

DESIGN THINKING: A PRACTICAL GUIDE

A HANDBOOK FOR MANAGERS IN HIGHER EDUCATION



DT.Uni.
Design Thinking Approach
for an Interdisciplinary University



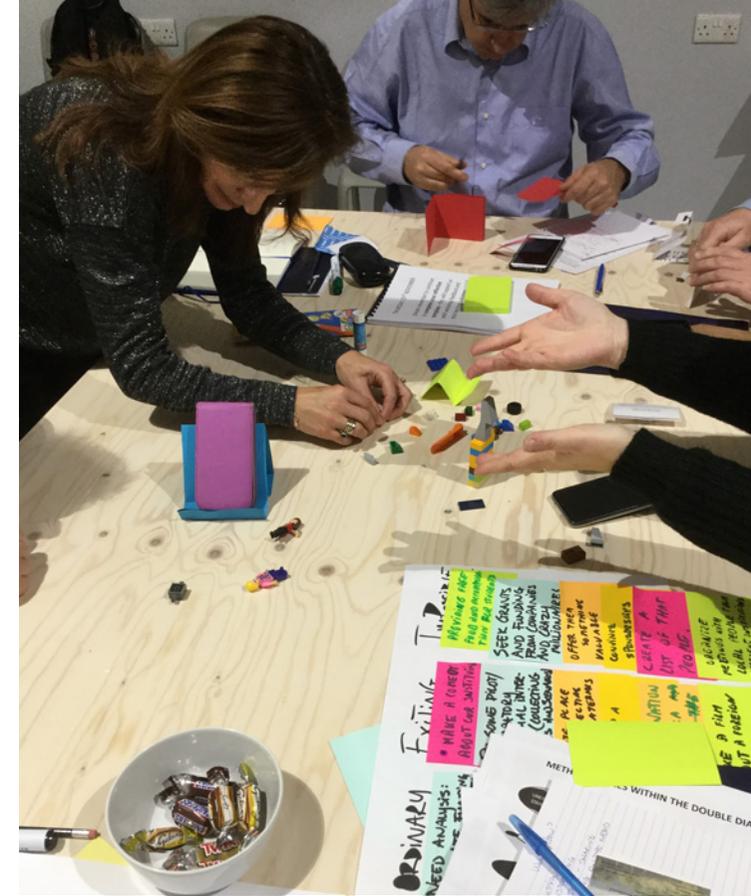
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PARTNERS



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THANKS:

The editors would like to thank all participants of the DT.Uni project without whose time and effort this handbook could not have been produced.

In particular, we thank Joanna Górká and Olga Pliszczyńska-Mokijewska, International Cooperation Centre, Maria Curie-Skłodowska University for their excellent project management and support; Veronika Nekolová, Barbora Paholková and Anna Veszprémi Sirotková, University of Economics in Bratislava, for their help in structuring the handbook and undertaking the comprehensive evaluation of the international workshop in Birmingham; and the following for contributing to workshops and

providing accounts: Maria del Carmen Arau Ribeiro, Pedro Rodrigues, Noel Lopes and Natália Gomes, Instituto Politécnico da Guarda; Claudia Carter, Laura Veart, Zuby Ahmed, Alexa Torlo, Steve Harding and Tom Cahill-Jones, Birmingham City University; André Nusselder, Katusha Sol and Natasa Brouwer, Universiteit van Amsterdam; Marino Bonaiuto, Silvia Cataldi, Michele Mazzola and Alessandra Talamo, Sapienza Università di Roma; and last, but in no ways least, Christian Bruchatz, Robert Fischer, Peer Kittel, Robert Härer and Martin Meyer, Technische Universität Dresden.

Very many thanks to all - Kathryn and Charmaine

PUBLISHER:

ISBN number - 978-1-904839-95-8

This project has been co-funded by the Erasmus+ Programme of the European Union (Project number: 2017-1-PL01-KA203-038527). This publication reflects the views only of the authors. The National Agency and European Commission cannot be held responsible for any use which may be made of the information contained therein.
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INTRODUCTION

The DT.Uni project

'DT.Uni – Design thinking approach for an interdisciplinary university' is part-funded by the Erasmus+ programme. Led by the University Maria Curie Skłodowska (UMCS), the project partnership comprises eight institutions:

Technische Universität Dresden (TU Dresden), Germany

Háskólinn á Bifröst, Iceland

Sapienza Università di Roma, Italy

Maria Curie-Skłodowska University (UMCS), Lublin, Poland

Instituto Politécnico da Guarda (IPG), Guarda, Portugal

University of Economics in Bratislava (UEBA), Slovakia

Universiteit van Amsterdam (UvA), The Netherlands

Birmingham City University (BCU), UK

DT.Uni's prime objective is the promulgation of interdisciplinary work in higher education institutions. It is intended that this is achieved by building an appreciation of design thinking methods in three interlinked groups: academics; higher education managers; and students. Project activities include international and local workshops as well as developing workbooks and case studies relating to the implementation of design thinking in higher education.

The project aims to equip the next generation with soft skills such as problem solving and critical thinking so that they become producers, not consumers, of knowledge. Overall, the project considers that design thinking will enhance the level of interdisciplinarity among participants by improving their abilities to think in a divergent, creative and designerly way.

For more details see: www.umcs.pl/en/dtuni.htm

DT.Uni methodology

DT.Uni's overall rationale is to 'train' people in design thinking tools and techniques through four-day workshops attended by representatives of the project partners. Attendees should then take the principles back to their institutions to implement for groups of students, academics and managers.

The first international workshop, for academics, was held in Dresden in April 2018 and organised by Technische Universität Dresden (TU Dresden). The second, described in this handbook, was held for higher education managers, including administrators as well as academics with managerial responsibilities, at Birmingham City University (BCU) in November 2018.

The TU Dresden workshop was organised and delivered by Christian Bruchatz, Robert Fischer and Pierre Herzer, who provided a blueprint for the BCU version. It also resulted in four local multiplier academic workshops at UMCS, IPG, UEBA and BCU, all delivered by TU Dresden attendees. The BCU workshop has led to four sessions for managers at UvA, Sapienza, TU Dresden and Westfälische-Wilhelms University, Münster.

For all the workshops, the organisers chose their own format and timetable. The following describes each session, covering pre-workshop planning, workshop organisation, the design thinking tools used and tips and recommendations. The handbook also includes examples of the practical implementation of design thinking tools in management and teaching contexts.

Overview of design thinking and its benefits

Throughout, design thinking focuses on and is empathetic with the user of a product or service. Key features include the use of techniques to cultivate divergent and convergent thinking, such as the generation and filtering of ideas, as well as working in groups to develop solutions.

The process starts with a challenge often a complex or 'wicked' problem. It is usually couched as a 'How might we.....?' question. At this stage, the process focuses on establishing what the challenge is and ensuring the appropriate one is being addressed. Design thinking then encompasses a number of stages. These vary according to design thinking gurus. The DT.Uni approach comprises four stages:

explore: build an understanding of the user and their needs as well as unsolved problems;

create: design and evaluate potential solutions;

prototype: build a physical or virtual model to demonstrate one or more solutions; and

evaluate: test the prototype with users and improve and/or redevelop ideas.

At each stage different tools are used to achieve the desired outcome. For example, we tended to use a form of brainstorming as an idea generator (divergence) and clustering and dot voting to filter ideas (convergence).

Key features of design thinking are:

- a focus on solving wicked or complex problems with an emphasis on the user;
- learning by doing, involving a haptic process, for example, writing and making;
- working in groups with no hierarchy; and
- allowing people to fail so that solutions do not need to be perfect.

Design thinking has a large number of benefits and attractions for academics, managers and students. These include:

- the formation of functional interdisciplinary groups facilitated through tools such as, brainstorming and brainwriting, which also allow all group members to present their ideas;
- a lack of hierarchy in groups where trust is formed relatively quickly with peer review allowing ideas to be discussed and assumptions challenged and/or tested in a relatively safe environment;
- the development of solutions that group members feel that they would not have arrived at individually; and
- the building of a prototype as a means of hands-on shaping and testing of ideas as well as a tool to sell the idea through the institution, particularly to senior management.

Potential uses of design thinking by higher education managers include:

- to gain a better understanding of their users, for example, students, to improve services;
- identifying new opportunities or solutions;
- supporting individuals to develop a broad mindset when dealing with complex problems;

- improving teamwork especially in mixed and/or interdisciplinary groups;
- testing solutions through prototyping using trial and error methods;
- exercising flexibility and adaptability to a variety of contexts and ideas;
- developing a variety of soft skills and interpersonal competences such as listening and communicating;
- reforming or building teams in uncertain situations; and
- facilitating organisational change.

More details of the design thinking process and descriptions of the tools and techniques can be found in various publications including Bruchatz et al. (2019), Fraser (2012) and Lewrick et al. (2018).

