Design thinking and interdisciplinarity: *Living 2050* - a case study

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ABSTRACT: A meeting early in 2018 triggered co-operation between the Institute of Design in the Faculty of Architecture and Design at Slovak University of Technology in Bratislava, and the Faculty of Commerce at the University of Economics in Bratislava, both in Slovakia. In this article, challenges have been signalled regarding the interdisciplinary teaching of students of design and business. The results presented are based upon an exploratory case study, *Living 2050,* where students from the two disciplines aimed to solve a problem related to future trends in urban living. The authors have dedicated this article to showcasing the methodology employed by the partnership between the two universities. The key challenges of the collective effort are outlined, along with the prognosis for future projects.

INTRODUCTION

In the business world, there is an understanding of the role of design: design brings innovation. Many business schools include lectures on design, and big corporations innovate through design. Large consultancies increasingly hire design agencies to create a better customer experience, to provide better service and to place people at the centre of attention. Therefore, the role of design is valued in the business world. However, there is one problem: in the design world, there is no equal realisation or valuing of the role to be played of business education [1].

Close co-operation between Slovak University of Technology in Bratislava and the University of Economics, both of which are in Bratislava, Slovakia, was developed to address this missing element of education. The aims are an interdisciplinary teamwork experience, shared knowledge and real-life assignments provided by a partner company.

> *The jobs that are likely to be automated are repetitive and routine. Much has been written about the sorts of jobs that are likely to be eliminated, another perspective that has not been examined in as much detail is to ask not which jobs will be eliminated but rather which aspects of surviving jobs will be replaced by machines. This is a problem for machine learning, which operates on data sets that, by definition, were created previously, in a different context. Our ability to manage and utilize emotion and to take into account the effects of context are key ingredients of critical thinking, creative problem solving, effective communication, adaptive learning, and good judgment* [2].

The 21st Century learning environment has changed. Teachers now face complex and ambiguous challenges that can best be defined as …*wicked problems that require a shift in thinking* [3].

THEORETICAL FRAMEWORK

There are a number of tools and techniques that support creative thinking and soft skills, such as teamwork and communication, e.g. problem-based learning and design thinking. Design thinking (DT) is defined as …*a creative problem-solving process that focuses on understanding the needs of others, rapid testing and iterating, and bringing out your inner creative genius* [4].

In this process, it is crucial to develop users' creativity, that is …*the ability to make or otherwise bring into existence something new, whether a new solution to a problem, a new method or device, or a new artistic object or form* [5].

Design thinking has emerged as a powerful new problem-solving approach and it is used in public and private sectors for solving the problems of tomorrow. Design thinking focuses on understanding the goals, experiences and constraints

of the people affected by a given problem. Design thinking is a process as much concerned with the problem as with the solution [6].

The design thinking process is made up of six main steps [7]:

1. Observation-inspiration: an ethnographic survey is conducted while demonstrating empathy for the people affected by the issue (the users), as well as for the problem they are experiencing.
2. Definition/synthesis: the problem is thoroughly defined and redefined using an iterative process. The main goal is to learn information and gain insight from various perspectives.
3. Ideation: many ideas are proposed and some of them are retained, while others are discarded.
4. Prototyping: prototypes are quickly built to emphasise the different ideas that have been generated, and these prototypes are shared with others in order to assess their implementation potential.
5. Tests: prototypes are evaluated by collecting opinions from users, as well as experts on the problem at hand and winning prototypes are then refined [8].
6. Communication: the developed solution (or product) is revealed.

Interdisciplinarity does not refer exclusively to teams consisting of scientists or students from different scientific disciplines. It also covers curiosity, knowledge and skills that transfer across the borders of areas of study. Interdisciplinarity also covers the freedom to choose the subject of research, the theoretical and/or methodological approach, and even the institutional affiliation of researchers [9]. New problems, both in practice and theory often occur at the edge of a discipline and require an interdisciplinary approach [10]. Avsec and Ferk Savec stress the value of interdisciplinarity for critical thinking in engineering design. Hence, there is a need to teach students the skills supporting this approach [11]. Interdisciplinarity is based on open discussion and constructive criticism.

In Table 1 and Table 2 a breakdown is provided of interdisciplinarity and design thinking [9]:

Table 1: Levels of interdisciplinarity.

Levels of Interdisciplinarity	Low	Medium	High
Process	Process is confined to a tight disciplinary framework	Processes enable working outside of the usual framework	Process is heuristic, iterative and reflexive using various tools
Perspectives	Homogeneous discipline group	Representatives from various scientific disciplines	Co-operation with external stakeholders
Thinking	Limited exchange of ideas + concepts	Exchange of ideas + concepts between project members	Incorporate ideas + concepts into participants' mind-set

Table 2: Levels of design thinking (DT).

