analyzed only from pro-environmental behavior change perspectives, therefore, the barriers (Kollmuss & Agyeman, 2002) and motives (McKenzie-Mohr & Schultz, 2012) for performing this behavior, as well as factors (Bandura, 1986) and stages of behavior change (Prochaska & DiClemente, 1983) determined from the current behavior of the target audience should be considered here.

The *ideation stage* involves brainstorming and consolidating ideas, and whereas the former process is aimed at coming up with as many ideas as possible to have a variety of design alternatives, the latter one should be done to form a list of ideas for the design phase. (Kapp, 2012; Deterding, 2015, 318; Morschheuser et al., 2017, 1302.) Therefore, it is suggested that game design elements considered on this stage of gamification should be formulated with their effects on behavioral processes.

Fogg (2009) presents the behavior model in which he assumes that behavior is affected by three main factors: motivation, ability and triggers. From the definition, triggers are seen as special game mechanics that can serve as reminders, sparks or facilitators of the behavior.

In the meantime, motivation is claim to be affected by a variety of game design elements (Robson et al., 2015), and the ability that refers to the perception of simplicity of the task is guided by the game mechanics. (Fogg, 2009; Basten et al., 2015; Hrena, 2016.) Motivation, however, is suggested to be also influenced by the process of satisfying three basic psychological needs for autonomy, relatedness, and competence (Ryan & Brown, 2003, 73).

Additionally the stages of behavior from transtheoretical model, which are already placed on the analysis stage, are assumed to be correlated to the processes of change (Prochaska & DiClemente, 1983; Velicer et al., 1998; Lenio, 2006, 77). The research does not focus on testing this theory per se, although it assumes that it order to define the targeted audience, it is necessary to look at the current stage of people's change process and identify the behavioral process that should be targeted by the appropriate game design elements further on during the gamification process.

The ideation stage is followed by *the design and implementation*. The design refers to creating the prototypes, which leads to launching a pilot version (Brito et al., 2015; Fitz-Walter, 2015). Once the gamified system is launched, *the evaluation and monitoring* take place. Evaluation is usually done through interviews, A/B testing, playtesting or surveys to observe user behavior (Helms et al., 2015; Klevers et al., 2015). The particular research utilizes the already existing gamified mobile application with the real users, and in order to evaluate their behavior the online questionnaire is utilized (Appendix 1). Thereby, it is possible to estimate the potential outcomes of applying gamification to reach pro-environmental behavior. This process can per se result in bringing a qualitative behavior change, no effect or other outcomes that are defined in the framework once the empirical part is ready. In order to have a long-lasting success of the gamified experience, it is also recommended to have continuous monitoring in order to be able to improve and optimize the project (Radoff, 2011; Morschheuser et al., 2017).

1.5 Research methodology

The study takes an abductive approach, as it allows the researcher to formulate new looks at the phenomenon of gamification in the environmental sustainability context concurrently with accumulating and analyzing the already existing theories and models of human motivation and behavior change. Abduction refers to the "continuous interplay between

theory and empirical observation", and correlates well with the research objective (Dubois & Gabbe, 2002, 559).

The research is exploratory in nature, due to the little study of the application of gamification for pro-environmental behavior change (AlMarshedi et al., 2014). Abductive research approach requires the collection of sufficient amount of detailed data in order to develop tentative theory. Therefore, the present study has a mixed method design, presented in the form of data triangulation or intramethod mixing (Johnson et al., 2007; WiŚniewska, 2011).

The strategy of the study is built on research objectives and questions, the amount and quality of exiting knowledge, the availability of time and resources for implementing the research (Saunders et al., 2009). The strategy provides the overall direction of the research (Remenyi et al., 2003), and for the particular investigation single case study design was chosen. Exploring the process of potential behavior change in the given environmental context is possible with the involvement of the gamified application JouleBug that serves as a prelude case for possible further research (Yin, 1994, 38-41). Moreover, the case possesses the unique features that serve as the selection criteria. It is focused on multiple ecological problems and provides an opportunity to create research environments with the equal conditions for users' participations.

Although environmental psychologists have researched the effects of related to gamification systems on motivating pro-environmental action (e.g. see Froehlich et al., 2010; McKenzie-Mohr, 2012), the topic of the present research has not yet been studied. Therefore, to gather sufficient amount of data, the principle of "methodological triangulation" is utilized, i.e. both primary and secondary data are collected (Denzin, 1989; Berker & Zauszniewski, 2012).

Whereas the corporate website, blog and online articles on the operations of the company serve as sources of secondary data; a semi-structured interview with the company representative - Grant Williard, co-founder and President, and the online questionnaire are chosen as primary data collection methods. The aim of the in-depth interview was to obtain detailed information on the operations of JouleBug. Meanwhile, the questionnaire format was chosen to get insights on the people's behavior and attitudes, as well as on the external factors that affect motivation and behavior change. It consisted of both close- and open-ended questions that were suitable for testing existing theories and getting in-depth opinions

and emotions of the users. All of the questions involved a sense of freedom and spontaneity of answers that minimized the effect of limiting respondents and maximized the opportunity to get data suitable for formulating the theoretical framework and answering the research questions. (Oppenheim, 1992; Bird, 2009, 1311; McLeod, 2014; Trueman, 2016.)

The interview took place online via email with accordance to the interviewee's preferences, while the data from questionnaire were collected and analyzed through the online software Qualtrics. In total, 50 respondents took part in the questionnaire, which refers to the 96% response rate. The data was analyzed with the phenomenological approach, which is considered appropriate for generating new conceptualizations (Thorne, 2000).

1.6 Delimitations

Delimitations for this research are formulated, considering the two categories: access to the information and narrowing down the scope of the research. Initial delimiting factors of this study are the aforementioned research problem and objective. (Simon, 2011.)

According to the stated objective in sub-chapter 1.1, the research focus is set on four main issues, which are 1) the application of gamification for 2) motivating people 3) to change their behavior into 4) more pro-environmental manner.

The use of gamification and the overall analysis take form of a single case study approach and apply the online questionnaire to collect extensive primary data. Therefore, the investigation is operated in the frames of one mobile application and addresses the sample of fifty people, who are the actual users of the application. The research does not consider the cultural differences of the respondents that may influence the process of motivation and behavior change, although users are originally from different countries. Moreover, the research does not empirically cover all possible game design mechanics, but rather utilizes PBL triad, known as points, badges, and leaderboards (Werbach & Hunter, 2012). Despite the review of the players' types, the developed theoretical framework does not include the identification of these types and does not test it empirically, as the main focus is on factors forming people's behavior, rather than on the description of users of the app. While analyzing the general effect of gamification elements on the extrinsic and intrinsic motivation, the study does not have a purpose of evaluation "motivational affordance" of the particular mechanics and dynamic (Zhang, 2008; Huotari & Hamari, 2017).

The gamification development process by Morschheuser et al. (2017) is taken as the conceptual basis for creating the theoretical framework of the study, and the processes of ideation, designing and implementing the gamified prototypes are not a part of the research. There is an intention to formulate and test the theory, where the initial goal of the gamified project is set as creating pro-environmental behavior change. Other potential objectives of the gamified experience are not included in the study, as well as the identification of success metrics, as those are determined by every business entity individually (Kapp et al., 2014).

Motivation as well as behavior change are the complex concepts that are widely theoretically and practically studied from different research perspectives. Therefore, the theoretical part of the present research work is based on the following theories: self-determination theory (Deci & Ryan, 2000), social cognitive theory (Bandura, 1986), transtheoretical model (Prochaska & DiClemente, 1983), behavior model by Fogg (2009), and the model for pro-environmental behavior (Kollmuss & Agyeman, 2002). These theories perfectly contribute to the development of the theoretical framework and help to address the most essential factors that relate to the process of motivation people and changing their behavior. In the meantime, the research considers motivation from the intrinsic and extrinsic perspectives and omits amotivation, because users are motivated to some extend to utilize the app. Controlled and autonomous motivations from STD are not included in the research.

The research takes place in the context of environmental sustainability and addresses pro-environmental behavior, thereby, it does not include the analysis of the two other pillars of sustainability, social and economic ones, though does consider that these elements of sustainable development mutually reinforce each other (Farley & Smith, 2014, 149).

1.7 Outline of the research

The present research is presented in the reporting form, which is divided into eight chapters.

Chapter 1 is the introductory part of the research, and it involves the directions that guide the overall work. Firstly, the author provides insights on the research gap, its objective and questions, which are followed by the presentation of theoretical framework, literature review and definition of key research concepts. The research methodology as well as delimitations are also described in the introductory chapter.

Chapter 2 is the first among three theoretical chapters, as it opens up the discussion on the topic of gamification, its distinctive features, challenges and drivers. The gamification

development project and its stakeholders are also defined here. Another sub-chapter provides more information on the game design elements and their correlation with human motives.

Chapter 3 possesses the aim of investigating the topics of motivation and behavior change. Special emphasis is put on the impacts of gamification on motivating people perform a change in their behavior. This part of the study defines the major theories and models that are in the core of the theoretical framework of the research. The processes of motivation and behavior change are also analyzed from the perspective of gamification.

Chapter 4 includes the main aspects that describe the environmental sustainability context of the research. Here the focus is put on defining pro-environmental behavior, and the motives and barriers people usually perceive when performing this behavior. The chapter is concluded by emphasizing the role and influence of applying gamified systems in the context of environmental sustainability.

While chapter 5 provides information on the research methodology and explains the choice of abductive research approach, mixed methods design, single case study strategy and suitable data collection methods; chapter 6 presents the actual results and findings of the study as well as describes the case company and users perception of the application.

Basing on the empirical results and theoretical data, chapter 7 represents the discussion, which leads to chapter 8 where conclusions in form of theoretical and managerial implications are identified. The limitations and suggestions for further research are also placed under the last chapter of this diploma work.

2 INTRODUCTION TO GAMIFICATION

People are familiar with games from an early age, but when it goes to gamification, there is a great possibility of concept misunderstanding and strategy misuse. Gamification has great potential in business, education, sustainability and other spheres of action, although now many companies and people are not just getting it right. (Burke, 2014, 6-7; Kapp et al., 2014, 15.) In 2012, Gartner predicted the majority of organizations that used gamified systems for business objectives would fail, primarily due to the poor design; while Daniel Newman (2016) put gamification as one of the top business trends, saying that in 2017 gamification "will go from a footnote to a core business strategy". Obviously, there is an ongoing discussion about the application of gamification and its effects on business operations and human activities (de Queirós & Pinto, 2017).

Therefore, in order to gain understanding on the concept as such and identify the uniqueness and potential of gamification, a variety of existing literature on gamification was analyzed and presented in this chapter. The following sub-chapters open up the discussion on the origins of gamification and the unique differentiating features of gamification. Moreover, it provides the theoretical review of the game design elements and the gamification development process, as well as provides the definition of the concept.

2.1 Origins of gamification

Going in the history of gamification is essential in order to build solid basis for defining the concept "gamification" and identifying its features that, in turn, is helpful for determining gamification from other terms, like playful design, serious games or persuasive technology.

Despite the usual misuse of term "gamification", the popularity of applying different game elements and fun has been known for long. Already in 1896, the company called S&H Green Stamps started to sell stamps to the retailers so those could use them for rewarding loyal customers (E-learning Infographics, 2014). Then in 1912, the Cracker Jack Company decided to put a surprise toy in every box of their product. Since then a great variety of firms utilized different game elements to sell their products by attracting and engaging customers. As nowadays, more and more businesses consider using game and fun elements to increase their business results, these historical examples greatly correlate with current understanding and application of gamification in this sense. (Werbach, 2017.)

Sixty-eight years had passed before the next important moment in the formation of gamification took place. It was, created by Richard Bartle and Roy Trubshaw, MUD1 or "Multi-User Dungeon"– the first widely known and used multiplayer online game, completely different from what is considered a game now, but still an interactive platform for collaboration. (Nielson, 2013.) Interestingly, exactly this first shared virtual experience that was created game-like thanks to the tasks and actions available to players, Bartle was calling "gamification" (McCormick, 2013).

However, according to Corbin (2015), it was not until 2002, when the actual term "gamification" appeared. This fact deals with the creation of Serious Game Initiative for a purpose of solving challenges in the areas of education, national defense, healthcare, and homeland security. It brought together two processes – learning and gaming, and aimed at integrating games into public policy, strategic communication and other aforementioned spheres of life. As such, serious games are defined as games designed to develop targeted skills of its players (Stege et al., 2011). While entertaining games are designed to bring pleasure and fun to the users, serious games are focused on combining educational goals with specific game mechanics that support learning processes. A principle of serious games is to promote intrinsic motivation for learning by applying reward systems. Therefore, apart from utilizing elements of video game design to create enjoyable environments, serious games are also based on theories of development and learning. (Whyte et al., 2015.)

Brian Burke (2014, 5) says that the concept "gamification" was first coined by a British consultant Nick Pelling in 2002. He referred this term to the utilization of game-like accelerated user interface design to make electronic transaction faster and more entertaining. (Perryer et al., 2016.) From then on, the term "gamification" has obtained a broader meaning and has started to popularize. It got the widespread adoption in the second half of 2010 primarily thanks to the establishment of specialized companies and industry players, like BigDoor and Bunchball that nowadays focus on utilizing gamification for business purposes. (Deterding et al., 2011, 1; Prakash & Rao, 2015, 35.)

Obviously, the evolution of gamification was not immediate (Prakash & Rao, 2015, 36) and its underlying ideas have already been researched previously (Deterding et al., 2011, 1). However, it is also possible to formulate three recent developments that have had an impact on the growing interest towards gamification these days.

First of all, the growing importance of game industry over the last two decades has induced game designers and researchers investigate a lot the question of what makes computer games so successful. That, in turn, has resulted in a variety of theories and studies about proper design and management of engaging game experience, alongside in a number of frameworks that specify elements that motivate people to play. (Robson, 2015, 412.)

Secondly, the appearance and popularity of mobile and web-based technologies as well as social media have modified the way individuals and companies act i.e. participate in events, share and exchange information, cooperate and discuss. (Kietzmann et al. 2011.)

Third development is about organizations, both non-profit and commercial, constantly being interested in broadening the ways of connecting with its customers or/and employees, learning from them and influencing their behavior (Robson, 2015, 412).

2.2 Defining gamification, its aims and features

Despite the long history of gamification formation and its current worldwide popularity, there is still no universal and commonly accepted definition of the concept as such. By having great potential in different areas of business operations, gamification is just not understood right by most of the companies. (Burke, 2014.) Thereby, in order to create a more holistic picture on what gamification actually is, this chapter identifies its distinctive features from play, game, serious game, game-based learning and playful design.

Play vs Games vs Gamification

Basic definition of gamification formulated by Deterding et al. (2011a) claims that gamification is “the use of game design elements in non-game content”. Obviously, the talk here is about a game, rather than a play.

Play is freeform, expressive and has no externally imposed objectives, which means that the only thing it pursuits is fun. Play represents a broader category than game, since play starts to be a game once rules are applied to it. (Juul, 2015; Marczewski, 2015.) Apart from the rules, games are categorized by competition or strife of its human participants towards quantifiable outcomes or aims (Salen & Zimmermann, 2004). Jane McGonigal (2011, 21) identifies two more components of games that are a feedback system and voluntary participation. While the feedback system informs players about how close they are to

reaching their goal, voluntary participation supposes that all players of the game are aware of and accept the goal, rules and feedback willingly. (McGonigal, 2011, 21.)

In turn, one of the differentiations between a game and gamification is that, in comparison to a game, the latter is not a self-contained unit and does not possess a distinct beginning, midst, and end (Brigham, 2015). The major difference between game and gamification lays in the nature of problem they solve. Gamification tries to figure out a solution for a real world problem and engages people to reach their real-life targets, applying proper game mechanics and dynamics. Therefore, it is utilized to obtain goals that are beyond game context, for example, goals of healthier or greener living. (Catalano, 2012; Bohyun, 2015; Masie, 2015.) In particular, aims of gamification are to engage, impact, and motivate diversified groups of people, i.e. to build up customer interaction and loyalty or to encourage employees and other stakeholders (Bunchball, 2016, 2).

Game-based learning vs Gamification vs Serious Games

With a great set of possible aims mentioned above, gamification has huge potential to be widely implemented in different contexts, e.g. healthcare, government, sustainability, or education (Robson et al., 2015, 412). Nowadays, there is a number of studies concerning the use of game structure and game elements for educational and motivational purposes, and quite often the concepts of gamification and game-based learning (GBL) are confused there. (Farber, 2015, 16; Majumbar, 2015.)

In their comparative study, Al-Azawi et al. (2016) state the difference between GBL and gamification as follows: whereas GBL applies a game as a segment of the learning process, “gamification turns the entire learning process into a game”. Gamification utilizes game mechanics and gameplay elements in existing educational courses to engage and motivate learners. In other words, gamification makes the complete e-learning process a game, and GBL turns just a singular learning objective from a course into a game.

Another popular confusion exists between the concepts “gamification” and “serious games”. Serious games are defined as computer/video games that have a set of appropriate design properties and are focused on delivering knowledge instead of implementing an entertaining function, as traditional games do. (Ghanbari et al. 2015.) The similar feature that gamification and serious games share is their use of game design elements. However, there is still a distinction between these concepts (Hughes, 2013; Marczewski, 2013).

Serious games are games that have not only entertainment purposes, but also educational and informative aims, while gamification is considered as the application of typical game elements within non-playful contexts, in particular to impact behavioral changes and develop new habits of its users (DASIC, 2014). Pappas (2017) adds that serious games have some form of training value, i.e. a learner has to overcome a series of challenges in the game in order to build necessary skills. Serious games are aligned with a specific learning objective and can exist independently, whereas gamification includes the traditional e-learning structure. Therefore, gamification is seen as more than serious games, since it utilizes game mechanics and thinking into different non-game environments, while serious games use game elements into "serious" subjects like politics or defense. (Hughes, 2013.)

Gamification vs Playful Design

The main difference between gamification and playful design is that the latter one misses such important elements, as rules and the specific goal. A famous example of playful design is Twitter's Fail Whale. (Bohyun, 2015.) Having this playful design as an alternative to the "boring" error message, Twitter was able to diminish users' frustration and attracted their attention, as some users visited the website just to check the popular image (Russell, 2013).

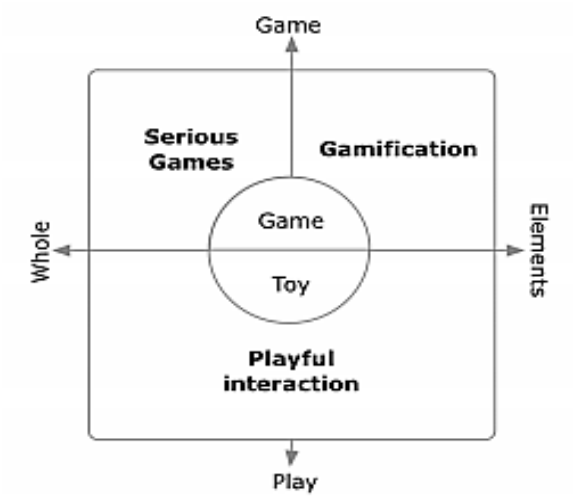

Figure 2. Defining gamification (Deterding et al., 2011a, 2)

Although Kapp (2012, 17) does not differentiate gamification from playful design or full-fledged games, saying that gamification utilizes game mechanics "for a purpose other than pure entertainment", this literature review suggests that gamification has its unique features. Figure 2 shows the distinction between gamification, serious games and playful interaction.

