LAB University of Applied Sciences

DESIGN OF A DIGITAL PRODUCT TO ENCOURAGE THE COMMUNITY TO RECYCLE IN RUSSIA

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Abstract

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Title of the thesis

Design of a digital product to encourage the community to recycle in Russia

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Abstract

Russia recycles only 6 % of a waste stocking. The rest amount stays in landfills. Even though Russia has not implemented the recycling procedure on the state level, many non-commercial and private organizations provide recycling services. Thus, the following question arises: Why Russian citizens do not recycle?

The research aimed to discover what factors can drive Russian citizens to start recycling. The thesis explored the potential of integrating frameworks and tools of behavior change and product designs. Furthermore, the thesis described Russia's current recycling situation based on statistics, law regulations, and the latest recycling news. Finally, the thesis explored the existing solutions presented in the Russian market.

The research's outcome is a prototype of the application for users located in Saint Petersburg, Russia. The application aims to facilitate recycling. The thesis research drew an inductive method. The author applied a mixed-methods approach to collect data. The implementation process included identifying users' barriers and needs based on a user survey. Additionally, the author identified the target audience and presented an analysis of possible competitors. Finally, behavior change design frameworks and strategies were used to create features of the application. Besides, five interviews were conducted to understand the efficacy of the solution. According to interview results, the created solution might be an impactful approach to influence people to start recycling.

The research findings conclude that a possible digital solution might be created based on behavior change design frameworks, product design tools, and analysis of the Russian community's desires and obstacles. The digital solution should include convenient navigation to recycling points, barcode scanning of waste items, waste collect order, infographics about the impact of individual's recycling on the environment, educational materials, and test of knowledge.

Keywords

recycling, behavior change design, product design process, digital solution

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List of Abbreviations

COM-B – Capability, Opportunity, Motivation - Behavior

BCW – Behavior Change Wheel

SDT – Self-determination Theory

UI – User Interface

UX – User Experience

Hi-fi – High-fidelity

Lo-fi – Low-fidelity

1 Introduction

1.1 Research Background

The human population of Earth produces 2.01 billion tons of municipal solid waste annually. Hereafter, worldwide waste production is predicted to increase up to 3.40 billion tons per year by 2050 if no urgent action is taken. (Kaza, et al. 2018.)

Therefore, due to the rapidly growing amount of waste produced by society globally, the issues of waste management and ecological awareness are more and more widely discussed (Kaza, et al. 2018). One of the generally used practices that facilitates waste management problem is recycling (RTS 2020). Many countries have already integrated the recycling of waste on the state level. According to the European Environment Agency, 46 % of the municipal waste generated in the EU-28 and Iceland, Norway, and Switzerland was recycled in 2019. (The European Environment Agency 2019.) However, according to the Greenpeace report, Russia recycles only 6 % of a waste stocking. The rest amount stays in landfills. (Greenpeace 2019.)

Even though Russia has not implemented the recycling procedure on the state level, many non-commercial and private organizations provide recycling services (Greenpeace 2020a; Ecopromcentr 2019). Thus, the following question arises: Why Russian citizens do not recycle?

People may face different obstacles to perform the behavior. For instance, an individual might have not enough motivation to do the recycling. Therefore, it is vital to have a solid understanding of the aspects that drive behavior change. Behavior change design can help identify those factors based on the research, frameworks, and theories (Bucher 2020, 3).

Using a mobile phone application to influence behavior is becoming increasingly common (McKay et al. 2019). Nowadays, more than 5.19 billion people use mobile phones, with user numbers up by 2.4 % over the past year (Kemp 2020). Building digital mobile solutions that enhance environmentally responsible behaviors, such as recycling, can significantly maintain positive ecological change.

The thesis work aims to research what factors can drive Russian citizens to start recycling. This work describes the recycling application prototype's implementation, which focuses on the features based on behavior change design techniques.

1.2 Research Questions and Objectives

The main research question of the thesis is the following:

How to design a digital solution that will motivate the community in Russia to start recycling?

The subordinate questions were defined to help the reader to focus on the study:

- What are the tools to change the behavior?
- What are the main steps of digital product design?
- What is the current recycling situation in Russia?
- What are the features of the digital solution required to help the user ease the recycling process?

The thesis's main objective is to explore how Russia's recycling situation can be improved by influencing the community through recycling mobile service.

Besides, the thesis aims to

- discover product design tactics and stages
- analyze the tools to enable the behavior change
- collect current data on the recycling situation in Russia
- design a prototype for a possible solution to solve the recycling problem in Russia
- provide prototype testing to understand the designed solution’s effectiveness and future improvements.

The research's anticipated outcome is a prototype of the application for users located in Saint Petersburg, Russia. The application aims to introduce to users waste management basics, provide convenient recycling service, and improve their waste management routine.

1.3 Research Methodology, Data collection, and Limitations

The thesis research is a creative and highly personalized process that requires full involvement and attention to the smallest detail. Nevertheless, research work should adhere to specific rules that can bring the finished material into a unified and easy-to-understand form. That is why research methodology and data collection are of great importance.

C.R. Kothari (2004, 8) defines research methodology as follows:

> *Research methodology is a way to systematically solve the research problem.*

Among various research methods, three common research approaches can be distinguished: quantitative, qualitative, and mixed methods. The quantitative method allows the researcher to examine the hypotheses being investigated and come to generalizable results. In comparison, the qualitative method allows the researcher to gain different visions into the hypotheses being investigated rather than finding confirmation for them. Nevertheless, the combination of the two methods can be applied to research that is called *mixed methods.* (Kuada 2012, 117–119.) Mixed methods allow the researcher to use both practices during their study and reduce both approaches' limitations (Cresswell 2013, 14).

The thesis background was formed using a deductive approach when the thesis research drew an inductive method. The author applied a mixed-methods approach to collect data. Data was gathered by conducting an online survey and carrying out market research. Further, the data was examined by various methods. Based on the data analysis, the author presented an application prototype. Finally, the application was evaluated by conducting video interviews.

The research study has some limitations that help to keep consistency in the presented thesis work. Firstly, the thesis research is framed geographically. The survey results and data presented in the given study refer only to the Russian country. Therefore, the thesis research might not apply to other countries. Secondly, the conducted research covers only the recycling process in the household segment. Hence, the thesis research information is not relevant to the recycling process at the industrial scale.

1.4 Thesis Structure

The thesis contains six main chapters. Figure 1 shows the structure of the thesis.

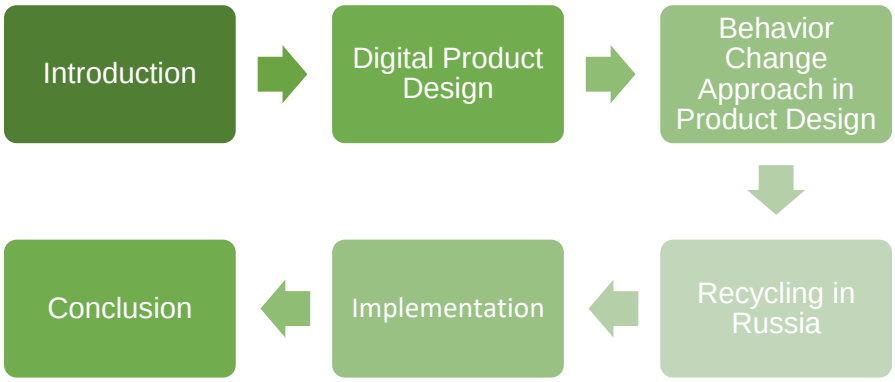


Figure 1. Thesis structure

Chapter 1 introduces the topic to the reader and its background. Furthermore, it determines the research objectives and questions. Moreover, the research method, data collection, and limitations are described.

Chapter 2 defines product design. Further, it introduces common product design processes and their similarities. The chapter covers a variety of techniques and tools used in each stage of product design.

Chapter 3 presents the concept of behavior change design. The chapter discusses the theories and frameworks that can be applied to facilitate common barriers, preventing the behavior. Besides, it introduces to the reader strategies to support the change of the behavior.

Chapter 4 describes Russia's current recycling situation based on statistics, law regulations, the latest news on the recycling topic, and what has been already done to improve Russia's recycling volume. In addition, an overview of already existing digital solutions is presented.

Chapter 5 contains the empirical part of the thesis. The chapter examines the tools, frameworks, and theories explained from previous chapters to apply them for the research's anticipated outcome – application prototype. Additionally, it covers how data for the research was collected and analyzed.

Chapter 6 is the conclusive part of the thesis that describes answers to the research questions and suggestions for future research. Moreover, it covers the reliability and validity of the research.

2 Digital Product Design

2.1 Digital Product Design Definition

What is the definition of the product? It was widely believed that the product could only be a material thing sold in the store until recently (Babich 2017a). Still, in the Cambridge dictionary, the definition of the product is the following:

> *something that is made to be sold, usually something that is produced by an industrial process or, less commonly, something that is grown or obtained through farming (Cambridge University Press 2020).*

However, it is a more accurate definition for the 20th century than for the 21st that we are currently living in. By 2020, society has obtained tremendous technological progress that caused the creation of digital products such as widely known video and music streaming service Apple Music or media service Netflix (McAlone 2017). Nevertheless, these products are not touchable and far from physical. Due to digital inventions like apps or websites, the understanding of the term product has changed. (Babich 2017a.) Therefore, the digital product can be explained as follows:

> *A Digital Product is a software enabled product or service that offers some form of utility to a human being (Napierkowski 2020).*

A digital product is a solution to users' needs and problems. Creating a digital product requires a determined process that is called product design. (Babich 2018.) Product design is the process of visualizing, implementing, and repeating products that resolve users' problems or serve particular needs in a specific market (Product Plan 2020). A product designer must determine the product that will be financially valuable and benefit practically, physically, cognitively, and emotionally many people (Goodwin 2009, 26).

Product design usually mixes several closely related design disciplines (Goodwin 2009, 5). When developing a complex digital product, product design can include user experience design (UX) and user interface (UI) design (Madhavan 2018). In terms of UX design, the product designer needs to understand how effectively, efficiently and satisfactorily, the product can be designed for user needs and what devices users will use (Interaction Design Foundation 2020a). In terms of UI design, product designers ensure how functional, reliable, and enjoyable the users' interface is (Xd Ideas 2020).

Generally, product design is a human-centered design that focuses on people's thinking, emotions, and behavior throughout the designing process. Moreover, users of human-centered products are regularly involved in their development from the early stage. Based

on users' constant feedback, designers can build products that correspond to users' needs to resolve their problems. (Philips 2020.)

2.2 Digital Product Design Process

Product design is a holistic process that designers can approach differently. This subchapter aims to explain what takes place in each stage of the product design process and propose a range of techniques and tools that can be used to maximize benefits when designing a new product. For readers' convenience, the stages of one process are discussed. However, the author combines the tools and techniques from other methods.

Digital product design stages can vary depending on the goal, timeframe, budget, and team size (Middleton 2019). For instance, according to Google Trends (2020), there are three popular design processes by user search volume, such as

- Design Thinking
- Google Design Sprints
- Double Diamond.

Design Thinking originated back in the 1970s and finally populated by IDEO, a famous design firm that has cooperated with the big tech companies like Apple (IDEO 2020; Interaction Design Foundation 2020b). Design Thinking is a process and a strategy by which a designer seeks to understand the user, refute assumptions, and rethink the problem to find unobvious alternative solutions. The phases of this strategy can alter by name, but they carry the same methods and tools. (Sell 2018.)

In cooperation with IDEO, Stanford School of Design proposed the latest process phases (Dam & Siang 2020a). The design process implies the following steps: **empathize, define, ideate, prototype, test**. Design Thinking steps are non-linear and flexible, depending on what challenge designers need currently solve in practice. (Dam & Siang 2020b.)

Google Design Sprint is a synergy of different processes. In 2009, Jake Knapp introduced the design process to Google, which he calls "Sprint" (Knapp 2016, 11–24). Jake Knapp's process is targeted for startups as it enables the implementation and testing of the ideas quickly. Lately, Google saw success in applying the process and, based on it, introduced the Google Design Sprint technique used up until now. (Google 2020a.) Google enhanced Jake Knapp's technique by adapting UX principles and other design processes. Like Design Thinking, the Google Design Sprint process aims to solve problems by designing, prototyping, and testing ideas together with users. Google Design Sprint follows the next steps: **understand, define, sketch, decide, prototype, test.** (Google 2020a; Google 2020b.)

In 2005, a charity company, Design Council, that aims to make life better by design, created the Double Diamond process. Later, in 2007 the Design Council did a study to confirm that their process is efficient. The research participants were 11 companies, including Microsoft, Apple, and Xerox. As a result, the Design Council proposes a unified method with the following stages: **discover, define, develop, and deliver**. (Design Council 2020.)

Although the different authors introduce different naming of the processes and stages, the authors follow the same problem-solving methodology when designing a product. That methodology involves the sequence of the steps from analyzing the context and defining the problem, generating and designing possible ideas, implementing the outcome solution, and testing it.

Out of three described processes, Stanford's Design Thinking process is chosen for an explanation. The author assumes that the design process is useful for her empirical part of the thesis due to users' high involvement in the process. Besides, the process focuses on the users' motivation, behavior, and emotion. Figure 2 illustrates the flow of the process.

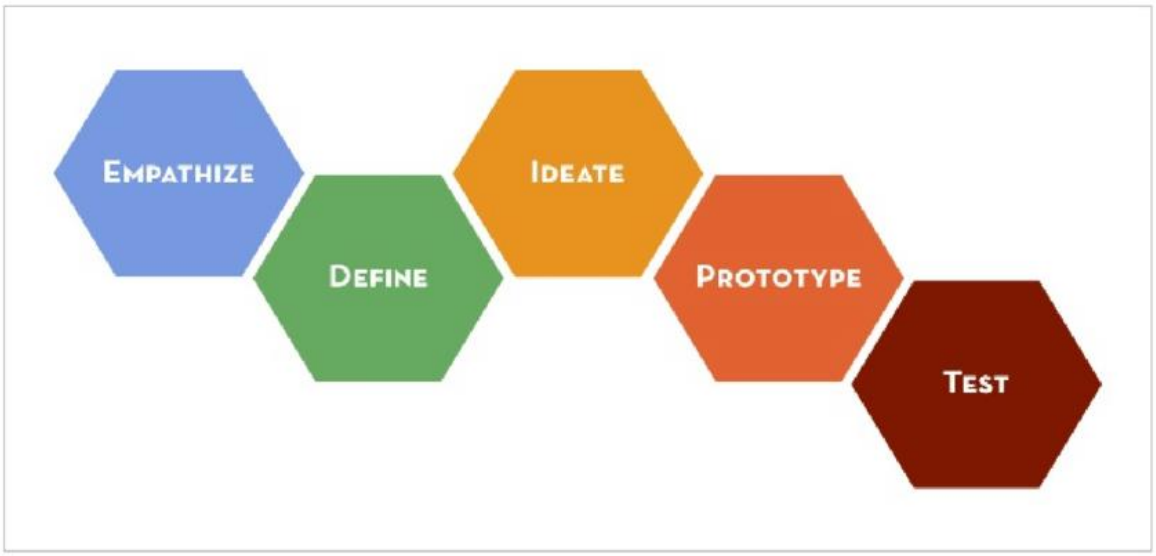


Figure 2. Design Thinking steps (Carter 2016)

Empathize Stage

Empathy is the ability to get involved in other people's experiences and understand what worries them. Empathy allows a designer to get away from assumptions and beliefs and look at the problem from the user's perspective. (Interaction Design Foundation 2020b.)

The Empathize stage refers to a phase where the designers establish the user problems by using empathy and in which context they appear. The empathy stage is a starting phase of the Design Thinking process, as it helps to discover the motivations and experiences of

users at the initial stage of product design. Thus, this stage requires research to immerse into the user environment. The study can include user interviews, user surveys, and market research. User interviews and user surveys usually contain a background (such as ethnographic data), the use of technology in general, the product's use, the user's main objectives and motivations, and the user's pain points. Market research involves comprehension of competitors' approaches that solves similar user's problems. (Lo 2020.) The designers can look for direct competitors that have a matching set of features and primary users. Additionally, designers can search for indirect competitors with similar features or primary users. (Levy 2020.)

Define Stage

When the designer has a clear idea of what the product is about and in which context it performs, it is time to move to the definition phase. During this stage, a designer should specify the users, the primary people, who will use the product. After that, the designer should define user's problems and needs that will be solved with a product. (Interaction Design Foundation 2020b.)

One way to structure who the users of the future product are and what problems the product can facilitate is to use the user persona. The user persona is a generalized description of a target user of the product. While the featured character is hypothetical, the persona's information should be real, based on research done during the Empathize stage. The information should focus on the user characteristics that affect the product. Usually, the factors are

- facts
- problems
- behaviors
- needs and goals. (Klein 2016, 38–43.)

All mentioned above aspects should relate to the features that might drive the current product's adoption (Klein 2016, 38–43). Table 1 illustrates the example of user persona.

Facts

Judy, Director of UX

- Recently joined a global bank
- 8 years of UX experience
- Focuses on enterprise products
- Leads a team of 10 designers

Pain Points

- Legacy systems prevent innovation
- No standard design process leads to chaos
- Difficult to attract talent amidst competition
- Lack of buy-in for UX leads to resourcing problems
- Waterfall process prevents collaboration
- Lack of visibility into remote designers' projects

Tasks & Behavior

- Stays up to date with UX best practices
- Creates an overall vision, then dives into select projects
- Holds 1-hour weekly 1:1s with direct reports
- Holds up to 8 daily meetings (70% of work day)
- Sets OKRs and tracks progress for all direct reports
- Resolves issues between designers, devs, stakeholders
- Holds weekly department design critique

Goals

- Create a consistent UX across suite of 5 products
- Transform culture from engineering to design-driven
- Ensure happiness and job satisfaction of designers
- Deliver great products on schedule
- Meet monthly business metrics set by VP Product
- Establish herself as UX thought leader in company

Table 1. User persona (Cao 2020)

Besides, based on market research, competitor analysis can be created. Once designers have found more than four direct and indirect competitors, they can make a competitor analysis matrix. Competitor analysis matrix is a table that contains competitors' name, the URL address, feature description, comments regarding the advantages and disadvantages of the competitors, and screenshots or video links related to the features or comments. (Kshirsagar 2018a.) Table 2 is an example of the competitor analysis matrix.

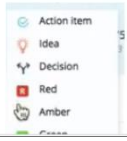
Competitior	URL	Features/Comments	Screenshots/Video Links
Direct Competitors			
Workboard	https://www.workboard.com/product/#meetings	As it is paid enterprise software, did not able to drill in too much. Here are some obervation based of data given on their site:	https://www.workboard.com/images/product/meeting-new.png
		Basically on first glance, it shows two column layout: 1. Discussions & 2. Takeaways	https://youtu.be/-yxLoM4Zgzo
		User can able to add different types of items in meetings like: Objective, Key Results, Workstream, Action items, Attachments	
		All these different item shown in Discussions column. Discussion stream is more like a Agenda for meeting.	
		Takeaways are more like a decisions of meetings	
		User can rate meetings	
		User can only add existing objectives, Key Results and Workstreams which are already present in the system. User can not able create new from meetings view.	
		User also can change type of item at any time.	

Table 2. Competitor analysis matrix (Kshirsagar 2018b)

Ideate Stage

During the Ideate stage, designers come up with different solutions for defined problems. Based on the analysis of the conducted research, designers brainstorm the ideas. A sketch is one of the quickest and easiest methods to illustrate brainstormed concepts. (Interaction Design Foundation, 2020b.)

Prototype Stage

The prototype helps to test the performance of ideas in practice. According to the Interaction Design Foundation (2020b), prototyping is an experimental process where design teams implement ideas into tangible forms from paper to digital. There are many types of prototypes, but the primary distinguishing factor is fidelity. Fidelity refers to the accuracy of the way it conveys the look and feel of the product. The fidelity can be either high or small. The fidelity types depend on visual design, content, and interactivity. (Babich 2017b.) Therefore, two types of prototype can be defined based on the fidelity type:

1. High-fidelity (Hi-fi) prototypes represent the closest look and feel of the real product. They allow users to navigate through each prototype feature by clicking and tapping various UI elements. Additionally, they also integrate animation and transitions, close to those applied to the final product. (Stevens 2019.)

2. Low-fidelity (Lo-fi) prototypes are fast and incomplete comparing to the final product. Such prototypes lack content, visual design, and interactivity but contain the core functionality. (Babich 2017b.)

Lo-fi prototypes can be paper prototypes where the designer draws interface elements on paper. Such prototypes are useful during the Ideate step to have a documented visual of brainstormed ideas. (Lo 2020.)