Purpose of this handbook

As above, this practical guide describes a number of workshops held across Europe to train fellow workers in design thinking techniques and processes. It covers how teams have organised their sessions encompassing the structure, tools chosen, length, workshop delivery and evaluation. Through reflection on this process we have developed top tips and recommendations for designing, delivering and facilitating sessions.

It is very much a practical guide, highlighting the elements that might be helpful for others delivering similar workshops or implementing the methods in everyday working. The workbook complements other DT.Uni outputs such as a set of best practice case studies, handbook of tools and database of teaching activities. These are available from the project website at www.umcs.pl/en/dtuni.htm.

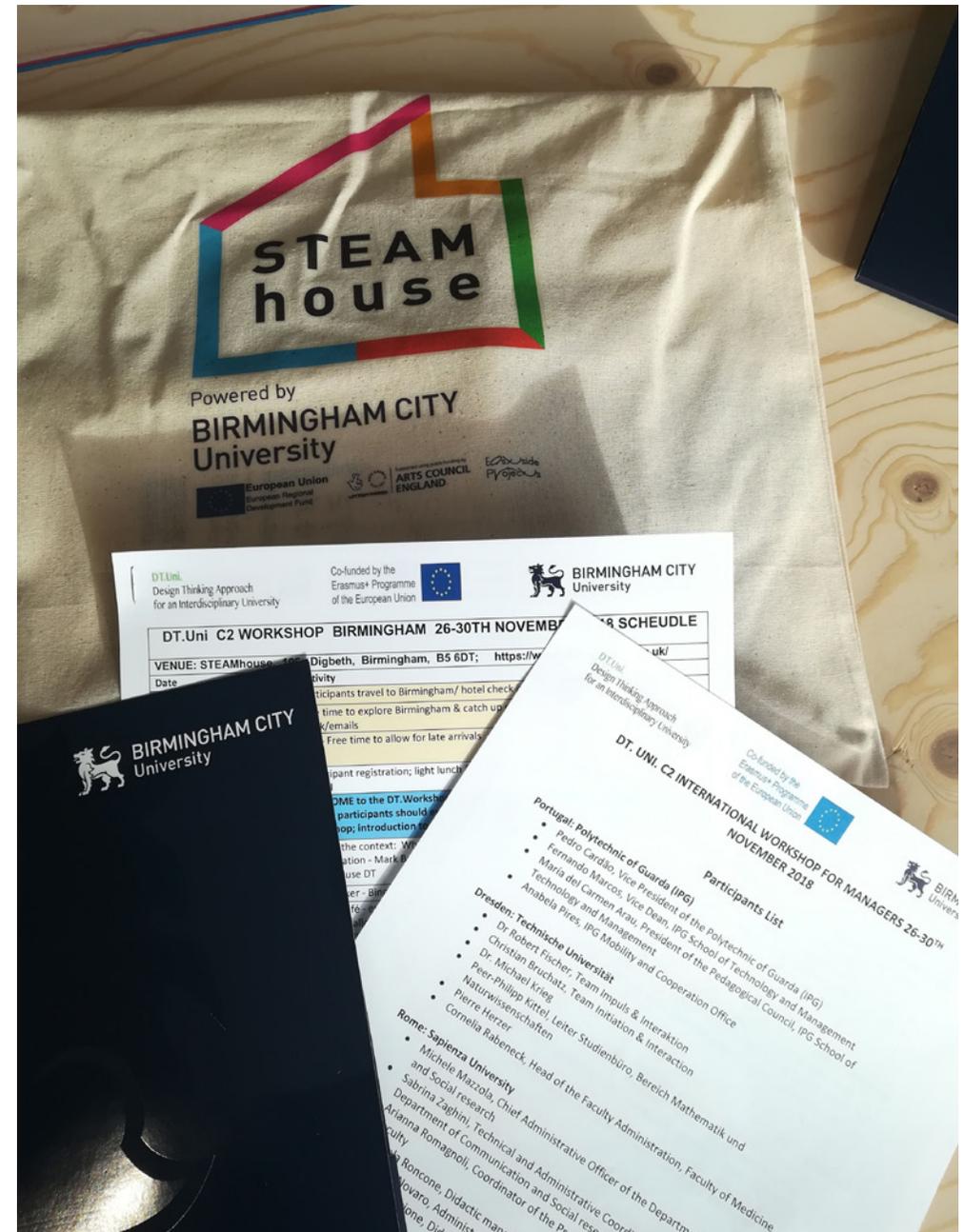
SECTION 1:

BCU INTERNATIONAL WORKSHOP FOR MANAGERS IN HE

This section describes the international workshop for managers held at STEAMhouse, Birmingham City University, Birmingham, UK from 26 November to 30 November 2018.

A key element of the DT.Uni project, the following covers how the BCU team devised and delivered the workshop. It reports on the workshop organisation, details of activities for each day and the thoughts of the team soon after its conclusion. The issues considered in planning and delivering the workshop as well as the thinking behind structure and content are also included.

A formal evaluation of the workshop is provided in Appendix II



BCU INTERNATIONAL WORKSHOP FOR MANAGERS

Summary of design thinking tools used

	Form and define	Introduction to design thinking World café
	Explore	Explain to a stranger Persona mapping Framing the challenge
	Create	Lean café Design brief Brainstorm and filtering Brainwriting Idea communication sheet
	Prototyping	Introduction to prototyping Prototyping Video pitch Refining of prototypes
	Evaluation	Show and tell Individual and group reflection Final review

Team

Kathryn Burns; Tom Cahill-Jones; Steve Harding; Charmaine Stint; Alexa Torlo - additional facilitators: Claudia Carter; Laura Veart

Participants

The 34 delegates came from DT.Uni's partner institutions (see Introduction) undertaking a range of management roles, such as, course director, IT or project manager, dean and principal. Several attendees had run or attended the Dresden workshop and, overall, there was a range of design thinking knowledge and experience from novice to expert.

More details of the demographic of the participants is given in the evaluation in Appendix II.

Pre workshop organisation

Aims and considerations: Our main driver in developing content for the workshop was to build the design thinking knowledge and skills of our participants. We also aimed to:

- increase understanding of the design thinking process and how it may be used in daily work;
- develop an ability to frame challenges, problems or 'wicked tasks';
- cultivate an appreciation of core design thinking elements such as empathy and creative problem solving as well as the value of different perspectives in establishing solutions;
- allow participants to network with like-minded people in similar roles in different institutions and countries; and
- provide a fun, useful and informative experience.

The workshop was conducted in English, but with participants from across Europe. Therefore, we also considered the international nature of the participants and the requirement that some (Germany, Iceland, Italy and the Netherlands) would need to run a local multiplier workshop. Overall, we wanted to deliver a hands-on experimental environment where participants were not afraid to make mistakes and could learn by doing.

Space: We held the workshop at BCU's STEAMhouse – a facility designed to tackle challenges and foster interdisciplinary working. We used the same room for the whole week with plenty of wall space as well as movable boards for the inevitable deluge of sticky notes!

Evaluation: Our colleagues from UEBA (Anna Veszprémi Sirotková, Barbora Paholková and Veronika Nekolova) undertook an evaluation through surveys before and after the workshop. This is described in full in Appendix II. The questionnaire is provided in Appendix III.

We also asked participants to reflect on workshop activity and complete a work log including 'what have I learnt?' and 'what does it mean for me?' at the end of each day. This was used on the final day of the workshop as part of a review session.

Agenda: At an early stage we decided to use the same format as the Dresden workshop prioritising: problem/challenge definition; user profiles and journeys; idea generation and filtering; prototype development and evaluation and reflection.

We chose to have a lead facilitator for each day who took ownership of the tools and content for their session. Tools and techniques included those felt to be particularly effective during the Dresden workshop, as well as some from our own practice and experience. The whole programme also included social visits and speakers from local projects and organisations. Each session was designed to be people centred as well as allowing participants time to understand and explore the relevant element of the design thinking process.

Group formation and challenges: While organising the workshop, we spent some time discussing how to set up the groups and the format of the challenges – should we set them in advance or allow participants to choose their own? We agreed that the challenges should be relevant to participants and the demands on the higher education system. After discussion, we decided to use a World Café to allow participants to work on their own challenges. Therefore, before their arrival in Birmingham, we asked delegates for the top three issues in their working life. Common issues are provided in Appendix I.

Organisation: We allowed around 21 days person time across the team for planning the workshop, comprising six sessions with usually 3-4 attending. Between sessions, we shared information and preparation of material via a one-drive shared directory.

Workshop overview

In line with the Dresden model, each workshop day focused on a phase of the design thinking process. The agenda overview is shown above – the following describes the tools used for each day in more detail.

Day 1: introduction and group formation

Our workshop started with a welcome, icebreaker and an introduction to design thinking. As described above, we wanted the groups to be self-selecting and relevant to members so we held a 'World Café' based on pre-submitted challenges. The challenges were grouped under themes identified as:

- Management
- Research
- Students
- Human resources
- Administration

- Internationalisation
- Project and team management

At the start of Day 2, we allocated the groups based on participants top three preferences using a challenge ranking template. The aim was to allocate participants based on their first preference where possible unless this resulted in a group with too many participants from the same organisation. Groups stayed together for the rest of the week.