Table 1. Definitions of Gamification

SOURCE	CONTEXT	ELEMENTS	GOALS	DEFINITION
Deterding et al. 2011b	Non-game context	Video Game Elements	User Experience & User Engagement	"the use of video game elements in non-game systems to improve user experience and user engagement"
Zichermann & Cunningham, 2011, xiv	User engagement	Game thinking, Game mechanics	User Engagement & Problem Solving	"the process of game-thinking and game mechanics to engage users and solve problems"
Lee & Hammer, 2011	Education	Game mechanics, Dynamics, Frameworks	Promotion of Desired Behavior	"the use of game mechanics, dynamics, and frameworks to promote desired behaviors"
Burke, 2014, 6	Business, Innovation	Game mechanics, experience design	Users Motivation & Engagement	"the use of game mechanics and experience design to digitally engage and motivate people to achieve their goals"
Bunchball, 2016, 2	Business, Marketing	Game mechanics, dynamics	User Motivation & Engagement	"the process of integrating game mechanics and dynamics into a website, business service, online community, content portal, marketing campaign or even internal business process in order to drive participation and engagement by target audience"
Huotari & Hamari, 2017	Service marketing	Motivational affordances, i.e. "stimuli designed with the intent of provoking the users' motivational needs and affecting the users' psychological states" (Huotari & Hamari, 2017)	User Experience, Value creation	"a process of enhancing a service with affordances for gameful experiences in order to support users' overall value creation"

Summarizing the data from Table 1 and other definitions of the concept, gamification can be described as the application of game design elements, game mechanics and game dynamics in non-gamified environments in order to engage and motivate users, change their

behavior and solve problems, thereby, supporting users to achieve their goals. By doing so, gamification eventually helps business entities reach their objectives. (Catalano, 2012; Dominquez et al., 2013; Brigham, 2015; Masie, 2015; Robson, 2015, 412.)

Speaking about the nature of gamification, limiting it to digital realm or software application, as it is done in the definition of gamification by Burke (2014, 6) in table 1, is supposed to be overly restrictive. Deterding et al. (2011a, 3) suggests not confining the term "gamification" to precise context, purposes, and scenarios, and argues that games themselves are "transmedial" categories, while media convergence and pervasive computing are currently making differentiation between non-digital and digital vague. That brings up the idea that restricting the use of gamification to digital realm should not take place. (Bohyun, 2015.)

2.3 Gamification elements

According to the data from table 1, there are different elements utilized in gamification, and this chapter is going to provide deeper insights on so-called building blocks of gamification (Surugiu, 2014, 23), in particular on game mechanics, game dynamics and emotions. The MDE framework (Figure 3), that stands for "Mechanics, Dynamics, Emotions", by Robson et al. (2015, 413) is taken as the basis for the following literature review. Worth noting, that suggested framework is meant to show the interdependent relationship of game mechanics, dynamics, and emotions, and the idea that when utilized together, they can create and broaden the gamified experience of the player (Robson et al., 2015, 416).

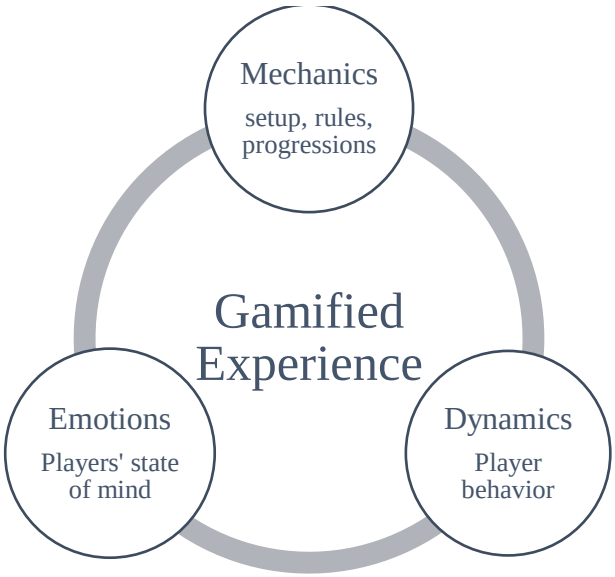

Figure 2. MDE framework of gamification elements (Robson et al., 2015, 413)

Game mechanics determine the whole structure of the game and are considered fundamental for creating engaging user experience. They are elementary actions, processes and control mechanisms that are used individually or together to gamify some specific activity. (Prakash & Rao 2015, 42; Bunchball, 2016, 3.) Game mechanics define the complexity of the game, as they are created to designate goals, rules, setting, context, and types of interactions in the game. In other words, game elements outline such issues, as who the key parties of the game are, how they interact, determine how to win or lose in the game, and certainly when and where the experience takes place. Game elements include anything a player can do in a game and exist before the gamified experience begins and stay constant, i.e. do not change depending on a player. (Dunniway & Novak, 2007, 5; Robson et al., 2015, 413-415.)

There are different types of game mechanics:

- *Setup mechanics* that form the environment in which experience takes place and, thereby, influence the overall context of the experience, e.g. setting;
- *Rule mechanics* that build the concept of the goal to be achieved during the experience;
- *Progression mechanics* that depict various kinds of tools that are used by designers to influence the experience when it happens, and therefore, are thought especially important in gamification (Elverdam & Aarseth, 2007).

Game mechanics include famous PBL triad – points, barges, and leaderboards – levels, virtual goods, gifts. They are the rules and rewards of the game, which are aimed at creating the well-gamified user experience and, depending on how players follow these mechanics, game dynamics are produced. (Robson, 2015, 415; Bunchball, 2016, 3.)

The dynamics describe players' behavior and their strategic actions and interactions in the game (Camerer, 2003). Predicting behaviors is a challenging task for designer, but they have to develop the suitable mechanics to create user experience that would drive intended behaviors. Therefore, the linkage between game mechanics and dynamics is obvious: by utilizing appropriate game mechanics and, thus, satisfying players' desires, it is possible to create experience that drives behavior. (LeBlanc, 2004; Robson et al., 2015, 416.) The examples of game dynamics are status achievement, self-expression, or competition. They are universal motivators that people possess (Bunchball, 2016, 6). The correlation between several game mechanics and dynamics is shown in table 2, with the red marks identifying the great extent of interplay.

Table 2. Correlations between game mechanics and dynamics (Bunchball, 2016, 5).

Game mechanics	Human Desires					
	Reward	Status	Achievement	Self-expression	Competition	Altruism
Points	x	x	x		x	x
Challenges	x	x	x	x	x	x
Levels		x	x		x	
Leaderboards		x	x		x	x

The third element of MDE framework is emotions, which are used by Robson et al. (2015) as a term that "better links to the engagement outcomes" that businesses may get from employees and customers. The MDE framework is derived from the attitude to game design that underlines the necessity to understand game mechanics, dynamics, and aesthetics. The concept "aesthetics" depicts the desirable emotional responses of players, when they play the game and appears in the forms, such as discovery, fellowship, or fantasy. (Hunicke et al., 2014.) In MDE framework, emotions are players' states of mind that are evoked as the result of interaction with a game, i.e. they are the consequences of the way players follow the mechanics and generate dynamics. As such, in the gamified experience emotions are ought to be attractive and fun-oriented. (LeBlanc, 2004; Robson, 2015, 416.)

2.4 Gamification stakeholders

By understanding the individuals engaged in the gamified experience, it is possible to understand gamification (Robson et al., 2015, 414). Obviously, gamification is supposed to target key human features and desires and can be utilized to engage practically anyone in order to evoke particular behavior. It was already discussed that gamification can be applied in a great variety of situations where people are supposed to be motivated or encouraged to maintain particular actions. (Bunchball, 2016, 9.) However, in order to understand the motives of individuals who participate in a game experience, it is beneficial to address Richard Bartle's classification of user types for a game (Figure 4). There are achievers, explorers, socializers, and killers.

While achievers are only interested in getting points and increasing their game levels, explorers pay most of their attention on the internal design of the game they play. Socializers, in turn, play a game in order to find other users and get engaged in the interactions and discussions with those. The stimulus for this type of users is a community. Killers, in the

contrary, do not really know how to express themselves and, thereby, impose themselves on other participants, usually creating nuisances and abusing fellows. They are also competitive players whose goal is triumphing by challenging others. The figure 4 illustrates in-game behavior, motives and play styles of each user type: whereas killers act on other participants and achievers act on the world, socializers interact with other users and explorers interact with the world. (Dixon, 2011, 1; Stieglitz et al., 2017, 12-13.)

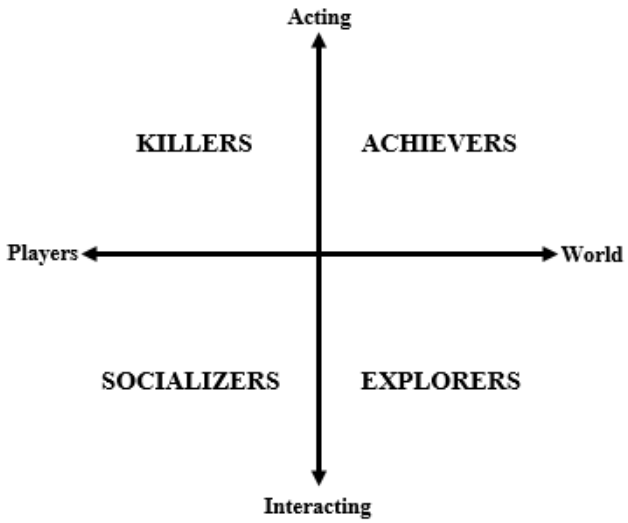

Figure 4. Bartle's player types (Bartle, 1996)

From the business perspective, Brian Burke (2014, 36-37) outlines the following targeted audiences: customers, employees, and communities of interest. Some organizations apply gamified solutions to engage and motivate either the entire group of employees or a subset of the base that has a specific goal. Other companies utilize gamification to engage their customers, for example, to add value to product offerings or to educate consumers on how to use a product. Meanwhile, for communities of interest gamified solutions are usually openly available online and can be utilized for a great variety of purposes.

Apart from players who compete in a gamified experience, Robson et al. (2015, 414) determine three more types of people involved in gamification, and those are designers, spectators, and observers. Whereas designers are the decision makers who develop, often manage and maintain the experience, observers are the outside individuals that are just passively involved in the process. Despite the fact that observers have no direct influence on the gamified experience, their presence is essential to its popularity. Spectators also take a passive role in the experience and do not directly compete in a game, although they still have an indirect effect on the experience by contributing to its atmosphere. In business entities,

spectators can be supervisors that ensure the smooth flow of the experience, but do not take part in designing or competing. Observers can be employees from other business departments, who are not involved in playing, but follow the experience to see the results.

2.5 Gamification development process

According to one of the most recent studies on the process of developing a gamification experience by Morschheuser et al. (2017), such kind of a project includes seven phases (Figure 5). Each step will be described in the following chapter, basing on the original research by Morschheuser et al. and other supporting literature on gamification.

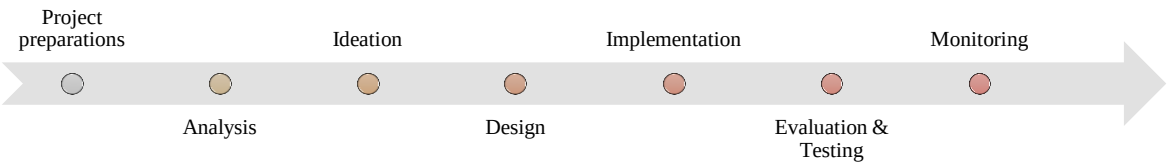

Figure 5. Phases of developing a gamification process (Morschheuser et al., 2017)

The preparation stage of a gamification project involves the identification of the problem or several problems that will be addressed with the help of gamification and the determination of goals that will be used to measure the success of the project. The main activity to do on this stage is to clarify the project's targets and identify whether gamification is actually suitable and effective for these objectives. In order to follow the project process, companies are supposed to create a project plan with all specific details, like deadlines, duration and budget, success criteria and project teams. (Burke, 2014, 97; Klevers et al., 2015; Morschheuser et al., 2017; 1300.)

Collecting and analyzing information about the target audience and the area of applying gamification are the main activities on *the analysis stage*. In general, defining the target group can be done via interviews, observations, focus groups, surveys, and analyzing behavior chains (Werbach & Hunter, 2012; Marache-Francisco & Brangier, 2013). By applying these data collection methods, companies should be able to depict and characterize the target audience, i.e. to identify users' needs, motives and behaviors in the system (Morschheuser et al., 2017; 1300). Burke (2014, 102) also emphasizing the need of creating player personas, imaginary individuals that represent some common feature of character of a particular group of people, since this is helpful to avoid abstract discussions within a project group. Meanwhile, the analysis of the system consists of the description and understanding

of the context, in which gamification will be utilized. Morschheuser et al. (2017; 1301) also include the depiction of success metrics on this stage of developing a gamification project.

After information about users and context is gathered and analyzed, it is time to start developing a gamification process, which preliminary needs to go through *the ideation stage*. The activities here are brainstorming and consolidating ideas, and whereas the former process is aimed at coming up with as many ideas as possible to have a variety of design alternatives, the latter one should be done to form a list of ideas for the design phase. (Kapp, 2012; Deterding, 2015, 318; Morschheuser et al., 2017, 1302.) Masie (2015) suggests recognizing three aspects when formulating the design ideas:

1. Every participant should be able to help shaping and personalizing his personal gamification experience;
2. A player should have a safe failure on the way to success;
3. Gamification elements can be successful when applied to a group as well as to individuals.

Additional RECIPE for meaningful and successful gamified experience is formulated by Reiners & Wood (2015, 5), and that is acronym for reflection, engagement, choice, information, play, and exposition. Reflection means helping users to find other interests and past experience that might deepen engagement, which, in turn, correlates with encouraging players to discover and learn from others who are interested in the settings. Choice is an important part of gamification as it implies to giving participants freedom and power within the experience (Werbach, 2017), as well as information since providing people with some details about the real-life context, the role of gamification diminishes (Hall, 2014). Meanwhile, play in this framework relates to the “failure within boundaries” by Masie (2015) and exposure is about creating stories that are intertwined with real world setting.

The ideation stage has a great linkage with and is followed by *the design of prototypes*. Once the ideas are collected, it is recommended to focus on rapid creation and development of prototypes that should be iteratively tested to evaluate the efficiency towards achieving previously identified objectives and establish a development concept. (Brito et al., 2015, 446; Morschheuser et al., 2017, 1302.) This concept includes all the information necessary for *the implementation of a design*. That is another stage of gamification development process, which outcome is to create a pilot. (Fitz-Walter, 2015.)

Once the pilot is ready, it is necessary to evaluate the design and access whether it meets the determined project objectives. *The evaluation*, implemented through interviews, A/B testing, surveys or playtesting that means observing user behavior, results in a number of quantitative and qualitative outcomes. (Helms et al., 2015; Klevers et al., 2015; Morschheuser et al., 2017, 1303.) In order to have a long-lasting success of the gamification project, it is recommended to do continuous *monitoring*, so to be able to come up with improvements and project optimization (Radoff, 2011).

2.6 Drivers & challenges of applying gamification

With the current growing importance of mobile web, social media and video games, there is a subsequent raising popularity of gamification that can be applied in a variety of areas for achieving different goals (Kim, 2015, 8). However, in order to get a full understanding on the process of utilizing gamification, it is beneficial to have an analysis of motives and benefits of applying gamification, and challenges and criticism it faces.

One of the greatest motives for using gamification in business, education and other industries is its ability to increase user involvement and engagement (Brigham, 2015). Especially for companies, gamification is beneficial to be implemented, since it supports and boosts the bottom-up collaboration, develops the culture of innovation, by bringing flows of ideas, and creates ongoing relationship among users (Dale, 2013). Prakash & Rao (2015, 103 – 108) also identify skill identification and easier performance appraisals as advantageous impacts of using gamification. Therefore, it is obvious that the wide range of objectives that gamification can contribute to are seen as a driver for applying it, in particular, in business.

Apart from that, Chou (2016, 3) formulates eight core drivers of gamification that are in detailed described below.

1. Epic meaning and calling: gamification participants feel and think that they do something great themselves, that the purpose and impact of their activities is huge and sufficient.
2. Development and accomplishment: internal drivers that motivate people to make progress, develop new skills or achieve mastery by overcoming challenges. Such gamification elements as points, badges and leaderboards, focus on these aspects.
3. Empowerment of creativity and feedback: the driver that is expressed in users constant engagement of a creative process that happens when people figure out new

things over and over again, trying different combinations of actions. However, participants are not only in need of expressing their creativity, but also in receiving feedback and adjusting their actions accordingly.

4. Ownership and possession: users are motivated in participating in the process, as they have a feeling of owning and controlling something; and when an individual senses ownership over something, they innately becoming willing to multiply and improve what they possess. In gamification system, this mostly relates to virtual good or virtual currency.
5. Social influence and relatedness: the driver that implies to all possible social elements that motivate people, such as social feedback, competition, mentorship, social acceptance or even envy.
6. Scarcity and impatience: people start to want something more, when they know that it is limited, rare or exclusive. For this reason, a lot of games have torture breaks or appointment dynamics, for example, when it is possible to accomplish a bonus task or level once in several hours and if they lose, they have to wait for it to be available again.
7. Unpredictability and curiosity: by not being aware of what can happen next, users can stay engaged and excited about the game experience.
8. Loss and avoidance: a motive that signalizes the people's desire to prevent something negative from happening.

Meanwhile, Chou (2016, 11) also determines a ninth core driver – sensation – physical pleasure that a user obtains from taking some actions that differentiate from aforementioned eight drivers. Sensation relates to the physical feelings that bring pleasure to the hearing, sight, taste, smell, or touch.

Interestingly, the existence of one or several drivers does not only make people act and change behavior, but can also make them feel powerful, while other motives can make people feel bad and create obsession, or even addition, therefore, it is highly advisable to consider those wisely once designing a gamification project (Reiners & Wood, 2015, 70-72, Chou, 2016).

Once drivers and benefits of gamification are clear, it is the time to have a look at its possible challenges and critiques in order to be able to evaluate and optimize the gamification process. In 2012, Gartner assumed that by 2014, 80 per cent of gamified applications would fail to

meet their business objectives, and stated the main reason for that is poor design. Indeed, designing and implementing gamification is considered to be complicated and beyond the expertise and knowledge of many specialists (Fogel, 2015). Apart from that, developing a game experience is a time and effort-consuming process, which sometimes can even be non-beneficial, not tied enough to strategy or business objectives (Brigham, 2015; Chavez, 2015).

Among challenges for business entities, Prakash & Rao (2015, 108 – 111) determine the following obstacles for gamification. First of all, they speak about the internal buy-in problem, meaning that that idea of utilizing gamification for business purposes should be well-defined and accepted by the management. Secondly, reaching successful outcomes of game experience is possible when there is clear communication, i.e. users share common passion, interest, or goal, and thereby are engaged and motivated. The delivery of a clear message is management's responsibility. Moreover, the challenge of setting appropriate scoring and incentive systems takes place and assumes clarifying clear quantifiable benefits that users will appreciate responsively without abusing the system. Another challenge when designing gamification can lay in the idea that in order to motivate people, it is necessary to create something meaningful, and the perception of what can be meaningful is defined by each individual. However, the solution for the last obstacle is to focus on creating as many experiences and ways of engagement as possible, therefore, to raise chances for every participant find something valuable. (Nicholson, 2012; Reiners & Wood, 2015, 4.)

Apparently, there are different aspects that speak for and against applying gamification for reaching business and societal objectives, and making the decision on whether to utilize it or not depends on the enterprise and its area of operations.

