Project-Based Education in COVID-19 Era. Disseminating Design Thinking in New Reality

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Abstract. This paper is devoted to Design Thinking as a method of project-based education in COVID-19 Era. COVID-19 has dramatically changed all spheres of our life, including education. Traditional teaching methods have been replaced by online and distance ones. The study analyses the advantages of Design Thinking in the New Reality, including in the online format, and some of its disadvantages. Real examples of remote project work formulated according to the principles of design thinking include participation of a team of students in the "Stanford Rebuild" global eight-week innovation sprint held by Stanford Graduate School of Business. In the course of that sprint they developed a comprehensive socially oriented online platform "COHELP-19". Another example is the successful participation of Plekhanov University students in the first international research "Ideathon" organized by the University of Munster, "Higher School of Economics" National Research University and SAP that resulted in the development of a prototype application for people experiencing psychological, environmental, and physiological discomfort due to the coronavirus pandemic. Based on the conducted surveys, the authors have shown that the remote project work of students based on the Design Thinking method allowed them to get a useful experience of interaction in a team, taught them to think "outside the box", brightened up their days spent at home, brought new emotions, and reduced the level of fatigue from video conferences.

Keywords: Design thinking · Project-based education · On-line projects · Prototyping · Innovation

1 Background of Design Thinking Using in Remote Mode

The coronavirus pandemic that broke out at the beginning of 2020 turned our lives upside down. It forced us to limit contacts with other people and abandon the traditional formats of work and study.

Before COVID-19 we hardly imagined that education could be completely transferred to the online format. However, it turned out that this is quite real. Thus, design thinking as a project-based learning method aimed at developing creative and cognitive skills, critical thinking, the ability to integrate knowledge from different fields and apply

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them to solve emerging problems, has shown its applicability and efficiency in a remote format.

The idea of using design as a way of thinking was generated by Herbert Simon in his book "The Sciences of the Artificial", published in 1969 [14]. Later it was developed by William Hannon, who founded the Institute for Design Management in 1975 and wrote "Design Thinking" in 1987 based on his own experience of combining design and business. Only in the early 2000s the method became popular thanks to Hasso Plattner and David Kelly - researchers and businessmen who created the Hasso Plattner Institute Design school and began to teach design thinking as a business approach [10].

Currently, the methodology developed by them is one of the most frequently used in project activities employed by business, management, medicine, and education, especially, considering our new reality. The basic rules of design thinking state that those who use it:

• shall be curious and involved in the process as much as possible and think "outside the box";
• shall not be afraid to make mistakes because in most cases the negative experience helps finding the right solutions;
• shall trust and listen to the opinions of other team members;
shall never give up;
• shall not criticize other people's suggestions and ideas;
shall be confident in the success of teamwork and aim to achieve great results [5].

2 Design Thinking as a Project-Based Education Method in New Reality

Design thinking is used to find non-obvious solutions to a wide range of problems [3, 4, 11, 13], as well as to create innovative products and services that can make the lives of their users easier [2, 7, 8]. This is proved by successful participation of Plekhanov Russian University of Economics students in two international sprints held under coronavirus restrictions and resulted in Plekhanov University version of Design Thinking designed as part of collaboration with University of Muenster, Germany [1, 15].

The first sprint was the eight-week project "Stanford Rebuild" organized by the Stanford Graduate School of Business. Its goal was to develop products and services for solving public problems caused by COVID-19. "Stanford Rebuild" was the competition where the Plekhanov Russian University of Economics students' team applied the methodology of design thinking for the first time. They used design thinking as a team in order to develop an unprecedented aggregated Internet platform aimed at overcoming the negative consequences of the pandemic (job loss, mental and cognitive overload, burnout due to constant being at home and studying or working online). The simplicity and accessibility of the methodology, the enthusiasm and creativity of the students helped them create a unique prototype and improve their professional and soft skills. According to the results of the sprint, the Plekhanov team was recognized as one of the two hundred finalists of the "Stanford Rebuild" project (Fig. 1).