STEAMhouse - workshop location



BCU managers workshop participants

Day 2: EXPLORE – scope the challenge

Starting point:	Formation of working groups
Ice breaker:	Share with your group members one thing you are good at and one thing you consider important in teamwork
Explain to a stranger	Choose a character from a picture in Birmingham Museum and Art Gallery (visited by participants) to represent the persona (user) affected by your challenge.
Persona mapping	For your chosen persona describe their goals; values; motivation; what they see and hear when they interact with the challenge; what they think and say to their peers about the challenge; their concerns, what they are happy about and how they interact with the challenge. This leads to an in-depth understanding and appreciation of the challenge.
Framing the challenge	Place the challenge at the centre of a workspace map all connection points (people, places, organisations etc) identifying how each is affected by the issue – leads to deciding 'How might we....?'.
End point:	Challenge expressed as 'How might we.....?'



Explore - persona journey



Explore - presentation



Explore - workshop view



Explore - explain to a stranger

Day 4: PROTOTYPE phase: developing responses to the challenges

Starting point	Idea Communication sheet
Introduction	Led by a prototyping expert What is prototyping? How to prototype? Exploration of prototyping methods and hands-on session – build a phone holder in 5 minutes
Prototyping	Using the material available plasticine, lego, coffee cups, sugar stirrers, sweets, paper and pens etc – build a prototype of your solution.
Video pitch	Guided by the workshop facilitator, each group prepared a short structured video describing its response to the challenge and the thinking behind its prototype.
Finalising	Groups refined prototypes until satisfied with the outcome.
End point	3D prototypes – see pictures



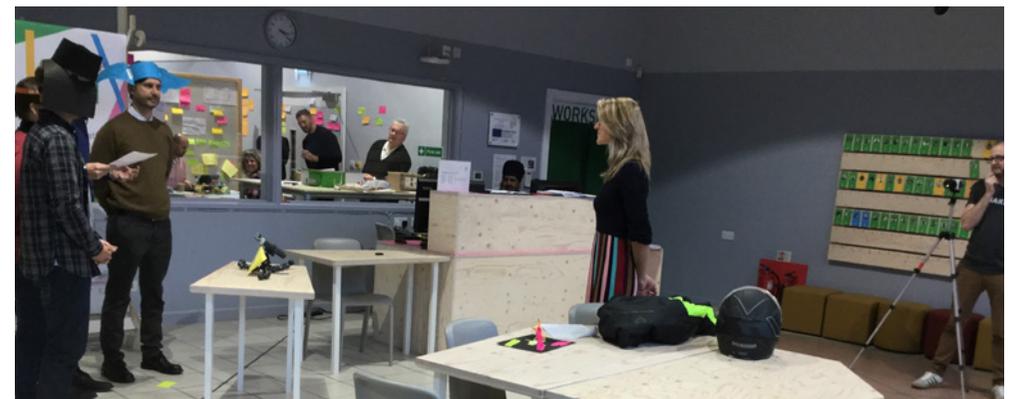
Prototyping - phone holder



Prototyping - getting going



Prototyping - presentation



Prototyping - pitch shoot

Day 5: EVALUATE day

We started the final day with a 'show and tell' where each group explained their thinking and how/why they created their prototype in the way that they did.

This moved to a review of the week where participants were asked to share their thoughts on how they felt overall and what they felt worked well and what worked less well.

Participants also completed a template, individually, to establish what they would focus on in the short, medium and longer term back at their own institutions. We thought this would help in identifying how they might use some of their new design thinking and learning.

The challenges and solutions developed by the groups during the workshop are given in the table below.



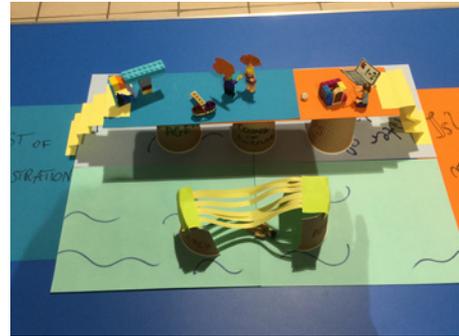
Evaluation - show and tell

Prototypes

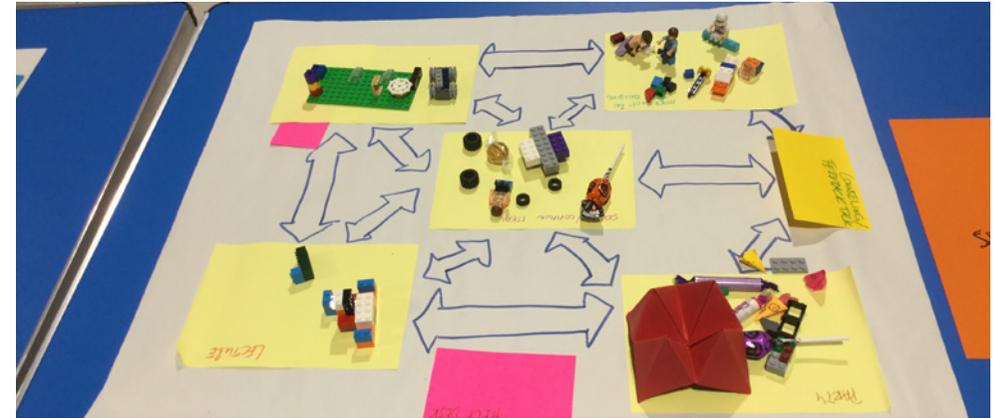
Group name	Challenge	Solution
Fri pm fever	How can we build flexibility into hierarchical decision making?	Informal meeting for discussing important issues between managers and teams (includes free beer and an idea collecting mechanism)
Lifelong learning	How might we make lifelong learning more motivating, valuable and attractive to students?	Students identify their own needs and create their own programmes, both locally and globally
Better together	How could we improve the quality of communication between academics/ researchers and administration?	Collaborative programme to improve understanding and build trust between academics and administrators based on a series of formal and informal activities
May the force	How to find the right project role for a person in order to maximise project potential?	A game to help team members to find their roles and understand other perspectives during the project
Connected spaces	How can we embed a sustainable learner-centred approach in our staff?	Promotion of fun, support and excellence through sustainable creative spaces and on-going activities to build a community for learners, staff and local people
Team day	How can we overcome the difficulties university employees find in collaborating?	A special programme held on a regular basis to encourage collaboration including social events; team building workshops; sports and counselling
Peace and love campus	How can we build an environment to attract international students?	Build a campus with a tolerance based strategy (diversity), cross-cultural events for students, mentoring for students and customised study



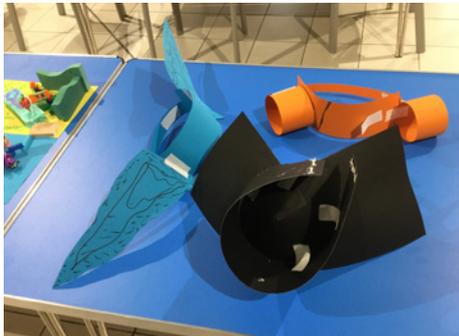
Solution - Connected spaces



Solution - Better together



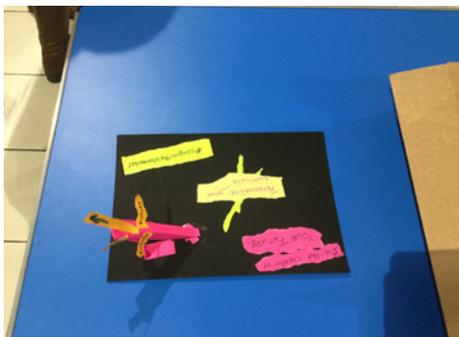
Solution - Team day



Solution - Feel the force



Solution - Friday afternoon fever



Solution - Life long learning



Solution - Peace and love

Evaluation

The following is based on the thoughts of the facilitation team shortly after the workshop was delivered. The results of the formal evaluation of the workshop by UEBA are presented in Appendix II.

The majority of participants expressed that they very much enjoyed using design thinking and that they found the approach very effective, producing better and more advanced solutions than they had expected from the workshop or if working by themselves or in their normal environment.

Group dynamics and engagement with the DT process

Functioning groups are fundamental to using design thinking techniques, whether in a workshop or daily work environment. Our groups had a mix of participants from different institutions as well as members from different levels and areas of management. We found that some groups took longer to bond, in part due to personalities and possibly being out of their comfort zone. However, by the end of Day 2 all groups were working well together with good and interdisciplinary communication and collaborative group dynamics.

Also, we observed that although all participants engaged with the different tools some needed repeated (or improved) explanation. This tended to be different methods for different people or groups rather than be uniform across the whole workshop. There was also one group that tended to work very quickly – possibly not fully embracing the ethos of design thinking – and showed a reluctance to the amount of writing and rewriting of ideas and solutions. While the group worked together for the week, it may have been more productive to move them into other groups to develop a more fulfilling experience.