3 MOTIVATION & BEHAVIOR CHANGE THROUGH GAMIFICATION

The need for change is sustainable throughout the life, as people tend to look for new opportunities, try to improve their lifestyle, and seize undesired behaviors. However, getting people to develop and make a behavior change involves the issue of motivation. (Carlstensen & Hartel, 2006.) The reality is such that changing behavior is difficult, as it represents a staged process that is affected by a variety of internal and external factors.

The main objective of the research deals with understanding the relationship between gamification and motivation to perform behavior change. Therefore, the intention of this chapter is to analyze the existing models of motivation and behavior change and to discover the presence of theoretical findings and frameworks on applying gamification for fostering behavior change and affecting different types of human motivation.

3.1 Definition and types of motivation

Due to the complexity of motivation and the lack of its understanding, it has been one of the most often analyzed and researched themes in psychology. Motivation has been conceptualized in various ways, such as inner forces, enduring traits, sets of affects and beliefs, and behavioral responses. Generally, motivation is considered as the driving force behind human actions that moves people to do something by nature. (Han & Yin, 2016, 3; Drawsheh, 2016.) Even the term “motivation” comes from the Latin word “movere” which means “to move”, and the questions of why people make this or that choice, how they engage in actions are in the heart of motivation theory. Motivation is responsible for three aspects:

1. Why people make a decision to do something;
2. How long they want to maintain the activity;
3. How hard they will pursue it. (Dörnyei & Ushioda, 2011, 3.)

Researchers of human motivation tend to determine two generic types of motivation: extrinsic and intrinsic (Maslow, 1954). In the majority of cases, both types of motivation come from a particular need of an individual that leads to the behavior, which, in turn, results in some kind of reward once the need is fulfilled. Accordingly, rewards can be intrinsic and extrinsic. The former ones come from within a person, while the latter ones are rewards that are given by another person. Therefore, the drive to do something without having an external reward is called intrinsic motivation. (Deco & Ryan, 2004; Buchbinder & Shanks, 2007, 24.) Intrinsic motivation is connected to the primary propensity of an individual to engage in the

activities that are interesting to him, and by doing so, to develop, expand, and learn the capacities (White, 1959; Sansone & Harachiewicz, 2000; 16-17). Extrinsic motivation, on the contrary, takes place when a person is motivated getting some kind of incentive, and a specific task here is an instrument to receive the external reward (Tanaka, 2013). The difference between intrinsic and extrinsic motivation is in locus of control: in first situation it is inside the person, while in second – it is external to the person who is asked to undertake the action. (Dailey, 2009.)

3.2 Relationship between intrinsic and extrinsic motivation

Many researches have come up with the findings that intrinsic motivation for an interesting activity decreases if initially a person was rewarded for doing it. This phenomenon is called the "undermining effect". (Deci & Ryan, 1985; Deci et al., 2001.)

Lepper et al. (1973, 130) found out that children who were offered a reward for drawing a picture after the experiment were less likely to draw spontaneously than those who were not rewarded. Meanwhile, if children received the same reward after drawing without expecting to get it, their desire to draw did not change. Therefore, researchers assumed that the effect depended on children's perception that were drawing to get a reward. In self-perception theory, "this reduction in free-time play" is called "overjustification effect". It was suggested that when a person had both intrinsic, i.e. interest, and extrinsic, i.e. reward, reasons to perform a behavior, he would refer the behavior towards receiving a reward and discount the intrinsic motives. (Sansone & Harackiewicz, 2000, 2.) In other words, researchers have an idea that when the extrinsic reward is no longer available, people do not have enough intrinsic reasons to engage in the experience, and in order to sustain the behavior, extrinsic rewards must be offered on the continuous basis (Carlson & Heth, 2007).

However, there is also an opinion expressed by Yu Kai Chou (2016, 107) that it is better to attract people in the experience with the help of extrinsic rewards and then transfer their interest through intrinsic rewards and eventually utilize intrinsic motivation to ensure long-term engagement of participants. Chou (2016, 110-115) proposes several recommendations on how to make the experience more intrinsic:

1. It is necessary to make experience more social, e.g. by asking users to invite their friends, but only when users were already able to see the value of the experience;

2. Adding more unpredictability in the experience can be also beneficial, e.g. creating a variable reward for the same action, can add a layer of intrinsic excitement;
3. It is advantageous to increase the number of meaningful choices and feedback.

Thereby, by following these guidelines the designers will be able to make users enjoy the experience without thinking about the possible extrinsic outcomes of their participation.

3.3 Self-Determination Theory

Self-determination theory (SDT) was initially developed by Edward L. Deci and Richard M. Ryan, and later refined by various scholars from all over the world (Gagné, 2014, 1).

This theory views basic psychological needs as human universals, determined as those psychological and social supports or nutriments that are needed for well-being, optimal growth, and integrity. The most basic needs that are evolved, rather than learnt are the needs for *autonomy, competence,* and *relatedness*. (Ryan & Brown, 2003, 73.) While autonomy relates to the feeling of being the origin of one's own behaviors, competence refers to the feeling of being effective and relatedness is about the feeling of being understood and cared for by others. Sustainable satisfaction of these needs helps to form the basis for psychological energy that motivates the initiation and long-term maintenance of behaviors, therefore understanding conditions that support autonomy, competence, and relatedness is essential when designing intrinsically motivated behaviors (Ryan et al., 2008; Surugiu, 2014, 32).

Other concept of self-determination theory is the perceived locus of causality (PLOC) that relates to the extent to which an individual perceives his actions as caused by internal or external reasons (Turban et al., 2007). That means that there are people who mostly follow their internal indicators of preference in choosing the course of action, whereas there are also those who tend to act according to the external norms and directives (Deci & Ryan, 2000). The perceived locus of causality correlates with the need of autonomy, and greater internal PLOC refers to the higher autonomy of the behavior. This comes from the idea that when a person has an internal perceived locus of causality, he or she will put more effort in the behavior and obtain greater satisfaction, than when having an external PLOC. (Ryan & Connell, 1989; Deci et al., 1999.)

Another segment of SDT deals with goal contents theory that states that materialism and extrinsic goals like fame do not help to satisfy needs, thereby, do not provide well-being (Niemiec et al, 2009). Meanwhile, such goals like personal growth or contributing to the

community enhance need satisfaction, which leads to health and wellness. These findings suggest that goals framed to intrinsic objectives are better followed than those that are aimed at extrinsic outcomes. (Vansteenkiste et al., 2006; Ryan, 2009.)

What is also important is that STD differentiates three broad categories of motivation: extrinsic, intrinsic, and amotivation. Amotivation means the lack of motivation, while intrinsic motivation is the motivation to make an act for its own sake and for personal pleasure got from engaging in the activity. External motivation takes place when an individual is motivated to perform an action for external reasons, such as getting a reward or avoiding punishment. (Ryan, 1995; Alhaji & Yusoff, 2012; Tanaka, 2013.)

The central aspect of SDT is the issue of the quality of motivation, which is linked to the understanding of what type or types of motivation prevails in goal pursuit, rather than how much motivation people possess. Therefore, two types of motivation are identified: autonomous and controlled motivation. (Gagné & Deci, 2005.)

When feeling autonomous, people act because they are interested or challenged by the experience of behavior, as well as if they see personal meaning in what results from it. Autonomous motivation is considered as the highest level of self-determination, when a person has an internal perceived locus of control. (Silva et al., 2014, 172.) On the contrary, controlled motivation associates with existing pressure to engage in the experience, therefore, a person has an external perceived locus of causality (Deci et al., 1994). Self-determination theory assumes that extrinsic motivation may vary in its degree of autonomy, but the more autonomously motivated a person is, the more adaptive his behavior will be (Gagné & Deci, 2005; Ng el al., 2012).

3.4 Motivation through the lens of gamification

The fundamental idea of gamification is to utilize the motivational power of games for the purpose, not in particular related to the entertainment of game itself (Hense & Mandl, 2012). In order to understand the psychological mechanisms in the basis of gamification, it is essential to study the effects of game design elements on user motivation. (Deterding, 2012.) This process relates to the concept of motivational affordance, which refers to “the properties of an object that determine whether and how it can support one’s motivational needs”. (Zhang, 2008, 145.)

Gamification is widely associated with various game design elements, in particular points, badges, and leaderboards (PBL), that have been empirically tested the most among other game elements (Hamari et al., 2014, 3027). Interestingly, whereas some studies suggest that, the implementation of game design elements can decrease users' intrinsic interest and lead to no engagement with the application (Koivisto & Hamari, 2014; Seaborn & Fels, 2015), there is also an argument that well developed and designed elements can improve intrinsic motivation. This is done by satisfying inner psychological needs of participants for autonomy, competence, and relatedness. (Francisco-Aparicio et al., 2013, 115; Pe-Than et al., 2014.) At the same time, Burke (2014, 19-20) suggests that it is essential to focus on autonomy, mastery, and purpose. Autonomy here refers to the desire to direct own lives and behavior, mastery is about the urge to progress and get better at something meaningful, and purpose is eagerness to make actions in service of something larger than oneself.

While Pink (2009) assumes that extrinsic rewards are not sufficient for creating long-lasting motivation and Mekler et al. (2017) suggest that game elements do not significantly affect competence or intrinsic motivation, the research by Sailer et al. (2013) has proven the opposite. For instance, it was found that obtaining a badge for a player can foster their feeling of competence, as well as a leaderboard for the top players of the application. These game elements can also contribute to users' feeling of community and social relatedness, as they work as a form of group identification and collaboration provided by shared goals and possibilities of shared experiences (Antin & Churchill, 2011). Including various challenge levels and immediate performance feedback also has an effect on satisfying need for competence (Zhang, 2008, 146). Points, in turn, can function as an immediate positive reinforcement for players, also taking a form of virtual reward. Meanwhile, offering a range of meaningful choices and stories, as well as different avatars, can boost the feeling of autonomy and raise the interest and positive feelings of the users. (Sailer et al., 2013.)

In general, in order to succeed in gamification, it is better to design the experience that motivates creativity, self-expression and social dynamics, so its users will be able to constantly enjoy and engage in the activity just because it is fun. To do so it is necessary to include game design elements that can motivate people both extrinsically and intrinsically. (Brigham, 2015; Chou, 2016, 8.) Offering users a meaningful experience, i.e. creating a linkage between current experience and something or someone from the past of every individual personally, is additional key to foster motivation. Thereby, a designer has to

provide a variety of ways to engage a person so to increase the chances of giving something meaningful to every user. (Nicholson, 2012.) Zichermann (2011a) continues: “Good gamification design seeks to understand and align an organization’s objectives with a player’s intrinsic motivation. Then, through the use of extrinsic rewards and intrinsically satisfying design, move the player through their journey of mastery”.

3.5 Theories of behavior change

McDougall (1908) explains human behavior in terms of the relative strength of internal and external forces that act on the individual. Internal forces are primarily cognitive and motivational dynamics, whereas external forces can take form of social norms, standards, and institutions. This determination of forces suggests that an individual is embedded in social groups and is influenced by those, as well as affect the groups himself. (Lewin, 1947.)

Changing behavior of a person, under these conditions, means diverging from the accepted social realities of a group that this person refers to, in particular, friends and family. Thereby, implementing a change is possible when attitudes and behavior of a person are addressed at same time as those of one’s friends and family. (Hardin & Higgins, 1996; Jost, 2015, 610.)

In order to understand the additional conditions under which a behavioral change can take place, the major theories are presented in the following paragraphs.

Social cognitive theory

Social cognitive theory, developed by Bandura (1986), suggests that human functioning is primarily guided by external factors and can be explained by a triadic interaction of three factors (Figure 6): behavioral, personal and environmental factors. Environmental factors are situational impacts, surrounding and conditions in which behavior is performed, whereas personal factors consist of instincts, features of character, drivers, and motivational forces. The theory focuses on the mutual interactions between these factors that are proposed to support behavior change. This dynamic interplay of the person, environment, and behavior is known as “reciprocal determinism” (Bandura, 1978).

According to Wood & Bandura (1989), cognitive factors, also called personal, cover individual’s knowledge, attitudes and expectations towards the performed behavior. Environmental factors involve social norms, access in community, and influence on others that correlates with the ability to change own environment.

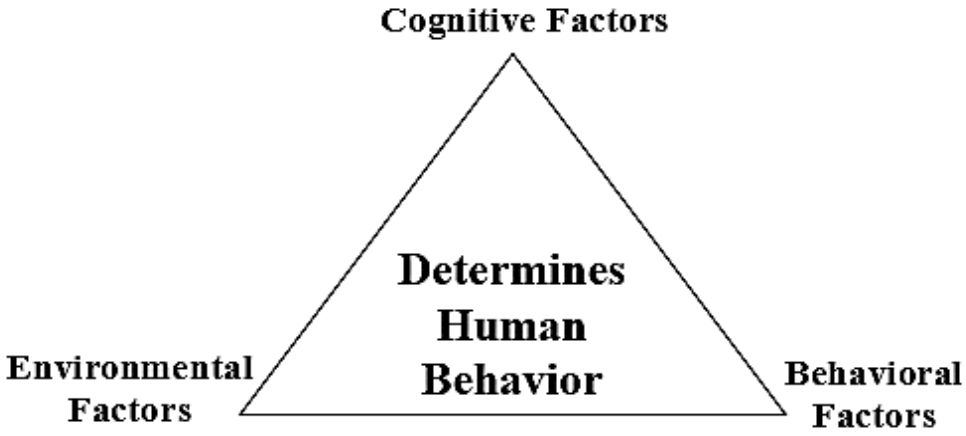

Figure 6. Factors Determining Human Behavior (adopted from Wood & Bandura, 1989)

In turn, the researchers define skills, practice and self-efficacy as the most significant behavioral factors. Other important concepts of the theory include:

- Self-efficacy: individual's confidence in ability to perform a particular behavior successfully (Bandura, 1977);
- Self-control: person's regulation of performance and ability to control their behavior (Snowman & McCown, 2015, 295);
- Reinforcements: internal or external responses to a person's behavior that increases or decreases the likelihood of continuing the behavior (McLeod, 2016);
- Outcome Expectations: the anticipation and consideration of possible consequences that the behavior will lead to (Bandura, 1998, 7);
- Observational Learning: the acquisition of behaviors that happens as a result of observing actions and outcomes of others' behavior (Glanz et al., 2002, 169).

Apart from defining concepts, it has been proposed that increasing self-efficacy is possible when behavior change is approached as a series of small steps (Perry et al., 1990). However, even when an individual has a strong sense of self-efficacy they may not be willing to perform the behavior without having an incentive. Therefore, it is essential to provide benefits and rewards for the behavior to people in order to make them actually change behavior. (Bandura, 1986.)

Transtheoretical Model

The transtheoretical model suggests that change as a process consists of six stages: 1) precontemplation, 2) contemplation, 3) preparation, 4) action, 5) maintenance, 6)

termination. This model of intentional change focuses on the decision-making abilities of an individual. (Prochaska & DiClemente, 1983; Velicer et al., 1998.)

In the precontemplation stage, a person is unaware of a problem and not intended to take action in foreseeable future, meanwhile, in the contemplation one – an individual is aware of the problem and consider changing behavior in the next six months (Patten et al., 2000; Scholl, 2002). Following preparation stage means that a person is intending to take action in the immediate future (within the next month) and has a plan of action. In the action stage, an individual has already made efforts to modify behavior, experiences, or environment within the last six months, thus, made a change. (Prochaska et al., 1992; Velicer et al., 1998.) In turn, maintenance is about an individual working to prevent relapse and strengthening gains. In this stage, people are more confident in their ability to continue the change. Termination relates to the situation when an individual has 100% self-efficacy and no temptation to bring back the problem behavior. (Prochaska & Velicer, 1997).

Understanding the stages of change helps to see when shifts in attitudes and intentions of a person take place. Another important part of the transtheoretical model that describes how these shifts happen are ten identified processes, which theoretically and empirically proven to develop and alternate though the stages, that is visually presented in table 3.

Table 3. The correlation between the stages and processes of change (Lenio, 2006, 77)

	STAGES OF CHANGE				
	Precontemplation	**Contemplation**	**Preparation**	**Action**	**Maintenance**
PROCESSES OF CHANGE	Consciousness raising				
	Dramatic relief				
	Environmental reevaluation				
		Self-reevaluation			
			Self-liberation		
				Contingency management	
				Helping relationship	
				Counterconditioning	
				Stimulus control	

Ten processes from the table are divided as such that first five of them refer to the early stages of change and represent experimental processes, whereas last five are behavior processes, and the description of each of them is presented further. (Velicer et al., 1998.)

Consciousness raising implies to the process when a person should increase the awareness about the problem, which can be done, for example, thanks to education and feedback. Experiencing and expressing feelings and emotions about the problem and its possible solutions lays in the basis of *dramatic relief* and can take place by means of role-playing, personal testimonies, and media campaigns. *Environmental reevaluation* is defined as the process of assessment how one's problems influence the physical environment and happen through, for instance, personal stories or documentaries. *Self-reevaluation*, in turn, is a cognitive and affective evaluation of an individual with respect to presence and absence of the problem that takes form of value clarification or imagery. (Prochaska et al., 1992; Prochaska & Velicer, 1997; Velicer et al., 1998; Patten et al., 2000.) *Contingency management deals* with providing consequences to the person for participating in or avoiding the problem behavior, this is where either punishment or rewards are supposed to be utilized (Lenio, 2006).

Self-liberation means making a commitment and believing that one is able to change. A well-known example of such a process in New Year's resolutions. Moving further throughout the change there is a process called *helping relationships*, i.e. being open and finding supportive people that are for change, that is possible through self-help groups or social support services. Other four processes are stimulus control, counter-conditioning, reinforcement management, and social liberation; and whereas *stimulus control* is associated with managing personal environment by utilizing various reminders that encourage the proper behavior and mitigate a possibility or relapse, *reinforcement management* means rewarding oneself or being rewarded for making the change. Eventually, *counter-conditioning* is about using substitutes for problem behavior like positive self-statements or relaxation, and *social liberation* is the process of enlarging the number of alternatives for non-problem behaviors that are available in society. (Prochaska et al., 1992; Velicer et al., 1998; Nash et al., 2011.)

Overall, the transtheoretical model of behavior change evaluates readiness of a person to perform new behavior and provides strategies related to the aforementioned processed that help the individual to come through the stages of change (Shumaker et al., 2009, 64).

3.6 Behavior change through the lens of gamification

As discussed in chapter 2.2., gamification is a lot more than points and badges, it can be used to achieve different aims, among which behavior change is. Behavior change as such is

necessary when "people understand something is good for them, but have hard time doing it" (Werbach & Hunter, 2012). Meanwhile, Zichermann (2011b) claims that the main purpose of gamification is "to help people get from point A to point B" that greatly correlates with the definition of change as doing something new or differently (Hultman, 2003, 1).

Despite the fact that maintaining behavior change with the use of game development is thought to be quite challenging, the power of gamification strategies to engage users and improve their motivation, and thereby, change their behavior is sufficient (Schoech et al., 2013). Burke (2014, 53-57) suggests that there are several common characteristics, essential to reach behavior change and establishment of a habit:

- *Setting goals* is the first step on the way of changing behavior that will determine the willingness of a person to participate and will meaningfully engage users. A gamified experience may also offer signposts to a player, so it will be possible to monitor progress and success in achieving the goal. (Bravata et al., 2007; Chandross, 2016.)
- *Using triggers* is necessary to remind users about particular actions those should do, until an action becomes a part of routine (Cognizant, 2014).
- *Taking baby steps* means breaking down the change into small and manageable stages that are to be achieved on the way to the general aim, since this long-term purpose might seem overwhelming and prevent an individual from starting the change (Burke, 2014).
- *Finding kindred spirits* relates to being a part of a bigger community of people who maintain the same change. The same idea is determined in the process of "helping relationships" of transtheoretical model of behavior change (Prochaska et al., 1992).
- *Enlisting support from friends* nowadays can take place through connecting the gamified experience with different social media channels that potentially extend the reach of players' support group, and, in this way, motivate those to perform the behavior.
- *Building flexibility over time* refers to the feature of gamified solutions to guide participants gradually through processes towards a more complex behavior change. (Burke, 2014, 55-56).
- *Repeating until new habits are formed* over some period of time takes place after the new behavior learnt and is essential to avoid relapse (Dorling & McCaffery, 2012).
- *Keeping it fresh* is needed to maintain interest of users to the gamified solution, it is especially important when the behavior change requires long-term use of the experience (Burke, 2014, 57).