Hi-fi prototypes can be either coded or designed using a design tool. Such prototypes are useful for testing purposes, which is the next step of the Design Thinking process. (Lo 2020.) As hi-fi prototypes are the closest version of the final product, users are more likely to behave realistically when using it (Babich 2017b). Different design tools are available for use, such as Sketch, Figma, Adobe XD, Framer X, InVision Studio, and many more (Bogawat 2019). According to many resources, Figma is considered the best application for designing prototypes (Bogawat 2019; Reeves 2020; Shabbir 2020; Ivanovs 2020). There are several reasons for that:

1. Figma is a browser-based application, and it is suitable for any computer operating system (Windows, Mac, Linux), so any user with internet access can use the Figma application. While for instance, Sketch and Framer X are only available for people who own computers with a Mac operation system. (Ivanovs 2020.)

2. Figma has a better performance comparing to other design tools. Moreover, Figma's users are not required to download any updates to view design tool improvements and bug fixes, as they are automatic. While, for example, Sketch and Adobe XD are desktop tools that require the user to upload any updates manually. (Ivanovs 2020.)

3. Figma allows sharing files in one click as it is browser-based, and all files are saved and available online, while other tools require completing many steps before sharing (Bogawat 2019).

Test Stage

When prototyping is ready with the possible solution, it is time to move to the testing stage. Testing allows designers to learn if they could provide a resolution to the user's problem and needs. (Interaction Design Foundation, 2020b.) The testing is done through prototype interactions with real users. There are several ways to test the prototype with real users. (Goodwin 2009, 55–56.)

Firstly, designers can gather a focus group. However, the focus group might not help understand how people will use the product. The reason is that some people may be less forthcoming in a crowd and may be affected by a group to a common consensus. Another way is to conduct individual interviews. Individual interviews allow gathering more details than the first method, and people tend to be more open when talking one to one. The third way is to organize direct observation. Direct observation allows designers to watch how people will interact with the product in reality. Nevertheless, direct observation is time-consuming and can take several days. Furthermore, the assumption from direct observation can lead to a wrong conclusion about user's behavior. The last method is to combine observation with interviews. Designers will comprehend how people will behave in the actual context and why they behave that way. (Goodwin 2009, 55–56.)

Summing up, product design can be approached in different ways. Its process stages may vary. However, its goals are always the same: resolving users' problems and serving particular needs in a specific market.

As the thesis objective is to understand how to encourage recycling behavior, it is crucial to know what methods affect it. The following chapter introduces the behavior change design concept, frameworks, and theories, which can be utilized to influence users' behavior.

3 Behavior Change Approach in Product Design

3.1 Behavior Change Design Definition

Behavior change design, or behavioral design, is one of the types of design frameworks (e.g., graphic design, industrial design) to purposely and methodically change human behavior through effective physical and digital changes. The methods used in behavioral design are based on empirical researches and studies from psychology, neuroscience, and behavioral economics. (Brown & Combs PhD 2018, 16.) Behavior change design techniques are used to develop products, services, and experiences (Bucher 2020, 4). These practices are not intended to force a change in human behavior. Instead, they aim to emphasize the already existing person's will to alter by minimizing the person's struggles. (Brown & Combs PhD 2018, 19.)

According to Susan Michie et al. (2011a), *any coordinated sets of activities designed to change specified behavior patterns* are called interventions in behavior change design. The interventions can be products or services aiming to change human' behavior (Bucher 2020, 4). One example of such interventions is a well-known Duolingo app that helps people learn new languages in a gamification way (Duolingo 2020). Moreover, the intervention can focus on one or many target behaviors to increase, decrease, or maintain them (Michie et al. 2011a).

Before implementing any intervention, it is essential to have a deep understanding of the target users, their needs, and challenges that prevent the intervention's behavior(s). The beforehand study about the target users helps the behavior change designer maximize target user engagement by understanding what should be included in the intervention in advance. The following information about the target users should be researched:

- demographic characteristics and current behavior
- beliefs and feelings about target behaviors
- needs, capabilities, and preferences.
- social identities and context
- environmental barriers and facilitators. (Yardley et al. 2020, 361–362.)

The behavior change design process can vary depending on the procedure defined in the specific teams or groups (Bucher 2020, 14). However, there is ABCDE approach to follow when creating and implementing an intervention. It consists of five continuous steps that are **assess, build, create, deliver, and evaluate.** (Aunger & Curtis 2016.)

The first step aims to gather information about the target behavior, the target users, and the context in which the target users live and the target behavior is performed. The information can be received from secondary research, e.g., the literature review. The next step was designed to organize the primary research, e.g., data collection. This step aims to fill the gaps in knowledge about the target users if the desired information was not found during the Assess step. Moreover, during the Build step, the possible resolutions and tools are explored to influence the target behavior. The goal of the Create step is to design the possible solution to reach the target behavior. In the Deliver phase, the behavior change solution is created. The last step refers to the evaluation of the solution's effectiveness using different measurement tools. (Aunger & Curtis 2016.)

There are specific categories of products and services that can profit from behavior change design. The first category is health, where a variety of behavior changes can be targeted, including eating, exercise, and deep breathing. Another natural area for behavior change is education. If a person is willing to learn something new, they will need to practice the behavior, e.g., programming, learning a new language. Furthermore, behavior change design can be used in environmental science. As people know the consequences of their actions for the environment, digital interventions' development is more widespread. One of the examples of behavior change in environmental science is to decrease the consumption of plastics. Other categories include finance and performance management tools. Moreover, behavior change design can be used for consumer engagement. (Bucher 2020, 4–6.)

3.2 Behavior Change Barriers

As mentioned earlier, behavior change design's primary purpose is to ease the target behavior's performance. In general, the designers should analyze whether the target users can do it or not. Therefore, it is essential to investigate the main barriers people face to change to effectively reduce and circumvent them. (Bucher 2020, 94.) In this subchapter, the common barriers are described. After that, the author presents frameworks that help overcome barriers when designing a product or a service.

Amy Bucher (2020, 94) refers to the obstacles that limit people's ability to perform the behavior as *ability blockers*. In behavior change design, ability blockers are also called barriers (Michie et al. 2011a). For the consistency reason, in this subchapter, the ability blocker term will be used.

The ability blockers can be found in a product or service itself, an environment where the product or service is used in or in users themselves. The following ability blockers can be identified:

- lack of knowledge
- lack of skills
- lack of time
- lack of focus
- lack of mood
- lack of tools and resources
- lack of motivation. (Bucher 2020, 95.)

There are three common ways to detect the ability blockers: brainstorming own ideas, conducting research (e.g., interviews, questionnaire), and doing a literature review. When the ability blockers are identified, the proper framework should be chosen to find an appropriate solution for each barrier. (Bucher 2020, 96–97.)

One way to overcome the ability blockers is to use the Behavior Change Wheel (BCW) framework. Susan Michie, Maartje M van Stralen and Robert West developed this framework from a synthesis of 19 frameworks of behavior change in a structured literature review. (Michie et al. 2011a.)

To understand the concept of the BCW, first, the COM-B model is explained as it is a framework's primarily base. The COM-B model states that anytime, a specific behavior (B) will happen only when the person concerned has the capability (C) and opportunity (O) to be involved in the behavior (B) and has more motivation (M) to perform that behavior (B) than any other behaviors. (West & Michie 2020a.) Figure 3 shows the relations of the entities of the COM-B model.

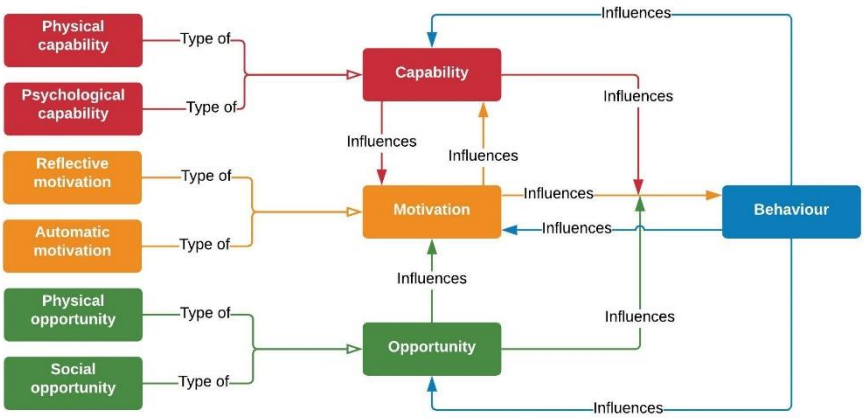


Figure 3. COM-B model (adapted from West & Michie 2020b)

Capability refers to the person's ability that, together with opportunity, empowers the behavior or facilitates it. The capability can be either physical (e.g., eyesight, hearing) or psychological (e.g., knowledge, skills). (West & Michie 2020a.)

Opportunity refers to the person's environment, which, together with the capability, empowers the behavior or facilitates it. The opportunity can be either physical (e.g., person's surroundings) or social (people who influence a person's behavior). (West & Michie 2020a.)

Motivation refers to a total of the mental processes that boost and guide the behavior. Two types of motivation are defined in the COM-B model: reflective and automatic. Reflective motivation is person's motivation that includes constant thought processes (e.g., person's plans and assessments). In contrast, automatic motivation includes habitual, intuitive, and emotional processes (e.g., emotions, desire, cultural background). (West & Michie 2020a.)

Furthermore, three points regarding the capability, opportunity, motivation, and behavior should be mentioned. Firstly, Figure 3 shows that the capability and opportunity influence both motivation and behavior rather than behavior exclusively. According to Susan Michie and Robert West, the reason is that *they act like 'logic gates' in that both of the 'gates' (capability and opportunity) need to be open for motivation generate the behaviour*. Secondly, capability and opportunity influence motivation. Generally, the more individual can do the behavior, and the more individual's surrounding is encouraging, the more individual is motivated to do the behavior. Thirdly, the behavior itself affects all three entities: motivation, opportunity, and capability. For instance, when learning a new skill by practicing it, the individual improves capability, and therefore, the capability affects motivation. (West & Michie 2020a.)

The COM-B model helps identify the ability blockers and structure them according to the root cause that prevents driving the behavior. The ability blockers' root cause can relate to opportunity, capability, or motivation as described above. That is the core and the first layer of the BCW framework, as shown in Figure 4. (Michie et al. 2011a.)

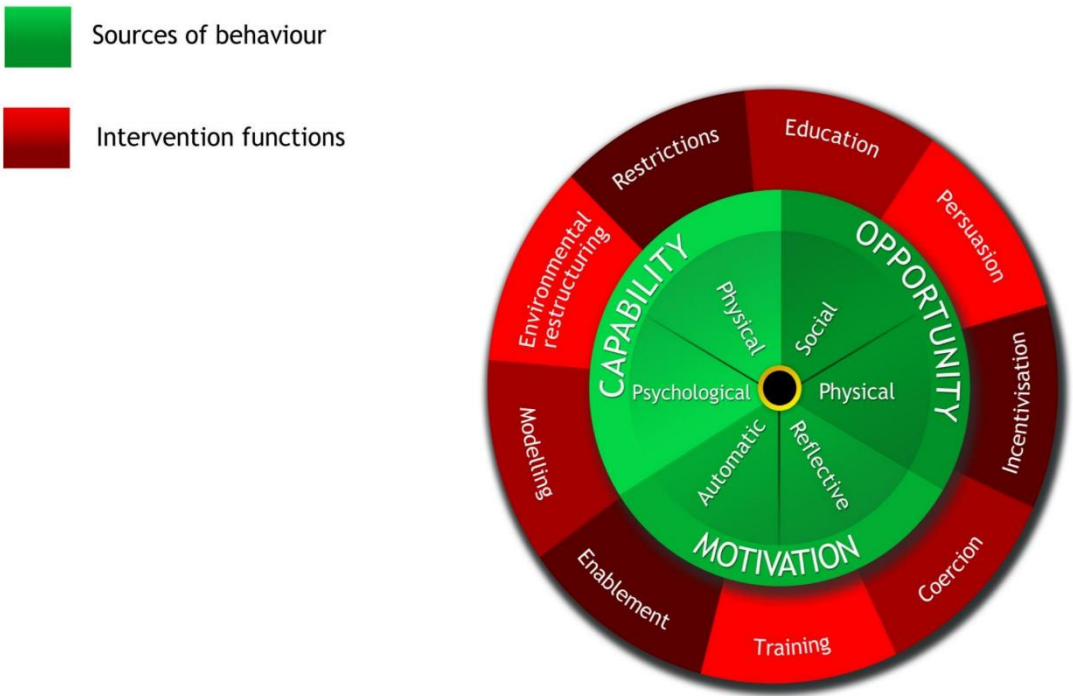


Figure 4. The Behavior Change Wheel framework (adapted from Michie et al. 2011b)

Further, from its core, the BCW expands to the second layer with nine categories of the ability blockers' solutions known as intervention functions. Intervention functions help to overcome the ability blocker in the most effective way to perform the behavior. They provide the following specific resolutions:

1. Education enhances knowledge and skills.
2. Persuasion stimulates positive or negative feelings to invoke action or thought.
3. Incentivization forms the assumption of the rewards to be expected.
4. Coercion creates the assumption of the punishments and costs to be expected.
5. Training improves skills through practice and instructions.
6. Enablement reduces barriers to the desired behavior, for example, by providing rules, tools.
7. Modeling shows the wanted behavior by providing an example to inspire.

8. Restriction reduces undesirable behavior by using rules. (Michie et al. 2011a.)

Each intervention function is connected to the root causes of the ability blockers. Table 3 demonstrates the defined intervention functions and their relations to the root causes.

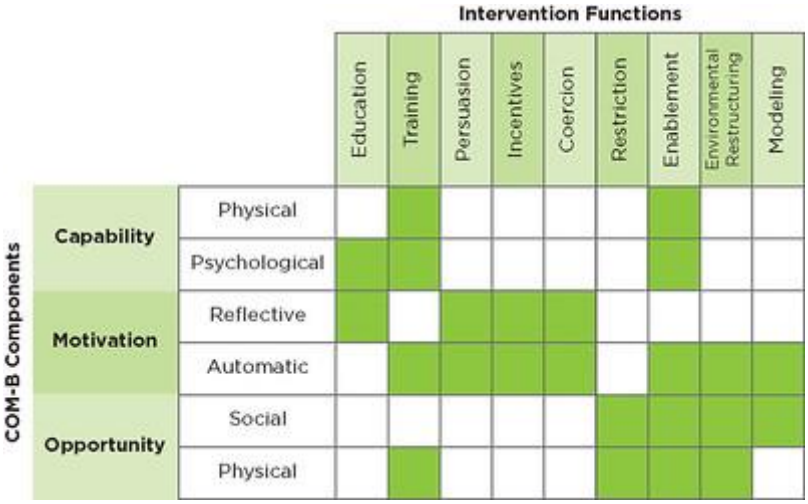


Table 3. Intervention Functions (Rosenfeld Media 2020a)

Solution for physical capability blockers can be either **training or enablement**. For example, the training can include separating the target behavior into smaller pieces until the user has learned enough to perform them all together. (Bucher 2020, 121–122.) A solution for a psychological capability can be **education, training, or enablement**. For instance, how-to resources can minimize the ability blocker of psychological capability. (Bucher 2020, 122–125.) When ability blockers refer to reflective motivation, the tactics to solve them are **education, persuasion, incentives, or coercion**. One example of the solution is to reward the individual once the performed behavior is successful. (Bucher 2020, 128–130.) The categories of solutions for overcoming automatic motivation are **training, persuasion, incentives, coercion, enablement, environmental restructuring, and modeling**. For example, by practicing a new behavior, the individual experiences the real consequences that can differ from one's expectations. Therefore, the beliefs of that individual can start to change. (Bucher 2020, 130–131.) **Restriction, enablement, environmental restructuring, and modeling** solve the ability blockers related to social opportunity. For instance, providing a group of people who practice the target behavior will decrease the barrier. (Bucher 2020, 125–126.) Lastly, when ability blockers relate to physical opportunity, **training, restriction, enablement, and environmental restructuring** are solutions to overcome them. One example is breaking the practice of the behavior into smaller pieces if the individual does not have enough time to complete them all. (Bucher 2020, 126–127.)

Based on the COM-B model and the BCW framework Amy Butcher (2020, 131) introduces the “Ability blockers + Solutions” notes grid. The notes grid helps organize data in a structured way to identify and overcome the ability blockers when developing a product or service (Bucher 2020, 110). Table 4 illustrates the example of the completed note grid.

ABILITY BLOCKERS + SOLUTIONS NOTES GRID: EXAMPLE

COM-B Category	Subcategory	Evidence for Existence of Blocker	Prevalence (0–3)	Impact (0–3)	Brand Congruence (0–3)	Total Score	Intervention Function	Solution Feature
Psychological Capability	Knowledge	P2: "I get confused by all the steps I'm supposed to do. What comes first? I always have to look back at the app to check. And then it takes so long to do the workout."	3	3	3	9	Training	Step-by-step videos breaking the workout down into bite-sized chunks
	Self-regulation	P5: "I can do the yoga sequence really well if I've got the energy and a quiet space to focus, but as soon as my kids come home it's game over."	2	2	1	5		Offer a list of specific ideas of when/where/how people can find quiet space for yoga in a busy home. Interview moms and use their stories.
Social Opportunity	Social support	P14: "I know my husband wants me to be happy, but he has a really hard time when I don't want to sit around with him watching TV anymore. He makes me feel bad about abandoning him and the things we used to enjoy together." P11: "It turns out my good friend also wanted to sign up but was afraid to do it alone. So now we're gym buddies. I know if I skip, I'll be disappointing her, so I go."	2	3	3	8		Coach people in asking for support; generate list of benefits to new behavior that can help people who miss the old way of life see some positives?

Table 4. Ability blockers + Solutions notes grid (Rosenfeld Media 2020b)

According to Amy Butcher (2020, 112–134), the following data should be filled in the grid:

1. The “Evidence for Existence of the Blocker” column includes the data collected from the research participants (e.g., notes, quotes) to prove the blocker's existence. Amy Butcher (2020, 112) suggests using a color-coding where participants' ability blockers are highlighted with red and possible facilitators suggested by participants are highlighted with green.
2. The “COM-B categories” column refers to the following COM-B model's entities: physical capability, physiological capability, physical opportunity, automotive motivation, reflective motivation. As in the BCW framework, it is used to define the source of the ability blocker.

3. The “Subcategory” column describes the more concrete type of COM-B model's entities.
4. The “Prevalence” column indicates how many participants of the research were affected by the ability blocker. The possible values are zero (none of the participants), one (a minority of the participants), two (half of the participants), and there (a majority of the participants).
5. The “Impact” column shows the impact size of the ability blocker. The possible values are zero (no impact on the behavior change), one (minor impact on the behavior change), two (medium impact on the behavior change), and there (significant impact on the behavior change).
6. The “Brand Congruence” column specifies how relevant the current blocker is to the product or service.
7. The “Total Score” column represents the sum of the Brand Congruence, Impact, and Prevalence scores that can be used to prioritize the ability blockers.
8. The “Intervention Function” column indicates the intervention function to overcome the addressed ability blocker.
9. The “Solution Feature” column refers to the product or service's possible feature based on the intervention function.

3.3 Motivational Factors for Behavior Change

Behavior change design aims to change the behavior and maintain the desired behavior longstanding. In this subchapter, the base that helps keep the behavior targeted by intervention long-term is discussed.

Many theories can be embedded to change the behavior (Hagger et al. 2020a, 1–14). For instance, Susan Michie et al. (2014, 4) described 83 theories of behavior change relevant to designing interventions. Because one of the thesis research objectives relates to the behavior's motivational factor, the Self-Determination Theory (SDT) was chosen as the prior one. The main reason is that SDT focuses on the motivation's quality and constancy (Hagger et al. 2020b, 104–119) that will be later detailed in the current subchapter.

SDT is a universal metatheory of motivation (Hagger et al. 2020b, 104–119). According to The Editors of Encyclopaedia Britannica (2020a), metatheory is *a theory the subject matter of which is another theory*, where SDT contains six interconnected theories.

Firstly, SDT proposes that people are motivated to grow and change by three following fundamental psychological needs:

- autonomy
- competence
- relatedness. (Hagger et al. 2020b, 104–119.)

The need for autonomy reflects the need to feel that one is the initiator of one's actions, in the sense that the person involves in them freely and feels a sense of ownership and choice in acting. The need for competence reflects the need to feel that one is sufficient, masterful, and controlling over one's actions and behaviors. The need for relatedness demonstrates the need to think that one has support and connectedness with others. Therefore, if three of these psychological needs are fulfilled, the individual's behavior has a higher probability of changing. (Hagger et al. 2020b, 104–119.)

Furthermore, the STD states several types of motivation that regulate an individual's behavior and are qualitatively different from each other. According to STD, six types of motivation can be ordered in a continuous sequence from the most controlled to the most autonomous, shown in Figure 5. (Bucher 2020, 11.)