In our desire to group people with their first choice of challenge some groups were only 3 – 4 people. This proved problematic with some tasks especially when one or more group members were absent, for example, late in returning from a break or arriving in the morning.

Facilitation

With the benefit of hindsight, we would refine some aspects of facilitation such as making the time for 'review and reflect' at the end of each day. As above, we should have checked understanding of tasks and clarified the iterative and divergent/convergent nature as well as the current position in the design thinking process. Also, we could have considered the language abilities of our participants more carefully – both verbal and written. Time slots for the tasks and the overall schedule should have been enforced more effectively.

Many participants had not used design thinking processes before, whereas others were very experienced. One had run a number of similar workshops in a professional capacity and several others had been involved in the Dresden workshop as facilitators or participants.

This mixed group made it difficult for us, as the facilitation team, to pitch content, gauge the level of instruction required and pace the days effectively. Participants more familiar with the process often completed tasks quickly, not allowing sufficient time for colleagues in their group to process the activity before moving on. On the other hand, experienced group members provided additional support and guidance to those less familiar with design thinking.

Content and instructions

As described above, each facilitator ran a separate day and phase of the workshop. This meant that planning could be done independently, saving time, but that content may have appeared disjointed. Additionally, facilitators were only fully conversant with the activities on their day, so that groups may have received diverse interpretations of instructions for specific tasks on other days.

This independence also meant that we did not refer to the original problem or check back often enough that new materials were still in line with the original challenge.

Further, we chose to cover a phase of the process each day. Again with hindsight, we could have covered this content in less time and used the last full day for groups to work with members of their own institutions on a blueprint for a multiplier workshop (if appropriate) and/or how they might use the tools and techniques in their every day work back at base.

Workshop length

It is difficult to get people to commit time away from their workplace and we found it exacting to achieve the workshop numbers we needed to meet the project's requirements. Spending a week of November in Birmingham was not overly attractive! As a result, we tried to provide a range of evening social activities to attract participants.

Tips and recommendations

- Create a list of priority objectives and create a schedule to meet them.
- Make the time to plan and organise your workshop effectively.
- Check that content links from day to day and that you allow time for participants to review and reflect – individually, with their groups and between groups.
- Keep in mind that you will have a range of experience, knowledge, abilities and personalities in your workshop or meeting. Try to use activities to appeal to a range of traits.
- Where possible, provide instructions in a visual and verbal format, providing an example where appropriate – for examples see the Dresden workbook.
- Encourage your participants to be open minded and be prepared to listen as well as keeping distractions, such as emails and phone calls, to a minimum.
- Enjoy it! Though daunting, facilitating a workshop to support people in their understanding of the value and benefits of design thinking can be extremely rewarding.

SECTION 2:

LOCAL WORKSHOPS FOR MANAGERS IN HE

Section 2 comprises four local workshops, following the Birmingham workshop, delivered by project partners and designed for managers in higher education.

Universiteit van Amsterdam, Amsterdam, The Netherlands (UvA)

Workshop held 20 and 24 May 2019 at UvA and delivered by UvA (with online activities between workshops)

Sapienza Università di Roma, Rome, Italy (Sapienza)

Workshop held 6 June 2019 at Sapienza and delivered by Sapienza

Technische Universität Dresden, Dresden, Germany (TU Dresden)

Workshop held 25 and 26 June 2019 at TU Dresden and delivered by TU Dresden

Westfälische-Wilhelms University, Münster, Germany (WWU)

Workshop held 25 February 2020 at WWU and delivered by Maria Curie-Sklodowska University (UMCS)



UVA MANAGERS WORKSHOP

Summary of design thinking tools used

	Form and define	Introduction to design thinking Get to know your team Challenges introduced
	Explore	First formulation of challenge - 'How might we....?' Who? What? Why? How? Interview potential user Persona mapping
	Create	Brainstorming and ideating 'How might we....?' Selection and evaluation of ideas through dot voting Brainwriting - done between sessions
	Prototyping	Introduction to prototyping Choose idea to prototype Build prototypes working in groups Test prototypes Teams present work through storytelling
	Evaluation	Reflection and evaluation

Team

André Nusselder, Katusha Sol, Natasa Brouwer, (attended Dresden, Birmingham or both), Frank Nack

Attendees

Nine in total split across University of Amsterdam, Vrije Universiteit Amsterdam, University of Applied Sciences, Amsterdam, Utrecht University and Reflect Academy covering a range of disciplines and mainly inexperienced in using design thinking.

Pre-workshop organisation

In preparing and organising our workshop we focused on increasing the motivation of our participants to explore and solve 'wicked' problems in education policy. We wanted to explore two increasingly popular approaches: interdisciplinary education, particularly in relation to explaining phenomenon, solving problems and/or creating a product, as well as design thinking as a method of solving problems innovatively.

We also combined our reflections on the Dresden and Birmingham workshops as well as our own experience and consideration of our participants' pressured timetables. In particular, we wanted to minimise the time spent writing on sticky notes! In response we devised a blended learning design, with some activities done face-to-face in workshops and an online activity between workshops, as explained in more detail below.

Prior to attending the workshop, participants were sent some preparatory materials including an introduction to design thinking and the DT.Uni book of best practice case studies. They also completed a questionnaire including the issues they felt that they wanted to tackle. We used the completed questionnaires to devise two challenges for the workshop and split the participants into two groups to respond to those challenges.

Workshop management

As described above we chose a blended learning structure for our workshop. This comprised two three hour face-to-face sessions on day 1 and on day 5 and three online group assignments comprising two hours to be completed between sessions.

André developed the workshop and led the face-to-face sessions, aided by Katusha as facilitator. Natasa undertook the organisation such as preparing presentations, sending out and collating the questionnaires and preparatory materials, recruiting participants and documenting the workshop through photographs and videos.



UvA - building a persona

The two themes tackled by participants were:

1. What digital platform would support lecturers and better facilitate their work?
2. What is needed so that lecturers make more space in their courses for the reflection of STEM knowledge in society? How do we change the curriculum to strengthen interdisciplinary education?

Attendees were assigned to a group to tackle a specific challenge, based on their response to the pre-workshop questionnaire. A summary of the tools used is given above.

Following an introduction to design thinking and a getting to know people exercise our first session explored the challenge through Who? What? Why? and How?. This was followed by interviewing a potential user and a persona mapping

activity. Finally we used brainstorming to ideate and create potential solutions. To conclude the first session, the top three were selected through dot voting.

The days between the face-to-face sessions gave the participants the opportunity for a collaborative online brainwriting to develop their ideas in more depth as well as time for personal reflection about the process. We used Google Docs to enable the online brainwriting.

In the final session our participants built and tested prototype solutions. These are shown in the photos. Throughout we emphasised the divergent and convergent nature of design thinking. We also took great care to reinforce the design thinking process as well as the phase of the process being covered in a particular session.

Evaluation

Based on pre and post test the participants have improved their knowledge and gained skills in design thinking approach. The participants were very satisfied with the workshop. For example, on a Likert scale of 5, they evaluated the statement "I found the workshop useful for me" at 4.6 and the statement "I found the workshop inspiring" at 4.9.

Examples of how participants plan to use design thinking in the future include:

- to work through complex vision, mission and strategy issues as well as aligning secondary and tertiary education;
- creating an educational vision for the faculty, battling the secondary school teacher shortage, and facilitating more interdisciplinarity within the faculty;
- as a methodology during entrepreneurial group projects;
- employing the understand and observe phases as well as ideation, field research, and stakeholders interviews to gain user insights; and
- solving problems we encounter in the policy team.

Evaluating as a team we felt that the workshop had been very successful. In particular, we felt that the gap between sessions helped our participants to understand the process as well as develop ideas in more depth than would have been possible in a single session.

Tips and recommendations

- Holding two short sessions helps participants in terms of workload as well as getting to grips with design thinking.
- Short, sharp sessions work well, but need to be well planned and executed.
- Carefully explain the design thinking process throughout a session as well as emphasising the different phases.
- Presenting challenges based on input from participants worked well and helped us to build a thorough and practical programme.