Fogg (2009) suggests another framework (Figure 7) for understanding human behavior that assumes that behavior is the result of three factors: motivation, ability, and trigger. According to this framework, the prerequisites of the target behavior are the presence of sufficient motivation, high ability, and an effective trigger. Importantly, these factors should occur at the same time, so the behavior will be performed. (Kosner, 2012; Lawley, 2013.)

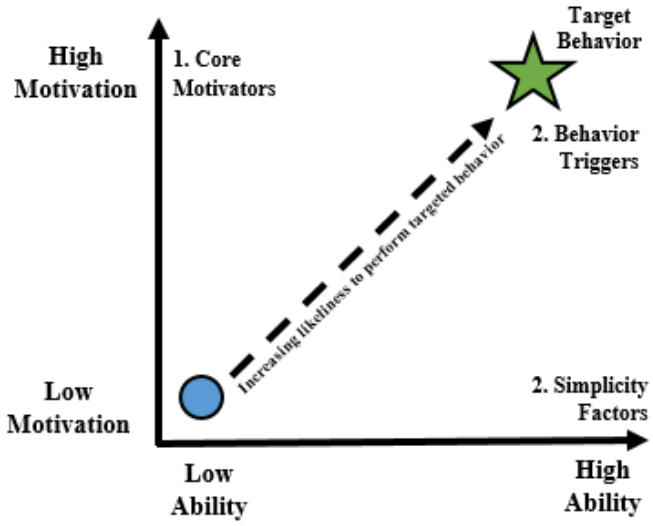

Figure 7. The Behavior Model (Fogg, 2009)

Each of the factors mentioned in the Fogg's framework have subcomponents. For examples, there are three core motivators identified that are 1) pleasure/pain, 2) hope/fear, and 3) social acceptance/rejection. The first one is different from others, as the results of this motivator are immediate, i.e. users are responding to what is happening in the very moment. The second motivator is determined by the anticipation of something good or bad to happen. The third one is a social dimension of the framework and relates to the social behavior of participants of the gamified experience. (Fogg, 2009; Eyal & Hoover, 2014; Markus, 2014.)

Fogg also differentiates three types of triggers: spark, facilitator, and signal. Spark is utilized alongside with a motivational element when an individual lacks motivation to behave in the desired way. In turn, facilitator should be applied when a person has high motivation, but lacks the appropriate level of ability. A popular example of "facilitator" is the promise that a task consist of only one click to do that will solve the problem. The third trigger – signal – serves as a simple reminder and is necessary when a user has both motivation and ability. (Fogg, 2009; Basten et al., 2015.)

Speaking of the ability, Fogg highlights that high ability relates to how easy it is to perform the behavior and claims: “simplicity changes behaviors”. He suggests dividing simplicity into six parts (Fogg, 2009; Hrena, 2016):

- Time - if the behavior requires a lot of time it is unlikely to take place;
- Money - if the task requires financial investments, not all people will able to do it;
- Physical effort – if behavior include some physical effort, it may seem complicated;
- Brain cycles – thinking hard when performing behavior may be considered complex;
- Social deviance –going against the social norms, which can be thought as not simple;
- Non-routine – generally people tend to act in some way if the behavior is routine and is performed over and over again.

In general, literature on utilizing gamification for behavior change proves positive effects on the process of maintaining change and proposes the use of reminders and different kinds of encouragements to reinforcing positive behavior. (Deterding et al., 2011c, 10-12; Kinley & Ben-Hur, 2015; Poultney et al., 2016, 96.) Moreover, Petkov et al. (2011, 2) defines gamification as a persuasive technology that tries to affect user behavior by activating individual motives through game design elements. Eventually, be providing emotions, in particular positive, gamification is thought to be capable of giving up existing behaviors and supporting the establishment of new behaviors by constantly setting suitable stimuli (Ortiz de Guinea & Markus, 2009; Blohm & Leimeister, 2013).

4 GAMIFICATION IN FOSTERING PRO-ENVIRONMENTAL BEHAVIOR

The research is maintained in the context of sustainability, particularly, in the frames of environmental sustainability that alongside with economic and social aspects contribute to the process, called sustainable development. The idea of environmental sustainability relates to keeping the health of ecosystems while meeting the resource needs of current and future generations. (Morelli, 2011.) It considers the environmental problems and strives to identify solutions to those. As human actions are thought to be one of the greatest causes of ecological problems, it is important to start addressing solutions by changing human behavior into pro-environmental manner. (Gardner & Stern, 2002; Vleg & Steg, 2007.)

The following chapter provides more information about the formation and gamification of environmental sustainability and identifies the most affective motives and barriers to pro-environmental behavior that contribute to the decisions and actions of people.

4.1 Introduction to environmental sustainability

Nowadays, the concept "sustainable development", known as "sustainability" has its stable place not only in the official documents of international organizations, but also in everyday life of people and various business ventures (Vezzoli & Manzini, 2008, 5). The issue of sustainability has been known since "An Essay on the Principals of Population" by Thomas Malthus (1798), where he talked about the limits of population growth. However, it was not until 1987, when The World Commission on Environment and Development presented the Brundtland report, or a document called Our Common Future, and there defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". (West, 2010.)

Despite the presence of other definitions of sustainability, the one written in the Brundtland report is coined as a standard (Edwards, 2010), thus, it is chosen as the central one in this research. What is more interesting to mention is that a basic concept of sustainability, known as "three pillars of sustainability", defines three systems, environmental, economic, and social that mutually reinforce each other and contribute to sustainable development (Brebbia & Beriatos, 2011; Farley & Smith, 2014, 149). These pillars are commonly referred to as "the triple bottom-line" that consists of ecological integrity, social equity, and economic stability (Beaton & Maser, 2012, 119).

However, since the research is concentrated on environmental aspect of sustainability, it is analyzed in more detail in the following sub-chapters with the help of suitable literature.

4.1.1 Defining environmental sustainability

The definition of "environmental sustainability" can be formulated by adding depth and details to the aforementioned definition of sustainability. Thereby, environmental sustainability can be determined as "meeting the resource and service needs of current and future generations without compromising the health of the ecosystems that provide them". (Morelli, 2011, 23.) It suggests the condition of balance that lets people satisfy their needs without exceeding the carrying capacity of supporting ecosystems to regenerate, known as resilience of nature, and decreasing biological diversity (Klein et al., 2003; Morelli, 2011).

Environmental sustainability refers to keeping natural capital as a provider of economic inputs, i.e. sources, as well as an absorber of economic outputs, i.e. wastes (Pearce & Redclift, 1988; Serageldin, 1993). Goodland and Daly (1996, 1008) also define environmental sustainability in terms of input-output rule. While output rule assumes that waste emissions should be within the capacity of the environment to absorb it and should not promote degradation of its future waste absorbing capacity, input rule include two parts:

1) Renewables, meaning that harvest rates of inputs of this type of resources ought to be within the capacity of natural systems to regenerate them;
2) Non-renewables, meaning that the depletion rates of inputs of this type of resources should be equal to the rate at which human invention and investments develop renewable substitutes.

The general definition of environmental sustainability is stated as the maintenance of significant environmental function (Ekins, 2002, 80), that are, however, are interrelated with social and economic dimensions of sustainability (Kleine & von Hauff, 2009; Potthast & Meisch, 2012).

4.1.2 Problems of environmental sustainability

The range of problems address by environmental sustainability is quite long and it is currently growing. These negative issues are "the result of long-term, low-grade and slow-onset cumulative processes". (Glantz, 1999, 4.) Environmental problem as such is defined as a set of co-dependent issues that regulate the sustainability of the planet (Cohen, 2014, 5).

Among the greatest environmental problems, addressed by sustainability, are the following (Sutton, 2004; Abdalla & Lawton, 2006; White, 2009; Cameron, 2012.):

- Degradation of water quality, especially because of polluting rivers, seas, and oceans; and wasting water in the developed countries of the world, while one-fifth of the planet's population suffers physical water scarcity in their living areas;
- Deforestation, which also leads to putting animals in danger by destroying their natural habitats in wildlife and worsening the climate change, as forests help to absorb carbon emissions and lower the heat;
- Natural resource depletion as a result of exceeding consumption of non-renewable resources as well as increasing amount of emission of greenhouse gases that, in turn, affects global warming and climate change;
- Transportation is taken as a problem in sense that, first of all, it causes huge greenhouse gas emissions, and, secondly, people give preferences to private transport rather than public vehicles, which also affects the fuel consumption;
- Waste pollution is also of great concern for environmentalists, since the growing world population produces more and more waste that ends on landfill and, thus, impact environmental destruction, water and soil pollution, and releasing greenhouse gases;
- Constantly increasing demand for food production is also detrimental to the environment, as it affects deforestation, the use of fertilizers that pollute water and soil.

Environmental problems undermine the capacity of the planet to sustain the growing world population. However, since the cause of these problems is human actions (DuNann Winter & Koger, 2004; Gardner & Stern, 2002), like irrational production process of industries, consumption and human behavior (Penn & Mysterud, 2009, 1), it is in people's hands to preserve and protect the environment by changing the relevant behavior, shaping proper values, commitment and skills (Said et al., 2003).

4.2 Conceptualizing pro-environmental behavior

A person when deciding whether to act for the short-term self-interest, even knowing that it can be harmful for the long-term sustainable living of others, experience environmental inaction, also categorized as one side of the tragedy of the commons (Hardin, 1968). It also relates to the situation when an individual does not protect shared resources for a range of reasons, like personal inability to understand outcomes of the behavior or perception that

others will take care of those (Quimby & Angelique, 2011). The concept of environmental inaction refers also to the overconsumption of resources, and stays opposite to the ideas of pro-environmental behavior (Lant et al., 2008).

The concept "pro-environmental behavior" is defined as behavior that improves the quality of the environment and reduces the environmental influence of human beings (Stern, 2000; Kollmuss & Agyeman, 2002). The aim of pro-environmental behavior is to minimize negative impacts and/or maximize positive ones on the planet. This behavior can include reducing the consumption of resources, moderate use of private vehicles, or recycling, and although single behavior has a small impact on the environment, long-term accumulation of these society-wide actions is sufficient. (Stern, 2000; Steg & Vlek, 2009.)

Stern (2011) considers two dominant theories of pro-environmental behavior. The first one suggests that an individual performs behavior as a result of seeking to maximize personal material welfare, subjective well-being, or utility. The second theory assumes that there are factors beyond individualism that serve as behavioral motives, such as eco-centrism or altruism. Schwartz (1977), for instance, presents his moral norm-activation model and proposes that the awareness of the negative consequences for a person and the environment can be a stimulus for pro-environmental behavior. Pruneau et al. (2006) define three factors that have an effect on pro-environmental behavior:

1. Level of awareness and knowledge;
2. Emotions, feelings, and personal features;
3. Situational factors, e.g., economic constrains or thoughts of the surrounding community.

Pro-environmental behavior is also proven to be interconnected with health-related quality of life (Yamazaki et al., 2006; Kaida & Kaida, 2017) and life satisfaction (Welsch & Kühling, 2010). Moreover, when people are associated with environmental groups they engage in pro-environmental behavior on a personal level (von Borgstede & Biel, 2002). Meanwhile, the barriers to becoming pro-environmental are lack of money and time, lack of efficacy, and a feeling of disappointment (Quimby & Angelique, 2011).

Apart from that, Kollmuss & Agyeman (2002, 257) present a model of pro-environmental behavior (Figure 8) that defines several other significant barriers to this behavior, such as lack of knowledge, lack of environmental consciousness and internal incentives, old

behavior patterns, existing values and knowledge that contradict with environmental values or prevent learning, and negative or insufficient feedback about behavior.

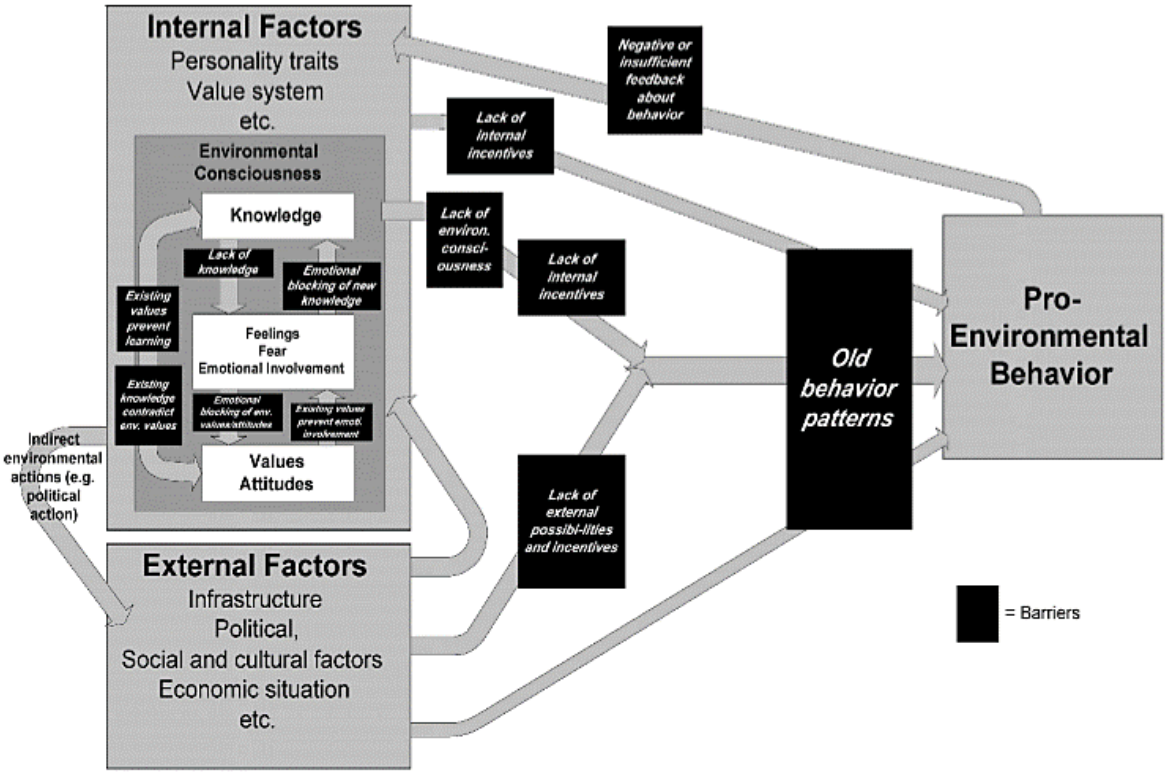

Figure 8. Model of Pro-Environmental Behavior (Kollmuss & Agyeman, 2002)

At the same time, the framework suggests that the greatest positive impact on pro-environmental behavior can be reached when external and internal factors act together. The idea of addressing values in order to overcome barriers is also expressed by Gatersleben (2012). Quimby and Angelique (2011) add that increasing education on the ecological and environmental matters, changing social norms and raising institutional support can benefit the adoption of pro-environmental behavior.

4.3 Motivating pro-environmental behavior

Behavioral psychology identifies various motivation techniques that can promote the desired behavior pattern (e.g. see Geller et al., 1990), and this chapter provides the insights on the most popular means of facilitating pro-environmental behavior.

One of the widely utilized ways to promote pro-environmental behavior is *information*, which is transferred through corporate websites, media campaigns, or leaflets (Steg & Blek, 2008). The rationale behind applying this means of motivation is the assumption that more

and better information will make people act in more pro-environmental ways. Importantly, such aspects as the easiness to understand and remember, attractiveness of the presentation, delivery and trustworthiness of the information influence the efficiency of this means of motivation. (Staats et al, 2004; Brewer & Stern, 2005.)

Another related to the information source of motivation is *feedback* that has been primarily studied from the household resource consumption perspectives (Froehlich et al., 2010). In practice, feedback is said to be capable of producing the pro-environmental behavior change when being mixed "with a meaningful referent", like normative information or cost (McKenzie-Mohr & Schultz, 2012). For instance, Fischer (2008) have found the causal relationship between energy savings and providing multiple feedback that comprised consumption patterns of the individuals, comparison of their amounts of spending or useful tips on how to save resources. Some researchers still keep to the opinion that alone feedback is not that effective for behavior change, it is rather more applicable for reaching set goals and is beneficial only when an individual is willing to achieve some outcome (Ehrhardt-Martinez & Laitner, 2010). Meanwhile, *goal setting* is considered to be another motivation technique that influences behavior via four main features that are presented as follows (Locke & Latham, 2002):

- Goals have an energizing function: the higher the aim, the bigger the effort to achieve it;
- Goals give direction and allow putting effort and attention to the activities necessary for achieving it;
- Goals influence persistence;
- Goals have an indirect effect on behavior over the process when people obtain some knowledge or apply strategies for the sake of accomplishing the goal.

Additional technique, widely utilized for pro-environmental behavior, is *social diffusion* and *comparison*. The first term refers to situation when a person is motivated to change behavior because his friends, family or colleagues already accepted and adopted the sustainable behavior and their actions make this change visible to others (McKenzie-Mohr & Schultz, 2012). Social comparison, in turn, relates to the situation when individuals or groups of people are compared and given feedback about their performance (Siero et al., 1966; Froehlich et al., 2010). Apart from that, providing people with an *incentive or reward* is theoretically and practically accepted as another effective way to facilitate the pro-

environmental behavior. However, the reward should be connected to the target behavior as close as possible. (Valente & Schuster, 2002.)

One more aspect that can be utilized to address behavior change is *prompts*. McKenzie-Mohr & Schultz (2012) define as "memory aids that are presented in close proximity to the repetitive behavior". The prompts should be noticeable, self-explanatory and address positive environmental behavior, rather than negative impacts of misbehavior.

4.4 Gamification of environmental sustainability

The traditional ways of promoting positive environmental actions, such as newsletters, posters, green guides, or sponsored events, have limited and short-term success (Yen, 2015). Meanwhile, researchers and business practitioners speak about the growth of green gamification, defined as "the use of games to make sustainability fun and rewarding" (Kamal, 2013). In 2012, the GreenBiz Group even ranked gamification among the top sustainable business trends, highlighting that game mechanics are widely applied by companies to offer "rewards for making good, green choices" (Makower, 2012).

Therefore, from the environmental sustainability perspective, application of gamification means the process of utilizing a set of motivational techniques to inspire and foster pro-environmental interest and actions, such as investing in renewable sources of energy, reusing materials when possible, or decreasing the amount of used resources (Froehlich, 2015; Seaborn & Fels, 2015). Gamification also helps to raise the awareness of environmental issues and present the complex study of sustainability in a more simplistic and understandable manner to a wide audience of people (Matthews, 2016). It can go even beyond awareness and visualization, and directly affect the adoption of the desired behavior. For the purpose of sustainability, gamified experience should lead to the feelings of enjoyment and fun, while also addressing the feeling of competitiveness, as when people compare their results, their behavior can change accordingly. (Dymek & Zackariasson, 2016.)