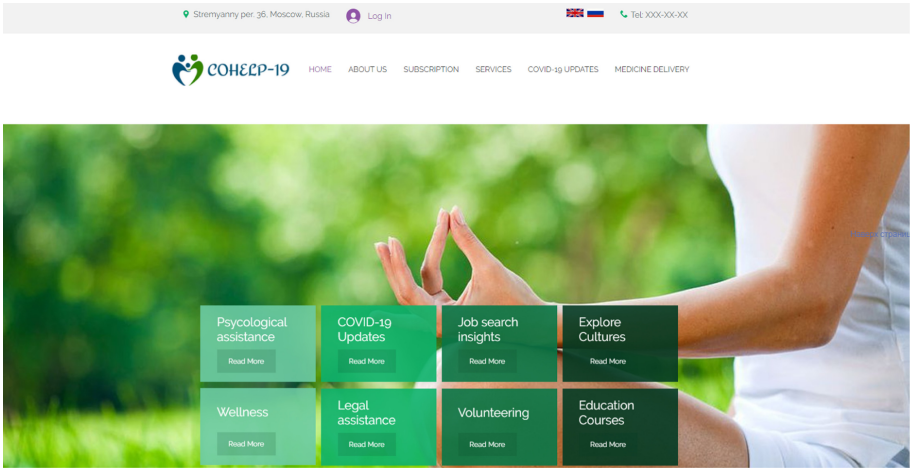

Fig. 1. The "COHELP-19" platform developed by Plekhanov University Team during "Stanford Rebuild" project.

Another example of the successful application of design thinking by students of Plekhanov University is the victory in the first international research "Ideathon" organized by the University of Munster, the "Higher School of Economics" National Research University and SAP. In less than two days, the students team became a single "organism" and developed a prototype of a mobile application for people experiencing psychological, environmental, and physical discomfort in self-isolation and wanting to move to the countryside for these reasons. Thanks to the use of design thinking methodology, team spirit, a high level of self-organization, compliance with deadlines and constant communication, the students at the Plekhanov Russian University of Economics proved themselves at the presentation of their product, received positive feedback from the jury and earned the first place among other nineteen bright, strong, and worthy competitors from twelve countries (Fig. 2).

A comprehensive analysis of the teamwork of students of Plekhanov Russian University of Economics showed the following advantages of using design thinking both as the traditional and remote mode (Table 1):

Because of COVID-19, video conferences have become an integral part of work and study. According to the Stanford University research, the number of users of the Zoom platform has increased from 10 million people (December 2019, when the coronavirus pandemic was not yet known) to 300 (April 2020 – booming spread of coronavirus). People who were "locked" in their homes and constantly used "Zoom" felt physical discomfort from lack of movement and prolonged use of the monitor, experienced cognitive overload and "Zoom fatigue" – depression, mood swings, emotional and professional burnout, the desire to retire after video conferences, etc. The experience of the Plekhanov University team showed that remote project work carried out using the design thinking methodology did not cause such "side effects", but on the contrary allowed students to get a useful experience of interaction in a team, taught them to think "outside the box", made their days at home brighter and caused to experience new emotions when faced

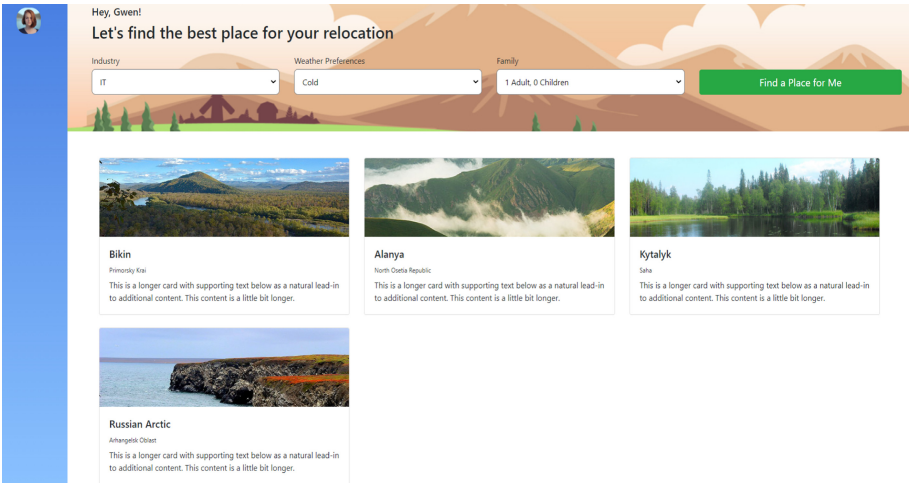

Fig. 2. The mobile application for relocation created by Plekhanov University Team during "Ideathon" project.

Table 1. The design thinking advantages

For the traditional mode	For the remote mode
• Human orientation, i.e. understanding and feeling consumers' problems, finding effective solutions; • Simplicity of used tools; • Wide application area; • Innovative products that make people lives easier and more convenient as a result; • Creativity and thinking "outside the box"; • Development of teamwork skills, i.e. learning to find a compromise, improve decision making, defend your point of view, listen to the opinions of other people and participate in effective communication; • Development of personal, professional, and soft skills; • Turning challenges into opportunities	All the design thinking advantages for the traditional format • Saving time and resources; • Low labor intensity; • Communication with team members and potential consumers regardless of where they are at the moment; • Great opportunity for survey; • Easy data collection and systematization; • Visualization via computer programs; • Cloud data storage

with interesting people. This was proven by the results of a survey conducted among the participants of innovative sprints.