UvA - prototyping



UvA - prototype - team 1



UvA - prototype - team 2

SAPIENZA MANAGERS WORKSHOP

Summary of design thinking tools used

	Form and define	Introduction to design thinking and the DT.Uni project Positives and negatives of design thinking from the Birmingham workshop
	Explore	User journey
	Create	Storyboarding
	Prototyping	Service blueprint Elevator pitch
	Evaluation	Reflection

Team

Marino Bonaiuto, Silvia Cataldi (Dresden attendees), Michele Mazzola (Birmingham attendee), Alessandra Talamo (design thinking expert)

Participants

26 in total, 16 from Sapienza University and 10 from other institutions Roma Tre University, Lumsa University, Rome Municipality, Acume (consultancy), Accademia di Psicologia Sociale e Giuridica (Psychologists training body) [all preceding bodies are based in Rome], Sao Carlos University, São Paulo, Brazil, Zhejiang University, Hangzhou, China

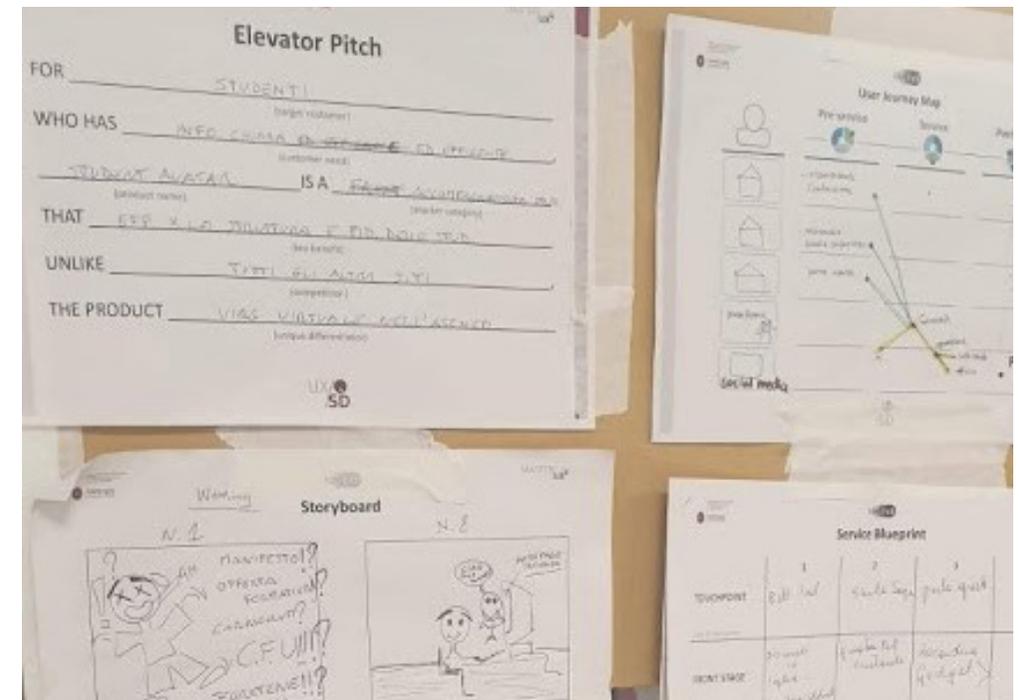
Pre-workshop organisation

In developing our workshop, we aimed to provide an experience of applying design thinking approaches in the administration and management processes of our participating institutions and universities.

The intended goals and outcomes for the workshop were:

- learning tools and methodologies to create innovative and 'human-centered' solutions;
- promote creativity, flexibility and adaptation to rapidly changing situations;
- improve the perception of the ability to solve problems;
- support innovation processes in team work; and
- improve the level of interdisciplinary work.

We based our choice of methods on our experiences at the Dresden and Birmingham workshops as well as the tools we have found most effective in our own teaching. We also considered the needs and roles of our attendees, ie, those that perform managerial and administrative functions, such as course directors and administrative personnel at department or faculty level.



Sapienza - completed templates

In preparing the work we held three meetings: two with the Sapienza University staff who had attended the Birmingham workshop (one face-to-face and one on-line) to gather lessons learned and areas for improvement and one internal staff meeting.

Workshop management

We wanted to provide an intensive and focused workshop in less than a day, to meet the work commitments of our intended audience. Therefore we introduced design thinking methodologies to guide a decision-making activity from the perspective of optimising the process. As such, we followed the explore, create, prototyping, evaluation model less rigorously than other workshops.

The methods we covered were:

- Story board
- Elevator Pitch
- User journey map
- Service blue print

We felt that this was a time effective structure that met our original goals. The feedback from our participants was very positive.

Tips and recommendations

We found it difficult to recruit external administrative people (due to their requiring the approval of their managers). We feel a focused schedule helped us to overcome this difficulty to a degree.



Sapienza - instructions



Sapienza - creating an elevator pitch



Sapienza - group shot

TU DRESDEN MANAGERS WORKSHOP

Summary of design thinking tools used

	Form and define	Warm-up Introduction to design thinking Each group finds its challenge
	Explore	Interview User motivation analysis Persona How might we?
	Create	Brainstorming Brainwriting Send a postcard
	Prototyping	Storyboard LEGO walk through
	Evaluation	Exchange of people Group presentation

Team

Christian Bruchatz and Robert Fischer (Dresden organisers and Birmingham attendees), Peer Kittel (Birmingham attendee), Robert Härer, Martin Meyer (photographer)

Participants

30 in total, 20 from TU Dresden, 10 from seven members of the DRESDEN-concept research alliance: Barkhausen Institut gGmbH, Saxon State and University Library Dresden, Militärhistorisches Museum der Bundeswehr, Fraunhofer Institute for Ceramic Technologies and Systems, Senckenberg Natural History Collections of Dresden, Helmholtz-Center Dresden-Rossendorf, and Technical Exhibition Dresden

Pre-workshop organisation

We promoted our workshop as 'Design thinking helps you to successfully deal with complex problems in a diverse group using structuring methods'. To this end we aimed to teach how design thinking approaches can be integrated into everyday work processes and which methods can be used in particular situations. In addition to our previous work on design thinking, organising the Dresden workshop for academics and our attendance at the Birmingham workshop for managers helped us considerably to decide which tools to use and how to structure the workshop.

We decided to run for 12 hours over 1.5 days and developed a schedule covering explore and create phases in the first day and prototyping as well as evaluation on the second half day. The two days were consecutive. The structure and methods used in the workshop were agreed in one meeting of the facilitation team

Other pre-workshop activities included booking the room and photographer, gathering and transferring supplies (such as, moveable walls, crockery, utensils and other refreshment essentials as well as the workshop materials (sticky notes, Lego, paper, templates and pens)), recruiting participants and distributing and collating responses to the pre-workshop questionnaire.

The latter allowed us to set exemplar complex challenges and allocate participants to groups to tackle one each of the challenges.

Workshop management

On the day our team comprised four moderators and a photographer. We had the help of two extra people at the start and end of the day in setting up the room and tidying-up at its close. Our participants worked at TU Dresden or one of the DRESDEN-concept partners. Their job roles were various and included team management, budget responsibility or a task-related management function predominantly in administrative or science-supporting work.

To help our attendees in developing skills in divergent and convergent thinking as well as designing creative solutions, we mainly relied on the methodological framework and methods tried and tested at the Dresden and Birmingham international workshops.

The tools we used are summarised in the table above. Due to our relatively long schedule, we were able to use more than one tool at each stage and check that teams had grasped the basics before they moved to the next stage. For example,



TUD - marshmallow tower

we included team bonding exercises: creating individual profiles and building a marshmallow tower - see pictures.

Each group then undertook an in-depth exploration phase including interviews and user motivation analysis to surface the challenge as 'How might we....?' for a specific persona. Create included brainstorming, brainwriting and send a postcard - closing the first day with each team having a solution for prototyping on the following day.

In our opinion, prototyping is a very important stage in the design thinking process and we devoted the final half day to that process as well as testing and evaluating the workshop as a whole.

The challenges proposed and tackled by our participants were:

1. How can we activate a demotivated employee to best use his knowledge and skills for the long-term team vision or for the team as a community?

Prototype: Storyboard

2. How can we support individual public relations staff members to use a uni-wide work-flow, its structures and its network?

Prototype: LEGO walk-through

3. How can we combine different competencies in strategy development effectively?

Prototype: LEGO walk-through

4. How do we use design thinking methods in a team setting to achieve a project goal (eg, the introduction of a wiki)?

Prototype: LEGO walk-through

5. How can I (as a leader) organise a team where personnel change regularly? (How can we help a long-term employee to work well with a new employee who takes over part of his work?)

Prototype: LEGO walk-through picture presentation with pitch.



TUD - meeting the team



TUD - prototype building

Evaluation

Our participants enjoyed the workshop and felt that they would use design thinking in their future work. Examples of opportunities they identified were:

- Introducing the culture of iterative problem solving in group work methodically.
- Designing work-flows more effectively and efficiently by incorporating interdisciplinary cooperation.
- Creating more sustainable solutions through creative processing and efficient documentation.