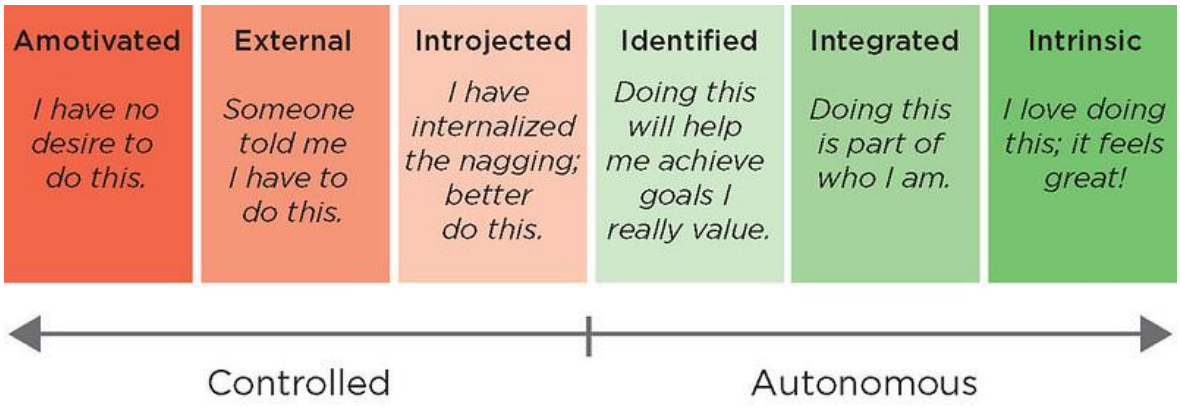


Figure 5. The six types of motivation (adapted from Rosenfeld Media 2020c)

The more person's motivation origins from the external source, the more controlled type of motivation is. The autonomous type of motivation refers to individual internal motivation. Additionally, individuals with autonomous types of motivation have a higher possibility of maintaining the behavior for an extended period. (Bucher 2020, 11–15.)

The interventions based on the STD theory have proven to give long-term results in maintaining the behavior change. By applying the STD theory, the target users are likely to con-

tinue the behavior change. Their motivation is expected to transform from controlled to autonomous, and their basic psychological needs are likely to be fulfilled. (Hagger et al. 2020b, 104–119.)

According to the STD, there are autonomy- and need-supportive strategies based on the tactical structuring of feedback and possibilities to the target users (Hagger et al. 2020b, 104–119). Amy Butcher (2020, 8) states that these strategies can be translated into digital product design as features.

One of the features that Amy Butcher (2020, 151) suggests is giving the target users feedback on behavior performance. The feedback helps to maintain one of the psychological needs – **competence**. By providing feedback, users can understand how effective their actions are towards behavior change. There are many ways to implement the feedback within the digital product. First, the feedback in digital products can be measuring data on behavior performance. Furthermore, there can be feedback at multiple levels:

- Immediate feedback indicates what the user just did.
- Cumulative feedback shows how the user has acted over time.
- Normative feedback informs the user how the user's performance of the behavior compares to other users. (Bucher 2020, 151–162.)

To sustain **relatedness,** social support features can be designed into digital products. One example of social support allows target users to share their achievements towards behavior change to their social networks. (Bucher 2020, 172–200.)

To reflect **autonomy**, the product should offer crucial choices to the users. The user should feel that they have control over the product and not the other way around. Applications that dictate user goals are more likely to be less autonomy-supportive. (Bucher 2020, 13.)

Summing up, many factors influence behavior. Behavior change design helps to ease the target's behavior performance and to keep the behavior long-term. To benefit from behavior change design, it is crucial to know the target audience's key ability blockers and motivational factors. However, before analyzing the ability blockers and motivational factors, the target audience should be studied. The following chapter researches the target audience environment and the challenges that the target audience face. Moreover, the basics of recycling are introduced.

4 Recycling in Russia

4.1 Recycling Definition

The United States Environmental Protection Agency (2020) describes recycling as following:

> *Recycling is the process of collecting and processing materials that would otherwise be thrown away as trash and turning them into new products. Recycling can benefit your community and the environment.*

The recycling process includes three cyclic steps. The stages are gathering waste materials, processing the recyclables or manufacturing them into new products, and purchasing those recycled products. (The Editors of Encyclopaedia Britannica 2020b.)

As understood today, the recycling activity appeared in the 1970s when environmental issues started to concern many students and activists across the world. In the same years, Gary D. Anderson created the famous recycling symbol. It represents three arrows arranged in a triangle, each one directing to the next. (Jørgensen 2019, 1–4.) Further, the Plastic Industry Association added to that triangle codes known as the Resin Identification Codes (RIC) in 1988. Today this symbol with codes can be found almost on each item. It helps to identify from which material the item was made and whether it is recyclable or not. (Leblanc 2019a.)

To make waste processing efficient and justified, the waste must be separated according to the material it is made, i.e., the glass is separate from the paper, plastic. Currently, the following materials are commonly recyclable:

- plastic
- paper and cardboard
- metal
- glass
- organic waste
- textile
- e-waste. (The Editors of Encyclopaedia Britannica 2020b.)

Plastic

Theoretically, plastic does not exist as one instance. It has many varieties that are classified by types. On the plastic material, the recycling triangle can be found. There is a number inside of it that describes the type of plastic and whether it is recyclable or not. (Jørgensen 2019, 4.) The identification of the numbers is the following (DiMugno 2020):

1. 01 PET (polyethylene terephthalate) – the most widely recycled plastic and usually used in bottles.
2. 02 HDPE (high-density polyethylene) – used for packaging.
3. 03 PVC (polyvinyl chloride) – used for medical purposes.
4. 04 LDPE (low-density polyethylene) – mostly not recycled. It is used for plastic bag wrapping and wires.
5. 05 PP (polypropylene) – used for packaging that will be heated or cooled.
6. 06 PS (polystyrene or Styrofoam) – used for packaging and disposables.
7. 07 Others – all other types of plastics that are difficult to recycle.

Paper and Cardboard

Most of the paper and cardboard can be reprocessed. If the paper material can be recycled, it usually has the following codes inside of the recycling triangle:

1. 20 PAP – used for identification of the cardboard.
2. 21 PAP – used to determine the mixed paper that can be detected in mail or magazines.
3. 22 PAP – used to define the paper. (DiMugno 2020.)

Metal

Metals are essential resources that can be recycled repeatedly without degrading their properties (Leblanc 2019b). For instance, the energy cost of producing new aluminum and the respective hazardous waste is much higher than recycling this metal (Jørgensen 2019, 88). Generally, the metal has the following codes (DiMugno 2020):

1. 40 FE – used to identify steel.
2. 41 ALU – used to determine aluminum.

Glass

A glass bottle is the oldest method for drinking, which is used up to now (Jørgensen 2019, 67). Moreover, glass is one of the first materials that was recycled initially. Like metal, glass material can handle continuous recycling without reducing the quality of the material. (Streissguth 2020.) As for all other recycling materials, on the glass can be generally found the following codes:

1. 70 GL – mixed glass
2. 71 GL – clear glass
3. 72 GL – green glass (DiMugno 2020).

Organic Waste

Ryan Cooper, Waste Diversion Manager and Organics Recycling Lead, explains organic waste clearly and concisely: *Organic waste is anything that was once alive.* The organic materials do not have code categorizations, but generally, food remains, food-soiled paper, cardboard, green waste, and non-hazardous organic wastes are considered as organic waste. (Cooper 2019.) Organic waste rots gradually accommodated by bacteria and fungus. If it is appropriately processed, organic waste will be transformed into soil, fertilizer, energy, or heat. Moreover, organic waste can be composted at home and transformed into soil. (Jørgensen 2019, 21.)

Textile

The main advantage of textile or cloth recycling is to reuse clothing. By doing so, pollution and energy-intensive production can be reduced, and therefore, the harmful environmental impact is decreased. (Leblanc 2019c.)

E-waste

E-waste is an electronic waste of the electronic and electric devices that are out of order and no longer serve their primary purpose. Even though electronic waste holds extremely toxic elements, many of the materials can be separated and recycled. (Gill 2016.)

Recycling Benefits

Recycling brings many benefits to the environment and society. One of the advantages is that recycling can mitigate the amount of waste deposited in landfills that will prevent landfills from being overloaded or expanded. In addition, the use of recycled raw materials will allow saving money and non-renewable natural resources. Another benefit is preventing air

and water pollution by lowering the need to gather new raw materials. Lastly, recycling contributes to job growth in processing enterprises. For instance, according to the national Recycling Economic Information (REI) Study, the embedded recycling activity brought up 751000 new jobs in 2016. (The United States Environmental Protection Agency 2020.)

According to Fin Arne Jørgensen (2019, 158):

> *Recycling can be a lesson in the art of attention, of noticing the many and diverse relationships between humans and waste.*

Recycling is not sufficient as an independent solution. However, along with other sustainability pillars, which are mentioned in the book *Zero Waste Home* written by Bea Johnson, it can be very efficient. The pillars are strongly advised to be implemented in the following order:

1. refuse (what we do not need)
2. reduce (what we do need and cannot refuse)
3. reuse (what we consume and cannot refuse or reduce)
4. recycle (what we cannot refuse, reduce, or reuse)
5. rot (compost the rest). (Johnson 2013, 65)

According to the pillars, recycling is only one step and not the first towards humankind's sustainable existence, but as crucial as others (Johnson 2013, 107).

4.2 Current Situation in Russia

In Russia, recycling garbage is at the initial stage of development. According to The Ministry of Natural Resources of Russia, each country's inhabitant produces up to 400 kg of various wastes per year. (The Ministry of Natural Resources of Russia 2020, according to Rcycle.net 2020.) Up to 90% of the waste ends up in landfills that cause bad smells, pollution of the groundwater, and the release of toxic gases (Netherlands worldwide 2019).

Dumps and landfills have become an integral part of the Russian landscape. Even the shores of Baikal, the largest freshwater reservoir on the planet, are buried in glass and plastic bottles, cigarette butts, wrappers, and other human presence attributes. (Plus-one 2017.) Furthermore, on the outskirts of megacities like Saint Petersburg, citizens continue to struggle with the smell of the landfills. More often one of the main points for people looking for a living location is to be as far from the landfills as possible. (Smirnova 2018.)

Rostechnologii's (Ростехнологии, transliterated by the author) data reports that landfill contains more than 40% of the valuable recyclable material that could reduce production costs in various industries if adequately processed. The wasted recyclable materials include biowaste, paper, carton, plastic, glass, and metal. Moreover, the report states that only 8% of the waste is being recycled. (Rostechnologii 2020, according to Rcycle.net 2020.)

The public recycling points provided by municipal services exist, but there are few of them. According to the report conducted by Greenpeace Organization, 18% of the entire population has access to the public separate waste collection points. The full availability of recyclable materials tanks was recorded in 26 cities - mainly in the Moscow region, Almetyevsk, Nizhnekamsk, Taganrog, Tver, and Shakhty. (Greenpeace 2020b.) Nevertheless, the citizens of Russia can still recycle, as many private and non-commercial recycling points exist over the country that accepts waste for recycling (Greenpeace 2020a).

Furthermore, for the past several years, many voluntary and non-commercial organizations have been formed to tackle and reverse Russia's recycling situation. One such organization is Razdel'niy sbor (Раздельный сбор, transliterated by the author) movement that was created back in 2015 in Saint Petersburg. The movement currently operates in the Leningrad region, Moscow, the Moscow region, the Cherepovets, and Veliky Novgorod. The environmental movement Razdel'niy sbor is a community of people who believe that separate waste collection is mandatory for society's development to improve the environment and human life quality. The movement promotes a complete rejection of mixed waste incineration technologies and any other technologies that destroy resources. The movement activities include

- organizing events where people can bring their collected recyclable materials (for further utilization)
- active interaction with municipal, regional, and federal authorities to establish an environmentally friendly and cost-effective waste management system
- encouraging companies to process recyclable materials from the public
- educating people about the waste problem and current recycling solutions in Russia using social media and creating information guides
- bringing awareness about poor waste management in Russia by giving interviews to print and online publications, television, and participating in major festivals. (Rsbor 2020.)

Razdel’niy sbor stimulates the emergence of a new system of waste management in Russia and forms a conscious attitude towards natural resources in people. (Rsbor 2020.)

Another organization that motivates people to start recycling is Greenpeace. Greenpeace has launched the program Nol’ othodov (Ноль отходов, transliterated by the author) to educate people to start conscious consumption and recycling of the waste materials. They have created the petition to make a separate waste collection for every citizen in Russia available. Besides, they conduct many surveys to show the importance of developing a new system of waste management. In addition, they have an educational blog where people can learn about recycling and how to do it in accordance with Russian realities. (Greenpeace 2020c.)

Due to such organizations' activity, a digital presence was built where people can find educational material or use digital services to be acquainted with the recycling routine. One such service, which was created in virtue of Razdel’niy sbor volunteers and the Greenpeace organization, is a web map RecycleMap. The map provides either public, non-commercial, or private existing recycling points marked by movement’s volunteers in the cities where more than ten such points facilities operate. By using this map, users can find the nearest recycling points to their location in their city and bring the collected recyclables there themselves. The user can recycle the following 13 materials in their city: paper, plastic, glass, metal, clothing, hazardous waste, batteries, mercury lamps, e-waste, cardboard, tires, and caps. Moreover, users can send information about the recycling point in their city to the volunteers if they could not find it on the map. After that, the volunteers will review it and add it to the map. Currently, RecycleMap is available for 80 cities. (Greenpeace 2020a.)

Another digital service is Ecotaxi. Ecotaxi is a paid delivery service for collected recyclable materials from home to existing recycling points. Currently, Ecotaxi does not have its official website, but the delivery can be requested via popular Russian social network – VK. Presently, Ecotaxi operates in six cities. (Sablin 2020.)

Soon in each region of Russia, the separate waste collection will become an obligatory element of the state policy in waste management. Still, Russia's citizens can already start recycling based on available public, private or non-commercial services. (Garkusha 2020.)

4.3 Laws, Regulations, Barriers

Until 2019, waste recycling regulations were absent in Russia. There were several reasons for this:

1. No work was done to promote sorting and reasonable consumption among the population.
2. Public initiatives were blocked due to several laws. For example, the old rules prohibited the installation of fixed waste collection points.
3. There were no recycling companies. Even if some activist citizens tried to sort out the garbage, it still ended up in a dump. (Rcycle.net 2020.)

Even the term "separate waste collection" in Russia was outside the legislative wording. It was only defined in 2017 by the main waste law - Federal Law No. 89-FZ as amended by the Federal Law of 31.12.2017 N 503-FZ. (Ecopromcentr 2019.)

However, a garbage reform was launched on January 1, 2019. The reform states that the responsibility for garbage collection and recycling goes over to regional operators. The regional operator is the company responsible for the entire waste chain in each region. The reform's primary purpose is to move gradually to a separate waste collection, with its subsequent recycling. (Snob 2019.)

To explain the reform in more detail: The regional operators will take over the management of all SMW (solid municipal waste) under an agreement with the regional government and will be responsible to the authorities for meeting their commitments. To ensure that the regional operator is aware of how it should process the municipal waste, the regional government has developed fundamental documents - the Territorial Schemes and the Regional Waste Management Programs. (Garkusha 2020.)

All regional operators are obliged to install waste collection sites for each municipal house of their region. Individuals and legal entities pay for the services of the regional providers separately from housing and communal services. Whether or not the regional operator is obliged to implement the separate waste collection depends on the direction that regional authorities in waste management follow. In the next paragraph, two options are described, which exist for Russian citizens depending on the region they live in. (Garkusha 2020.)

The first option, which currently exists, is that the regional operator is required to implement the separate waste collection according to the region's defined program. In that case, the region's residents should ensure that separate waste collection is implemented in full compliance with regional conditions. Otherwise, the resident can request to install the waste collection system. The second option is that the regional operator is not required to implement the separate waste collection. In that case, the resident cannot request the waste collection system but still can recycle to the nearest non-commercial or private recycling points. (Garkusha 2020.)

However, the territorial schemes and programs of the regions have limitations. Regional operators cannot provide containers for separate waste collection due to the lack of financial resources. Regional operators can spend no more than 1% of their revenues for this purpose. Accordingly, this amount is not enough for many regions. Besides, there is no federal financial support from the government. For example, in Rostov-on-Don city, 1% of the revenue covers 5% of the outdated containers and tanks, where 15-20% fail annually. (Podobedova 2020.)

Furthermore, the separate collection development is almost impossible, as most regions have not yet established waste management infrastructure and public sorting facilities. For example, the Murmansk region, where the separate waste collection initiative is supported, has to export the waste to another region, as there are no current facilities on its own. (Mihailov 2019.)

Nevertheless, the Ministry of Natural Resources of Russia has requested the government to increase funding for separate waste collection systems (Berezina 2020). Additionally, the Ministry has set a voluntary task for the Russian Federation's regional entities to prepare for the transition to separate waste collection for the population already this year. From 2020, it is planned to have a two-container system with division into mixed and separate accumulated waste (paper, plastic, glass, metal). There are twelve regions where work is at a high stage of implementation. (Press Service of the Ministry of Natural Resources of Russia 2020.)

Currently, the establishment of mandatory waste sorting and separate waste collection for all regions is still under discussion but has not been implemented in the current legislation. Therefore, it prevents the real solution to the garbage problem across the whole country. Still, the country is just beginning to develop a legal framework to regulate separate waste collection. Some regions only formally issue by-laws and regulations but do not implement separate waste collection. Others are determined to get involved. (Ecopromcentr 2019.)

Summing up, the recycling situation in Russia is deficient. However, the government has begun to propose reforms to regulate the recycling procedure slowly. Furthermore, volunteering, non-commercial and private organizations provide waste separation collection. Therefore, Russian citizens can start recycling. In the following chapter, the implementation of an application prototype is presented to ease the recycling process for Russian citizens.

5 Implementation

This chapter focuses on applying the product design process, its techniques, behavior change design theories, and frameworks to develop the application prototype. During the implementation, the author applied the researched Stanford Design Thinking process described in Subchapter 2.2. The author followed the next steps to design a digital solution:

1. Empathize stage
2. Define stage
3. Ideate stage
4. Prototype stage
5. Test stage

In the following subchapters, the author discusses the results of the applied tools used on each stage related to data collection or data analysis. Besides, the author presents the application prototype, which is the primary outcome of the research. The application prototype aims to facilitate the recycling activity for people located in Saint Petersburg.

5.1 Empathize Stage

During the Empathize stage, the author finds through user's perspective what prevents them from recycling. The author conducted an online survey to identify the target audience and their needs. After that, the author researched market competitors and their current performance. The author followed a mixed-methods approach during this stage. In the following subchapters, the findings of the user survey and market research are discussed.

5.1.1 User Survey

The author used the Google Forms tool to create a survey in the Russian language. The survey was open from 2020-10-1 until 2020-11-1. During that period, one hundred and eight answers were received.

The author shared the questionnaire via online messenger (Telegram) among acquaintances and family members who live in Saint Petersburg. Most of the author's acquaintances are students. The author's family members work in the engineering and educational industry. Moreover, the author asked her contacts to share the questionnaire among their colleagues and their acquaintances via messengers.

The survey consisted of nine questions that were divided into three main parts. The first part contained general questions about demographics and the current recycling situation. In the second part, participants were asked to share their knowledge about existing recycling online services. The third part included questions about participants' general thoughts about recycling activity and current blockers that prevent recycling activity. The survey consisted of questions with multi-choice and open-ended answers. A mixed-methods was applied to collect and analyze answers to questions. The author summarizes the findings of the survey based on the parts the survey was divided. The author does not list every answer provided by participants but provides a general overview of the crucial results for further development of the digital solution design. The full questionnaire is presented in Appendix 1.

Overview of the Survey's First Part

Firstly, participants were asked demographic questions related to their inhabitance, gender, and age. All survey's participants currently live in Russia. The vast majority of participants (84 respondents) are from Saint Petersburg that proves data's relevance of the participants on a geographic level as the application is intended for residents of Saint Petersburg. However, the answers from the rest of the group (24 respondents) do not differ significantly from the majority group and are also considered by the author. Most of the respondents are women (70, 4%). The age of the participants varies from 18 years to 80 years. Figure 6 illustrates the age variations where, at first glance, it is clear that the most prevalent age group is people between 18-25 years.