Levels of design thinking (DT)	Low	Medium	High
Process	DT is not part of the project	Elements of DT in the project	Complete DT process used for creative and innovative ideas
Perspectives	Homogeneous group	Different people with different perspectives	Participants can immerse themselves in the group and think like others
Thinking	Mostly knowledge input for target group	Active knowledge production, small range of ideas + concepts	Participants can immerse themselves in the group and think like others

CASE STUDY: *LIVING 2050*

To inspire critical and creative thinking, 32 students were brought together for the case study; the students were from the two universities and a construction company, YIT Slovakia a.s. that entered the partnership as a third party or client. Interdisciplinary student teams were formed to work together on a challenging assignment. Experts from the company observed the solution developing and provided students with feedback. Thus, the design process offered

real-life simulation and work experience for students. The aim of the case study was to identify innovation in construction and furnishing of residential objects in 2050 using interdisciplinary teamwork.

The *Living 2050* was a highly ambiguous case study about the real-world challenges without clear and certain solutions. Business and design students worked in interdisciplinary teams. Different points of view are key to pushing students to advance their design practice. Students had opportunities to experiment, take creative risks and fail. It provided them with a simulation for real-world problem solving. *Living 2050* was assigned to students with no specification of problems to solve. The student teams were asked to identify and analyse an issue - and design a solution.

Co-operation is always demanding, the more so between different study programmes and universities: teams reflect academic structures, timetables and conditions of limited space. Interdisciplinarity encourages everyone to step outside their comfort zone. Beside *hard skills*, students - and also lecturers - took the opportunity to cultivate soft skills that are becoming core values in labour markets.

RESULTS AND DISCUSSION

The teams used design thinking (DT) tools supplemented with theories of ethics, critical thinking and framing. The team members mapped the needs of their potential users with structured interviews. A mixture of design thinking tools, project- and problem-based learning principles were used. The diversity of designers and economists brought different techniques from their disciplines. Different phases of the design process were embedded in the structure of the course, starting with user interviews and field research (tools: persona and mind map). This was followed by framing and defining a point of view, ideating a solution (tools: brainstorming and brain writing), prototyping and final project presentation for the company and lecturers.

Table 3: Levels of design thinking and interdisciplinarity used in the challenge, *Living 2050.*

Levels	Process	Perspectives	Thinking
Design thinking	Medium	Medium	Medium
Interdisciplinarity	High	High	Medium

The key objective was to develop a complex *Living 2050* solution: students considered the given urban landscape through the principles and construction of modular architecture in accordance with the developer's intentions for sustainable architecture, and the use of ecological materials and technologies, while addressing the challenging issues of the future. Listed in Table 3 are the levels of design thinking and interdisciplinarity in *Living 2050.* Students identified the major challenges of tomorrow that covered the following topics:

1. Global warming: increasing need for green living/housing. Nutrition of tomorrow.
2. Commuting to work causes overcrowded cities: modular interior and furniture reflect the reduction of space due to higher prices and lack of new estates.
3. Home office: a trend accelerated by Covid-19. Goods delivery and transport, smarter services and applications.
4. Pet care: single households of workaholics with a pet as company that needs treatment.
5. Leisure time: young people with a tendency to spend time at home playing virtual computer games, doing work-out exercises, social life.

The final presentations were held in December 2019 at YIT Slovakia headquarters in Bratislava. Even if the course and the process were not easy, the final presentations proved the students' ability to push hard towards the finish and all five teams managed an excellent defence of their projects. Final design solutions were presented using virtual reality. The *Living 2050* challenge brought satisfaction to the partner company and their decision to further develop and nurture the co-operation between design, business and the professional world. The best students were offered a paid internship at the company headquarters in Bratislava.

After the project, a survey was conducted to analyse students' satisfaction using a structured yes/no questionnaire. The questions were:

1. If the students prefer team or individual work.
2. If the expert guidance and consultation from of the partner YIT helped them to solve the problem.
3. If the students would like to have more interdisciplinary courses during their studies.
4. If the design thinking methodology helped the students to solve the problem.
5. How difficult it was to work in a team with students from another university, and if it was difficult to look for a common view of the problem and reach a common result? A Likert scale was used for this question.

The questionnaire revealed that nearly 73% of students preferred teamwork to individual work. 91% of the students considered the consultations from the company YIT helpful in solving the problem. Close to 73% of the students would

like more interdisciplinary subjects during their studies. Of the students, 65% reported that the design thinking methods helped them when solving the problem and finding the solution. See Figure 1 for the results of the questionnaire.

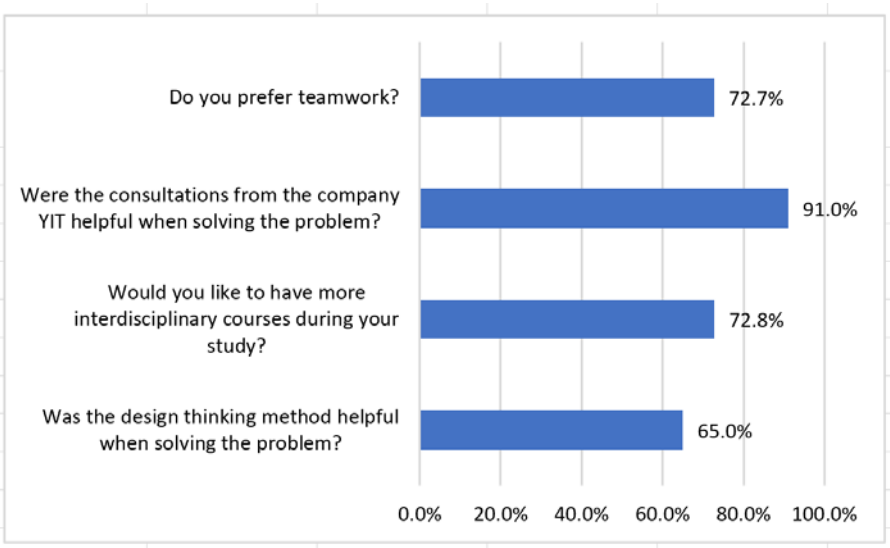

Figure 1: Students' survey (0 = no, 1 = yes).