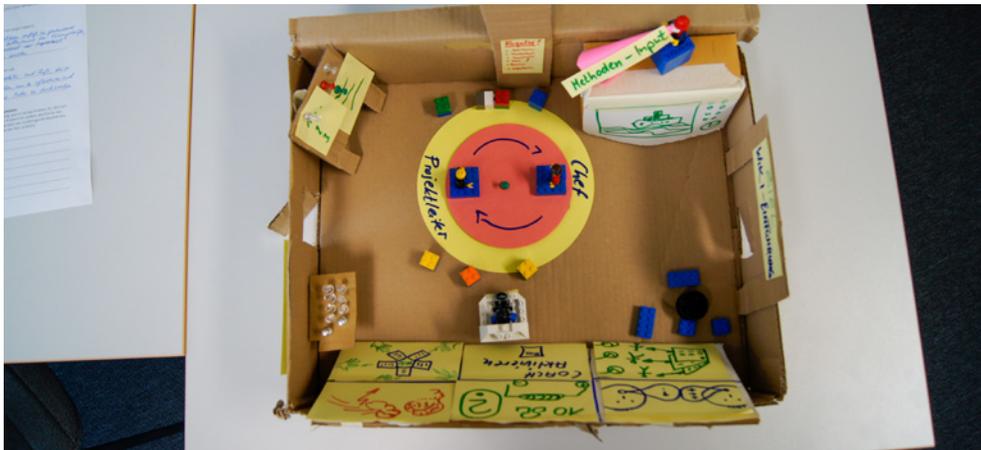
Tips and recommendations

- Using a local network, such as the DRESDEN-concept research alliance, can be helpful in attracting participants.
- Take time to present completed example templates for each method to aid understanding.
- Let people clear their working tables and meet afterwards for a final feedback session.
- Some people don't like music as a trigger during brainstorming.
- Brainstorming variations should start from bad and go through to childish.

- Allow people to change groups during the workshop if they so wish.
- Try 'Kill your idea' as an alternative to 'Send a postcard' because voting and choosing (convergence) can be covered in brainwriting.
- Try to build the timetable round the needs of participants, eg we found that a 9am start and lunch break at 1pm is too late for administration managers (which is different from researchers!).



TUD - prototype example



TUD - prototype example



TUD - prototype example

WWU MANAGER WORKSHOP

Summary of design thinking tools used

	Form and define	Introduction to design thinking and the DT.Uni project
	Explore	Defined challenge Who? What? Why? How? Persona Challenge defined with 5 x Why?
	Create	Brainstorming Clustering Brainwriting Letter to
	Prototyping	Warm-up exercise Introduction to prototyping Final choice for prototyping Prototyping in groups Testing and feedback on prototypes
	Evaluation	Learn/keep/try/kill Reflection

Team

Olga Pliszczynska-Mokijewska, Head of the International Cooperation Center, UMCS [Delivered at Westfalische-Wilhelms University (WWU), Münster, Germany.]

Participants

The six participants were five employees and one student from WWU Münster

Workshop management

In a different fashion from the others, this workshop was delivered solely by myself Olga Pliszczynska-Mokijewska (UMCS) for staff and one student from Westfalische-Wilhelms University in Münster, Germany.

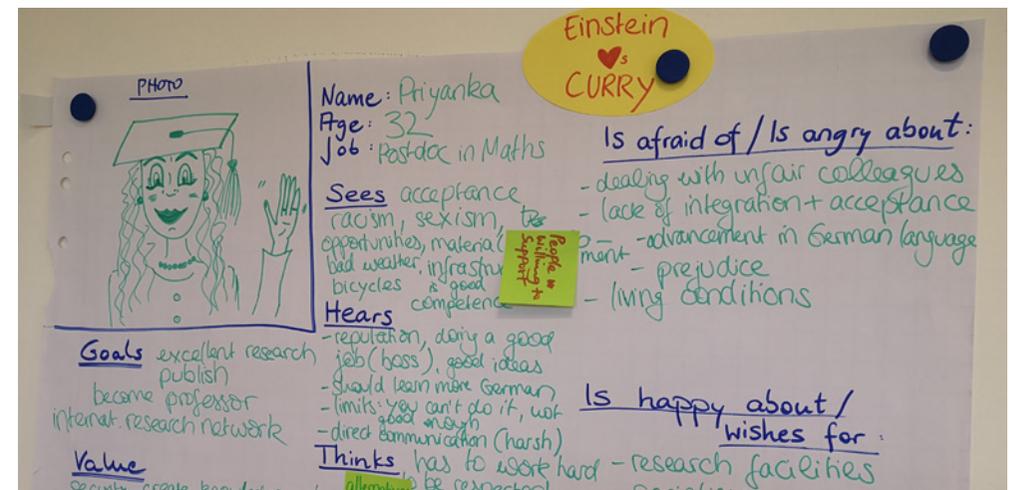
WWU was keen to explore using design thinking to redesign its website dedicated to PhD candidates. Based on my experience I felt confident that I would provide a useful and practical experience in one day. I had also attended the Birmingham workshop.

Therefore, I developed a schedule based on an eight hour timeline for two groups to tackle the same challenge of revamping the website.

The methods I chose are summarised in the table above. Briefly we covered an introduction to design thinking and the DT.Uni project. We then used Who? What? Why? How? to develop a persona (see picture). The explore stage finished with a definition of the challenge based on the 5 x Why? tool.

For creation I chose brainstorming, brainwriting and letter to, for the groups to summarise their ideas.

The afternoon session comprised a post-lunch warm up, introduction to prototyping and the actual prototyping in groups. We followed with testing and feedback on the prototypes. I rounded the day off with reflection on the overall process and an evaluation of the workshop.



WWU - persona

Evaluation

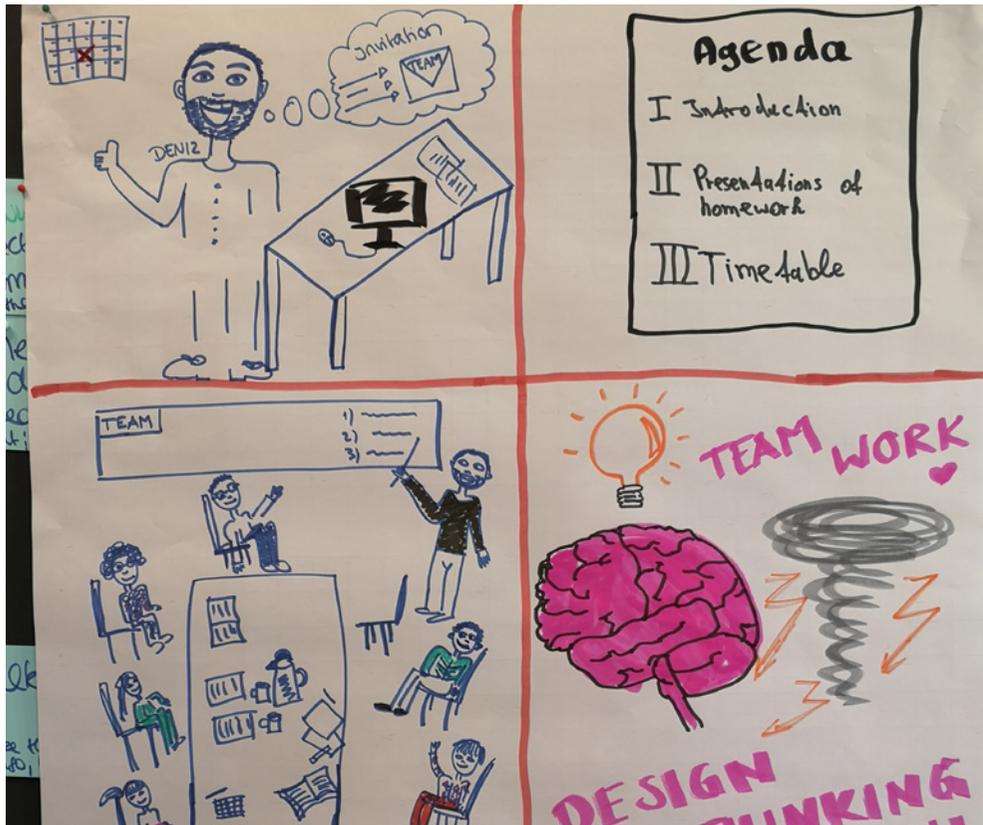
From my own point of view, the workshop was well received and worked well, despite the relatively small group and only me to facilitate.

Based on before and after questionnaires the participants have improved their knowledge and gained skills in design thinking approach. The participants were very satisfied with the workshop.

Examples of their feedback include:

'It's creative, interactive team-work, which also reveals hidden agendas that you didn't think of in the first place.'

'The whole process is not only team building but you also get closer to what you need to do as a team to find a solution for a problem.'



WWU - storyboard



WWU - working group 1



WWU - working group 2

SECTION 3:

LOCAL WORKSHOPS FOR ACADEMICS

Section 3 describes six workshops for academics held by project partners following the international workshop organised by TU Dresden. As with the other sections, the workshop descriptions provide HE managers with exemplars of managing sessions to aid understanding of design tools and techniques in their own institutions.