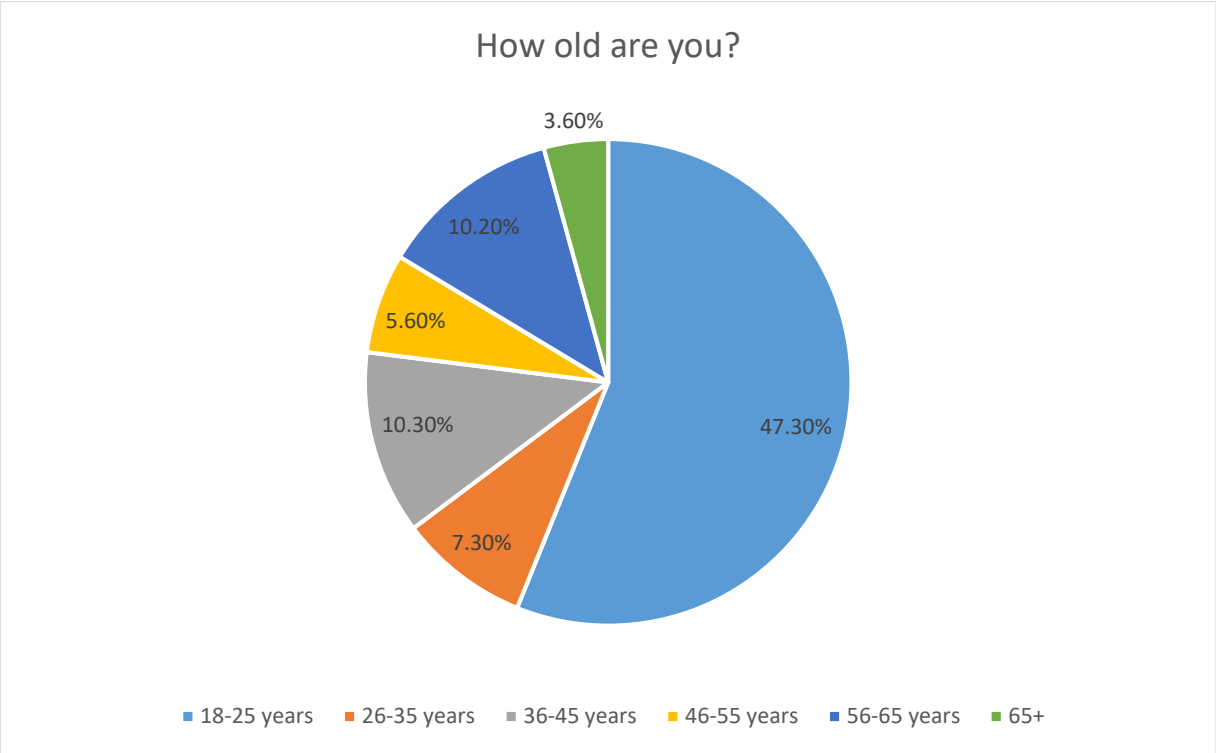


Figure 6. Age groups of the participants

Additionally, the participants were asked whether they recycle. Four participants replied that they recycle everything, and 25 participants recycle only the items they know how to recycle (batteries and glass). Others replied negatively.

Overview of the Survey's Second Part

Secondly, participants shared their knowledge about existing recycling solutions. Most of the respondents (76, 9 %) are not aware of any online services presented on the market. Even though the rest (23, 1 %) of the participants know them, less than half of the respondents (7, 4 %) use them. One reason for not using is the inconvenience of current services. Another reason is the lack of desire to use them at all.

After that, participants were asked to share voluntarily the online services that they can advise. Figure 7 shows respondents' suggestions. Figure 7 demonstrates that 8 participants were willing to share that information where RecycleMap is the most known suggestion, as five respondents recommended that service. The author in Subchapter 4.2 already researches all services except for Artecospb.

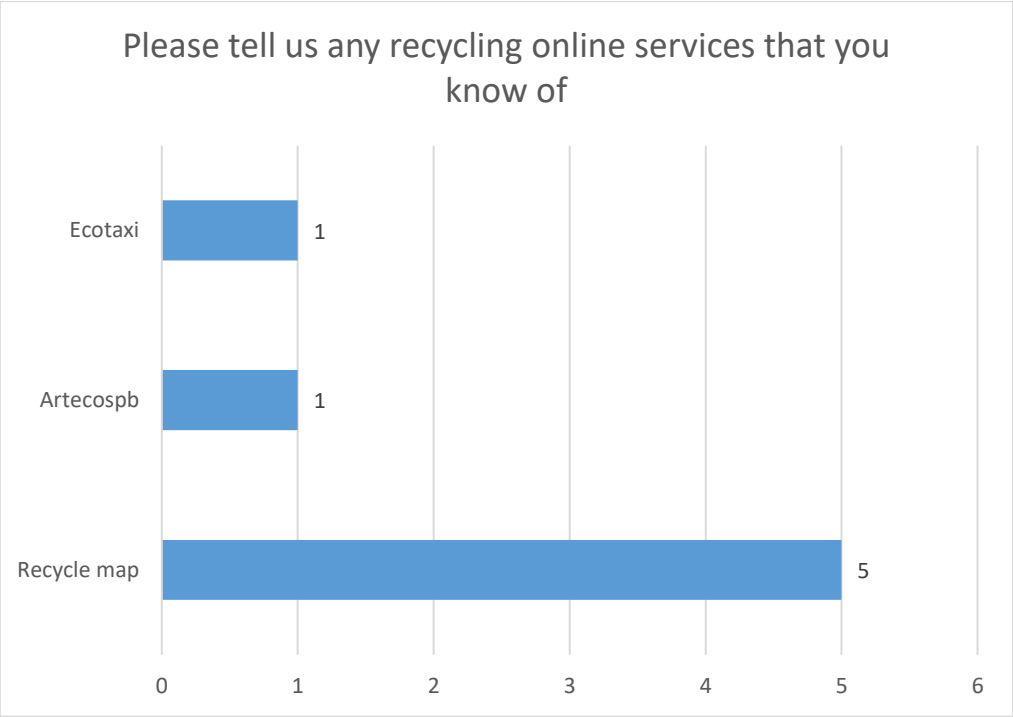


Figure 7. Participants' suggestions of competitors

Overview of the Survey's Third Part

The participants were asked whether they would like to start recycling in the future. Only nine participants replied negatively. Other participants replied positively.

Lastly, participants were asked voluntarily to give any ideas or concerns about the possible recycling digital solution with detailed answers. Additionally, the participants provided blockers that stop them from recycling. Seventy-seven of the participants chose to respond. Most of the given ideas, concerns, and blockers have different wording but carry the same meaning. The author analyzed all the detailed answers and grouped ideas and blockers by the same meaning in two different tables. Figure 8 demonstrates all the grouped frustrations and blockers that respondents currently face, where Figure 9 shows all the grouped suggestions for the future application given by respondents.

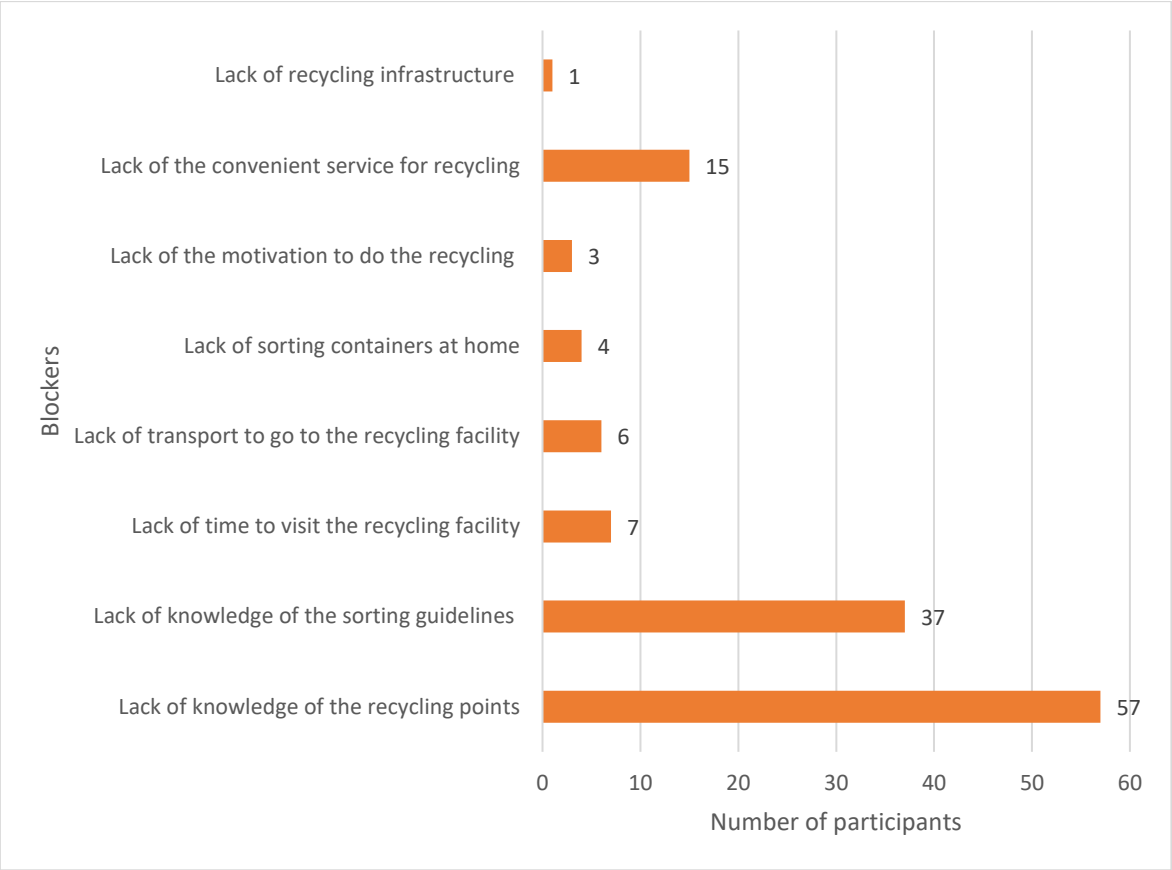


Figure 8. Blockers of the participants

Figure 8 demonstrates that the lack of knowledge of the recycling points is the most common survey participants' blocker. The second most popular blocker is the fact that there are no convenient online services to use. The participants explained that the current services are outdated and not user-friendly. Furthermore, respondents do not know how to sort waste. Another blocker, which participants often wrote, is that they do not have enough time to go to recycling facilities. Besides, several participants mentioned that the recycling point could be far and they require a car to go there, as the sorted waste is hard to take with in the public transport. The last and the least blocker is that respondents are not motivated enough to start learning about recycling activity and later actually doing as there is no convenient online service that offers it.

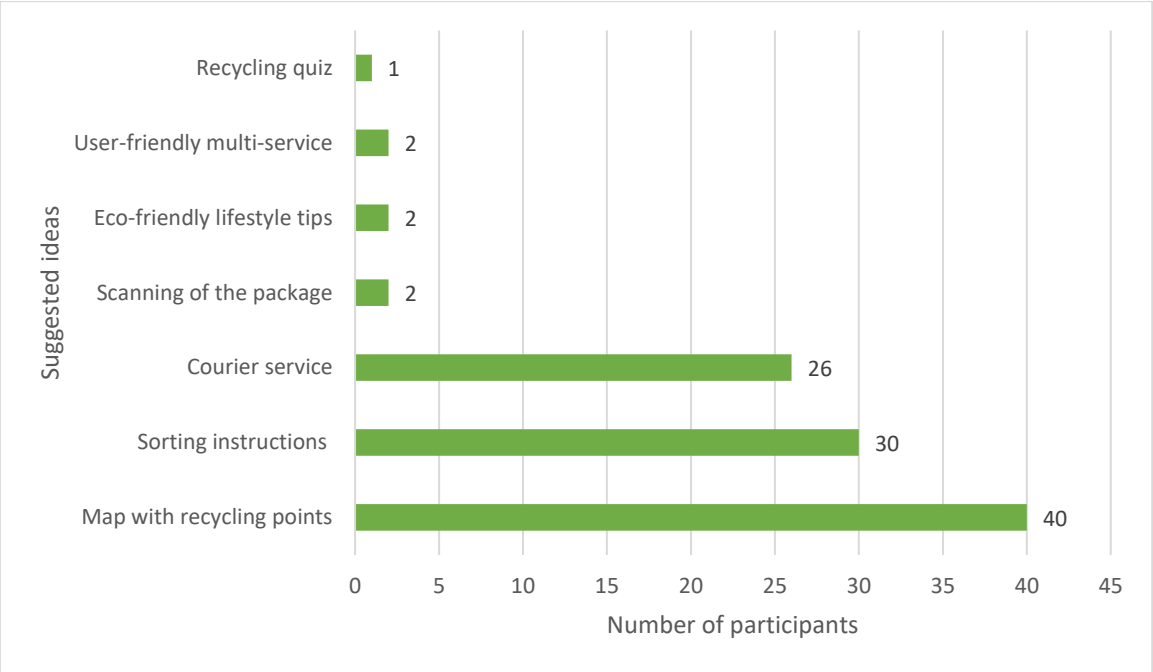


Figure 9. Participants' ideas for a possible recycling solution

Figure 9 shows that a map with recycling points was the most frequent suggestion by the participants. Using the map, participants want to find the nearest recycling points and understand what type of trash recycling facility accepts. The second recommendation by frequency is to provide sorting instructions. Two participants also specified that they would like to have sorting instructions as *a step-by-step guide with pictures that will be easy to follow.* The courier services are the third popular idea. The participant mentioned that they would like to order the waste collect from home, as they do not have time to go to the recycling point. A few participants suggested a scanning feature so they could understand how to sort the scanned package. Two participants recommended having an application that can solve several needs at once (e.g., education materials and map with recycling points). Additionally, participants would like to have tips on the general eco-friendly lifestyle. One participant advised creating recycling quizzes to consolidate the knowledge gained from educational materials.

5.1.2 Market Research

In the following subchapter, the author discusses online products presented on the Russian market that targets to facilitate the recycling procedure for Russian citizens. The author's market research aimed to find specific feature solutions of competitors that can be adapted or improved. The feature solution criteria rely on the participants' ideas and blockers (Figure 8 & Figure 9).

The author was not able to find similar applications presented on the Russian market. Therefore, the author searched for services that have a digital presence on websites and social networks. The author chose three online services based on survey participants' suggestions and own findings in Subchapter 4.2. The online services are RecycleMap, Ecotaxi, Artecospb.

RecycleMap

Image 1 demonstrates that the RecycleMap's home page represents a map with locations of the sorting facilities in the selected city. Each sorting facility has different colors depending on the type of recycling waste. The home page has a mobile version. All the features of the platform relate to interaction with recycling points.

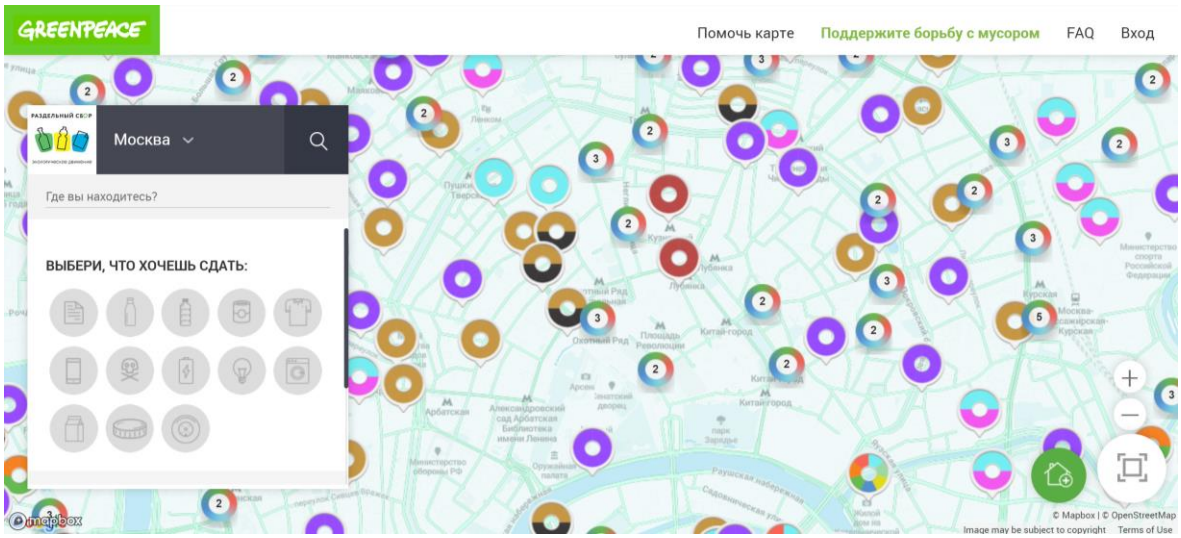


Image 1. RecycleMap's home page

The platform users can filter sorting facility by type of waste, such as cloth and plastic. Moreover, the platform allows users to enter an address when they can later navigate the selected recycling point from the given address. Additionally, the user is given detailed information about each sorting facility, such as open hours, contact details, and address. Lastly, the platform allows the rating of the recycling facility. More information about RecycleMap can be found in Subchapter 4.2.

Ecotaxi

The Ecotaxi service provides courier services to the recycling point. The service does not have an official website and operates as a community in the social network VK. Image 2 shows the community page's content. The user can order a waste collect via messaging functionality in the community or via WhatsApp messenger. Ordering of the waste collect is

only possible two days in advance. Furthermore, users can find education materials in the feed of the community. The service also accepts donations for future development.

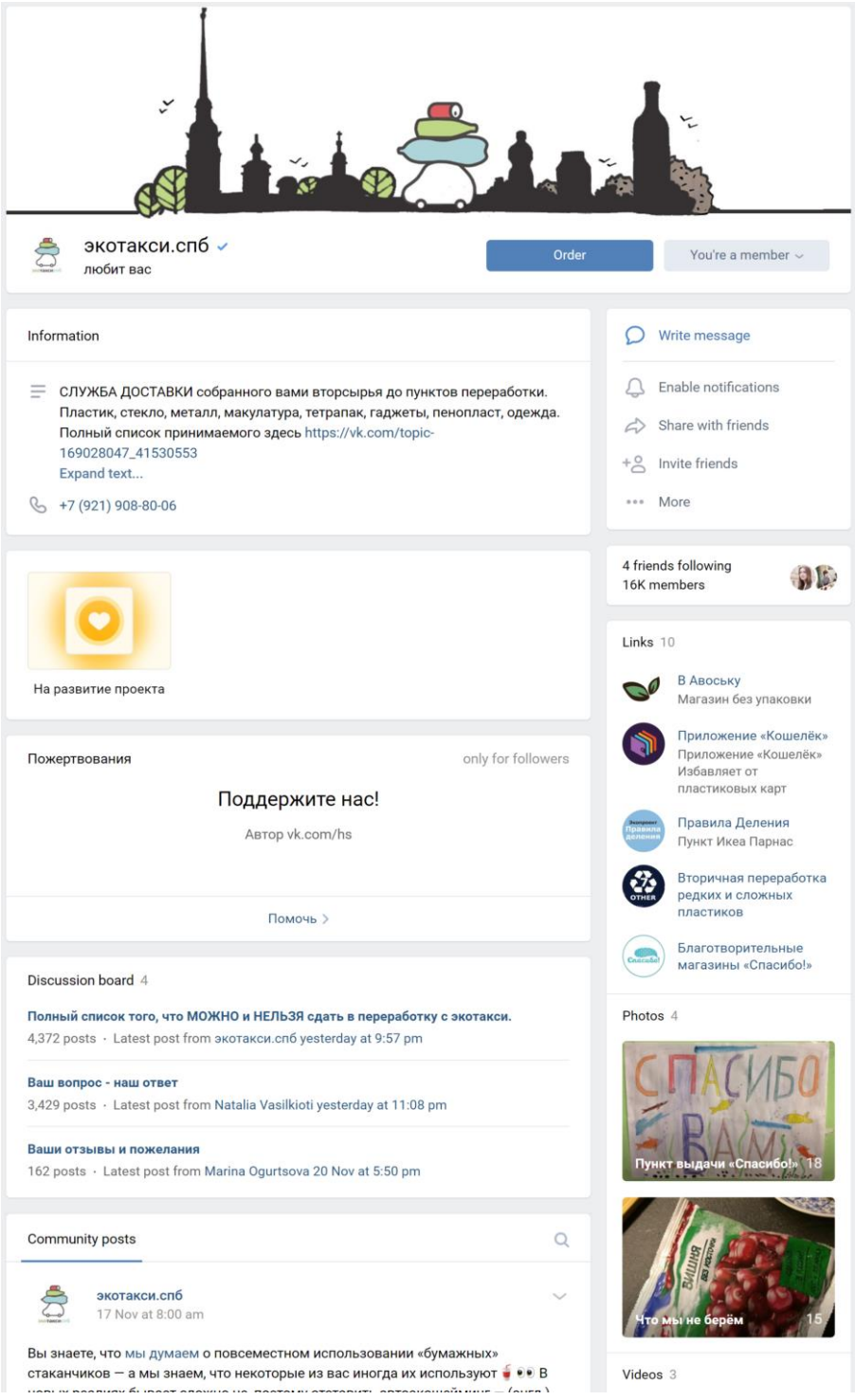


Image 2. Ecotaxi community in the social network (VK)

Artecospb

Artecospb is a mix of different services. Like Ecotaxi, the service does not have an official website and has a digital presence in three social networks, such as Instagram, Telegram,

and VK. Image 3 demonstrates the home page in one of the social networks. The Artecospb allows users to order a waste collect via a phone number or messenger (Telegram). In addition, the service sells the sorting bags via phone number and messenger (Telegram). Lastly, the company provides a Google Form where users can request for installation of containers for separate waste collection near their home. (@Artecospb 2020a; @Artecospb 2020b.)