Interdisciplinary work was difficult for nearly 46% of the students (Figure 2), but they would still like to have more interdisciplinary courses at the university (Figure 1).

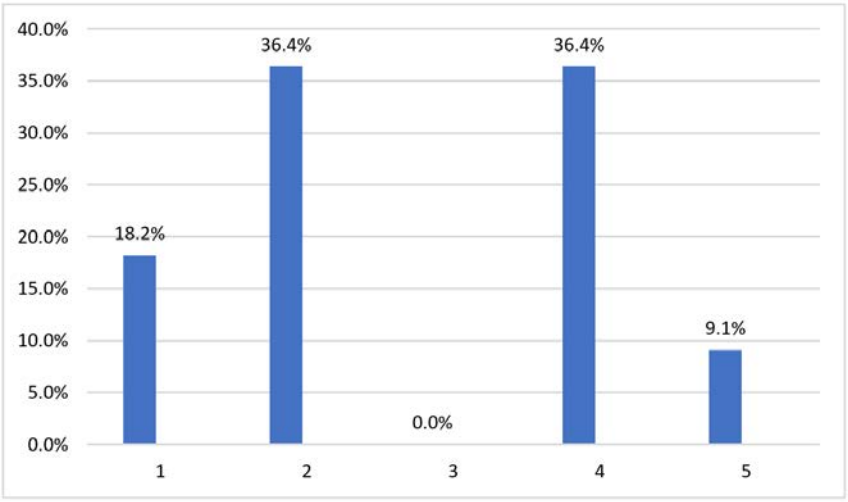

Figure 2: Interdisciplinarity and the case study, *Living 2050* (From left to right: *not challenging* to *very challenging*).

The survey showed relatively strong preference for a collaborative approach and interactive project work based on partnership with a third party. Design thinking may be challenging for students who need to learn tools for user-oriented design and to use them to solve real-life problems. They learn not only to answer the customers' needs, but to co-design with users, to listen to all stakeholders and also to be aware of their role as an expert [11].

The structured questionnaire showed predictable learning and confirmed previous attitudes to collaboration between these institutions. Further insights were collected to understand deeper views, comments and the feelings of students, i.e. what was difficult, what do they like and why?

The feedback was collected based on open-ended questions and short interviews. A selection of answers covers students' opinions.

1. *I see as a positive the possibility to work in a team with people we did not know before. It was very demanding - especially at the beginning - to showcase our vision to economics students and find a proper role in our common work. At first, we had a feeling everyone goes his/her own way, the totally different one. However, later on it got framed and we started to complement each other* (Adam, design student).

2. *It was enriching to work with a real company and their requirements. On the other hand, it was very difficult to communicate everything with students from the University of Economics. Our thoughts and requirements were*

often different and we did not understand each other. In the end, everything was cleared up, however, much could have been anticipated. This project was something new to me and I was trying to see my ideas from a different perspective, and to learn not to take [things] personally (Klaudia, design student).

3. *We took such a long time to define what we were actually going to do. The idea of interdisciplinarity and team work is great. However, it did not work out very well in our case. The other university brought us no useful information. What's more, we lacked the understanding of our common mission and purpose of the outcome* (Kristina, design student).

The short interviews and open-ended questions showed rather different individual perceptions of co-operation. Whereas students of economics generally expressed overall satisfaction and a strong determination to attend other courses offering interdisciplinary co-operation, only six out of 11 designers involved in the project claimed a certain respect for further teamwork. Not even the positive feedback provided by the company influenced their total impression which remained determined by some negative factors experienced during the process with their colleagues.

CONCLUSIONS

In engineering case studies, competence in solving real-life problems is most important [12]. Future architects, designers and engineers need to possess domain knowledge - to be competent professionals - but their work also needs to respond to societal needs [13].

The project, *Living 2050*, brought forward many new challenges. It enabled the lecturers to test diverse aspects of teamwork, interdisciplinarity and leadership. The project revealed diversity in interaction and data sharing between different professional worlds; it is the task of lecturers to leverage these into professional advantage for students. Designers work intuitively and are trained to generate many ideas, to prototype and iterate. This chaotic and fuzzy process sometimes is hard to follow and it is easy to get confused. Designers/creative workers are naturally inadequate completer-finishers unless working hard to fight for details. Students of business schools are trained to identify one correct plan which they follow [14]. However, these diversities across disciplines could become a collective strength that should be built upon.

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