Maria Curie-Sklodowska University, Lublin, Poland (UMCS)

Workshop held 14 and 15 November 2018 at Ecotech Complex, Lublin, Poland and delivered by UMCS

Birmingham City University, Birmingham, UK (BCU)

Workshop held 7 November 2018 at BCU and delivered by BCU

Instituto Politécnico da Guarda, Guarda, Portugal (IPG)

Workshop 1 held 5 and 6 July 2018 at IPG and delivered by IPG

Workshop 2 held 11 and 12 October 2018 at IPG and delivered by IPG

Workshop 3 held 21 December 2018, held at Instituto Politécnico de Viseu, Portugal and delivered by IPG

University of Economics, Bratislava, Slovakia (UEBA)

Workshop held 11 and 12 October 2018 at the Faculty of Commerce, UEBA and delivered by UEBA



UMCS ACADEMIC WORKSHOP

Summary of design thinking tools used

	Form and define	Introduction to design thinking
	Explore	SCAMPER Persona Who? What? Why? How?
	Create	Brainstorming Brainwriting Letter to
	Prototyping	Introduction to prototyping theory and examples Build prototypes working in groups Present to the rest of the workshop
	Evaluation	Trash bin/suitcase/mincer Learn/keep/kill

Team

Lidia Pokrzycka, Barbara Bilewicz- Kuźnia, Ewelina Panas, Kamil Filipek, Joanna Górka (Dresden attendees) Prof. Anna Jarosz-Wilkotazka (design thinking expert)

Attendees

Participants comprised 17 young researchers and academics from Lublin's HEIs: 12 from UMCS (humanities, political science, economics, biology and biotechnology) four from the Medical University in Lublin and one from the University of Life Science in Lublin

Pre workshop organisation

To build the agenda for the workshop, the UMCS team held several meetings based round design thinking techniques. These started with 'empathy' and 'exploring' to sum up and evaluate the DT.Shop in Dresden. Our brainstorm conclusions were:

- organise the workshop space and hold the two days in the same place;
- have rules of engagement;
- send materials to participants before the workshop; and
- provide a chance to get feedback about the final project.

We then developed the general plan and agenda. Individual team members took responsibility for separate phases, specifying tools, tasks and materials.

As project manager, Joanna prepared the workshop presentation, including instructions for each phase. She also took charge of the logistics, communicating with participants, booking rooms and securing supplies such as sticky notes, tape, paper, flipcharts, markers and Lego for prototyping.

Workshop management

We ran the workshop as a two day event, working for four hours each day. Our agenda and the tools we used are shown above. Briefly, the first day covered an introduction to design thinking, the rules of engagement for the workshop and the explore and create phases. The second day included prototyping, presenting the solutions, workshop evaluation and a final round up.

We made sure that participants had explicit instructions for each task and a schematic of the design thinking process so that they could keep track of progress. All team members took active roles during the workshop:

- Joanna was the organiser, time keeper and ran the workshop evaluation.
- Anna, our design thinking expert, was responsible for summing up and giving feedback to participants.
- Ewelina, Kamil, Lidia and Basia led their assigned phases, giving instructions and checking understanding as well as providing feedback after the presentations.

We felt that dividing the work that way went well. Everyone knew what to do and who had the final word if we had problems or misunderstandings. The table on the next page shows the challenges and solutions that arose in the workshop.

In future we will focus more on the timetable, thinking through how much time we need for each phase. For example, we will allow more time for exploring - it is a key phase and the participants need time to understand and define the challenge. On the contrary, we found that the prototype stage took under the two hours we had allocated to it.

However, this provided an opportunity to spend more time on the groups presenting their prototypes and getting feedback, making this phase of the workshop the most fruitful. We saw how engaged they were and what great solutions they prototyped for all challenges.

Straight after the feedback session we asked the participants to sum up and evaluate the workshop using the kill/keep/learn tool - see photo.

We evaluated the workshop from both the participant and team perspective. We felt that the workshop was a very effective event. Our work benefitted from ongoing iteration during the workshop. Importantly, the whole workshop was well prepared and the participants were very satisfied.

Tips and recommendations

- Send design thinking information prior to the workshop - this helps participants to understand the approach.
- Ask participants to choose the challenge before the workshop.
- Prepare detailed instructions for each tool and demonstrate how participants can use the tools and strategies.
- Divide the work between moderators/ facilitators and appoint the 'leaders' of the process to make it clear who is responsible for giving instructions to the participants.
- Give space for team members to discuss all challenges in a group.
- Plan coffee breaks during the workshop.
- Think about how to arrange the space - use walls if you do not have boards.
- While you are planning the time for each task, add about 15% extra time, just in case.
- Have good background music.
- Evaluate the workshop with the facilitating team and celebrate success together!

Group	Challenge	Solution
1	Difficulties in time management and work-life balance for scientists	A time-planner, both in paper and as a mobile app, to make it easier to maintain work-life balance, plan and organise work, including the delegation of tasks to others and teamwork.
2	Lack of motivation for learning in students	A game prototype, which can be discipline specific, comprising mechanisms to show students that learning, acquiring new skills and competence is not boring, as well as leading to success in the job market. The pilot phase should verify which mechanisms are the most effective. We would also use consultants to adjust the game to the given discipline.
3	How can we improve internal procedures for the scientists to submit more well-prepared applications for research projects?	Create a webpage where scientists can find the following: <ul style="list-style-type: none"> • information about research funding agencies' calls and competitions; • a forum type feature allowing contact with other scientists interested in a call and to create a research team; • infographics depicting the procedure and steps of submitting an application and who should be involved in the submission process; • information on what mistakes are made the most often - opinions/excerpts from the reviews of other applications submitted in similar contests.
4	Inadequate competence and skills of the scientists	Create a competence development centre for scientists - a place where they could examine what they lack, eg, in soft skills and receive support in the form of specialised workshops or training developing their skills. The centre could put emphasis on feedback right after the support is given and after some time has passed to ascertain the effectiveness of the support provided.



UMCS - workshop facilitators



UMCS - feedback and presentation session



UMCS - evaluation [Bartosz Proll]



UMCS - persona template

BCU ACADEMIC WORKSHOP

Summary of design thinking tools used

	Form and define	Introduction
	Explore	Respond to set challenge and personas Customer journey
	Create	Brainstorming Brainwriting
	Prototyping	What is prototyping? How to prototype? Initial prototyping session (self-guided) Peer review session Finalising prototype and presenting it to other workshop participants and facilitation team
	Evaluation	Reflection

Team

Zuby Ahmed; Claudia Carter; Kathryn Burns; Susan Sisay (Dresden attendees); Charmaine Stint (project manager)

Attendees

There were 14 participants, three from external HE organisations, the remaining 11 from BCU. All participants were academics/researchers.

Some participants were familiar with design thinking but did not necessarily actively implement the process within their teaching or academic working practice.

Pre workshop organisation

In a similar vein to UMCS above, the BCU facilitating team held a number of meetings to plan the workshop. Again, we started with a discussion of the learning points from the Dresden workshop. We particularly concentrated on condensing the five day format into a single day. We felt that our target participants would find it difficult to take more than a few hours from their duties, as well as considering the travel arrangements and expense for those coming from external organisations.

The workshop structure was then prototyped as a slide deck, incorporating the tools and techniques, eg, brain storming, brainwriting and prototyping, that we had found valuable in the Dresden workshop. In all, pre-planning took about seven days person time across the team, comprising four half-day sessions and sharing of information and preparation of material in between meetings via a shared online directory.

As a team we produced 'ground rules' for facilitators and participants. These included a facilitator being allocated to each group. The intention was to clarify instructions but not lead or coach groups as well as providing the lead facilitator time and space to run their specific session in the way they chose without interjection. This is very similar to the UMCS facilitation described above. Overall, we wanted to encourage a general feeling that this was a 'safe' space to test out thinking and to explore the design thinking process without pre-judgement.

Workshop management

Our workshop was run as a one day event, using the tools summarised above. To condense all phases into one day, we decided to provide the groups with a single challenge:

How can you motivate students to engage within the teaching & learning experience?

We also provided a set of personas:

Student persona 1: overseas male, age 20, lives in student accomodation

Student persona 2: local male, age 18, lives at home

Student persona 3: UK female, age 19, lives in student accomodation

Student persona 4: UK female, age 27, lives alone, previous life experience

We explained the process of building a persona and participants could amend or enrich their persona as needed.

Group	Prototype solution
1	'Connected Spaces' – Improving cultural inclusivity because universities are culturally siloed spaces
2	'Innovative and engaging classroom' – Creating a diversified teaching and learning selection strategy
3	'Experimental Learning + industry' – How to embed opportunities to engage with industry into the curriculum

Notable during the delivery of the workshop were fluctuations in group dynamics and engagement with the design thinking process. Group members did not know each other at the start of the workshop but all groups seemed to develop good interdisciplinary communication and collaborate well. However, in one group there were initially some tensions - issues of people wishing to explain a lot/being dominant/being quite outspoken and precise.

As sessions progressed, especially during the prototyping phase, these tensions seemed to dissolve and productive working relations and a more relaxed atmosphere were evident. All participants engaged with the different methods although some methods needed repeated explaining.