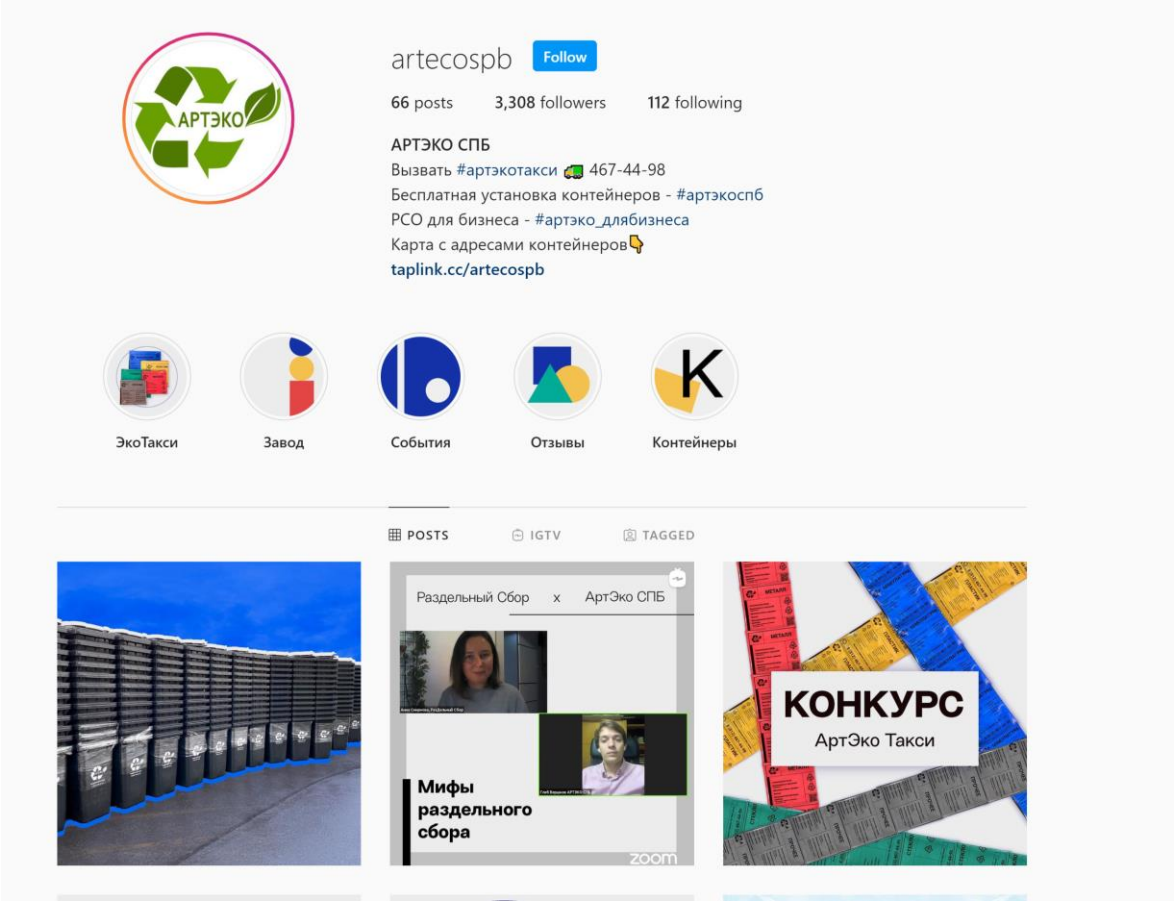


Image 3. The official page of the Artecospb in one of the social channels (Instagram)

After competitor's research was done, the author divided the competitors into direct and indirect competitors, as explained in Subchapter 2.2. Thus, the author came to the following conclusions:

1. Recycle map is considered a direct competitor as the service has an independent presence with the functionality that is also implemented in the application prototype.
2. Ecotaxi and Artecospb considered indirect competitors as the provided solutions are presented in social networks and not as a standalone application.

5.2 Define Stage

During the Define stage, the author analyzed the collected information from the Emphasize stage to find everyday needs and problems that participant face when they perform recycling activity. In the following subchapters, the author examines the results from the user survey and creates a user persona. Furthermore, the author identifies the advantages and disadvantages of the investigated competitors.

5.2.1 Target Audience

Based on the user survey findings, the author created a user persona to specify the target audience. The author outlined one target group based on age: people between 18 and 25 years old. Table 5 shows the common facts, behaviors, pain points, goals, and needs of the target audience.

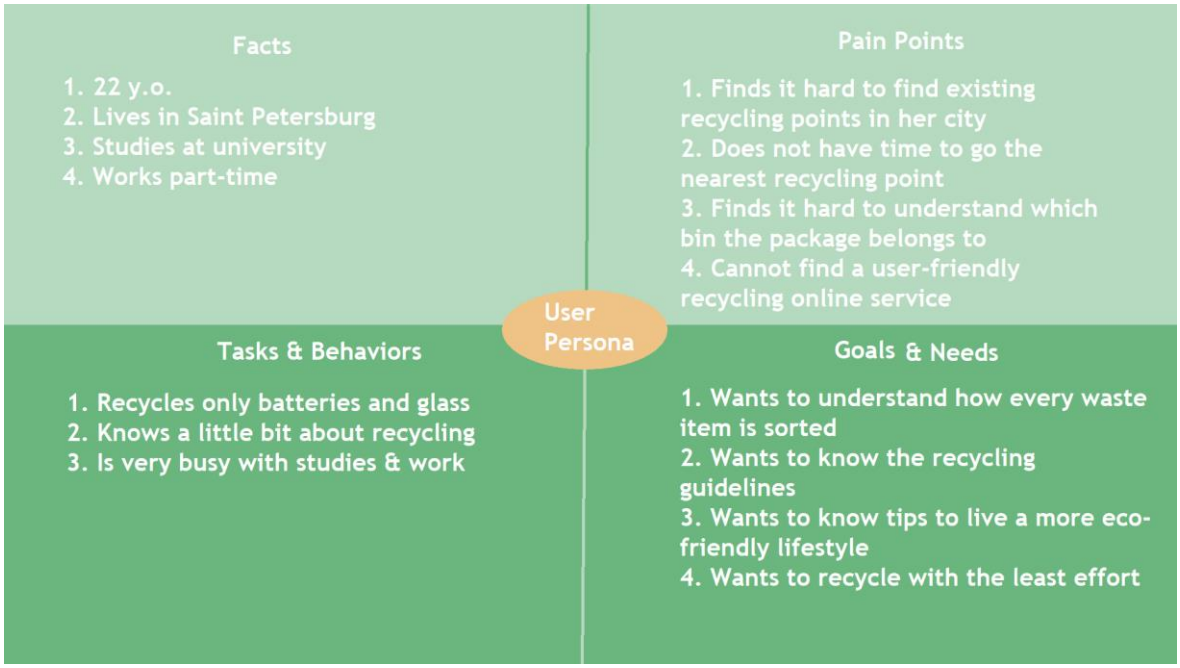


Table 5. User persona

5.2.2 Competitor Analysis

The author used the competitor analysis matrix to reveal competitors' strengths and weaknesses by their features and current performance. The competitor analysis matrix also helps understand how the major competition is handling the overall user experience. Four competitors were analyzed. The full competitor matrix can be found in Appendix 2. Based on the competitor analysis matrix, the author gives overall feedback for each competitor.

RecycleMap

The most significant feature of the RecycleMap is a map that provides the recycling points over the selected city. An interface design is not intuitively understandable with poor navigation. The loading time of the map can take more than 20 seconds that is considered long. Moreover, the feature of navigating to the selected recycling point does not work. Overall, the service gives a poor impression of an outdated website that is no longer supported.

Ecotaxi

Overall, Ecotaxi indicates a prospective courier service concept that can be in demand and famous as many survey participants suggested the idea. However, the realization of the service is imperfect. The Ecotaxi does not have a website and exists only in social networks. No timeslots and available dates are presented, making it difficult for users to understand when the service is available. The education materials are presented in the social network feed, making it hard for users to look for a specific material, as there is no search function.

Artecospb

Artecosbp is the only competitor offering three different services simultaneously, such as bag ordering, courier service, and request for container installation. Therefore, Artecosbp attempts to minimize three blockers that prevent users from recycling. The main disadvantage is the absence of the official website. Thus, the users cannot track the bags' order to see the progress of the request for container installation. Furthermore, like Ecotaxi the education materials are presented in the feed of the social network (Instagram), making it hard for users to look for a specific material, as there is no search function.

Summary

The Russian market seems to have an opportunity to develop online recycling applications. As discussed, the current services lack the proper functionality that leads to a poor user experience. According to Amy Butcher (2020, 206), user experience is one of the keys to successful behavior change.

5.3 Ideate Stage

During the Ideate stage, the author defined the solution for the users' researched needs and problems. For the creation of the possible solution, the author used Ability blockers + Solutions Notes Grid described in Subchapter 3.2. This grid helps to analyze each ability blocker's possible solutions based on the BCW framework and structure the ability blockers in priority. Furthermore, the author brainstormed features that could help the user to maintain the behavior based on STD techniques defined in Subchapter 3.3.

Ability Blockers

Table 6 demonstrates the Ability blockers + Solutions Notes Grid. In the “Evidence for Existence of the Blocker” column, the author listed participants’ ideas and blockers represented in Figures 8 and 9. Moreover, the author used color-coding, where the red color represents the blocker, and the green color represents possible facilitating ideas. The ability blockers are ordered by implementation priority based on the total score. In case the total scores for several ability blockers were equal, the author referred to the conducted survey and gave more priority to the blocker, which was reported more often by respondents.

#	COM-B Category	Evidence for Existence of Block	Prevalance	Impact	Brand Congruence	Total Score	Intervention Functi	Solution Feature
1	Psychological Capability	1) Lack of knowledge of the recyling points (57 participants) 2) Map with recycling points (40 participants)	3	3	3	9	Enablement	Map with recycling points
2	Psychological Capability	1) Lack of knowledge of the sorting guidelines (37 answers) 2) Eco-friendly lifestyle tips (2 answers) 3) Sorting instructions (30 answers) 4) Recycling quiz (1 answer)	3	3	3	9	Training	Recycling guide and possibility to complete quiz after
3	Psychological Capability	Scanning of the package (2 answers)	3	2	3	8	Enablement	Photo-scan that will automatically tell the type of packaging and how to sort it
4	Physical opportunity	1) Lack of time to visit the recycling facility (7 participants) 2) Lack of transport to go to the recycling facility (6 participants) 3) Courier service (26 participants)	2	2	3	8	Enablement	Order a collect
5	Autonomous motivation	Lack of the motivation to do the recycling (3 participants) Lack of the convenient service for recycling (15 participants) User-friendly multi-service (2 participants)	1	2	3	6	Enablement	Provide a multi-service
6	Physical opportunity	Lack of sorting containers at home (4 participants)	2	2	2	6	Enablement	Provide list of shops where user can buy containers or allow users to buy containers in the application itself

Table 6. Ability blockers + Solutions Notes Grid

Table 6 shows that most participants’ blockers relate to knowledge gasps (psychological capability) and the participant’s environment (physical opportunity). Additionally, one blocker refers to the unpleasant experience of using the existing services (autonomous motivation).

Based on the BCW Framework, the author chose the intervention function for each ability blocker. The solution feature criteria were relied on the survey’s participants’ ideas and conducted competitor analysis matrix. In most cases, the author’s solution features refer to enablement by providing features that facilitate recycling activity.

Motivational Factors for Behavior Change

The author expanded the functionality of the features described in Table 6 by applying strategies based on the STD theory. Table 7 shows all the strategies the author brainstormed for a possible solution.

Basic physiological need	Strategy type	Solution Features
Autonomy	Choice	Choosing how to deliver sorted items to the recycling point: 1) Ordering a collect 2) Navigating to nearest recycling point using map
Autonomy	Choice	Choosing the way to undertstand how the waste item is sorted: 1) Recycling guide and possibility to complete quiz after 2) Photo-scan that will automatically tell the type of packaging and how to sort it
Competence	Immediate feedback	Showing the results of the quiz completion
Competence	Normative feedback	Showing the user's performance of quizzes results comparing to others
Competence	Competence	Showing the user's performance of waste collect orders over time
Competence	Competence	Showing the user's performance of quizzes results over time
Relatedness	Social support	Sharing the result of quiz completion
Relatedness	Social support	Having a community of friends that recycle

Table 7. The solution features based on STD strategies

5.4 Prototype Stage

After the solution features were identified in the previous subchapter, it is time to develop the research's anticipated outcome – the application prototype. The author used high-fidelity prototyping to achieve the objective of this thesis. The author profoundly explored listed features in a fully interactive and visually complete experience. However, some other elements and areas, which are not related to solution features, but are presented in the prototype screens, exemplify lower fidelity. Such elements are either entirely locked out or static.

The prototype was designed using the Figma design tool. The content used in the prototype is fictional. The images and their sources presented in the prototype can be found in Appendix 3.

One purpose of the application prototype is to solve six ability blockers defined in Table 6. The ability blockers refer to psychological capability, physical opportunity, and autonomous motivation. The author decided to create multi-service to minimize determined barriers. Besides, using the multi-service allows the target audience to recycle with the least effort. In the following subchapter, the author presents four services in one application, which are

- map service
- educational service
- scanning service
- waste collect service.

Image 4 shows that each of the services has its menu option. The author also creates a section for storing a user profile. Furthermore, the author applied STD techniques to help users sustain recycling activity. In this subchapter, a visual representation of the techniques is discussed.

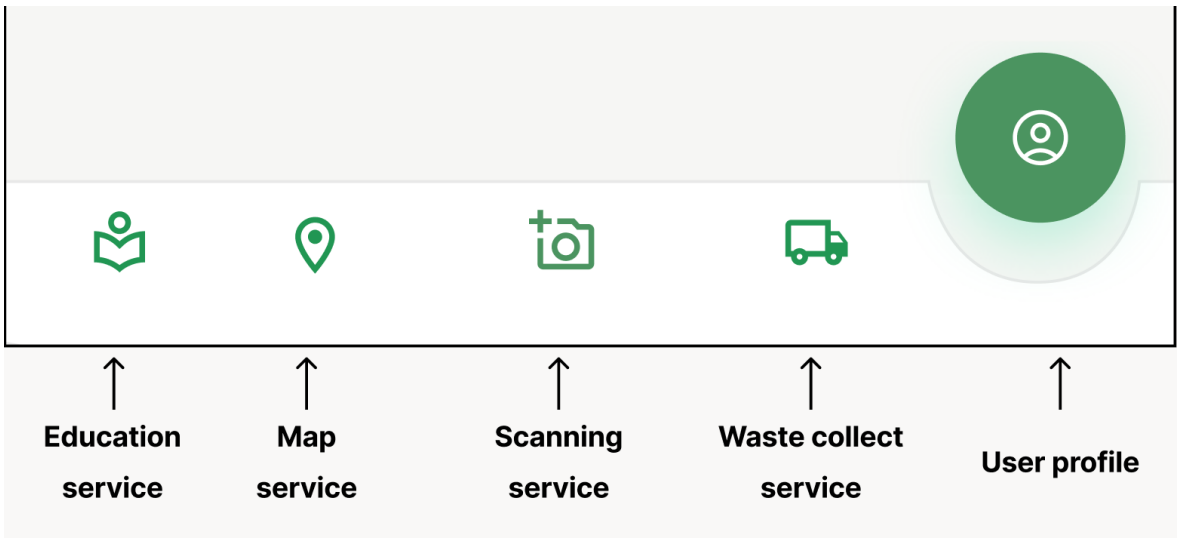


Image 4. Menu options with explanation

Map Service

According to Table 6, the lack of knowledge is the most frequent ability blocker. To enable users to find recycling points, the author created a map service. The inspiration for the service was the RecycleMap competitor. The author created six prototype screens, as shown in Image 5. The author tries to create a user-friendly map where the user can find recycling points. By using this map service, the following features are available for the users:

1. The user can locate him/herself on the map.
2. The user can select the recycling point. After the user has chosen it, the selected location becomes green, and a quick overview of the recycling point appears. The quick overview represents the recycling facility's name, what type of waste the facility accepts, and how far the facility is from the user’s location.

3. The user sees detailed information about the recycling facility, such as open hours, address, and general info, by tapping on the quick overview.
4. The user can navigate to the chosen recycling facility using the blue button. After the user has clicked the blue navigation button, the application shows the route to the facility and instructions on reaching it. The user can cancel the action if needed.
5. The user can find a specific recycling point by name, address, type of recycled waste using the search bar.
6. The user can filter the recycling points by collected waste type.

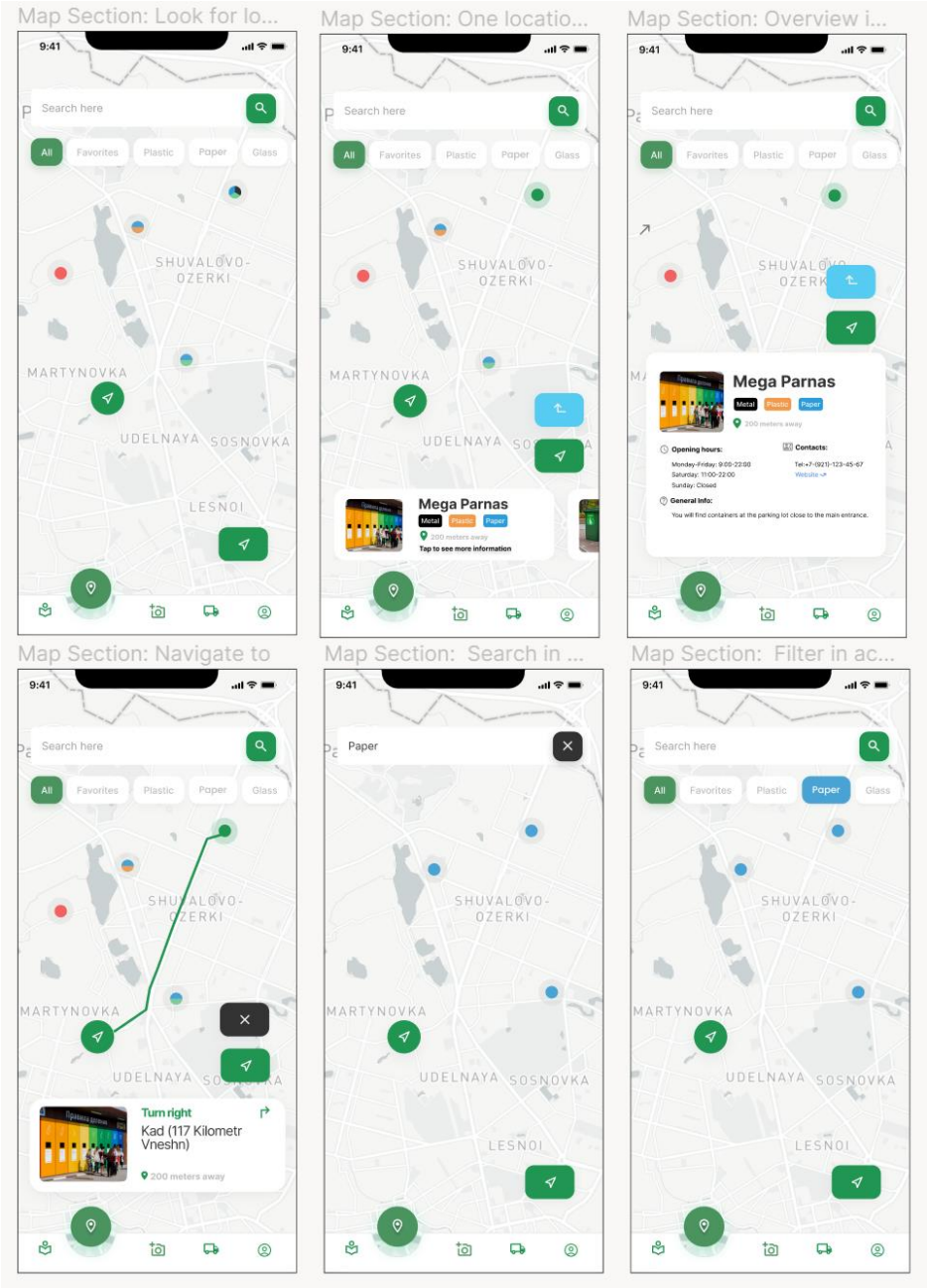


Image 5. Map service

Educational Service

The educational service aims to reduce the ability blocker related to lack of knowledge by providing training. The educational service provides guidelines and exercises in various subjects, such as eco-lifestyle living and recycling instructions. In addition, the service contains information about existing organizations that provide recycling events and offer utilities (containers, eco-friendly products).

The educational service is visualized via the content blog and quiz sections. Firstly, the content blog is explained. Image 6 shows four screens of the content blog. By using the content blog, the following features are available for the users:

1. The user can find educational material by typing the topic name in the search bar.
2. The user can use filters for educational materials.
3. Each material is tagged depending on the content it represents. The tags can indicate the type of the content (tips or instructions), the type of waste the content describes, and specify whether it contains a quiz.
4. The user can save the educational material by clicking the heart on the content section. After the user has saved the recycling material, the material is available by using the filter function.
5. After the user has read the material, the user can choose to complete the recycling quiz or game.