Another idea of utilizing gamification for adopting pro-environmental behavior implies to the findings that even after people stop utilizing gamification, they still might consider environmental issues and become more sustainable in their everyday activities (Dymek & Zackariasson, 2016).

Nevertheless, it is also assumed that there is still some uncertainty about the utilization of gamification, although the theoretical potential of the sustainability-related gamified systems is enormous. The main reason for that is the lack of awareness and familiarity of designers and managers about the performance of gamification. (Mazur-Stommen & Farley, 2016.)

Although there is not much theoretical research of how gamification can be applied in sustainability and what possible outcomes there can be, Xi (2011) proposes that gamification can raise sustainability consciousness and educate people, as well as motivate them to perform pro-environmental behavior. However, since gamification mostly focuses on providing extrinsic motivation by adding a gamified layer of externally driven incentives to the unenjoyable tasks that in many cases undermine intrinsic motivation (Kohn, 1999; Deci et al., 2001), green gamification can seem only as a short-term solution (Froehlich, 2015). De Young (1996), on the contrary, says that in order to make people behave in a pro-environmental manner there is no need to use external rewards, it is enough to emphasize how intrinsically satisfying the conservation-oriented living is.

Speaking of the targeted audience to address in the realm of environmental sustainability, Stern (2000, 410) suggests motivating and educating manufactures rather than individuals and households on the negative impacts of their corporate actions, so they start considering utilizing “greener” technologies, developing environmental criteria in their decisions and policies. The rationale here is that organizations and corporations are doing greater harm to the environment. Importantly, companies are not supposed to use gamified solution for “greenwashing”, i.e. representing misleading or false facts about products or services being beneficial or at least non-harmful to the environment (Feinstein, 2013, 233).

Szaky (2016) does not make a difference between target groups, but proposes to apply gamification to engage young generations to the problems of sustainability and teaching them to implement “green” habits. He sees the huge incentive of utilizing gamification in its capacity to create reward systems with the thrill of competition that are different from conventional ways of communication.

5 RESEARCH METHODOLOGY

Research is a "systematized effort to gain new knowledge" (Redman & Mory, 1923, 10). It refers to the original contribution to the existing pool of knowledge by making it more advanced, whereas research methodology is defined as a way to systematically solve the research problem (Kothari, 2004, 1-8). Methodology, thereby, represents the logic of applying scientific methods to investigate the phenomenon (Mouton & Marais, 1988, 16).

The objective of the present research is to explore how the application of gamified systems can motivate people to perform pro-environmental behavior change and to formulate theoretical framework that would describe this process. This research perspective is unique in a way that previous studies focused on the effects of gamification on customer (e.g. see Berger et al., 2014) or employee (e.g. see Börner et al., 2013) behavior, on creating pilot versions of applications (e.g. see Kärp, 2013), rather than building and testing theory. To achieve the set objective, the research takes a single case study method with a questionnaire as the main primary data collection method. The questionnaire is structured so that it refers to the principles of intramethod mixing, i.e. quantitative data being analyzed qualitatively.

This chapter provides insights on the chosen research approach, design and strategy that were developed in obtain the answers the research questions. Apart from that, the process of collecting and analyzing data is also presented in the following subchapters.

5.1 Research approach

Traditionally researchers distinguish inductive and deductive types of research approach, where induction refers to moving from the specific to general, while deduction starts with the general and results in the specific (DePoy & Gitlin, 2016, 6). In other words, an inductive manner of research also known as "bottom-up" approach is concerned with theory building from the data. On the contrary, a deductive "top down" approach starts with already available theory and tries to test formulated hypotheses, thereby, emphasizing theory testing. (Creswell & Plano Clark, 2011; Schensul & LeCompte, 2013, 320; Rose et al., 2015, 95.)

By testing hypotheses referring to specific theories, researchers usually implement a quantitative research and use a deductive logic. Meanwhile, in qualitative research the frequent aim is to generate theories or hypotheses by applying an inductive approach. (Thyer, 2010, 34; Riazi, 2016.) The significant issue to consider when choosing the suitable research approach is the objective of the study and the actualization of its topic (Deborah, 2013). An

inductive research is primarily utilized when there is “no useful theories available”, so it is applicable for the new study topics (Marshall, 1997, 17). It also lets a researcher to obtain more explanation of what is happening (Saunders et al., 2003).

Considering these features of an inductive approach, it could be seen as suitable for the current research, since the topic is new and deals with studying gamification. However, the researcher also accumulates and analyzes the existing theories and models of motivation, behavior change and environmental sustainability, which all together serve as a solid basis for the research. Therefore, this thesis study takes the abductive research approach that is defined as “continuous interplay between theory and empirical observation” (Dubois & Gabbe, 2002, 559).

The main difference between abduction and deduction is that the former approach shows how something can be, while the latter one proves that something is of a certain way (Habermas, 1978). Consequently, abduction allows a researcher to formulate new ideas, look at some phenomenon in a different context, and “see something else” that goes beyond the initial theory through elaboration, modification, or combination of pre-existing literature (Kelle, 1995, 34; Danermark et al., 2002).

5.2 Research design

Research design is a strategy of the investigation that requires the logical and coherent integration of different elements of the study so to ensure efficient problem solving. It is a blueprint of collecting, measuring and analyzing data, which allows obtaining answers to research questions and controlling variance (Phillips, 1976; Kerlinger, 1983; Kumar, 2008, 30; Grover, 2015.) Traditionally, three broad categories of research design are discerned: exploratory, descriptive, and casual. Whereas descriptive studies seek to define and describe a phenomenon, causal researches attempt to determine the causal relationship between variables. In turn, an exploratory research is utilized to make investigations into relatively unknown areas of research and to generate new ideas. (Blanche et al., 2006; Wrenn et al., 2007; Beri, 2008.) Hence, this thesis research is exploratory in nature, as it addresses the phenomenon of gamification, and there is little study of the effects of gamification on human motivation and behavior change in environmental sustainability (Law et al., 2011, AlMarshedi et al., 2014).

Abductive research approach, described in the previous chapter, requires the collection of sufficient amount of detailed data in order to develop tentative theory and flexibility to assist the iteration between data and theory. These prerequisites assume the use of qualitative or mixed method research designs. (Rose et al., 2015, 81; Riazi, 2016). In order to obtain a better understanding of research problem and utilize the strength of both qualitative and quantitative data, the current research applies mixed method design (Johnson et al., 2007). Despite the fact that mixed method in business research might sometimes be not the best choice (Hurmerinta-Peltomäki & Nummela, 2006), here it lets to gather data to test existing theories of motivation and behavior change and identify new aspects of fostering pro-environmental behavior change with the application of gamification.

The current research involves intramethod mixing also known as data triangulation that in the particular study refers to using online questionnaire as the single method to collect qualitative and quantitative data (WiŚniewska, 2011). The questionnaire is built so that it concurrently uses open- and closed-ended questions that provide the researcher with concrete answers and let respondents express their opinions (Johnson & Turner, 2003; Katsirikou & Skiadas, 2009). The limited number of questionnaire participants does not allow applying quantitative approach, as it requires greater size of sampling (Tashakkori & Teddlie, 2003).

The questionnaire is answered within a short period of time soon after respondents utilize the gamified system aimed at adopting pro-environmental behavior. Thereby, the research takes a cross-sectional perspective, where data are collected at only one time period from a sampling of individuals of different age and nationality (Bailey, 1994; Mills et al., 2010). This timing is appropriate for the current research, as gamification has not yet been widely utilized in pro-environmental behavior change strategies, and the study attempts to look at how it is done nowadays and tends to serve as the solid basis for further research.

5.2.1 Case study research

The present study takes a case study as the research strategy. Thereby, it makes it possible to investigate the emerging phenomenon in its real-life context (Yin, 1994). The case study design addresses the questions “what”, “why”, and “how” and is aimed at gathering all the details of the analyzed system that can be relevant to the actual objective of the research.

That is what contributes to a holistic orientation of any and this particular case study. (Benbasat et al., 1987; Darke et al., 1998; Thomas, 2011.)

Researchers express an opinion that it is difficult to generalize from the results of case studies that are too situation oriented (Eisenhardt, 1989; Stake, 1995, 7). Meanwhile, Yin (1989, 38) argues that case research can support analytical generalization, though not statistical one. Nevertheless, case study method is intensive in nature, as it provides a great scope for in-depth research of a particular problem. It is also useful for theory development (George & Bennett, 2004), as well for formulating the questionnaire and making it more pointed towards the researched issue. (Mustafa, 2008, 17-18.)

This research is focused on single case study, primarily because of the unique distinctions and features of the selected gamified application (Yin, 2009, 53). Moreover, single case research design is claimed to be less biased (Mahakud, 2013, 103). This research design is also considered valuable for testing theoretical propositions that actually takes place in the current study (Levy, 2008). As the research is implemented in the little studied area of relationship of gamification and pro-environmental behavior change, single case study is supposed to provide a deeper understanding of the subject (Dyer et al., 1991).

5.2.2 Case selection

Selecting case studies should not be random; it should rather be systematic and justified in order to provide the audience with a context for judging the sample (Yin, 1994). According to the categorization of single case study selection by Yin (1994, 38-41), the current research takes a prelude case selection strategy, meaning that it explores a case of utilizing gamified mobile system for motivating people behave pro-environmentally that is aimed at creating theoretical basis for further research of the phenomenon.

Previous research on the utilization and effects of gamification have focused on customer (e.g. see Berger et al., 2014) or employee (e.g. see Börner et al., 2013) behavior, on creating pilot versions of applications (e.g. see Kärp, 2013), rather than building and testing theory. Although environmental psychologists have studied the effectiveness of techniques that in some cases overlap with gamification strategies for motivating pro-environmental action (e.g. see Froehlich et al., 2010; McKenzie-Mohr, 2012), the process of applying gamification to motivate people to implement pro-environmental behavior change has not yet been theoretically framed.

The mobile gamified application JouleBug is the unit of the present case study that was chosen as the result of online screening. Since the topic refers to the users' behavior change, no geographical boundaries were set for selecting a case company. Moreover, the criteria for case selection were the following. Firstly, it was necessary to have an application that addresses several different problems of environmental sustainability, like water consumption and waste management. Secondly, since the idea was to identify the possible impacts of external rewards on internal motivation and create a users' community of a similar interest, the application had to provide some customization options to the researcher to secure their equal conditions for users' behavior change. An additional criterion that guided the selection process was the continuous operations of the company and the availability of already existing and long-term participating users. Thereby, start-up and pilot applications were not considered. The case company is described in more detail in chapter 6.1.

5.2.3 Data collection

The choice of data collection methods may differ according to the design of the research, the nature of the research problem, and the availability of data (Pawar, 2004, 3-4). Generally, there are two major sources of collected data: primary and secondary; and while primary data are gathered via focus groups, in-depth personal interviews, survey, instructed stories and diaries, secondary data are gathered with the use of videos, presentations, historical analysis, published printed documents, websites. Primary data are usually utilized when there is not enough secondary data, i.e. existing data that greatly serve as a starting point for the research. (Bryman & Bell, 2003; Kotler & Armstrong, 2010, 133.)

The current research utilizes the principle of "methodological triangulation", i.e. the researcher apply several data collection methods to obtain more comprehensive data and greater understanding of the phenomenon, as well as to increase the validity of the findings (Denzin, 1989; Berker & Zauszniewski, 2012).

In order to gather data about the case company initially secondary data collection sources – the corporate website and blog, as well as online articles about the application – were utilized. Additionally, it was decided to have a semi-structured interview (Appendix 2) with company representative – Grant Williard, co-founder and President. This type of interviewing is based on a core list of questions that the interviewer wants to cover and is categorized by the flexibility in when the questions are asked and how the interviewee

responds (Edwards & Holland, 2013, 29). On the request of the interviewee, the in-depth interview with open-ended questions was conducted over email.

Meanwhile, the major data are collected from the users of the gamified application with the help of the online questionnaire that, in the particular research, refers to intramethod mixing of qualitative and quantitative data (WiŚniewska, 2011). The questionnaire is standardized, i.e. each respondent was exposed to the same questions and the same system of collecting and analyzing replies was utilized (Siniscalco & Auriat, 2003, 3). The online platform Qualtrics was used for implementing the questionnaire, the initial aim of which was to determine the diversity of the topic within a given population, rather than to establish frequencies (Boyatzis, 1998).

The questionnaire (Appendix 1) includes both close- and open-ended questions. While closed questions, i.e. multiple choice, are aimed at testing existing theory and identifying the sufficient factors of behavior change and human motivation, open-ended questions are focused on gathering users' opinions and experience (Trueman, 2016). This approach to managing data collection proved itself as an effective tool for measuring behavior, attitudes, and intentions (McLeod, 2014). Open questions were advantageous in a way that they involved freedom and spontaneity of answers, while closed questions apart from providing sets of response options, included "your answer" option that minimized the effect of limiting respondents (Oppenheim, 1992). The given options in the questionnaire were based on the existing theories that are crucial for understanding and creating the theoretical framework. Overall, a combination of open and closed questions was applied to provide the survey with quantifiable and in-depth results (Bird, 2009, 1311).

The questionnaire format was sequent in a logical order that allowed respondents smoothly proceed from one topic to another (Sarantakos, 2005). Thereby, it was possible to provide participants with the understanding of the purpose of the research and carefully reply to the questions (McGuirk & O'Neill, 2005), that were preliminary discussed with the research supervisor. As a good design of the questionnaire is crucial for generating data that correlate with the objectives of the research, the questions were well thought-out and put in blocks according to the study topics (Patton, 1990; Bulmer, 2004).

In order to achieve reliability and validity of the findings, the questions were kept short, avoiding double-barreled and negative inquiries (Payne, 1951; de Vaus, 2002). As the

respondents were from different countries, the research implemented the online questionnaire. Moreover, distribution through email is advantageous as it provides time to consider the replies, lets the researcher to ask more complex questions and guarantee strong response rate (Bird & Dominey-Howes, 2008).

Speaking of choosing the respondents of the questionnaire, overall, 50 out of 52 challenge participants submitted their answers. The only criterion for selecting participants of the challenge was their interest in pro-environmental behavior and the desire to test the application that potential could promote the adoption of "greener" behavior patterns. While 60 people were directly contacted and invited to take part in the challenge, 52 out of those agreed. This group of people also served as a questionnaire group of respondents that were each sent the email with questionnaire. Therefore, the researcher was able to identify the population of interest, i.e. relevant people to the survey, and to create a sampling frame, i.e. challenge in the application to identify the survey participants (McCormack & Hill, 1997, 49). As an intramethod mixing of the research suggests that obtained quantitative data is analyzed qualitatively and the sample sizes for qualitative research are usually small, around 32-64 people, the chosen sample size is considered appropriate for the study (Stone & Desmond, 2007, 134).

5.3 Data analysis

The researcher applied the phenomenological approach to data analysis, that is aimed at identifying the phenomenon of applying gamification for pro-environmental behavior change through how it is perceived "by the actors" of the situation, i.e. users of the application. The main advantage of phenomenological method is that it is focused on "bringing to the fore the experiences and perceptions of individuals from their own perspective", that, in turn, correlates with the research objective and contributes to answering the research questions. Applied in the single case study, this approach allows identifying factors and their effects under unique conditions, i.e. specific features of the application. (Lester, 1999, 1.) The phenomenological approach provides the researcher with an opportunity to work inductively with the collected data in order to generate new conceptualizations (Thorne, 2000).

Alongside with data analysis, data reduction, data display, and conclusion drawing processes took place. Data reduction refers to the process of selecting and organizing the data so the

conclusions can be formulated and verified. In the particular study, this process started even before the data collection, when the researcher made decisions on the case study, research questions, and conceptual framework, and continued until the completion of the study. (Miles & Huberman, 1994, 10; Saunders et al., 2009, 503-505.) Data display is the organized form of data presented as graphs and charts that the scholar can utilize to draw conclusions. Together with building conclusions, data display are ongoing processes till the completion of the research, where the former process takes place after collecting the data, and the latter one starts with collecting the data. (Lee & Lings, 2008, 236-237.)

With the application of the online platform Qualtrics, it was possible to collect and analyze qualitative and quantitative data concurrently and efficiently. In order to be able to get an idea of how efficient and fully people respond, the research utilized an exploratory data analysis, thereby, the researcher could look into the data files before all the data were entered and collected. The reason to apply this principle was primarily to identify on the early stages of data collection whether additional data would be necessary to gather. In the particular research, it is not assumed that the results of exploratory data analysis were released as study findings. (SSC, 2001.) The link for the questionnaire was active for five days with seventy-two hours possibility to re-enter the survey and finalize it that allowed getting 96% response rate, which is much higher than the targeted response rate for most researchers that is more than 60 per cent (Fincham, 2008).

6 RESULTS & FINDINGS

This chapter presents the empirical findings of the research, mainly obtained from the primary data collection methods. The presentation of the results starts with the description of the case study – mobile application JouleBug, which is followed by the identification of initial user's behavior, motives and obstacles for utilizing the gamified experience and barriers to perform pro-environmental behavior. The findings about the application of gamification for motivating pro-environmental behavior change, as well as the actual impacts of JouleBug on the achievement of this behavior pattern through motivation are also determined in the following sub-chapters. The chapter as such provides the obtained data, which is discussed in more detail in chapter 7.

6.1 Case description

Established in 2007 in San Francisco, CA, JouleBug has now two main product lines, applications JouleBug and Shine that are meant to encourage and reward people to take small actions with a greater aim to improve their lives, the community and the Earth (Willards, 2017). While Shine is focused on well-being, JouleBug is oriented toward sustainable behavior and is called "an absolute winner in the environmental apps" (Shoutem, 2016).

Starting JouleBug an experiment in the early days of mobile, social and gamified software, the founders wanted to evaluate the possible effects of these elements brought together on human behavior and to create "something relevant and important to society". The mission of the company speaks for itself (Williards, 2017):

> *"We want to use technology (mobile, social and gamification) to persuade/encourage users to take small actions that improve their lives, their community and the planet."*

The company tries to keep the application "lighthearted and fun" and takes a positive approach toward sustainability. Individuals rarely recognize that their small actions actually do matter over the long period of time. Therefore, the application is designed in a way to engage and educate people on the possible solutions to environmental problems, as well as to show users that some of their everyday actions already have a positive impact on the environment. (Willards, 2017.)

JouleBug uses a variety of game design elements and rewards people for taking “green” steps toward pro-environmental behavior. It provides points for taking and “buzzing” actions, has achievements to demonstrate the change of behavior, scoreboard to provide a sense of competition. Every user has also a trophy case where all the rewards and achievements are stored and he or she can always easily connect to their friends via social media like Facebook and Twitter (Willams, 2017). The application allows setting competitions in a form of challenges with countdown clock to participate, which represents a proven technology to promote sustainable actions in cities, schools or business corporations. For example, companies like KPIT Technologies (India) and HQ Raleigh (USA) have utilized JouleBug for implementing challenges within their closed communities and have reached enormous ecological results while also getting pleasure from the process. (JouleBug, 2017.) Moreover, the application provides the distinct feedback to its users and has a structured system to measure and present the results of one’s actions (Elliot, 2012).

The option of setting a challenge allows users to identify the desired objective to be achieved, involves creating teams, competing and getting prizes and rewards. JouleBug app also utilizes notifications that offer some fun “green” suggestions and serve as reminders (McKenzie-Mohr & Schultz, 2012) and triggers (Fogg, 2009). The application also provides helpful tips, tricks and video tutorials for environmentally friendly behavior (Shoutem, 2016). It also possesses feedback system that serves as a positive reinforcement for users (Elliott, 2012). Apart from awarding points, JouleBug also provides participants with a chance to connect to and import data from their utility accounts, so to monitor the energy savings, which consequently result in monetary outcomes that some of the participants value a lot. Users have shown “an average of $200 a year with the app” (Oaks, 2015), which is a considerable result, especially for the free app as JouleBug is (Paul, 2014).