It turns out that it is easier for most students to communicate with unfamiliar people in the online format. As part of teamwork, it contributes to a rapid transition from the "formation" stage to the "activity" stage and increases the effectiveness of interaction, a high degree of which is noted by about 58% of respondents. Project activity of students using

design thinking in a remote format does not cause cognitive overload but contributes to the development of hard and soft skills (57% and 79% of respondents, respectively, think so), improves teamwork skills (according to 86% of students' opinions) and does not lead to "Zoom fatigue".

However, there are two sides of a coin. So, using design thinking in the traditional format has some disadvantages:

- no guarantees of getting a fast, high-quality and relevant result;
- the non-linearity of the process necessitates going through the stages of design thinking again and again to perform the same iterations until a certain result is achieved;
- risks of obtaining biased data in public opinion polls due to the homogeneity of the respondents' group;
- the inability to develop a unique product in the absence of team cohesion;
- the need for training in the methodology of design thinking or inviting specialists;
- resource intensity.

In the case of online format, design thinking methodology disadvantages are supplemented by:

- the need to have computer skills, special equipment, software and Internet access;
- the risk of technical problems;
- the lack of communication with other team members;
- the inability to express emotions fully, manually create a prototype and touch it during testing;
- low physical activity and the lack of movement.

These disadvantages may be attributed to the fact that in the conditions of the new reality [6], when applying the design thinking methodology "Zoom", "Skype", "Microsoft Teams" and "Discord" applications have been used for discussion and live communication; e-mail, social networks and messengers ("Google Mail", "Facebook", "Twitter", "Instagram", "WhatsApp", "Viber" etc.) have been used for written communication, and cloud data storage ("Google Drive", "iCloud", etc.) have been used for joint document management. At the same time, the content of the stages of design thinking carried out via the Internet remained unchanged, and effective virtual alternatives were found to the classically applied methods, technologies, and tools. This resulted in developing the Plekhanov University version of Design Thinking. Its stages shall be described below.

3 Plekhanov University Version of Design Thinking

The first step of the Design Thinking – "empathize" technique – involves putting team members in the user's place, feeling his/her problems, understanding their physical and emotional needs, i.e. empathizing with them. The goal of this stage is understanding what is important for a person, as well as finding so-called "pain points". In the process of traditional design thinking it can be done via interviews and surveys, in Plekhanov

University version these methods are replaced by remote conferencing, questionnaires in social networks and Google Forms. Their advantages include: saving the time that the interviewer and interviewee may spend on getting to the meeting place; the ability of users to complete the survey at a convenient time for them; automatic storing of answers; and the possibility to reach a wide range of people and learn the opinions of those who live in other regions and countries.

The use of computer technologies at the second ("define") stage of design thinking makes it easier to collect, sort, organize and group the results of Internet surveys. Video communication and mind mapping desks are further used to discuss these results as a team and highlight a narrowly focused problem that bothers users. In order to create "personas" in the Plekhanov University version of Design Thinking, image editors such as "Photoshop", "Paint", etc. are used to visualize typical representatives of the target audience of a future innovative product or service. It is also important to come up with their names, fields of activity, hobbies, life goals and dreams in the process of online communication. The tools described above reduce the complexity and duration of the design thinking procedures and allow team members to realize their creative potential and inspire others.

The next stage of the project methodology is called "ideate". It consists of group work aimed at developing unusual solutions to a previously identified users' problem. This stage involves the absence of criticism and stereotypes in the team, its positive attitude, focus on innovation, unlimited imagination, flexibility of thinking and the ability to listen to others. During their activities, members of the group have to put aside their fears and put forward all the solutions that come to their mind for public discussion, regardless of their originality and atypical nature. In the process of "brainstorming", it is important to write down all the ideas without exception and not stop at the first one that seems to be the most advantageous. To go through these steps, team members can use traditional text editors such as "Microsoft Word", "Notepad" etc., screen demonstration, mind mapping desks and drawing tools.

When the list of solutions to the users' problem is formed, project developers can choose the idea. It is necessary to evaluate each of the team members' proposals based on the developed criteria, select one or more of the most innovative and progressive by voting, or synthesize all their ideas into one. The team must not hesitate in choosing a very broad direction of their activity, because the process of design thinking implies the possibility of correcting mistakes at all stages of the project. Plekhanov University students' practice shows that the choice of ideas can be made both in one conference session and in several, since group participants may need additional time to make a final decision. The discussion, visualization, representation, and selection of the most successful ideas are usually performed with the help of above-mentioned software and applications.