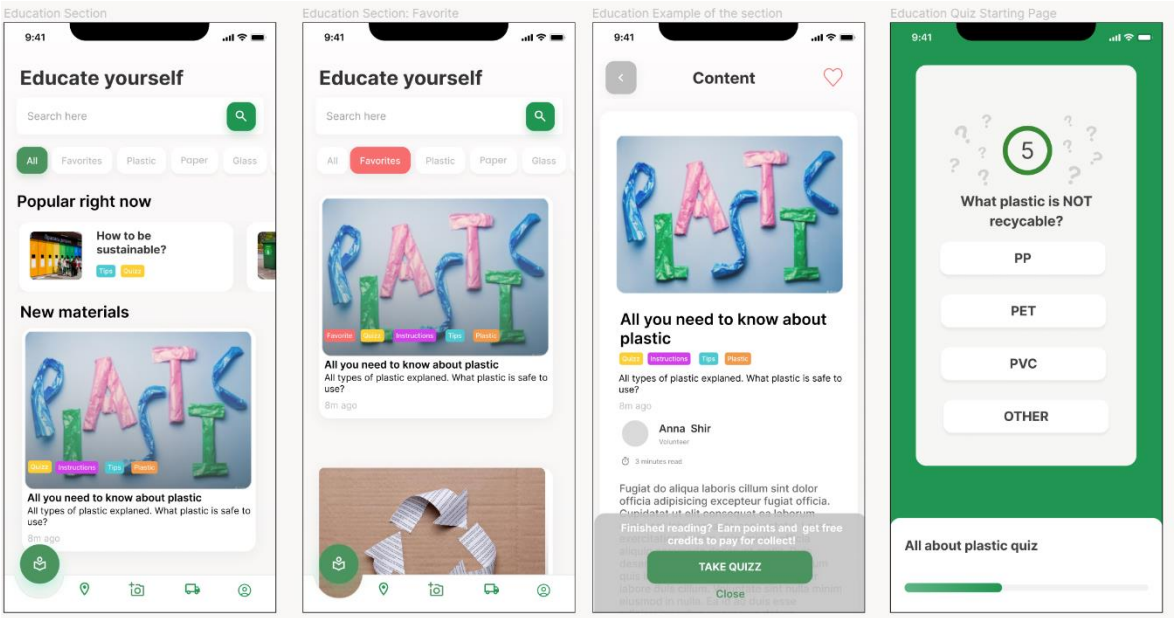


Image 6. Content blog

The quiz section has two types of quizzes: multi-choice and game-based. Image 7 demonstrates the quiz section types. A multi-choice quiz allows users to answer the question based on the content they have read. The game-based quiz allows user to play a game where users need to guess by the image of the item to which bin the item belongs.

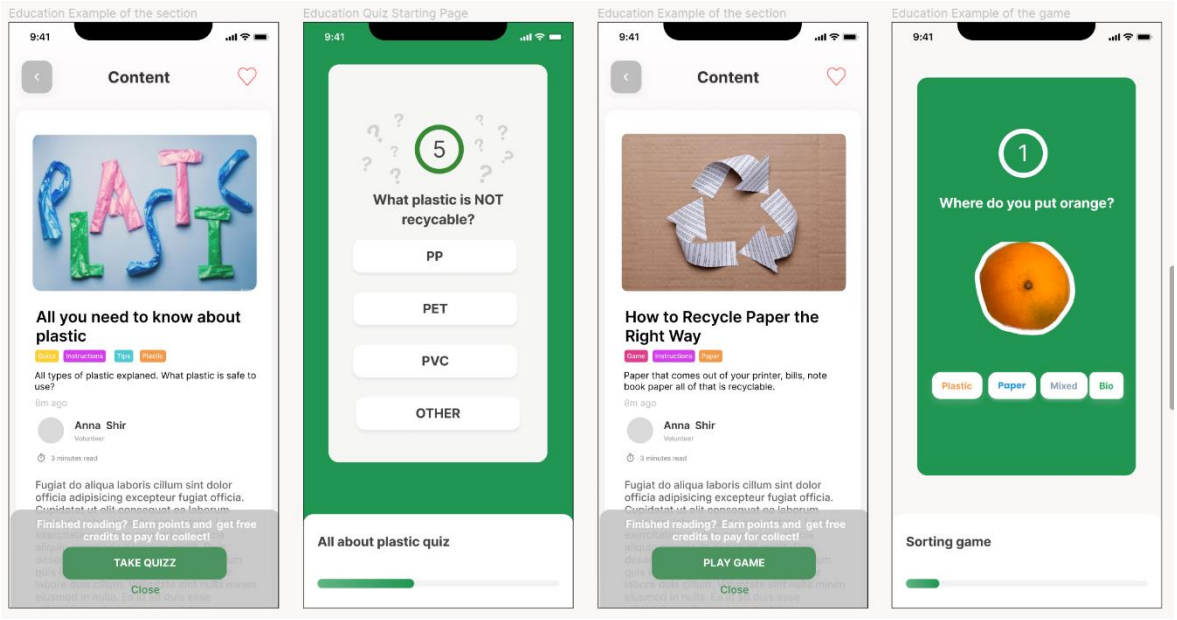


Image 7. Multi-choice quiz and game-based quiz

Scanning Service

Another service that the author created is barcode scanning. The author utilizes the idea suggested by participants in the survey. The indication of the service is to ease the process of sorting the packaging. Scanning service allows users to understand quickly which type of waste the packaging belongs. Image 8 shows the screens that were created to visualize the solution. By using the scan service, the following actions are available for the users:

1. The user can find the packaging by the name. The user can also filter the packaging by favorite items.
2. The user can scan the barcode of the packaging. The user can cancel the action if needed.
3. By scanning the barcode, the user can see to which recycle bin the scanned package belongs. Furthermore, the application also shows the recycling symbol for common knowledge.
4. The user can save the packaging to the favorite section by clicking the button with the heart icon.

5. The user can click on how to recycle button to see the plastic's education topic.

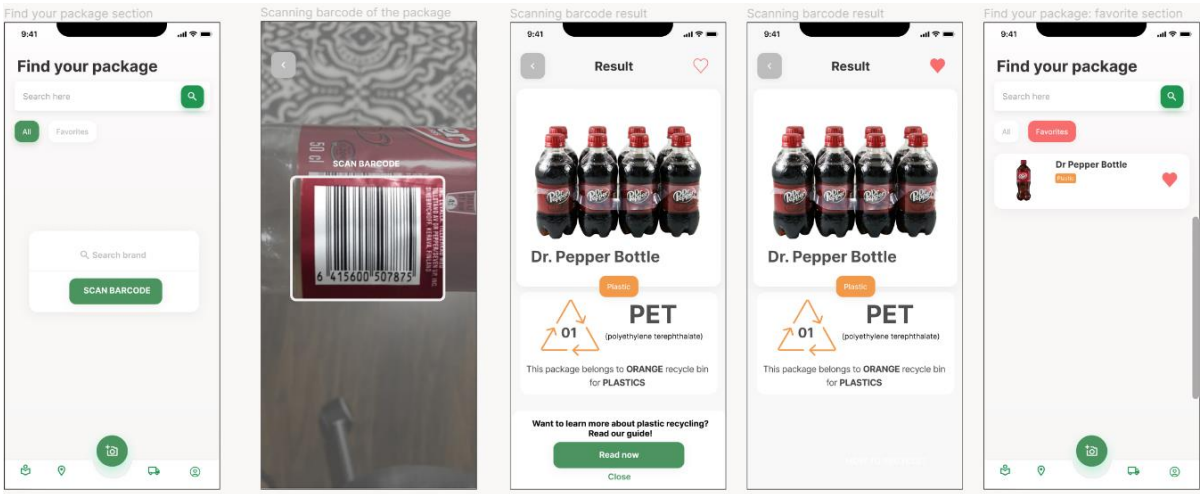


Image 8. Scanning service

Waste Collect Service

The last service is the waste collect service. The service's objective is to provide a list of the courier companies available to pick up the bags of the collected waste from the user's home. The author believes that the current solution can be applied in cooperation with competitors Ecotaxi and Artecospb. Image 9 shows six screens of the waste collect service. By using the waste collect service, the following actions are available for the users:

1. The user can see the available courier services.
2. The user can filter the courier by the waste it collect.
3. The user can see the detailed information of the chosen courier
4. The user can order the waste collect to the specified address.
5. The user can choose the exact date and available time slot of courier arrival.

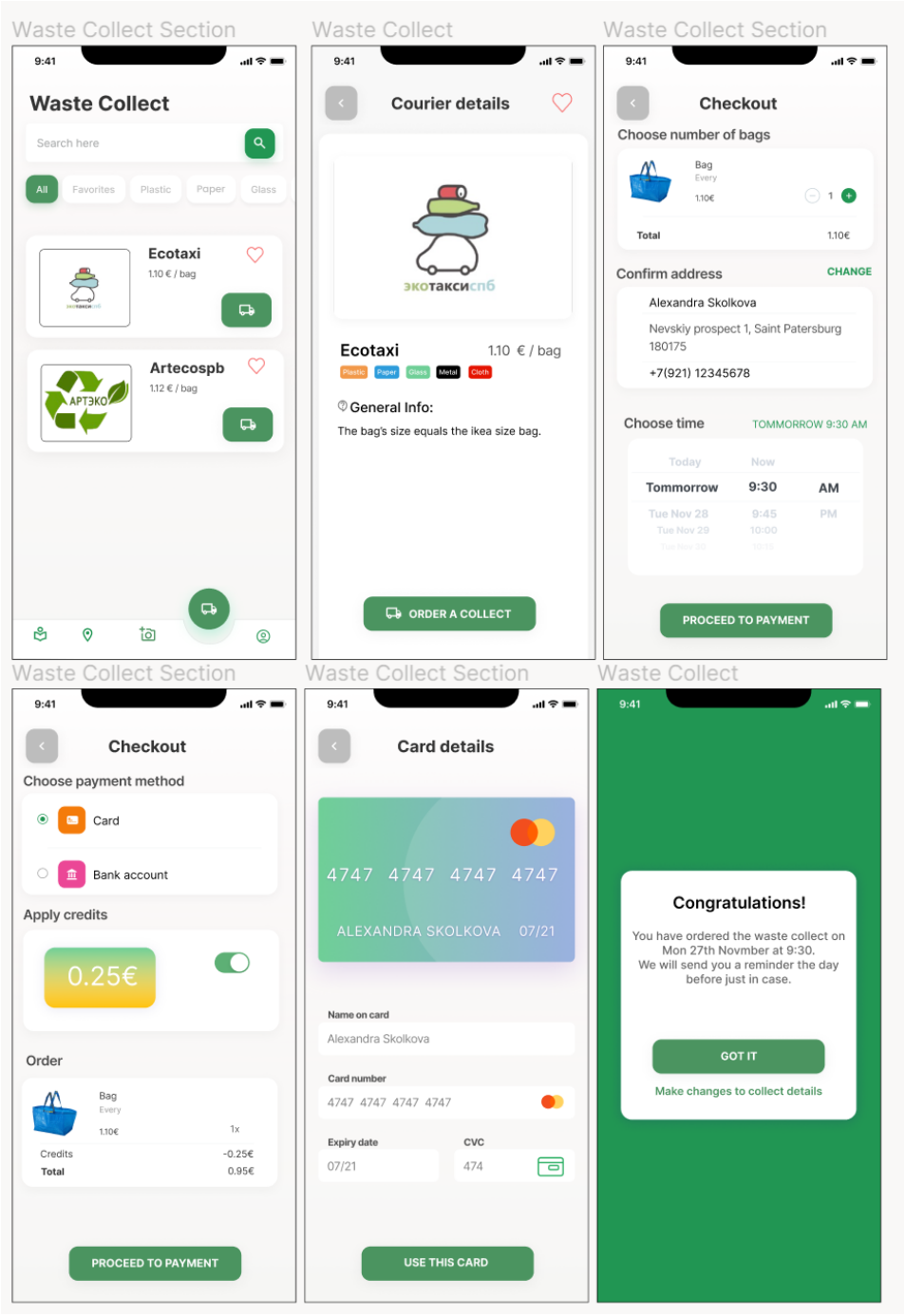


Image 9. Waste Collect Service

Motivational Factors for Behavior Change

With ability blockers, the author provides features based on the STD strategies described in Table 7. The author supports the motivation for behavior change by fulfilling three psychological needs and designing the following product element

Autonomy

To deliver autonomy, the product should have a provision of the ultimate choice. The users should feel like they have control over choice. The author decided that the best possible idea is to provide a multi-service. Thus, users could choose several ways that they can solve their requests:

- If users need to dispose of the waste, they can choose between ordering a waste collect (waste collect service) or using the map to find the nearest recycling point (map service).
- If users need to understand how to waste item is sorted, they can choose between scanning service or educational service.

Competence

To provide competence, users should have the possibility to see how they make progress. Therefore, the author created three types of feedback for users to see their performance.

Image 10 represents the feedbacks on the current quiz completion. Firstly, the quiz page has a question number and a progress bar that shows how much is left to complete the quiz. If the user has answered correctly, the quiz page indicates the successful answer. If the user chooses the wrong answer, the quiz page designates the wrong answer and successful answer. Lastly, after the user has answered all questions, the quiz shows the result of completing the current quiz. All described elements were implemented to support an immediate feedback strategy to provide competence.

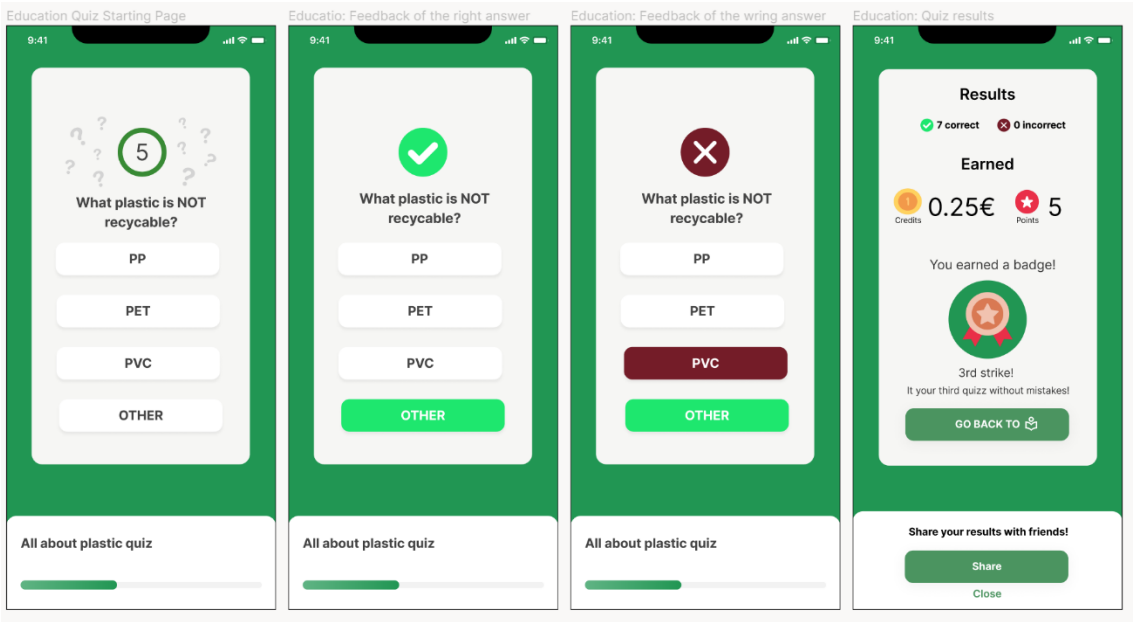


Image 10. Immediate feedback of the quiz answers and result

The author designed badge rewards to provide feedback about user's performance over time. Thus, the author used a cumulative feedback strategy to provide competence. The user gets a badge for every third ordered waste collect or for every third quiz completed without mistakes in a row. Image 11 demonstrates the screens that are shown to the user after successful third quiz completion and successful third order of the waste collect.

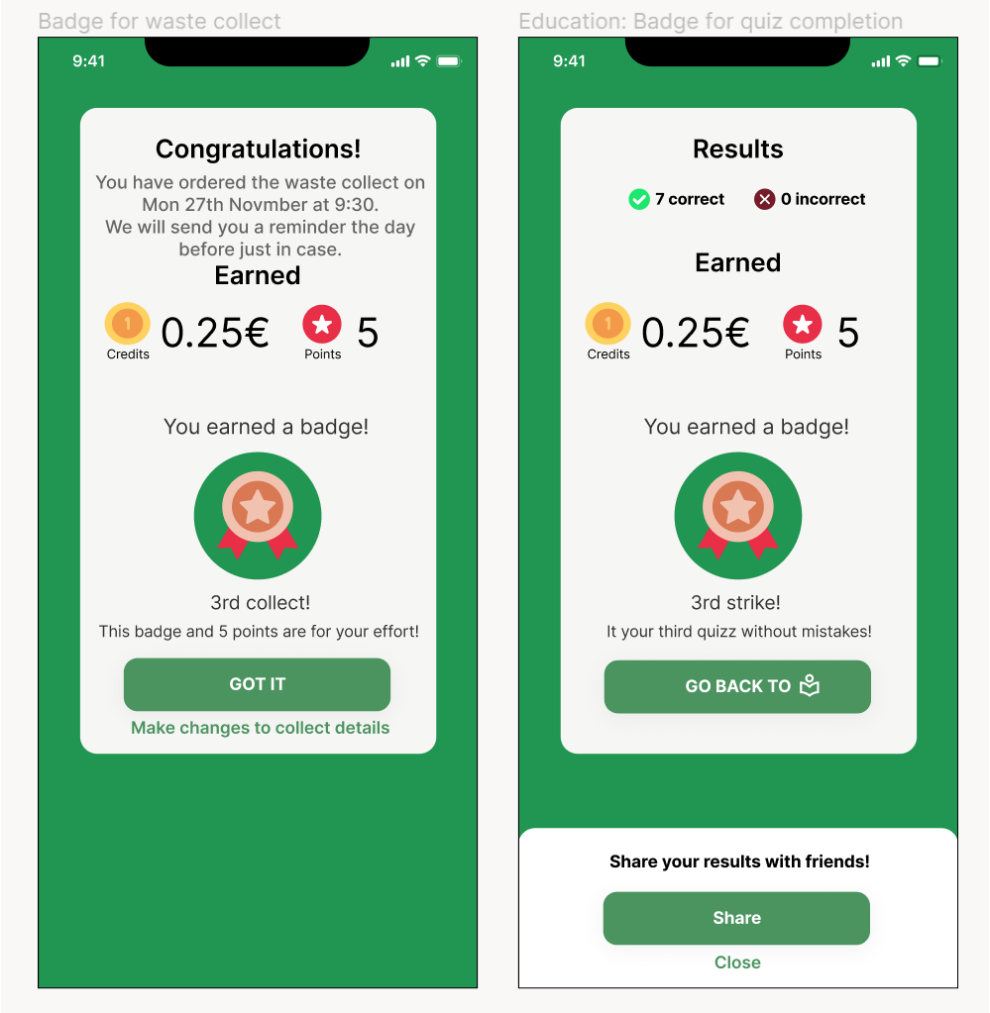


Image 11. Badge for a third ordered waste collect and badge for a third completed quiz

Furthermore, the earned badges are stored in the user profile. Image 12 shows the user profile section with an overview of collected badges. Besides, the user can click on the badge number to navigate to the Badge section. In the Badge section, the user can see earned badges with detailed descriptions and unearned badges that users can get by completing specific actions defined in the badge description.