Thereby, the company implies the variety of motivational tools for behavior change and tries to provide an enjoyable and fun experience that would engage users and facilitate qualitative change towards pro-environmental behavior. It addresses motivation with the help of providing information, feedback, the sense of competiveness and social community, the rewarding and behavior evaluating mechanisms. By applying the aforementioned game design elements, the application also addresses the basic psychological needs for competence, autonomy, and relatedness, mentioned in the self-determination theory (Deci & Ryan, 2003) as those responsible for formatting intrinsic motivation. It also strives to

provide participants with a sense of achievement and conscious satisfaction from performing pro-environmental actions that matter on the global scale (Bunchball, 2016). Points, badges and trophies, in turn, refer to the provision of external rewards that are supposed to boost both intrinsic and extrinsic motivation of the users (Richter et al., 2015).

Despite the fact that the company works in the sphere of mobile and gamified systems, it considers that motivating people and changing their behavior is a long-run process as it takes much time and effort to establish new positive everyday habits. Gamified solution in a sense of using a reward system to encourage specific behaviors should be fine and simple in order to sustain desired behavior patterns. (Willards, 2017.) In general, JouleBug is determined as a socially and environmentally focused app that has potential in facilitating behavioral change (Hower, 2016). The present research in a way tests the effectiveness of the application for the aim of behavior change by asking the actual users on the perception of the experience and suggesting possible improvements based on recommendations.

6.2 Pre-gamification user behavior

Totally fifty users of the Joulebug application from different countries of the world aged from 20 to 45 took part in the questionnaire with women and men ratio 70 and 30 per cent respectively. Despite the age, gender and nationality, the majority of people identified themselves as pro-environmentally behaving (49 out of 50) and defined this behavior pattern as the one that is characterized by the following actions:

- Being aware of and realizing the effects of human actions on the environment;
- Modifying the everyday behavior according to the environmental values and rules;
- Minimizing the negative impacts on the nature and surroundings;
- Sharing skills and knowledge and inspiring others to behave accordingly;
- Preserving nature.

While most of the people said to be aware of the general importance of human behavior in terms of improving the ecological situation, some of them still confirmed having initial challenges to change the personal behavior patterns, cognitive and environmental in their nature. Despite realizing the effects of human actions on the environmental systems, people emphasized several greatest barriers to change that are presented in the order of their popularity as follows:

- Lack of motivation;
- Lack of knowledge about the possible effects of their small actions on the environment and the processes of what and how should be done;
- Lack of time to reconsider the behavior;
- Lack of social support;
- Well-being and comfortable living environment.

Obviously, before using the application, most of the respondents had already thought of adopting some "green" habits, as they were aware of the possible influence of the behavior on environmental sustainability and that serviced as one of the greatest motives to perform some pro-environmental actions. For example, participants mentioned cutting down meat consumption, recycling, using public transportation, and switching off light and water among the top activities done or considered from time to time.

However, still a quarter of the questionnaire participants have not paid attention to the importance of their daily actions and have not been performing pro-environmental behavior in any of the mentioned above ways for a variety of reasons, and the barriers to perform green action are described in more detail further on.

6.3 Barriers and motives to pro-environmental behavior

People have identified a variety of barriers to perform and sustain the pro-environmental behavior, which can be generally divided into two large groups: external and internal factors.

Some of the respondents highlighted the *lack of knowledge* about the solutions to environmental problems, also mentioning having a *perception* that single person actions are not significant for making a world-scale impact, necessary to improve the environmental conditions. Simple *forgetfulness* to perform a particular action instead of an *old behavior pattern* was also among the intrapersonal barriers to pro-environmental living. Only one person among the survey participants expressed *no interest* towards environmental situation and improving the existing lifestyle, while being aware of existence of the problems.

Meanwhile, user applications said that the *location* is important for taking some environmental steps, like recycling or using public transportation. City or even country authorities do not invest in creating the necessary *infrastructure*, so citizens are not motivated to be sustainable without being provided the necessary conditions to do so. Overpricing of organic daily products according to "normal" once and higher costs for

“green” technological items are also the concern for making behavior more pro-environmental. Although people do express the interest towards living and taking care of the nature and surroundings, they point out the *lack of money* as one of the major barriers. Apart from that, the majority of respondents speak of the *discouragement or lack of support* from the social environment, i.e. friends, family and colleagues. They say that once being eager to make a personal change, they were asked for the rationale to behave so and were questioned whether the small actions taken by the individual are really influential for the society. This factor also speaks of the lack of awareness and knowledge of the society about the accumulated impact of the single human on the environment.

There are also those who express their concern about not being able to change some things in their living toward pro-environmental manner due to the *lack of power and control*. For example, not being capable of changing the heating in the apartment, light switcher in the corridor of the house or updating the systems in the working office makes people feel not capable of making a change that would contribute to the solving environmental problems. Respondents consider it as something out of their responsibility, though if being fully caring and attentive to the environmental issues, the concerns about the light or heating at home or work could be delivered to the authorized parties. In the meantime, some of the respondents simple call it “self-excuse” for not change the behavior.

Additionally, *lack of time* is referred to as a barrier to pro-environmental behavior. This, in particular, relates to driving cars instead of using public transport or walking or generally to obtaining information about what actions are beneficial to the environment and pondering on how existing unsustainable behavior can be modified to bring benefits to the nature. Living in the hectic and busy world of today, people just admin to be more *focused on personal issues*, rather than on what is happening with the environment. Another simple manner that is remarked as a factor to prevent pro-environmental activity is the *lack of external reminders and guidelines* to actually perform “greener” action instead of the opposite one. This factor relates to the previous matter of people’s business, so they need visual triggers and prompts to simply remember about what and how should be done.

Apart from identifying the barriers to pro-environmental behavior, respondents were asked to determine the motives and drivers to act with accordance to sustainability principles. Some of them mentioned factors that are opposite to the barriers of others, *like readiness to overpay* for the “green” products and *presence of encouragement* from the surrounding

society. Interestingly, there are also two equally popular answers stated by the respondents. These factors are on the extremes of self- and eco-centrism and vary on the range from external benefits to intrinsic intentions.

The first factor suggests the people are ready to take environmental behavioral patterns, because it helps them to *save money*. Especially the saving comes from the energy and water consumption that is easy to monitor with special techniques. The contrary rationale to become "green" is the *inner understanding* people have about the importance of being environmentally friendly and their desire to act according to the environmental rules and values. Brought together, these factors suggest that people are ready to make a behavior change for personal and environmental reasons, and almost equally appreciate the potential outcomes pro-environmental behavior can bring to the individual.

Another important aspect that drivers the behavior is the *internal desire* to make a change and *serve as an influential example* for the society around. It is intrinsically important for people to have the sense of pro-environmentally behaving person who is capable of not only making a personal change, but also inspiring others to learn and adopt this type of behavior.

There are also society related motives to be sustainable, and those are a *sense of community* and the *fear of missing out*. Both factors deal with the influence of the surrounding community on person's choices and decisions to adopt "green" actions. However, there is also a difference to keep in mind. In the first case, the motive refers to behaving pro-environmentally, because friends, family members or colleagues behave in the "green" way and a person just wants to do the same, so he or she possesses a desire to be a part of environmentally friendly community. The second condition deals with the situation when an individual tries to avoid bad thoughts about themselves not behaving pro-environmentally. The person can be simply not willing to receive negative feedback and judgements from the society, so he or she decides to perform environmental actions.

Generally, people state that both internal and external factors have more either positive or negatives effects on their behavior. The situation is such that in their majority, the respondents are aware of the environmental problems and the influence of human actions on worsening or solving those primarily on the opinions and involvements of other people or lack of some resources or necessary knowledge. Even though quite many respondents are ready to perform pro-environmental behavior and make a qualitative change in the way of

maintaining their actions, their intention to live “green” is not enough. It should be supported by a variety of motivational factors, like information, social relatedness and triggers. What is also important to point out is that, the described in this sub-chapter, external aspects can have both negative and positive impacts on people’s intrinsic motives and conscious decisions to perform specific behavior or to change the existing patterns toward environmentalism. Whereas external factors in their majority are hard to adjust with the use of gamification, there is a chance to address internal aspects to make people change their behavior, and the following chapters provide more information on how the gamified systems can influence human motivation to perform the desired behavioral patterns.

6.4 Drivers and challenges of gamification for motivation and behavior change

When being asked whether they see the potential of gamified systems for motivating and affecting human behavior, the responding users of the application said at once that gamification is a unique tool that can be pleasant and useful for a variety of purposes cause of different reason, described in more detail below. Some of them also suggested the improvements for the case application, which are considered as challenges of proper and efficient utilization of gamification for addressing human behavior.

Among the most advantageous and effective aspects, respondents identify the function of bringing people of the same interests on one platform, where those can monitor others’ success and progress and communicate on the interesting topics, commenting and liking posts of each other. Additional plus to generating motivation to participate is when there are friends or acquaintances also using the service. People express interests towards competitions within the community, and not only for the sake of some external prize, but for the winning status and sense of achievement. Comparing one’s behavior to the other participants brings up the internal motivation and, thereby, benefits the process of behavior change, as people do not even notice how by competing, their actions change.

This is achieved by gamification utilizing the variety of game design elements, like points, badges and leaderboards. Having immediate feedback for performing some actions presented in form of aforementioned game mechanics as well as textual positive appraisals also tends to affect person’s motivation. External rewards, however, are shown to have less effect on motivation than all the previously mentioned aspects. Nevertheless, there are some people, who appreciate the rewarding system of gamification and like to participate for the

sake of obtaining some tangible assets. Even fewer are motived to take part in the experience simply for competing to win, despite what type of experience it is.

The users also identify the importance of measuring feature of the system that can provide visual and numerical statistics of achievements of a person, so to help to adjust and update the existing patterns of behavior by raising intrinsic motivation. This motivating function of gamification can be also be presented in the form of feedback.

Gamified experience also helps to address self-efficacy of the person, i.e. their confidence in having an ability to perform some action or behavior. Gamification works greatly for those who already have some interest toward some particular topic. For those who initially lack interest toward the subject of the experience, gamified system can hardly influence the longitude motivation for behavior change. It can rather provide information on the subject, therefore, raise the level of user's awareness on some problem, and from there the person will decide himself or herself whether to continue to change adoption or quit it. Gamification is effective for appliance when a person possesses some aim, extrinsic or intrinsic, and by addressing the existing motives and desires of the person, it can bring some value to the user, so motivate and engage them.

Apart from being only a positive experience that addresses different needs and desires of participants, gamification is supposed to have elements that are demotivating to the users and, thus, challenging to the developers to implement in order to address motivation for behavior change. Among those, the respondents identify the complicated design and confusing structure of the application and absence of story lines to follow. Providing users with disinformation or no chance to customize the experience also decrease the effects of gamification on motivating people. Therefore, the great challenge of gamification is to set and develop it right in terms of *visual and context structures* provided to the users.

People also say that using gamified systems can be *time consuming*, and having a wearable device with game incremented game mechanics rather than a mobile app might be beneficial. Another challenge of using gamification is *setting the rules* so that people would not cheat on their experience and actions. The cheating itself does not really work for the actual behavior change, as well as it is also considered demotivating for other users who see that it is possible to cheat the system and understand that others can actually take advantage of it. Additional importance factor to consider is that the users of the gamified apps can be from

all over the world, so if not providing them with tools applicable for their *location*, people will just bounce the gamification even if it is fun. Therefore, when considering the providing of gamified experience to the target group, making the analysis is necessary.

Despite a great variety of drivers to use gamification for motivating people to change their behavior, without initially considering the challenges and potential obstacles to the process, all the development work can be eventually just not valued and utilized by the users. Whereas, the main drivers of gamification base of its applicability, unique social and game related features that affect human motivation and foster behavior change; its challenges deal with the process of analyzing what targeted users want, value, and expect from the experience. Thereby, considering challenges and drivers should take place on the early stages of developing gamification project.

6.5 Gamification of pro-environmental behavior change

Human behavior is determined by the combination of personal, behavioral and environmental factors, however, there are also people who are guided primarily by personal cognitive aspects, like knowledge, attitudes and expectations. Meanwhile, the synergy of different affective factors is represented by such issues as the presence or absence of particular skills, personal perceptions and beliefs, self-efficacy, social norms and influence on a person from the surrounding society.

Speaking of the impacts of gamified systems on the user behavior, respondents' answers diversify a lot. However, to summarize the effects of gamification on making a pro-environmental behavior change it is mostly positive due to the motivational power of such an experience; apart from only three people out of the whole control group saying that JouleBug as the case application was not helpful for them. The impacts of this mobile app on making pro-environmental behavior change are described in more detail in chapter 6.6.

Referring to the ways in which gamification can influence human behavior change, the results of the questionnaire brought up the most necessary and effective functions and motivational techniques of gamified systems. First of all, people pointed out the *informative* aspect of gamification, i.e. they realized that their actions have an impact on the problems that are greater than they are, e.g. on the environment. Respondents also got motivated to make a change when understanding that the pro-environmental behavior change is possible without limiting oneself. They also expressed the opinion of utilizing gamification for

educating other people who are not aware of the existing environmental problems and ways to solve those and *engaging* them in the experience toward pro-environmental living.

Apart from that, by participating in the gamified experience users started to get the *feeling of how right* it is to make a change in the behavior, while also they *learnt a lot* about the existing environmental problems. Moreover, some respondents stated that while using the application they realized their *self-efficacy*, internal confidence in making a change and contributing to the existing ecological situation.

Getting *reminders* about the possible "green" actions, *feedback*, *points and badges* for actually performing the environmental behavior were also mentioned among the influential behavioral factors. People also appreciated the support from other users of the application and assumed that it was important to have *a sense of community,* like-minded and interested people, who inspired to perform more "green" actions, by doing the same. They appreciated the feeling of relatedness and feedback from the peers.

Still a few respondents mentioned *competition* and *external rewarding* for taking "green" actions as the motivator to behave pro-environmentally. Even less spoke about the motivating power of the possible *monetary outcomes* in the form of savings for making environmental steps. Meanwhile, there were also participants who suggested that the gamified experience served more like an *entertaining* mind map of what can be done apart from the green actions that these people have already been taking before using the app.

In rare cases, respondents assumed that gamification could harm the process of changing behavior into pro-environmental one. Some assumed that whether the mobile application or gamified system is too assertive, it could influence the abortion of participating in it. Thereby, in order to engage people, but not make them irritated with the presence of the experience in their life, a balanced notification system should be designed by the developers. Others suggested that if the person initially did not have an intention to change, the gamified system would just serve for the sake of fun and could lead to no effect on the behavior change. Gamified experience could also provide misinformation on the issues of environmental sustainability and be used as a tool for greenwashing.

Apart from general negative situations of using gamification, itself it can lead to the negative outcomes during the behavior change process, when once not utilizing the app, a person could have no intrinsic motivation to behave according to the environmental values as no

points or badges would be provided for taking actions. In principle though, not a single respondent mentioned the undermining effect of external rewards on their internal motivation during the use of JouleBug.

Meanwhile, the dominating majority of the respondents concluded that even if their behavior did not fully change into the pro-environmental one, they still stayed motivated to perform "green" actions and some even got inspired to learn more about the subject so to upgrade the existing behavior patterns. There were also those who raised their knowledge on the subject in a way to bring some incremental changes to their routine tasks and shared the experience with friends and colleagues, thereby, attracting more people to the problems of sustainable living and motivating them to consider pro-environmental behavior change. Another outcome of utilizing gamification mentioned by the respondents is that the experience taught them about the variety of possibilities on how to act with accordance to the environmental values without limiting oneself in satisfying personal needs. Other respondents also appreciate the chance to see that there are a lot of like-minded people who are aimed at and ready to make changes to their behavior in order to contribute to the well-being of ecosystems and, consequently, people who live there.

6.6 JouleBug for qualitative behavior change

Despite the generally positive comments about the application, its users still have identified the aspects that can be addressed by the company for further improvement and development, and this chapter is about to provide the insights of respondents' opinion about the motivational power of JouleBug, its functionality and user-friendliness. The aspects analyzed in this sub-chapter can also be applied when developing other projects aimed at gamifying pro-environmental behavior change.

The first thing appreciated by all the respondents is the ability to participant in challenges and compete with other users for achieving different objectives, intrinsic and extrinsic. For example, some people love the idea of getting prizes for doing what they like and value, i.e. pro-environmental actions. With the help of application, they realize that the daily actions they maintain do not only bring them satisfaction for performing pro-environmental behavior and self-confidence by recognizing that their actions do really matter on the larger scale, but also provide them with points and badges, that as such serve as virtual appraisal and effective measurement of their behavior. Besides, people like getting feedback on their actions, which

consequently motivate them to perform more “green” actions and move on toward achieving some “green” objectives. JouleBug is also able to address the personal needs for competition and peer comparison that make people be eager to try their efforts in reaching a leading positions in the ranking among other application users.

Another important and unique feature of the application highlighted by the users is the presence of useful and cognitive information about a great variety of sustainable actions that can be and are usually done on daily basis. By providing users with additional information on the effects of their actions, JouleBug engages them to participate in the process of gamifying sustainability and serves as an interactive and entertaining platform for sustainable actions. It also helps to raise consciousness and awareness among those who are not familiar with what environmental problems and solutions exist. Therefore, JouleBug perfectly maintains the informative functional application for those who decide to change behavior toward pro-environmental manner.

The application also seems to serve well as a social media platform for the environmentally concerned people. Users commented that they enjoy using JouleBug because of other users who perform “green” actions and share those with others, who can like and comment one’s “buzzes” and, thus, motivate people to act sustainable and share the experience and achievements with others. They especially appreciate getting feedback and appraisals from the peers that boost the desire to implement more activities and get engaged in the actual process of using the gamified system.

Despite the positive comments on the application, the respondents also expressed several concerns on the process of its utilization and functionality.

A quarter of the respondents pointed out the complicated structure of the app, saying that although being graphically well-designed, getting to know the application at first was problematic and confusing. People could not understand the necessity of having long lists of activities to do, and suggested improving the process of offering environmental actions to be taken. For instance, one of the respondents assumed to make it possible to customize “buzzing” of the action, so instead of putting one “buzz” per action, people could write a list of “green” activities implemented during the day. This would save the time for using the application, while also keep people engaged in the experience and interested in monitoring

their and other users' results. Additionally, a more holistic picture on the daily achieved pro-environmental steps could work as guidelines to follow the next day.

Apart from being time-consuming at times, JouleBug was also characterized as sometimes boring, due to no plot development. Having a story line or a daily "must-do" task would serve well as a solution to this drawback, as it would give at least some sense of development and necessity to utilize the application. There were users who said that even quitting the usage of the app, they still perform "green" actions, which is good in a sense of sustainable behavior change, however, not so good from the company's perspective to retain the users.

Quite many users also questioned the trustworthiness of behavior evaluation, which raised the demotivating aspect not only for utilizing the app, but also for adopting pro-environmental behavior change. Respondents mentioned the cheating from other users' side that "overbuzzed" in order to win in the challenges, whereas the gamified system did not monitor the situation and did not take proper measures.

Additional short-coming of the system users identified in the absence of mobile reminders to use the app or perform some environmentally beneficial action. As the most active participants of the app are at the working age, they were becoming demotivated on their way to behavior change due to forgetfulness. Thereby, using such triggers as reminders and daily "green" suggestions would be quite advantageous when addressing this issue.