The fourth stage of the method ("prototype") involves checking viability of the chosen idea and creating a product or service model, i.e. a simplified version that can solve the users' problem. A prototype may be simple during an early stage of development, but it must be completed and made more complex during testing. This step of design thinking is used to adjust and develop a product in details or to understand that the product is useless, stop the process and save resources. In the traditional mode, a prototype can be

drawn on paper, made from scrap materials, or even built from "Lego". In Plekhanov University version of Design Thinking, there are extra options for creating it: graphic and video editors, games ("The Sims", "Minecraft", and etc.), services that allow to animate static models and develop mobile applications, websites, and so on.

Table 2. Steps of Plekhanov University version of design thinking.

The design thinking stage	Tools used during this stage	The advantages of used tools
"Empathize"	Social media polls and Google Forms	Saving time, convenience of survey, automation of recording responses and the ability to interview a wide range of people all over the world
"Define"	Graphic design software ("Adobe Photoshop", "Sketch", "Paint", and etc.), mind mapping desks	Low labor intensity and saving time during creating personas, the most plausible visualization
"Ideate"	Word processing programs ("Microsoft Word", "Note", and etc.), screen demonstration, painting tools, mind mapping desks	Visualization of the ideas of the whole team, ease of perception and visibility
"Prototype"	Graphic design and video editing software; services for animation and website creation, games	Detailed creation of prototypes, the possibility of animation
"Test"	Social media polls and Google Forms	Automation of recording responses, their rapid subsequent processing, coverage of a wide range of people all over the world

The benefits of an invented product or service must be evaluated not by team members, but by ordinary users who can check how effective and easy to use the prototype is. It is essential to get feedback from them that will help project developers to know consumers better, more accurately formulate their problem and eliminate the disadvantages of the developed product or service. All this constitute the fifth and final stage of design thinking – "test" – that involves observing and communicating with persons who evaluate the prototype. Both steps can be implemented in an online format via video or audio communication or feedback forms that give team members the opportunity to get the opinion of any person, regardless of their location. During the testing process, it is important to ask users what they are not satisfied with and try to understand the reasons. Testing a prototype allows seeing the product problems in due time, eliminate them and thereby save a great amount of time, as it is much better to improve the project at initial stages than to invest a huge number of resources during its launch and fail (Table 2).

Although "test" is the final stage of design thinking, it does not mean that the work on the project ends there. The inability to produce a perfect product or service, constantly changing reality, globalization, trends, the political and economic situation in the world as well as other factors make the team of entrepreneurs systematically return to certain stages of project activity and even start the process again. As the practice shows, the more iterations a product goes through, the more useful, convenient, and effective it becomes for the user. The transfer of the design thinking methodology to a remote format opens more opportunities for repeating iterations since the use of computer tools allows to move from one stage to another in a shorter time and achieve results faster (Fig. 3).

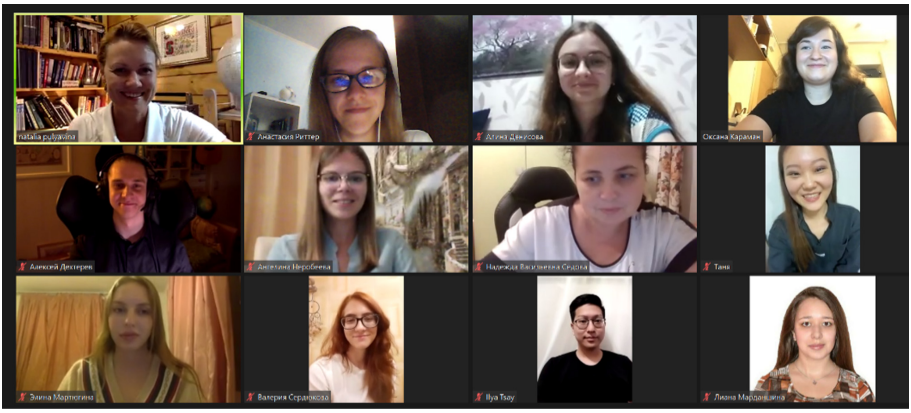

Fig. 3. Communication between Plekhanov University team members in "Zoom".

4 Conclusion

Thus, the coronavirus pandemic has proved the applicability of design thinking as a method of project-based learning in the online format. It turned out that sometimes this method of team interaction is more applicable, efficient, and successful compared to the traditional one. An example of this was the participation of Plekhanov Russian University of Economics students in international innovative projects, that allowed them to show their creativity, cohesion and efficiency and create unique prototypes that can solve social problems in the conditions of a new post-COVID reality. Moreover, they created Plekhanov University version of Design Thinking that can be adjusted and applied not only to education, but to the other aspects of our life. As future work, more theoretical research is needed, for instance on computer-supported group decision making [12] in order to create a comprehensive framework and to validate such approach at experimental level.

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