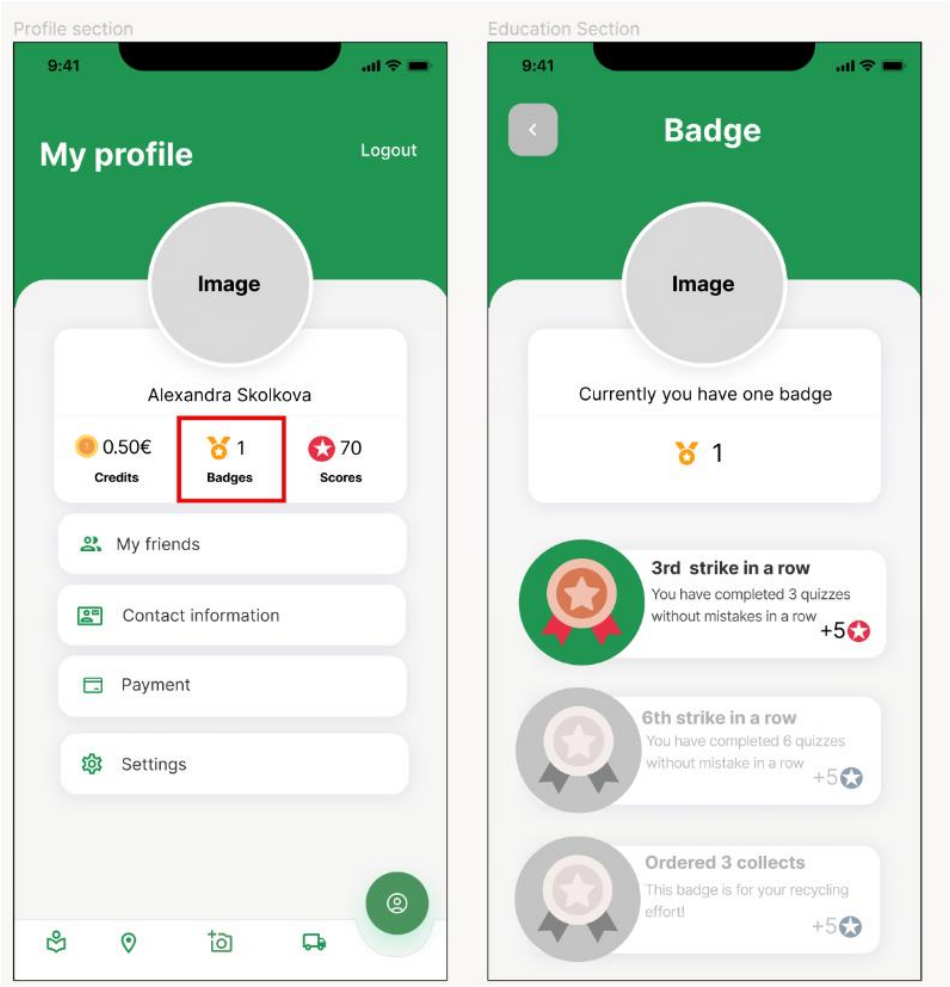


Image 12. User profile section and Badge section

Moreover, the author created the leader board based on the earned scores across the user's connections on the platform. The leadership board is available by clicking the number of scores on the user profile section (Image 12). The user gets five scores for every badge he/she earns. Besides scores, the user also gets credits that he/she can use for paying a waste collect. Images 13 demonstrates a leadership board. The leadership board refers to normative feedback to deliver competence.

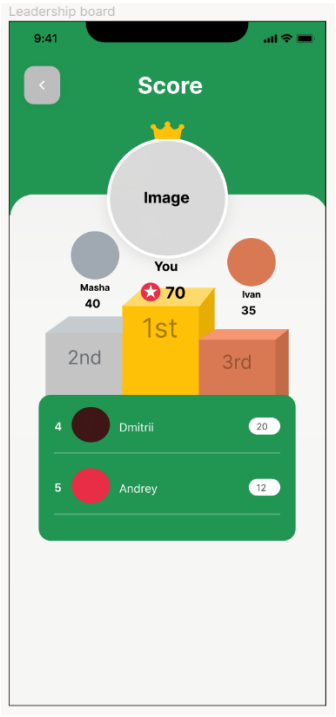


Image 13. Leadership board

Relatedness

To convey relatedness, users should feel that they are part of the community. Thus, the author designed features to sustain social support. As shown in Image 14, the users can invite their friends who already joined the application. Besides, users can ask to join contacts to register for the application.

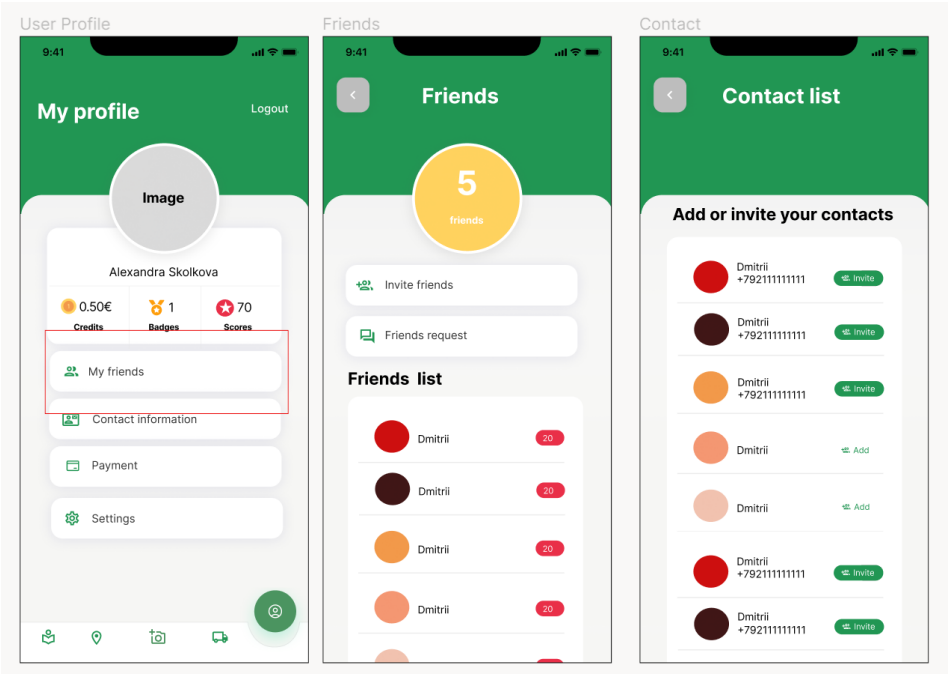


Image 14. Community features

Furthermore, the author created another feature that will allow users to share their earned badges. Images 15 represents the design of the sharing function.

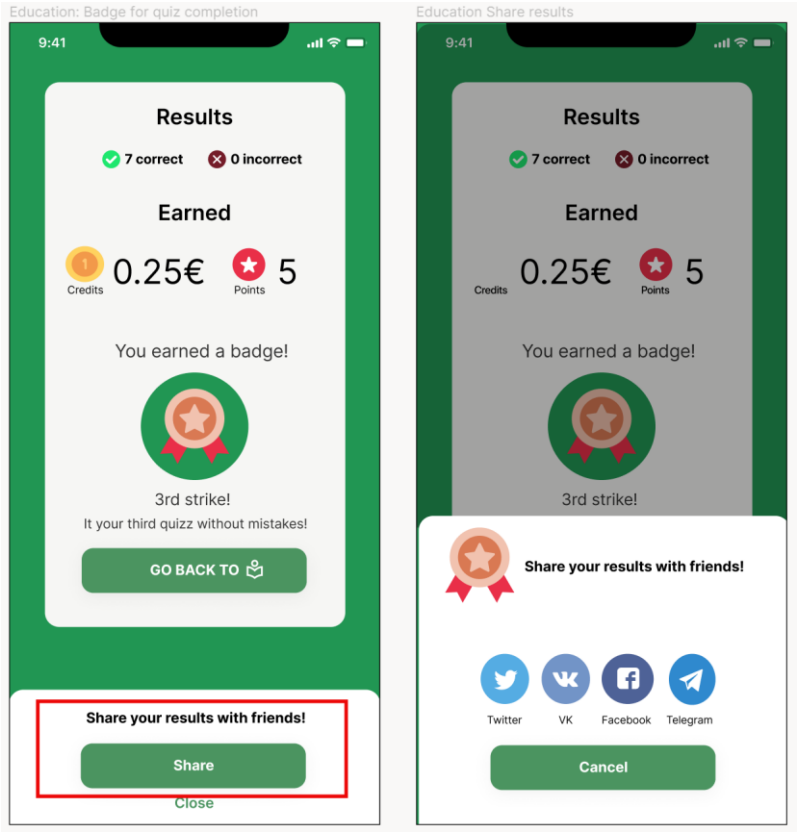


Image 15. Sharing results feature

5.5 Test Stage

During the Test stage, the author evaluated whether the designed solution simplified the recycling behavior for citizens living in Saint Petersburg. The author used the interview method for testing. The interview questions consist mostly of open-ended questions. A qualitative research method was applied to collect and analyze answers to such open-ended questions. In this subchapter, the author sums up the results of the interview. The author does not list every answer provided by participants but provides a summary of the results. Interview questions can be found in Appendix 4.

The author used a video tool Google Meet to conduct five video interviews. All interview respondents live in Saint Petersburg and are between 20-23 years old, matching the target audience description. Four of the participants are female, and one of the participants is male. During each video interview, the author presented an interactive prototype and explained all the features and actions. After that, the author shared the prototype's link to let the interview participant interact with the prototype him/herself.

At the beginning of each interview, the author asked whether the participants recycle. One participant replied that she recycles only the items that she knows how to recycle, such as batteries and glass. Four participants replied negatively. They explained that they do not perform the recycling activity due to the lack of proper infrastructure and knowledge. Besides, none of the participants is aware of online recycling services presented in the Russian market.

Additionally, the participants were asked to assess the prototype. The visual design appealed to everyone. All of the participants mentioned that they liked the idea of multi-service, *as having them all in one place is much more convenient than using separate services*. Three of the participants were attracted by the idea of the quiz and competition among their acquaintances. Moreover, four participants stated that the prototype looks innovative and promising. If the community in Russia supports it, it might quickly become the first step toward a better ecological situation.

None of the participants said that the prototype has unnecessary features. However, several suggestions were made to take into consideration. One participant recommended having an opportunity to use credits from the application for potential partner companies' services, such as bonuses at sustainable shops or restaurants. In addition, another participant suggested having integration with recycling points to track the amounts of waste sent for recycling. Therefore, later the application could present infographics about the impact of an individual's recycling on the environment. This feature is a perspective strategy of cumulative feedback to fulfill competence. Another suggestion was to be able to buy containers and waste bags directly in the application. Lastly, one of the participants recommended having an opportunity to share the educational content with social media that could support application engagement and user-relatedness.

Further, the author asked the participants whether they would use the application once released in the market. All of the participants replied positively. Moreover, three of the participants would recommend the application to the people they know.

Based on the interview results, the application prototype proves to be a possible practical solution to improve Russia's recycling situation. However, interviews can only give presumptive opinions and not real facts. Therefore, the application should be finalized and released for the beta-testing to see its actual effect on the behavior change that can be a subsequent study.

6 Conclusion

This chapter is the conclusive part of the thesis. Firstly, the chapter provides the answers to the research questions determined in Chapter 1. Secondly, the reliability and validity of the research are specified. Finally, the chapter covers suggestions for further research.

6.1 Answers to the Research Questions

The study's objective was to discover how Russia's recycling situation can be improved by influencing the community through recycling mobile service. Below the author states the answers to the research questions.

Firstly, the sub-questions with the answers are provided:

What are the tools to change the behavior?

Many factors can drive the behavior of individuals. Due to behavior change design, empirical evidence of the theories and frameworks exists to prove the strategic approach of achieving the behavior change. Behavior change design offers a wide range of tools to initiate the behavior. In the current research, the BCW framework and STD strategies demonstrate the effectiveness of applying such tools. The tools help create evidence-based data and find proper solutions to influence the desired behavior.

What are the main steps of the digital product design?

The standard product design process includes the following sequence of steps: analyzing the context and defining the problem, generating and designing possible ideas, implementing the product solution's design, and testing it.

What is the current recycling situation in Russia?

Currently, only 6% of the waste was recycled in 2019. Based on the research findings, the reason may be that Russia lacks the public infrastructure to provide convenient recycling. Furthermore, citizens of Russia may not be educated enough to start recycling.

Even though the Russian government has only begun to create laws and projects to provide public infrastructure for recycling, Russian citizens can start recycling. Many private and volunteering organizations accept the waste for processing. Furthermore, several online services exist that try to make recycling convenient for its citizens. However, based on the research survey, online services are recommended to reconsider implementing their solutions, as many survey participants find them challenging to use.

What are the features of the digital solution required to help the user ease the recycling process?

According to research discoveries, the Russian community faces many barriers that can be solved with online service. Furthermore, STD strategies can be applied to encourage recycling behavior. Hence, the following features can be suggested based on the research findings:

- providing educational materials
- implementing the test of knowledge, for instance, quizzes
- creating convenient navigation to recycling points
- allowing ordering of the waste collect
- providing the barcode scanning to decode the information about the item for further sorting
- generating feedbacks in the forms of rewards for continuous recycling and learning
- creating a community
- allowing to share the results of the test of knowledge
- offering a competition
- generating infographics about the impact of an individual's recycling on the environment.

How to design a digital solution that will motivate the community in Russia to start recycling?

To influence people to start recycling, it is essential to understand the community's barriers and needs. By comprehending the community's perspective, the designers might be able to create the product that matters to the people of that community. Furthermore, the designers might generate a motivational factor by applying behavioral science theories and frameworks into solution implementation. Finally, it is crucial to test the solution with part of that community to analyze whether the created solution has a significant influence on people. If not, the designers should continue researching people's needs and barriers until seeing the actual change in people's behavior.

6.2 Reliability and Validity

The thesis used secondary and primary data sources. Secondary sources were books, articles, reports, blogs of industry experts, previous research, and verified websites. Primary data was collected by creating the user survey, market research, and video interviews. Reliable methods of data analysis have been applied to examine results. Key findings based on these data gave answers to the research question and sub-questions, and the objectives of the research were fulfilled. Thus, the research can be considered valid.

6.3 Suggestions for Future Research

Based on the interview result, the next iteration of the prototype could be designed to continue current research. Moreover, further research could be conducted with a larger number of participants from other cities to ensure more in-depth new insights into the topic. Besides, the prototype can be developed and released to study the actual effect on recycling behavior. Finally, user interface and user experience design standard practices deserve to have distinct research to improve users' engagement and overall user experience.

References

@Artecospb 2020a. Как заказать АртЭко Такси? Post 20 October 2020. Instagram Blog Service. Retrieved on 19 November 2020. Available at https://www.instagram.com/arteco-spb/?hl=en

@Artecospb 2020b. Кондратьевский д.64 к.4. Post 8 February 2020. Instagram Blog Service. Retrieved on 19 November 2020. Available at https://www.instagram.com/p/B8TCl7FKH7A/

Aunger, R. & Curtis, V. 2016. Behaviour Centred Design: Towards an applied science of behavior change. In Health Psychology Review 10(4). Retrieved on 23 October 2020. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5214166/

Babich, N. 2017a. The Evolution of UI/UX Designers Into Product Designers. Adobe Blog on 10 January 2017. Retrieved on 15 November 2020. Available at https://blog.adobe.com/en/publish/2017/01/10/the-evolution-of-uiux-designers-into-product-designers.html#gs.ljj8kx

Babich, N. 2017b. Prototyping 101: The Difference between Low-Fidelity and High-Fidelity Prototypes and When to Use Each. Adobe Blog on 29 November 2017. Retrieved on 11 November 2020. Available at https://blog.adobe.com/en/publish/2017/11/29/prototyping-difference-low-fidelity-high-fidelity-prototypes-use.html#gs.kr7iko

Babich, N. 2018. A Comprehensive Guide To Product Design. Smashing Magazine. Retrieved on 12 November 2020. Available at https://www.smashingmagazine.com/2018/01/comprehensive-guide-product-design/

Berezina, E. 2020. Регионам выделят средства на организацию раздельного сбора отходов. Русская Газета. Retrieved on 23 October 2020. Available at https://rg.ru/2020/05/21/regionam-vydeliat-sredstva-na-organizaciiu-razdelnogo-sbora-othodov.html

Bogawat, A. 2019. Sketch vs Figma, Adobe XD, And Other UI Design Applications. Smashing Magazine. Retrieved on 15 November. Available at https://www.smashingmagazine.com/2019/04/sketch-figma-adobe-xd-ui-design-applications/

Brown, R. A. & Combs PhD, T. D. 2018. Digital behavioral design. Venice: Boundless Mind.

Bucher, A. 2020. ENGAGED Designing for Behavior Change. New York: Louis Rosenfeld.

Cambridge University Press 2020. product. Retrieved on 13 October 2020. Available at https://dictionary.cambridge.org/dictionary/english/product

Cao, J. 2020. Referenced on 15 November 2020. Available at https://www.uxpin.com/studio/blog/ux-designers-5-minute-guide-lean-personas/

Carter, C. 2016 Referenced on 13 November 2020. Available at https://medium.com/stanford-d-school/lets-stop-talking-about-the-design-process-7446e52c13e8

Cooper, R. 2019. Organics Recycling 101: How to Properly Recycle Food Waste. Rubicon Blog on 1 March 2019. Retrieved on 3 September 2020. Available at https://www.rubicon.com/blog/organics-recycling-101/

Creswell, J. 2013. Research Design: qualitative, quantitative, and mixed-methods approaches. Fourth Edition. California: SAGE Publications, Inc.

Dam, R. F. & Siang, T. Y. 2020a. 5 Stages in the Design Thinking Process. Interaction Design Foundation. Retrieved on 8 November 2020 Available at https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process

Dam, R. F. & Siang, T. Y. 2020b. Design Thinking: Get a Quick Overview of the History. Interaction Design Foundation. Retrieved on 14 November 2020. Available at https://www.interaction-design.org/literature/article/design-thinking-get-a-quick-overview-of-the-history

Design Council 2020. What is the framework for innovation? Design Council's evolved Double Diamond. Retrieved on 13 November 2020. Available at https://www.designcouncil.org.uk/news-opinion/what-framework-innovation-design-councils-evolved-double-diamond

DiMugno, L. 2020. Recycling Symbols Decoded. Treehugger. Retrieved on 24 August 2020. Available at https://www.treehugger.com/recycling-symbols-decoded-4864145

Duolingo 2020. Learn a language for free. Forever. Retrieved on 16 October 2020. Available at https://en.duolingo.com/

Ecopromcentr 2019. Раздельный сбор мусора и ТКО: главное и детали. Retrieved on 4 September 2020. Available at https://ecopromcentr.ru/razdelnyi-sbor-musora/

Garkusha A. 2020. Как внедрить раздельный сбор в своем дворе (микрорайне/городе). Фонд поддержки молодежных инициатив «ЭРА» и Движение ЭКА при поддержке Комитета общественных связей города Москвы и экспертной поддержке Ассоциации

«РазДельный Сбор». Retrieved on 4 September 2020. Available at https://lk.ecowiki.ru/download/instructions-material/14/#_=_

Gill, G. N. 2016. Electronic waste. Encyclopædia Britannica, Inc. Retrieved on 4 September 2020. Available at https://www.britannica.com/technology/electronic-waste

Goodwin, K. 2009. Designing for the Digital Age: How to Create Human-Centered Products and Services. First Edition. Indianapolis: Wiley Publishing.

Google Trends 2020. Сравнение. Retrieved on 8 November 2020. Available at https://trends.google.com/trends/explore?date=today%205-y&q=%2Fg%2F11cl_5n682,%2Fm%2F0c5z0t,%2Fg%2F11c2j2yfhp

Google 2020a. Design Sprint Methodology. Retrieved on 14 November 2020. Available at https://designsprintkit.withgoogle.com/methodology/overview

Google 2020b. Transform the way your team works. Retrieved on 12 November 2020. Available at https://designsprintkit.withgoogle.com/

Greenpeace 2019. Retrieved on 19 September 2020. Available at https://greenpeace.ru/wp-content/uploads/2019/10/report-RUSSIA-GARBAGE.pdf

Greenpeace 2020a. Greenpeace. Retrieved on 19 September 2020. Available at https://recyclemap.ru/

Greenpeace 2020b. Сколько жителей России имеют доступ к придомовому раздельному сбору. Retrieved on 19 September 2020. Available at https://greenpeace.ru/wp-content/uploads/2020/03/rating-rso-2019-greenpeace.pdf

Greenpeace 2020c. Ноль отходов. Retrieved on 1 September 2020. Available at https://greenpeace.ru/projects/zero-waste/

Hagger, M. S., Cameron, L. D., Hamilton, K., Hankonen, N. and Lintunen, T. 2020a. Changing Behavior: A Theory- and Evidence-Based Approach. In Hagger, M. S., Cameron, L. D., Hamilton, K., Hankonen, N., and Lintunen, T. (Eds.). The Handbook of Behavior Change. Cambridge Handbooks in Psychology. Cambridge: Cambridge University Press, pp. 1–14.

Hagger, M., Hankonen, N., Chatzisarantis, N., & Ryan, R. 2020b. Changing Behavior Using Self-Determination Theory. In M. Hagger, L. Cameron, K. Hamilton, N. Hankonen, & T. Lintunen (Eds.). The Handbook of Behavior Change. Cambridge Handbooks in Psychology. Cambridge: Cambridge University Press, pp. 104-119.

IDEO 2020. History. Retrieved on 12 November 2020. Available at https://designthinking.ideo.com/history

Interaction Design Foundation 2020a. Usability. Retrieved on 15 November 2020. Available at https://www.interaction-design.org/literature/topics/usability

Interaction Design Foundation 2020b. Design Thinking. Retrieved on 14 November 2020. Available at https://www.interaction-design.org/literature/topics/design-thinking

Ivanovs, A. 2020. Figma vs Sketch vs Adobe XD: Which Is the Better Design Tool? CodeInWp Blog on 29 June 2020. Retrieved on 15 November 2020. Available at https://www.codeinwp.com/blog/figma-vs-sketch-vs-adobe-xd/

Johnson, B. 2013. Zero Waste Home: The Ultimate Guide to Simplifying Your Life by Reducing Your Waste. First Edition. New York: Scribner.

Jørgensen, F. A. 2019. Recycling. Cambridge: The MIT Press.

Kaza, S., Yao, L., Bhada-Tata, P. & Woerden, F. V. 2018. What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. Washington, DC: International Bank for Reconstruction and Development / The World Bank.