The respondents from countries other than USA also highlighted the US user oriented features of the app that does not let them connect home utilities to the app and measure the efficiency of behavior in the monetary and energy savings value. From the perspective of participating in challenges, respondents appreciated 15 days challenge organized for this research, as one week challenges are said to limit users' ability to perform diversified set of actions and express the full capacities of their pro-environmental intentions.

To sum up, JouleBug seems to have its positive and negative sides, where advantageous aspects mostly deal with the motivational techniques it uses, and disadvantageous – with the process of designing and organizing the gamified experience. Presented transcription of this case findings are also supposed to be a good starting point for companies that are interested in addressing the questions of environmental sustainability through gamification, as well as for JouleBug to reconsider the needs of the target audience and its main features and to work on the incremental improvements of the application.

7 DISCUSSION

Once the literature review is completed and the empirical findings are gathered and transcribed, it is the time to discuss their correlation. The aim of this chapter is to provide the insights on the similarities and differences of the theoretical data described in chapters two, three and four of the present study, and research results obtained from primary and secondary data collection methods. The chapter considers the practical applicability of the most essential theories and models with the application of obtained results.

7.1 Behavior change through gamification

As the behavior change process involves the understanding of the factors affecting the change as well as the determination of the process, these two aspects are separated, but presented under the same sub-chapter.

Factors of behavior

Fogg (2009) suggests that human behavior is formulated under three main elements: motivation, ability, and trigger, whereas Bandura (1986) defines human functioning being primary determined by the behavioral, environmental and personal factors. The results, in turn, showed that all the aforemented aspects take place to some extend during the process of addressing behavior through gamification, and the discussion is structured in the order of factors appearing.

Motivation

Many psychological theories identify motivation as a significant behavioral determinant (Rabideau, 2005; Dixon, 2008, 6; Keller, 2011) and divide into extrinsic and intrinsic motivation (Maslow, 1954). Self-determination theory also identifies amotivation (Ryan, 1995; Alhaji & Yusoff, 2012), which, however, is not a part of this particular research. The findings also suggest that performing behavior and changing existing behavior patterns is greatly correlates with the presence of motivation, both extrinsic and intrinsic; and whereas scientists describe the “undermining effect” of external rewards on internal motivation (Deci & Ryan, 1985; Deci et al., 2001), the participants of the questions did not specify having any problems with performing targeted behavior. On the contrary, some of them suggested having a positive effect of tangible incentives on the increase of internal motivation and general interest and desire to take actions.

This can be explained by the existing features of the gamified system that Chou (2016, 110-115) identifies as recommendations on how to make the experience more intrinsic. He suggests that the experience should be more social and provide the meaningful choices and feedback to the users, as well as have a sense of unpredictability to sustain the engagement. The application organized well the social conditions for the users as well as provided well-formulated feedback that motivated users for some time, however, as it did not include the story lines and unpredictability, even in terms of getting some special prizes or additional points for regular actions, some users confirmed being bored of the application after a while.

It is widely accepted that human motivation is generated by the satisfaction of basic psychological needs for autonomy, competence, and relatedness (Ryan & Brown, 2003, 73). Especially, the effects of these needs are considered when aiming at designing intrinsically motivated behaviors (Ryan et al., 2008; Surugiu, 2014, 32). Meanwhile, in their majority, the respondents confirmed having initial interest and decision to perceive the behavior change, and the gamification was a good tool to sustain the process, also bringing a sense of community of like-minded people who supported the continuous motivation to change. It was also motivating to take actions and participate in the gamified experience, knowing that familiar peers are also involved in it. Additionally, some of respondents said that they were initially demotived to take actions, because of the complex structure of the application, which, in turn, questioned their abilities. At the same time, respondents expressed more interest toward performing particular behavior when the gamified system provided them with more information on the existing problems and solutions, addressed from the context of its appliance. Therefore, the findings reveal the equal importance of the needs for autonomy, competence, and relatedness on the process of intrinsically motivating people take some actions.

Apart from that, the empirical results suggest the effects of other factors on human motivation. Some of respondents, who had some initial interest and knowledge, were eager to participate in the gamified experience for the sake of fun and entertainment, they also enjoyed getting rewards for taking some actions, that previously were just a part of daily routine. That correlates with the research by Francisco-Aparicio et al. (2013) and Pe-Than et al. (2014), but is opposite to the opinion of Deci (1971) that implies to the undermining effect of extrinsic rewards for behavior that is intrinsically motivated. Others enjoyed competition per se and a chance to monitor the present behavior patterns and its effects in

the monetary value for a person. Even more realized the importance of actually taking particular actions for their high importance in the larger scale, which refers to the human desire of altruism and status (Bunchball, 2016, 5).

The idea that the provision of a meaningful experience that creates the linkage between current experience and something from the past of a person is a key to foster motivation (Nicholson, 2012) also found its confirmation in the results. People, who had already taken some small steps toward the targeted behavior change before the gamified experience, appreciated it a lot, saying that it was able to enlarge their knowledge on the subject, provided them with a sense of community and created guidelines for further improvements of every day actions while also rewarding them for taken actions. This was possible to achieve with the use of game design elements (Deterding, 2012), that Robson et al. (2015, 413) divide into mechanics, dynamics, and emotions. Zhang (2008, 145) calls it the "motivational affordance" of game elements, i.e. their propensity that determines whether and how they can support one's motivational needs.

The findings suggest that all types of elements have an effect on motivation. Game mechanics like points, leaderboards, the general context of the application help users to measure and evaluate the performance and, thus, motivate them to adjust some actions and interact within the experience, i.e. game dynamics. That is exactly what LeBlanc (2004) and Robson et al. (2015) suggest: by applying suitable game mechanics and satisfying players' desires, it is possible to create experience that motivates user and drives their behavior. Emotions, in turn, are presented in the form of better connections of users to the engagement outcomes. Moreover, by addressing the key human features and desires gamification is empirically proven to evoke particular actions. The important moment here is to realize the type of users, which are theoretically classified as killers, achievers, socializers, and explorers (Bartle, 1996). The taken case study was able to identify all types of players and was successful in promoting the achievement of their needs.

Motivation identifies person's decision making process concerning the performance of some actions, the duration and efforts put for keeping the actions. (Dörnyei & Ushioda, 2011, 3.) Therefore, addressing it is crucial for the creating high quality behavior change.

Ability

Fogg (2009) relates ability to the level of simplicity to perform some action and suggests if behavior requires a lot of time and money, it is unlikely to take place. The results of the study supported these ideas. The respondents clarified that time is essentially important and highly valued when considering taking some action. Some said that even the realization and understanding of problems was not enough for them to take measures, as it was time and resource consuming. The participants of the gamified experience all suggested then when being ready to adopt the behavior, they faced the barrier of making extra investments that eventually stopped them from the initially planned actions.

Apart from these two elements of simplicity, Hrena (2016) also identifies physical effort, non-routine behavior, brain cycle and social deviance. While the two latter issue was not empirically analyzed, including physical efforts did not prove itself as a negative impact on implementing some actions that is explained by the presence of internal motivation and understanding the importance and effects of one's behavior. Non-routine behavior was partly identified as an effective aspect on behavior, by respondents explained it by simple forgetfulness to take actions and moderate old behavior patterns. In general, the findings proved the impacts of "ability" by Fogg (2009) on the adoption of behavior and implementation of behavior change, which can be facilitated by providing the appropriate game mechanics in the gamified experience.

Trigger

There are three types of trigger identified in theory – spark, facilitator, and signal. Spark works as a motivational element when an individual misses motivation, facilitator serves well when a person lacks the appropriate level of ability, and signal is used as a reminder to take action. (Fogg, 2009; Basten et al., 2015.) According these definitions, the triggers from the gamification perspective are some game mechanics. The respondents mentioned the importance of the reminders (signals) to perform the behavior, also spoke about the significant impact of simple, but informative tips on how to behave (facilitators) and points and leaderboards as elements that facilitated their extrinsic and subsequently intrinsic motivation on the way to behavior change.

Social cognitive theory

According to the social cognitive theory by Bandura (1986), there are three types of factors that affect human behavior: personal, behavioral and environmental. The empirical findings show that the people's actions are determined by the combination of these factors, while there are also those who give preference to the personal or also called cognitive factors, such as knowledge, attitudes and expectations.

Speaking of the environmental factors, the theory refers those to the presence of social norms, access in the community and the possibility of influencing on others (Wood & Bandura, 1989). Meanwhile, the respondents express opinion that the external factors play an essential role in their behavior. People confirm being influenced by the community's opinion and behavior, which leads to them adjusting some of their behavior patterns. The users admit that there are more eager to participate in the gamified experience and adjust their habits if there are friends or someone from the surrounding community ready to support and share their experience. There are also those who are just willing to be a part of gamified system to communicate with people of the same interests. Moreover, people realize the importance of the infrastructure and other external facilities that have impact on their behavior that is well described on the example of pro-environmental behavior in chapter 7.2. Respondents determine the availability of resources among the most influential behavioral factors. The empirical findings allow suggesting that environmental factors as well as all other types of influencers can have negative and positive power on person's decisions and actions, however, external factors also affect human's motivation to perform some actions. This related to the lack of control and power that people experience when not being in charge of something that though affect them.

The theory identifies skills, practice and self-efficacy as the most essential behavioral factors (Wood & Bandura, 1989); and self-efficacy here relates to the individual's confidence in the ability to successfully perform a particular behavior (Bandura, 1977). The findings reveal that being a participant of the gamified experience that majority of people were able to identify the importance of their actions on the environment and got more confident in what they did or decided to do. The gamified application approaches this factor by bringing down the complex behavior into smaller actions that also proves the idea of Perry et al. (1990) that it is possible to raise self-efficacy if behavior change takes the form of a series of small steps. However, the recommendation that in order to make people a qualitative behavior change it is necessary to provide them some benefit or reward (Bandura, 1986) practically did not get

that much support. Users say about short-term pleasure for getting points for taking some actions, they rather prefer having internal interest and conscious decisions to act accordingly, but do not mind being rewarded for taking some actions. Therefore, human actions to some extend tend to be affected by reinforcements, both internal and external (McLeod, 2016).

As already mentioned, the majority of respondents assume that their behavior is primarily influenced by the personal factors, such as knowledge, attitudes and outcome expectations (Bandura, 1989; Bandura, 1998). Indeed, the findings show that once the application was used and people started to obtain more useful information on the existing problem and its possible solutions, they started to before more actions to solve this problem. They realized the effect of their actions and adjusted some of their daily routine into more concerned actions that was a conscious, internal trigger to the process of change. Additional, just a few of the respondents expressed no interest toward the problem and, thereby, were not really involved in the offered experience, which, in turn, serves a proof to the idea that attitudes do really matter when addressing human behavior.

In general, human behavior is viewed as a complex phenomenon that consists of actions that are influenced by a great variety of intrapersonal and interpersonal factors. Addressing gamification to the question of changing behavior should involve the analysis of the influential behavioral factors, as only providing a set of game design elements is not enough for making a change. The complexity of approach behavior change is widely suggested in theory, and one more time empirically tested within the frames of the mobile gamified application.

Stages and processes

The literature review includes the description of the transtheoretical model. It suggests that every behavior change comes throught the set of stages, starting from not being aware of the problem and not intending to take actions in the foreseeable future to the stage when person has 100% self-efficacy and no temptation to return to the problem behavior (Prochaska & DiClemente, 1983; Prochaska & Velicer, 1997; Velicer et al., 1998). Practically in was identified that most of the respondents and participants of the gamified experience are in the later stages of change, action and maintenance, as their behavior is characterized by either making efforts to modify existing behavior or by working on prevening the relapse (Prochaska & Velicer, 1997).

This theory also suggests that stages of behavior change exist in the relationship to the ten process of change, and there is a correlationship between a particular stage and process (Lenio, 2006). For example, on the action and maintenance stage people are supposed to be involved in the processes like contingency management, helping relationship, and stimulus control. Contingency management refers to providing rewards for taking some action, helping relationships relate to finding and being surrounded by supportive who are positive about making this change. Stimulus control deals with utilizing reminders that would encourage the proper behavior pattern. (Velicer et al., 1998.) Obviously, these process are greatly covered by the gamified experience: people are the part of the like-minded people who possess the same goal and strive to do the same behavior changes; every person gets notification and tips on what and how to proceed on the way to goal achieving; and users are getting rewarded for performing actions. All these aspects do influence the behavior change, and that is what the findings are about.

The answers of some respondents also correlate with the definition of the preparation stage of change, where a person is intended to take an action soon and has some plan of action. Self-liberation process, i.e. making commitments and believing in one's abilities to change, relate to tis particular stage of change and is empirically evaluated to be a characteristic of some users. (Prochaska et al., 1992.) Nevertheless, these participants identify the importance of helping relatioships and reinforcements on the adoption of their behavior, thereby, the structured correlation of process and stags of change is a bit modified when dealing with gamification.

7.2 Pro-environmental behavior change through gamification

Literature suggests that pro-environmental behavior is the behavior that improves the conditions of the ecosystems and reduces the influence of human actions on the environmental (Stern, 2000; Kollmuss & Agyeman, 2002). It possesses the aim of minimizing negative effects and maximixing positive impacts on the planet (Steg & Vlek, 2009). Apart from that, usual participants of the questionnaire suggest that pro-environmental behavior deals with modifying daily actions with accordance to the environmental values and sharing the knowledge and experience with the others. Thereby, it is obvious that people understand what this concept means and for a reason primarily identify themselves being pro-environmental.

Most of the respondents confirm being aware of the environmental problems and human actions being a cause of those. The main motive for behaving pro-environmentally people see in the personal desire to make a contribution to problem solving and valuing the environment, what fully correlates with the ideas of Schwartz (1977) and Pruneau et al. (2006). The respondents also highlight the inevitable influence of the social environment on their actions (von Borgstede & Biel, 2002), as well as lack of resources and time (Quimby & Angelique, 2011).

One of the greatest benefits of gamification for adopting the pro-environmental behavior change people see in its informative, educative and social functions (Steg & Blek, 2008), putting rewarding and entertaining systems on the secondary sites. They admit that presence of the detailed information and useful tips about the possible solutions to the environmental problems positively affects the overcoming of such barriers as lack of knowledge, existing values and attitudes (Kollmuss & Agyeman, 2002; Quimby and Angelique, 2011). By seeing how others are involved in the gamified process, respondents conclude being also more active in performing pro-environmental actions, concurrently enjoying getting points and competing for the leading places in the general ranking.

Another positive aspect of gamification, empirically discovered during the study, is the functional elements like feedback on performing particular actions that work as a supportive motivational technique and has full effectiveness when being collaborated with, for example, information or cost (McKenzie-Mohr & Schultz, 2012) or provided for reaching set goals (Ehrhardt-Martinez & Laitner, 2010). Indeed the findings show that people are eager to perform the behavior change when having a goal, like getting a badge or winning in the challenge, which is divided into small steps and feedback and some points are given on the way toward the goal.

Some people highlight that the application help them to understand the amount of influence one's action have on the global environment once being accumulated and realize that there is a variety of options to live in a "greener" way without limiting oneself. These ideas are supported by two different dominant theories of pro-environmental behavior, where the first one refers to the individual behaving for maximzing personal material welfare and the second one – to the motives beyond personal, like eco-centrism (Stern, 2011). Therefore, gamification can be applied to address people of different values and make them act according to the preferences, eventually benefiting the environment.

In the meantime, during the process of utilizing the gamified application, people express their concerns about the design of the experience, even call it complicated and not user-friendly. They say that they would be more willing to participate if there would be more simplicity and straightforwardness in actions. Other also mention the trustworthiness issues as demotiving on the way to pro-environmental behavior change. People question the process of evaluation the results on one's behavior. Apart from being empirically realized during the research, these aspects of easiness to understand and remember, attractiveness of presenting information and the trustworthiness, are also considered by the theorists (Staats et al, 2004; Brewer & Stern, 2005).

Still others suggest that if the application had a function of notifications that would make the process of reminding about making some steps and taking some actions toward pro-environmental being easier and more efficient. That, in turn, correlates with the assumption of Fogg (2009) and McKenzie-Mohr & Schultz (2012) about the presence of triggers, i.e. memory aids that should be provided in close proximity to the repetitive behavior. Moreover, the literature considers rewards or incentives as a facilitator of pro-environmental behavior (Valente & Schuster, 2002), whereas only a few questionnaire participants state that having trophies for their actions is the guiding motive for them to behave pro-environmentally. The majority still values the issues of environmental sustainability per se, and see gamification is a nice guiding and monitoring tool on the way to pro-environmental behavior change.

Therefore, after evaluating the positive and negative sides of utilizing gamification for pro-environmental behavior change, it is essential to identify the possible drivers and challenges of applying gamified systems for motivating people change their behavior. Theoretically assumed that gamification is a beneficial strategy to use as it can promote reaching a variety of business objectives, in particular, behavior change (Burke, 2014), by engaging and motivating users and supporting them in achieving their goals (Huotari & Hamari, 2017). The findings, in turn, prove that gamification is a valid technology for approaching motivation for the sake of behavior change, however, it is supposed to be attractive and user-friendly, well-designed with the gamification elements well planned and presented.

Thereby, the challenge of gamification is the way it is approached by developers, is the lack of accumulated knowledge about human psychology and game design. It is essential to understand the possible correlation of human motives and game mechanics (Bunchball, 2016, 5), as exactly these elements influence the satisfaction of players' desires that leads to

creating proper experience for driving behavior (LeBlanc, 2004; Robson et al., 2015, 416). One more challenge expressed by the theorists is setting the appropriate scoring and incentive systems that would not let users abuse the use of application (Nicholson, 2012; Reiners & Wood, 2015). The survey participates highlight this issue a lot: they show concern toward the fact that other users of the experience can simply cheat on the system for the sake of winning, and it brings them a sense of demotivation during the use of gamification, and negatively affects their behavior change acquisition.

On the contrary, the benefit of gamification for behavior change is seen in the easier performance appraisals (Prakash & Rao, 2015), that is also identified in the result section of the study. People appreciate the idea of being rewarded for the actions they take and they like to monitor their progress on the way to reaching the set goals. Chou (2016) determines eight drivers of gamification that are only partly represented in the case study. For instance, participants express that they are motived by feeling that there are actions matter and that environmental conditions depend on their choices and decision, which relates to the drivers of ownership and possession, and loss and avoidance, in a sense that people are eager to behave pro-environmentally in order to prevent negative effects on the planet. Moreover, as it has already been mentioned earlier, human behavior is influenced a lot by the social environment a person lives in, and if some acquaintances or friends take part in the gamified experience, this person is more willing to try it himself. The driver of social influence and relatedness also relates to the competition and social acceptance in the experience (Chou, 2016). Meanwhile, the chosen case study was not able to offer any information about such drivers as scarcity and impatience, although influenced that participant can get bored on their way to change if not being provided with a sense of curiosity and unpredictability.

All in all, the empirical findings have lots of similarities with the theoretical overview and prove gamification to be a sufficient tool to use for reaching pro-environmental behavior change. However, it is of great importance to pay attention to the challenges of utilizing gamification that can have a negative impact on the use of the gamified system itself, consequently affecting the motivation of people to perform desired behavior patterns. It can also be so that apart from reaching the targeted behavior, gamification can serve an informative, social and entertaining system for its participants that correlates with such aims as educating people on environmental issues or helping them realize the concern on the environmental sustainability on the global scale with users from all over the world.

8 CONCLUSIONS

The main objective of the research was to explore the process of gamifying pro-environmental behavior change and to formulate the theoretical framework that would describe this process with the aplication of existing theoretical findings and empirical results. Therefore, after fulfilling the research, it is possible to conclude that the stated aim has been achieved.