Kemp, S. 2020. DIGITAL 2020: GLOBAL DIGITAL OVERVIEW. Datereportal. Retrieved on 10 November 2020. Available at https://datareportal.com/reports/digital-2020-global-digital-overview

Klein, L. 2016. Build better products: A modern approach to building successful user-centered products. New York: Rosenfeld Media.

Knapp, J. 2016. Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days. First Edition. New York: Simon & Schuster.

Kothari, C. 2004. Research Methodology: Methods and Techniques. Second Edition. Daryaganj: New Age International Ltd.

Kshirsagar, M. 2018a. A Brief Guide About Competitive Analysis. Smashing Magazine. Retrieved on 15 November 2020. Available at https://www.smashingmagazine.com/2018/08/guide-competitive-analysis/

Kshirsagar, M. 2018b. Referenced on 15 November 2020. Available at https://cloud.netlifyusercontent.com/assets/344dbf88-fdf9-42bb-adb4-46f01eedd629/6295ffa4-3c5a-4d25-bbb4-9bd62b75063e/08-a-brief-guide-about-competitive-analysis.png

Kuada, J. 2012. Research Methodology: A Project Guide for University Students. First Edition. Frederiksberg: Samfundslitteratur Press.

Leblanc, R. 2019a. The Meaning of Recycle Symbols on Plastics. The Balance Small Business. Retrieved on 29 August 2020. Available at https://www.thebalancesmb.com/what-recycling-symbols-mean-4126251

Leblanc, R. 2019b. An Introduction to Metal Recycling. The Balance Small Business. Retrieved on 28 August 2020. Available at thebalancesmb.com/an-introduction-to-metal-recycling-4057469

Leblanc, R. 2019c. Textile and Garment Recycling Facts and Figures. The Balance Small Business. Retrieved on 06 September 2020. Available at https://www.thebalancesmb.com/textile-recycling-facts-and-figures-2878122

Levy, J. 2020. Chapter 4. Conducting Competitive Research. O'Reilly Media, Inc. Retrieved on 13 November 2020. Available at https://www.oreilly.com/library/view/ux-strategy/9781449372972/ch04.html

Lo, G. 2020. What is Product Design and the Product Design Process? UX Planet. Retrieved on 15 November 2020. Available at https://uxplanet.org/what-is-product-design-and-the-product-design-process-41b41a5bf795

Madhavan 2018. How Product Design is different than UX, UI Design. UX Collective. Retrieved on 15 November 2020. Available at https://uxdesign.cc/how-product-design-is-different-from-ux-ui-design-6d22c582e917

McAlone, N. 2017. How Apple is taking a page out of the Netflix playbook with its Apple Music strategy. Insider Inc. Retrieved on 15 November 2020. Available at https://www.businessinsider.com/apple-music-wants-to-be-more-than-a-utility-2017-1?r=US&IR=T

McKay, FH., Slykerman, S., Dunn M. 2019. The App Behavior Change Scale: Creation of a Scale to Assess the Potential of Apps to Promote Behavior Change. In JMIR Mhealth Uhealth 7(1). Retrieved on 16 November 2020. Available at https://mhealth.jmir.org/2019/1/e11130

Michie, S., van Stralen, M. M. & West, R. 2011a. The behaviour change wheel: A new method for characterising and designing behaviour change interventions. In Implementation Sci 6. Retrieved on 17 October 2020. Available at https://implementationscience.biomedcentral.com/articles/10.1186/1748-5908-6-42

Michie, S., van Stralen, M. M. & West, R. 2011b. Figure 2. Referenced on 17 October 2020. Available at https://implementationscience.biomedcentral.com/articles/10.1186/1748-5908-6-42/figures/2

Michie, S., West, R., Campbell, R., Brown, J. & Gainforth, H. 2014. ABC of Behaviour Change Theories. Great Britain: Silverback Publishing.

Middleton, S. 2019. Design Process: 3 Most Popular Product Design Processes & When To Use Them. Agile Insider. Retrieved on 13 November 2020. Available at https://medium.com/agileinsider/3-product-design-processes-and-when-to-use-them-2c6552522637#:~:text=Google%20Search%20Trends%20tells%20us,Double%20Diamond

Mihailov, A. 2019. В цепочке отсутствуют звенья. Русская газета. Retrieved on 17 September 2020. Available at https://rg.ru/2019/10/15/reg-szfo/pochemu-popytki-razdelnogo-sbora-musora-terpiat-neudachu.html

Napierkowski, S. 2020. How to Explain Digital Products and Bring Them to Life. Innovatemap Blog on 7 February 2020. Retrieved on 13 November 2020. Available at https://innovatemap.com/resource/how-to-explain-digital-products-and-bring-them-to-life/

Netherlands worldwide 2019. Waste management in Russia. Retrieved on 12 September 2020. Available at https://www.netherlandsworldwide.nl/binaries/en-nederlandwereldwijd/documents/publications/2019/09/05/factsheet-on-waste-management-in-russia/Waste+management+20190726+FINAL.pdf

Philips, M. 2020. The Importance of Human-centered Design in Product Design. Toptal Blog. Retrieved on 15 November 2020. Available at https://www.toptal.com/designers/ux/human-centered-design

Plus-one 2017. Отходы. Вторая жизнь. Retrieved on 12 September 2020. Available at https://plus-one.rbc.ru/othody/

Podobedova, L. 2020. Мусорная реформа потребовала новых жертв. РБК. Retrieved on 12 September 2020. Available at https://www.rbc.ru/newspaper/2020/03/16/5e68f75e9a794718d39dca34

Press Service of the Ministry of Natural Resources of Russia 2020. С 2020 года планируется внедрение системы раздельного сбора ТКО в Кировской, Воронежской, Свердловской областях и других регионах страны. Retrieved on 15 September 2020. Available at http://www.mnr.gov.ru/press/news/s_2020_goda_planiruetsya_vnedrenie_sistemy_razdelnogo_sbora_tko_v_kirovskoy_voronezhskoy_sverdlovsko/

Product Plan 2020. Product Design. Retrieved on 13 November 2020. Available at https://www.productplan.com/glossary/product-design/

Rcycle.net 2020. Сортировка мусора в России: нововведения, сложности и перспективы. Retrieved on 15 September 2020. Available at https://rcycle.net/musor/razdelnyj-sbor/reforma-sortirovki-v-rossii-novovvedeniya-slozhnosti-perspektivy

Reeves, D. 2020. Figma Vs Sketch: Which UI Design Tool Is Better In 2020? Fyresite Blog on 3 January 2020. Retrieved on 16 November 2020. Available at https://www.fyre-site.com/figma-vs-sketch-which-ui-design-tool-is-better-in-2019/#:~:text=Collaboration,col-laborate%20on%20a%20single%20document

Rosenfeld Media 2020a. ENG052: Figure 6.2. Referenced on 10 October 2020. Available at https://www.flickr.com/photos/rosenfeldmedia/49467508958/in/album-72157712912697267/

Rosenfeld Media 2020b. ENG059: Figure 6.9. Referenced on 10 October 2020. Available at https://www.flickr.com/photos/rosenfeldmedia/49467508878/in/album-72157712912697267/

Rosenfeld Media 2020c. ENG001: Figure 1.1. Referenced on 10 October 2020. Available at flickr.com/photos/rosenfeldmedia/49467509553/in/album-72157712912697267/

Rsbor 2020. О движении. Retrieved on 15 September 2020. Available at https://rsbor.ru/about/

RTS 2020. Ready for these? 10 recycling facts you need to know. Blog on 10 August 2020. Retrieved on 27 November 2020. Available at https://www.rts.com/blog/ready-for-these-10-recycling-facts-you-need-to-know/

Sablin, R. 2020. ЭкоТакси. Зеленый драйвер. Retrieved on 15 September 2020. Available at https://greendriver.ru/ekotaxi/

Sell, R. 2018. Design Thinking: A Beginner's Guide to the History, Terminologies and Methodologies. Prototypr.io Blog on 25 June 2018. Retrieved on 12 November 2020. Available at https://blog.prototypr.io/design-thinking-a-beginners-guide-to-the-history-terminologies-and-methodologies-e527f7afdcd1

Shabbir 2020. Sketch vs Figma — Which one is the best design tool so far in 2020? UX Collective. Retrieved on 15 November 2020. Available at https://uxdesign.cc/sketch-vs-figma-which-one-is-the-best-design-tool-so-far-in-2020-4b964d18fa7a

Smirnova, A. 2018. Мусорные страдания. Коммерсантъ. Retrieved on 12 September 2020. Available at https://www.kommersant.ru/doc/3635090

Snob 2019. Отходы, энергия, два бака. Первые итоги мусорной реформы в интервью с Андреем Шипеловым. Retrieved on 12 September 2020. Available at https://snob.ru/entry/174959/

Stevens, E. 2019. Step Four In The Design Thinking Process: Your Complete Introduction To Prototyping. CareerFoundry Blog on 28 January 2019. Retrieved on 12 November 2020. Available at https://careerfoundry.com/en/blog/ux-design/design-thinking-stage-four-prototyping/

Streissguth, T. 2020. How to Make Money Recycling Glass. Leaf Group Ltd. / Leaf Group Media. Retrieved on 1 September 2020. Available at https://bizfluent.com/13643479/how-to-make-money-recycling-glass

The European Environment Agency 2019. Waste recycling. Retrieved on 17 September 2020. Available at https://www.eea.europa.eu/data-and-maps/indicators/waste-recycling-1/assessment-1#:~:text=In%202017%2C%2046%20%25%20of%20the,Liechtenstein%20and%20Norway%20was%20recycled.&text=In%202017%2C%20three%20countries%20recycled,more%20of%20their%20municipal%20wa

The Editors of Encyclopaedia Britannica 2020a. Metatheory. Encyclopædia Britannica, Inc. Retrieved on 25 October 2020. Available at britannica.com/topic/metatheory

The Editors of Encyclopaedia Britannica 2020b. Recycling. Encyclopædia Britannica, Inc. Retrieved on 15 August 2020. Available at https://www.britannica.com/science/recycling

The United States Environmental Protection Agency 2020. Recycling Basics. Retrieved on 21 August 2020. Available at https://www.epa.gov/recycle/recycling-basics

West, R. & Michie, S. 2020a. A brief introduction to the COM-B Model of behaviour and the PRIME Theory of motivation. Qeios. Retrieved on 17 October 2020. Available at https://www.qeios.com/read/WW04E6.2

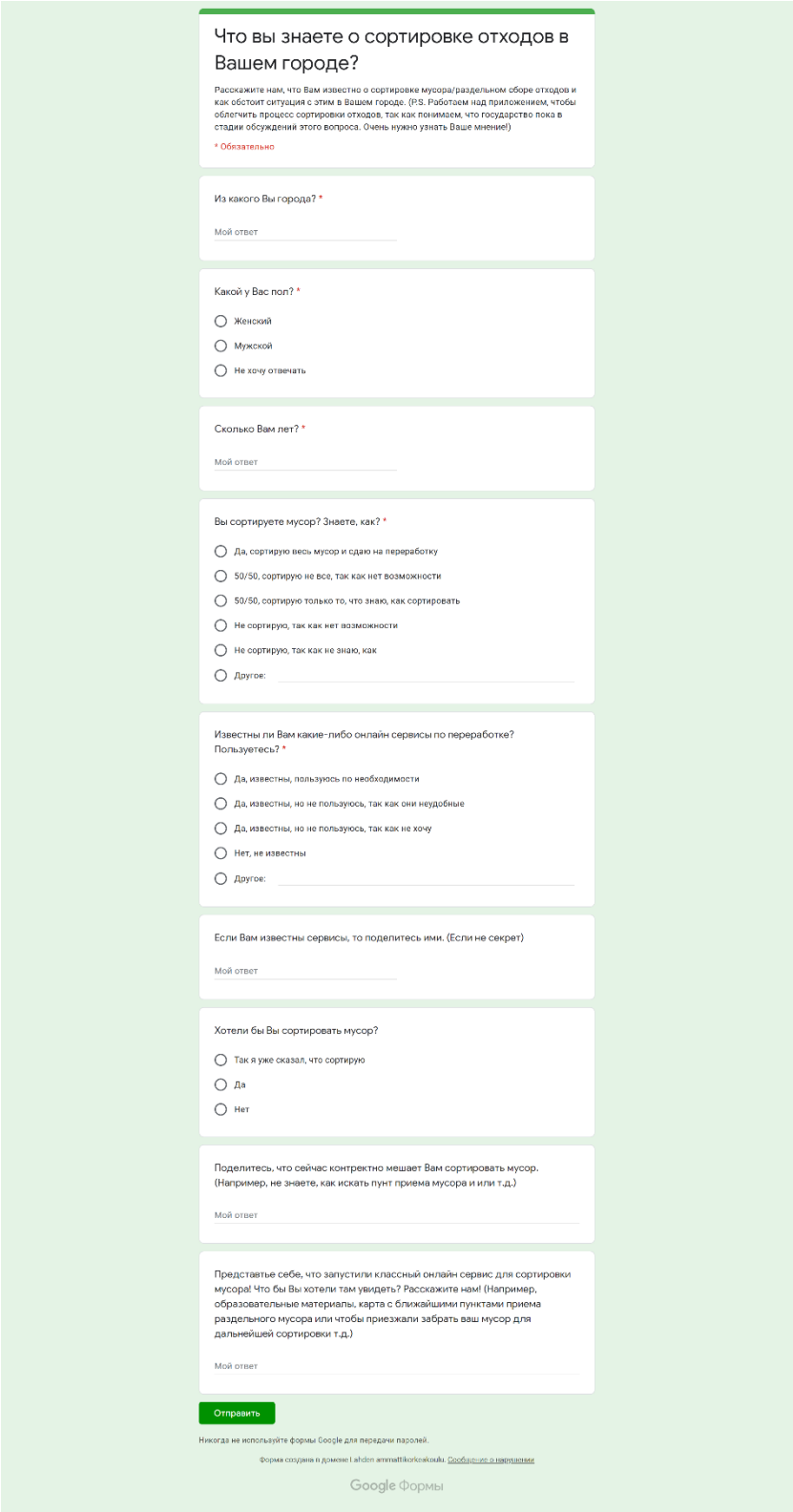
West, R. & Michie, S. 2020b. Figure 1: The COM-B model of behaviour. Qeios. Referenced on 17 October 2020. Available at https://www.qeios.com/read/WW04E6.2

Xd Ideas 2020. UI DESIGN. Retrieved on 15 November 2020. Available at https://xd.adobe.com/ideas/process/ui-design/

Yardley, L., Morrison, L., Muller, I., & Bradbury, K. 2020. Maximizing User Engagement with Behavior Change Interventions. In M. Hagger, L. Cameron, K. Hamilton, N. Hankonen, & T. Lintunen (Eds.). The Handbook of Behavior Change. Cambridge Handbooks in Psychology. Cambridge: Cambridge University Press, pp. 361-371.

Appendices

Appendix 1. Online Survey



Что вы знаете о сортировке отходов в Вашем городе?

Расскажите нам, что Вам известно о сортировке мусора/раздельном сборе отходов и как обстоит ситуация с этим в Вашем городе. (P.S. Работаем над приложением, чтобы облегчить процесс сортировки отходов, так как понимаем, что государство пока в стадии обсуждений этого вопроса. Очень нужно узнать Ваше мнение!)

* Обязательно

Из какого Вы города? *

Мой ответ

Какой у Вас пол? *

- Женский
- Мужской
- Не хочу отвечать

Сколько Вам лет? *

Мой ответ

Вы сортируете мусор? Знаете, как? *

- Да, сортирую весь мусор и сдаю на переработку
- 50/50, сортирую не все, так как нет возможности
- 50/50, сортирую только то, что знаю, как сортировать
- Не сортирую, так как нет возможности
- Не сортирую, так как не знаю, как
- Другое:

Известны ли Вам какие-либо онлайн сервисы по переработке? Пользуетесь? *

- Да, известны, пользуюсь по необходимости
- Да, известны, но не пользуюсь, так как они неудобные
- Да, известны, но не пользуюсь, так как не хочу
- Нет, не известны
- Другое:

Если Вам известны сервисы, то поделитесь ими. (Если не секрет)

Мой ответ

Хотели бы Вы сортировать мусор?

- Так я уже сказал, что сортирую
- Да
- Нет

Поделитесь, что сейчас контрактно мешает Вам сортировать мусор. (Например, не знаете, как искать пункт приема мусора и или т.д.)

Мой ответ

Представьте себе, что запустили классный онлайн сервис для сортировки мусора! Что бы Вы хотели там увидеть? Расскажите нам! (Например, образовательные материалы, карта с ближайшими пунктами приема раздельного мусора или чтобы приезжали забрать ваш мусор для дальнейшей сортировки т.д.)

Мой ответ

Отправить

Никогда не используйте формы Google для передачи паролей.

Форма создана в домене l.ahden.ammattikorkeakoulu. Сообщение о нарушении

Google Формы

Appendix 2. Competitor Analysis Matrix

Competitor	**Url**	**Features/ Comments**	**Screenshots/Links**
Recyclemap (direct competitor)	https://recyclemap.ru/	The most significant feature of Recycle Map is a map that provides the recycling points over the selected city. An interface design is not intuitively understandable with poor navigation. The loading time of the map can take more than 20 seconds that is considered long. Moreover, the feature of navigating to the selected recycling point does not work. Overall, the service gives a poor impression of an outdated website that is no longer supported. **Features:** 1) Allows filtering by type of the trash (cloth, plastic etc.) 2) Offers navigation to the selected recycling point. 2) Gives detailed information about sorting facility such as open hours, contact details, address 3) Allows to rate the recycling facility	

Ecotaxi indirect competitor)	https://vk.com/ecotax-ispb	Overall, the Ecotaxi indicates a perspective concept of courier services that can be in demand and popular according to survey's result. However, the realization of the service is imperfect. The Ecotaxi does not have its website and exists only on two social networks such as Instagram and VK. No timeslots and available dates are presented, making it difficult for users to understand when the service is available. The education materials are presented in the feed of the social network, making it hard for users to look for a specific material, as there is no search function. **Features:** 1) Order a collect via messages function in the community 2) Donation feature for the future development of the organizations	Donations: https://vk.com/app5727453_-169028047?ref=group_menu
Artecospb (indirect competitor)	https://www.instagram.com/arteco-spb/?hl=en	Artecosbp is the only competitor offering three different services simultaneously, such as bag ordering, courier service, and container installation requests. Therefore,	1) Link for container installation: https://docs.google.com/forms/d/e/1FAIpQLSdpcYxf38UciplXE-WrTopDv71gwAM3zt6xJCHh3s8kC-pj_g/viewform 2) Link for waste collect order in

		Arecosbp attempts to minimize three blockers that prevent users from recycling. The main disadvantage is the absence of the official website. Thus, the users cannot track the bags' order to see the progress of the request for container installation. Furthermore, like Eco-taxi the education materials are presented in the feed of the social network (Instagram), making it hard for users to look for a specific material, as there is no search function. **Features:** 1) Waste collect via the phone number 2) Order of the waste bags 3) Request for container installation	Telegram messenger: https://teleg.run/artecotaxi_bot

Appendix 3. Images and Sources

BITC 2020. Referenced on 10 October 2020. Available at https://www.bitcni.org.uk/plastic-is-it-always-a-prob-lem/.

West, L. 2019. RTimages/Photographer's Choice/Getty Images. Referenced on 10 October 2020. Available at https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.treehugger.com%2Fthe-benefits-of-paper-recycling-1204139&psig=AOvVaw0wzx01JRA6rSfFvZg8OJrE&ust=1606349586731000&source=images&cd=vfe&ved=0CAMQjB1qFwoTCPCdntq0nO0CFQAAAAAdAAAAABAD

Экотакси.спб 2018. Referenced on 10 October 2020. Available at https://vk.com/ecotax-ispb?z=photo-169028047_456239023%2Falbum-169028047_0%2Frev

Артэко 2020. Referenced on 10 October 2020. Available at http://www.artecospb.ru/

Meijer 2020. Referenced on 10 October 2020. Available at https://meijer.queue-it.net/?c=meijer&e=prodallsite&t=https%3A%2F%2Fwww.meijer.com%2Fshop%2Fen%2Fbeverages%2Fsoft-drinks%2Fdr-pepper-6-16-9-oz-bottles%2Fp%2F7800000386&cv=-969651807&cid=en-US&l=GM%20Layout

The Village 2020. Пункт раздельного сбора отходов | «Правила деления». Referenced on 10 October 2020. Available at https://www.the-village.ru/city/news-city/353909-mega-parnas-razdelnyi

Appendix 4. Interview Questions

1. Do you do recycling?
2. Are you aware of any recycling online services?
3. What do you like about the prototype?
4. What do you dislike about the prototype?
5. In case you know any recycling service, do you think that this service is easier to use comparing to other that you know of?
6. What can be improved? What features are missing?
7. Does anything seem out of place or unnecessary?
8. How likely or unlikely would you use this product once it is finished?
9. If such product appears on the market, would you use the product?