Undoubtedly, gamification can be defined as an effective tool for motivating people to change their behavior into pro-environmental manner (Froehlich, 2015; Seaborn & Fels, 2015), but apart from the actul shift in acting, gamified system are able to provide other outcomes, like raising awareness on the environemental problems and ways to solve those. Pro-environmental behavior, despite being well-defined by the scientists and well-understood by the population, might still be considered as a complex concept, as it implies to a set of varied actions a person can and should perform for the sake of saving the environment. Thereby, on the way to this behavior change the developers of the gamified experience as well as the users can face some challenges, which are also significant to consider. For instance, gamification can be useful and valuable in context of environmental sustainbility only when being designed and though-out well enough (Fogel, 2015). For this reason, it is necessary to make analysis of the existing behavior of the target audience as well as evaluate the possible influencial factors, such as surrounding community, presence of the necessary resources and actual internal desires for a change.

The following sub-chapters present detailed information and suggestion on how to make the process of gamifying pro-environmental behavior and which aspects to consider when deciding to address this type of behavior. The conclusions are presented in the form of theoretical and managerial implications of the study and formulated by answering the research questions.

8.1 Theoretical implications

Developing a successful gamified project is a demanding, but if designed properly an efficient strategic decision for those who want to motivate pro-environmental behavior change. The gamification process is well-defined by Morschheuser et al. (2017), that is why it is taken as a basis for the suggested theoretical framework (Figure 9).

Although it is suggested that design and implementation phases, as well as evaluating and monitoring should be separated, the present research assumes having five main stages, which are project preparations, analysis, ideation, design and implementation, evaluating and monitoring. The research pays attention primarily to the first three steps of gamification process.

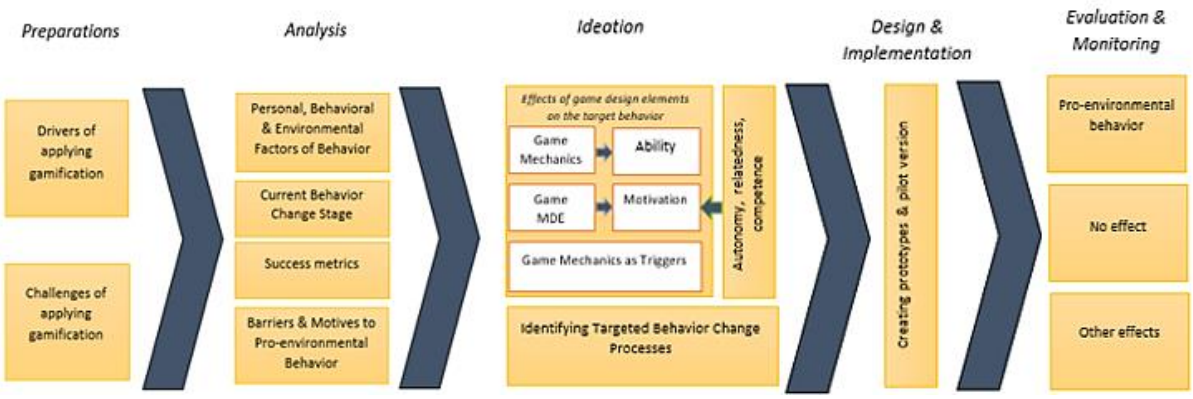

Figure 9. Gamifying pro-environmental behavior change

Theory speaks about the necessity to define the problem that should be addressed by gamification (Burke, 2014; Klevers et al., 2015). As the idea of the gamification and its main aim in this study is identified as facilitating pro-environmental behavior change, on the preparation stage it is suggested to consider the drivers and challenges of applying the gamified system. This will help to evaluate whether gamification is actually a suitable tool for reaching the project aim.

The major drivers of gamification for motivating pro-environmental behavior change are the diversified functionality of the tool, the wide range of objectives and game mechanics that can influence both intrinsic and extrinsic motivation of the participants. Whereas, the greatest challenges of gamification are the complexity of designing the experience, provision of trustworthiness of scoring and evaluating behavior, and creating something meaningful for every user of the system. The solution to these obstacles is seen in the proper approach of the analysis stage, where the targeted audience should be well-determined.

For this reason, it is suggested to analyze the current behavior of potential participants from the perspective of identifying the main external and internal behavioral factors, defined by Bandura (1986), and consider the stage of behavior change of the users. Additionally it is necessary to ponder on the possible barriers and motives to perform pro-environmental behavior. Among the most important influential factors and barriers, there are the sense of

community in the form of opinions and actions of the surrounding people, the presence of appropriate knowledge and resources, as well as external infrastructure. Speaking of the motives to perform pro-environmental behavior, there are several the most significant ones: the realization of the importance of solving environmental problems, the perception of the possible outcomes of one's actions, and the desire to be a part of like-minded community, i.e. pro-environmentally behaving people.

The success metrics are suggested to be determined on the analysis stage (Werbach & Hunter, 2012), but since they are not a part of the present research, no additional information is provided on this topic.

After considering the factors, affecting human behavior, it is the time to move to the ideation phase of the gamification process, where game design elements and a variety of alternatives of the gamified experience should be chosen and presented. According to the behavioral model by Fogg (2009), it is determined by three main elements, which are ability, motivation per se, and triggers. Triggers are the special game mechanics that are used to facilitate the experience and provide reminders to the users, whereas ability refers to the simplicity of utilizing the system. It is defined by the special game mechanics, while intrinsic and extrinsic motivation are affected by the combination of game mechanics, dynamics, and emotions. Apart from that, motivation is formulated by the satisfaction of basic psychological needs of competence, autonomy and relatedness (Ryan & Brown, 2003). Concurrently, it is beneficial to identify the change processes that might important to implement by gamification. Those can be providing social community and feedback, rewarding or basically communicating useful and interesting information that can affect behavior change on the initial stages of change.

Consequently, it is possible to move to the stage of designing and developing prototypes, which is followed by the implementation of the pilot gamified version (Brito et al., 2015; Fitz-Walter, 2015; Morschheuser et al., 2017, 1302). Once there is a ready-made gamified system, it is necessary to evaluate its performance, which is in the context of environmntal sustainability can be either reaching pro-environmental behavior or not. The other possible outcomes of applying gamification can be raising awareness on the environmental situation and the impacts of one person's actions on the well-being of ecosystems; bringing together like-minded people; engaging and motivating users to learn more about the situation.

The suggested framework brings together the elements of different theories and models from the field of behavior change, motivation and sustainability. It is aimed at providing some details on the process of utilizing gamification for pro-environmental behavior and and opens up new space for further research on the topic.

8.2 Managerial implications

The research has tried to make contribution to the sphere of gamification development, especially to benefit the companies that operate in the sphere of environmental sustainability. The results of the study are presented in the theoretically framed process of gamifying pro-environmental behavior change, which is, however, highly applicable in the practical business operations. Instead of the framework, the implications for the managers are presented in the form of ordered guidelines, i.e. suggestions on how to approach the analysis of the target audience and its behavioral factors

First of all, the project is supposed to start from the identification of the main objectives that are meant to be achieved by the application of gamification, as well as the main driver and challenges of develoing a gamified system should be evaluated. This will promote the understanding of whether gamification is a suitable tool for the set objectives. From the perspective of the pro-environmental behavior, the main advantages of gamification are the functionality and diversified range of possible game mechanics to address the motivation for the sake of behavior change. In the meantime, it is challenging to design the experience and provide the users with the understandable and reliable scoring system of assessing the actions. When considered on the intial stages of developing a gamified system, these factors will not provide any inconveniences further on the gamification process.

Further on, it is necessary to identify and characterize the target audience of the experience. Dealing with the process of behavior change it is vital to understand whether the potential users are already aware of the problem and are planning to make a change, or whether they, for instance, already perform some “green” actions, though need more guidelines, motivation and support. Idenitfying on which stage of behavior change possible players are will help to formulate the ideas on what game design elements should be utilized. The same rationale stays behind the identification of behavioral, personal, and environmental factors that influence the actions people take. The most significant ones

are the presence of enough resources like money and time, opinions of the surrounding, knowledge on the subject and personal values. Considering the location is also necessary, as the presence or lack of appropriate infrastructure has a direct effect on people's taking "green" actions. Additional feature of the target group that should be determined relates to the drivers and barriers to pro-environmental behavior. It is also proven that the success metrics for evaluating the results should be structured at this phase.

Once the analysis is ready, the most suitable game design elements should be idetified, especially it relates to the formation of ideas on the game mechanics, like points, badges, and leaderboard. Solely additing these elements is not beneficial to the experience, only those mechnics should be chosen that help to address the internal and external motivation of the users. It is essential to address the needs for autonomy, competence and relatedness. By utilizg appropriate game elements, users should feel the their actions matter and that a lot depends on them. People also value informative and rewarding systems of the gamification, especially appreciating the social factors and feedback on their actions. Users have a tendency to be engaged in the process of changing behavior when it is divided into smaller steps, i.e. they appreciate simplicity, also not being willing to invest too much time of such valuable resources, as time or money. Extra help on the ideation stage of the gamification can come from the earlier identified stage of change. Thereby, if for instance people already take some actions in the pro-environmental way, it is advantageous to provide them with rewards that are close to the "green" subject and facilitate proper social community of like-minded and active participants; or on the contrary, if users are not that familiar with the subject, they will appreciate more advanced information on the problems and their solutions in a form of daily tips or tasks. Reminders are also highly valued by the users, as they can actually prevent them from forgetting doing the sustainble action instead of an opposite one. However, the gamified system should not be too pushy, so not to irritate users and make them abuse the application.

After there are enough ideas on what kind of design the system should adopt and what elements should include, it is the moment of designing prototypes, which is followed by implementing a pilot version of the gamification experience. Even after that, the gamification is not completed, as every project assumes, this one should also be followed by the evaluating of results and monitoring the longitude and willingness of keeping the

behavior change, as well as the engagement and interaction levels of the users in the gamified experience.

Speaking of the possible outcomes of utilizing gamification for pro-environmental behavior change, the first one is undoubtedly the change itself in a sense that people adjust their habits into the "green" way. In practice, it is suggested that apart from this result, the experience can serve as an informative, educating, entertaining and social process. In other words, it can raise awareness of the existing problems and the impact of every human's actions on the environment; it can teach users about what should be done and how to minimize negative impacts and maximize positive ones. It can also serve just as a fun experience or bring like-minded people together, provide them with competitions on how is "greener". There is also a chance that the gamification will not bring to any results. In this way the process should be completely reconsidered from the initial stages. If some objective is achieved, but not the desired one it might be wise to reconsider some actions and bring incremental changes to the gamified experience.

In general, it is theoretically and practically confirmed that the utilization of gamification can and do affect an individual behavior, in particular, it is done in the context of environmental sustainability. In their majority companies make mistake on the design stage of gamification (Burke, 2014), although the present research that gamification as such is a complex process, and a lot more depends on the preparations, analysis and ideation phases.

8.3 Limitations of the study and further research suggestions

The limitations of the research refer to the features of design and methodology that have an impact on the interpretations of the research findings, they represents the constraints on the practical applications of the results, their generalizability (Price & Muman, 2004). The limitations can be considered by identifying the credibility, trustworthiness, dependability, confirmability, and transferability of the research results (Merriam, 2009, 211). Trustworthiness determines whether the findings are worth paying attention to and persuades readers in the credibility, confirmability, dependability, and transferability of the results (Guba, 1981).

Meanwhile, credibility relates to the appropriateness, meaningfulness, and usefulness of the applied research methods and gathered data (Cottrell & McKenzie, 2011). The study

utilizes both primary and secondary data that together bring more holistic picture on the understanding of the phenomenon. Since the idea of the research is to analyze the utilization of gamification from the users' perspective, applying online survey to gather both qualitative and quantitative data on the behavioral factors and human motives is suitable for obtaining credible results. The findings are meaningful and useful as they provide insights on the perceptions and ideas of the actual participants of the gamified experience, thereby, can be beneficial to the developers of gamification. In the meantime, although testing the theoretical framework is not a part of the research, which might doubt its credibility, it is based on the empirically proven theories, and thus, valid and reliable. Thereby, the first suggestion on the further research is actually the formation of gamification for pro-environmental behavior and testing it with the aforementioned behavioral factors considered and evaluated, this will give more practical insights on how to modify and upgrade the process.

The confirmability of the findings refers to the maintenance of objectivity, i.e. the results of the research are the experiences and ideas of the informants, rather than a researcher (Shenton, 2004). Dependability, in turn, suggests the research process being appropriate and clear, as well as its structure should be accessible to the readers (Pitney & Parker, 2009). The present research is presented in a thought out way, so the readers can easily understand the research logic and directions. It also strives to provide objectivity in the findings, as the researcher utilizes the advantageous primary data collection methods in a way so people are able to express their opinions and feelings about the gamified experience. As the research is done to get more information about user behavior and motives, it is important to describe the realities on human motivation and behavior, which, consequently means that the researcher tends to keep objectivity of the findings. Meanwhile, the respondents' answers are subjective, which assumes that in order to get more numerical insights on the problems of motivation and behavior change, it is beneficial to choose different data collection methods.

The transferability identifies the extent of applicability of the research finding with the other parties. It is focused on determining that what is meaningful and applicable in one situation is also crucial and valuable in the different settings (Macnee & McCabe, 2008). The fact that the research takes a single case study strategy might seem as its short-coming, as to provide generalization it is beneficial to have a multiple case study.

Nevertheless, the decision of choosing the particular mobile application is made upon its unique features, services and current popularity. This can serve as an example of how gamification can be applied in order to motivate pro-environmental behavior change and what can be done differently in order to achieve greater results from the corporate and environmental perspectives. Besides, since the survey has only a limited number of respondents participating in it, it might be also advantageous to choose a greater survey sample that would support or, possibly, question the obtained qualitative data with quantitative findings on the topic.

Nevertheless, another suggestion for the further research is the analysis of multiple companies from the gamification sector that operate in the context of environmental sustainability. It is also beneficial to bring the topics of behaviorism, sustainability and gamification together, especially considering that the latter phenomenon is theoretically and empirically proven to be a potential tool to address human motivation and behavior. However, it is also essential to remember that the process of designing and implementing gamification is a resource-consuming and complicated activity. This fact leads to another research suggestion aimed at investigating how to simplify the process of gamification and creating a more unified approach to its application for qualitative pro-environmental behavior change, whereas the present thesis work is supposed to be only the starting point of this complex and little researched area of gamification.

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APPENDICES

Appendix 1. Survey outline

Basic information

Gender
- Male
- Female

Age
- 20 or less
- 21 - 30
- 31 - 40
- 41 or more

Pre-gamification behaviour

1. Do you consider yourself as a pro-environmentally behaving person?
   - Yes
   - Maybe
   - No
2. How do you understand the term "pro-environmental behaviour"

3. Have you thought of changing your behaviour toward environmental before using JouleBug? What actions have you taken?

4. Have you faced any barriers to perform pro-environmental behaviour before using JouleBug? Please, specify what affected you. *Example: lack of money or time, thinking that your change doesn't matter in a bigger scale, external factors, etc.*

5. Have you faced any barriers to change the behaviour before using JouleBug? Please, specify what affected you. *Example: lack of motivation, knowledge or interest, etc.*

Gamification for motivation

1. What motivates you to behave pro-environmentally/ change behaviour into pro-environmental one? Choose up to 3 options.
   - "Green" actions help to save money, e.g. paying less for water, electricity usage
   - Sense of community, i.e. my friends/ family members/ colleagues act green, so do I.
   - Fear of missing out, i.e. my friends act "green", and I don't want them to think bad about me not doing the same.
   - I understand the importance of being environmentally friendly and want to act accordingly.
   - I want to make a change myself and inspire others.
   - I am not motivated, but still understand the importance of behaving "green"
   - I am not motivated, and I do not really care about environmental issues
   - Your answer

(continued)

Appendix 1 continued

2. Have you participated in LUT Sustainability Challenge?
   - Yes
   - No

3. Did you feel motivated enough to change the behaviour, while using the JouleBug? Why?

4. What motivated you to actively participate in the Challenge? Choose up to 4 options.
   - Tangible reward, i.e. prize to the winner of the leaderboard
   - Game design elements, e.g. leaderboard, badges
   - Sense of community, i.e. participation of your friends
   - Immediate feedback on your "buzz", i.e. points, medals, badges
   - Self-efficacy, i.e. confidence in your ability to perform pro-environmental behaviour
   - Desire and interest to act and make a change
   - Facts and information about environmental problems and solutions
   - I simply like to win
   - I am just an environmentally-minded person
   - I was not motivated at all
   - Your answer

5. Was there anything in the application or Challenge that demotivated you? Please, specify what. *Example: poor design and complexity of the application, lack of time etc.*

6. Did points, badges or the prize negatively affect your internal motivation? *Example: Once there is no reward offer the green behaviour, I do not want to act accordingly any more*.

7. Was your motivation sustainable during your participation in the Challenge? Why?
   - No, specify
   - Yes, specify

8. Are you still motivated to behave pro-environmentally once the Challenge is over?

<u>Gamification for behaviour change</u>

1. What generally determines your behaviour? (From Social Cognitive Theory by Bandura, 1986)

   - Personal factors, such as knowledge, attitudes, expectations
   - Behavioural factors, such as skills, practice, confidence in your capacities
   - Environmental factors, such as social norms, influence on others
   - All of the factors

(continued)

Appendix 1 continued

2. How JouleBug helped you change the behaviour? Choose as many options as you want or suggest your own opinion.

   - I have learnt a lot about the problem
   - I started to feel that it is just right to make this change
   - I realized that my actions affect the environment
   - I started to feel that I am able to make this change, although I couldn't do it before
   - Other users are so supportive and inspiring, that it motivated to act
   - I liked the fact that I get points for my actions and I can win a prize
   - I realized that there are lots of options of behaving "green" without limiting myself
   - I was getting reminders and feedback for JouleBug, so was able to develop some "green" habits
   - JouleBug did not help me at all
   - I was acting pro-environmentally only when the Challenge was on, once it is over I keep to the previous behaviour pattern
   - Your answer

3. Has your behaviour/ attitude changed toward pro-environmental after using JouleBug? If yes, then why?
   - No
   - Yes

4. What challenges did you face during the use of JouleBug that negatively affected your behaviour change? *Example: poor design of the app, complicated structure of the app, lack of internal motivation*

5. Do you think that mobile applications like JouleBug can make people behave in a "greener" way? Why?
   - Yes
   - No

6. How gamified applications can promote pro-environmental behaviour? Choose as many options as you want or offer your opinion.

   - By educating users on environmental problems and their possible solutions
   - By bringing together like-minded people and serving as an ecological social media platform
   - By providing tangible rewards like points and badges for "green" actions
   - By making users feel that their actions matter
   - By providing feedback to users' actions
   - Your answer

7. Can gamified applications harm adopting pro-environmental behaviour? How?

8. Did you like the Challenge and what did you like or did not like about it?

Appendix 2. Interview Outline

Questions about Gamification and Its Application in Sustainability

1. How would you define gamification?

2. What game design elements, to your opinion, are the most important and effective?

3. What is the mistake(s) of companies and applications that fail when addressing sustainability through gamification? What do these companies miss?

4. Do you think it is possible to motivate people and change human behavior through gamification?

5. What are the drivers and challenges of gamification for behavior change and motivation?

Questions about JouleBug

1. When, where and how was the company established?

2. What are the mission and vision of the company?

3. What are the products and services provided?

4. What gamification elements are used and why, in particular, these elements?

5. What are the achieved results of the app utilization? Are there some real life improvements?

6. What is the mechanism behind calculating the “buzz” points for different activities?

7. How many people are using JouleBug so far?

8. What makes JouleBug special and unique?