The prototype solutions are shown in the table above. Two groups developed prototype outcomes using post-it notes and flipchart paper, the other produced a slide deck. During the prototype presentation, one group presented outdoors to highlight the importance of connecting to our local and diverse communities: a key strategy for BCU.

We too evaluated the workshop from both a participant and a facilitator perspective. All participants expressed that they very much enjoyed using design thinking. They found the approach very effective, producing better and more advanced ideas and solutions than they had expected from the day or if working by themselves or in their usual environment. Indeed, our three externals would like to run the session in their own institutions.

As a team we too felt that the workshop had been effective and enjoyable. However, getting people to attend for just one day was difficult, as well as managing the group dynamics and level of facilitation. We also felt that we should have worked harder to encourage participants to consider how they might use design thinking in their own teaching practice.

Tips and recommendations

- To get a good attendance, consider how to get busy people to commit a day to the workshop possibly through explaining the process and benefits of design thinking more explicitly prior to the event and/or choosing dates outside of term time.
- Most academics face similar issues so the challenges and the personas can be developed beforehand to save time on the day.
- Use peer review sessions to reinforce learning and exchange ideas.
- Consider the level of facilitation - we kept this to a minimum, but feedback suggests that participants would have liked more direct facilitation.
- The action of working together in a team to prototype was the most useful stage – a simplified version using just paper and sticky notes was very effective.
- Small group of 14 participants worked well as it supported good interaction.

Many colleagues want to implement this process with MA/PhD student groups and colleagues – this one day compressed version seemed to work very well and could be used more widely within the teaching process – how can we further support and help academics to implement this?



BCU - presentation

IPG ACADEMIC WORKSHOP

Summary of design thinking tools used

	Form and define	Introduction to design thinking Clarifying the challenge with storytelling
	Explore	Personas User motivation analysis How might we?
	Create	Brainwriting and ranking Send a postcard or Tweet
	Prototyping	Prototyping in 2D and in 3D
	Evaluation	Reflection and evaluating – peer, self and user assessment

Team

María del Carmen Arau Ribeiro, Pedro Rodrigues, Noel Lopes and Natália Gomes who had all attended the Dresden workshop

Attendees

Professors, researchers, managers, administrative staff and students from Polytechnic of Guarda and Polytechnic of Viseu drawn from a variety of disciplines including: mathematics, language and culture, computer engineering, education and pharmacy. Most participants did not have previous knowledge of design thinking.

Pre workshop organisation

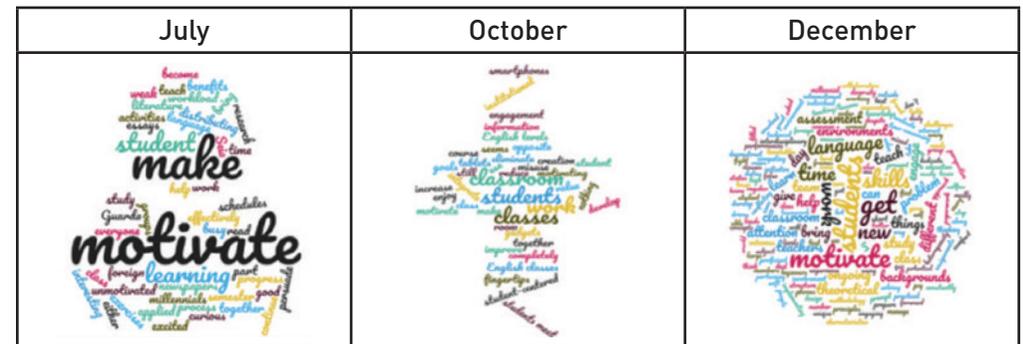
In building the agenda for the workshops, we considered two schedules: 10 hours over two days and eight hours in one day - our thoughts on workshop length are presented later.

Two weeks before the workshop, we used responses to a questionnaire to tailor the workshop schedule according to the design thinking knowledge and interests of our participants. The questionnaire also allowed us to gather

challenges (through responses to 'How can we...?'). The table below shows word clouds for the three events, highlighting common and dissimilar issues.

From our experience in Dresden, we felt that the group dynamics were fundamental to the success of the workshop. Therefore, we put some effort into covering team formation throughout the workshop as well as creating workshop groups. Prior to the workshop, we formed the groups depending on their research/teaching area so that they were characterised by diversity. We also put people with similar challenges together, so that they could focus on their issues with others.

This work in advance takes time but makes a big difference in the interdisciplinary nature of the groups in the workshop.



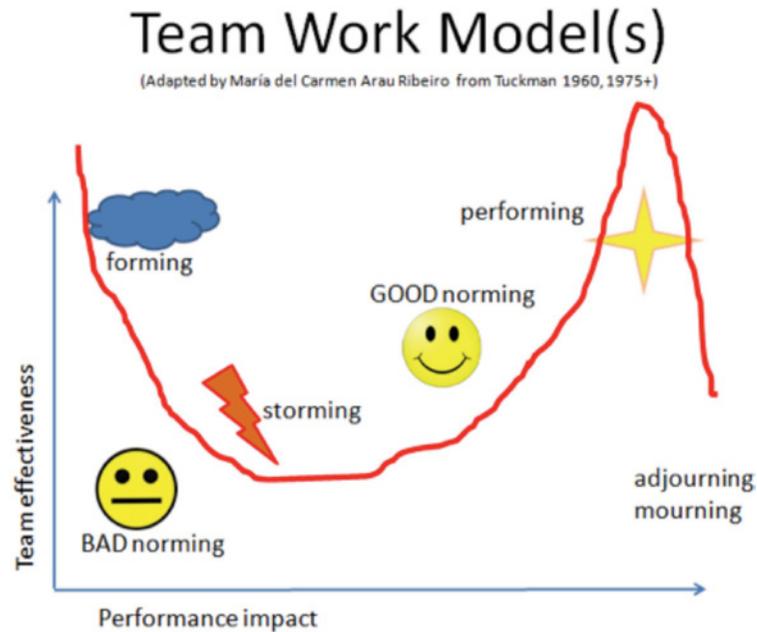
Workshop management

Our agenda is shown above. Briefly we provided an introduction to design thinking and interdisciplinary team work; clarifying the challenge with storytelling; exploring including persona, user motivation analysis, and 'How might we...?'; creating with brainwriting, ranking, and sending a postcard/telegram/tweet; 2D and 3D prototyping with pen and paper and evaluation both individual and peer review.

As with the other academic workshops, each team member had clear roles. María presented the introduction and the tools and techniques. Then María, Pedro, Noel, and Natália circulated from group to group to guarantee a clear dynamic and offer constructive criticism, enhancing the error tolerant culture of the event.

As mentioned above, extra time in the introduction to the workshop was dedicated to what can happen in teamwork, based on ongoing research begun by Tuckman (1965). This alerted teams to the reality that working well together requires effort and ultimately the success of the team depends on the commitment of each individual.

Participants were also warned that feeling frustrated is a natural part of the process, when working together, since not everything is exactly what you might choose. Everyone was encouraged to communicate ideas clearly and diplomatically, with care not to offend others who do not share their opinion.



We also set a rule: no secretaries. Everyone should be hands on for all activities. Haptic work, for example, drawing and writing, produces kinetic energy and helps participants to engage their brains more effectively. Moreover, it is important to create an error tolerant culture, encourage wild ideas and allow for mistakes that can be identified for further improvement.

In comparing the workshops, we felt that the 10 hours over two days was more beneficial as it allowed extra time for applying the tools and techniques. An afternoon break provided time for bonding as well as catching up on normal duties. Further, some participants took time to do their own research in the afternoon free time.

We felt that although a one-day workshop is more economical in terms of time and expenses, it may not result in a group bonding experience including all the participants. Instead, connections are only felt only within separate groups.

To counter this and try to promote group bonding we deliberately incorporated joint feedback sessions into the event. These are shown here:

Analogies - if your challenge were:	... a meal, what would it be and where would you eat it? ... a sound, what would it be and where would you hear it? ... a symbol/icon/emoticon, what would it be?
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Finessed challenge:	How might we help [persona] to meet her [challenge] within her [specific context]?
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Elevator pitch:	Project name Slogan Problem to be solved/need to be met Solution Benefit
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Peer review	Evaluating prototypes of other groups
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Tips and recommendations

- Workshop dates should be selected carefully, preferably outside of the teaching timetable, and considering the needs of your target participants.
- Make sure that different levels of staff will feel comfortable working together and expressing themselves freely.
- If you know in advance that certain participants do not work well together, be sure to place them in separate groups initially. You can bring together diverse points of view later when people feel comfortable with the design thinking process.
- Include students in workshop groups to guarantee a variety of perspectives as well as reminding participants of the fundamental importance of ignoring the local hierarchy.
- Convince all participants to help with writing out ideas and organising sticky notes.

In terms of further dissemination, participants have been asked to return as facilitators in following sessions and the response has been very helpful for creating and maintaining dynamic interaction in the teams. Seven academics have voluntarily participated in subsequent seminars and the initial students have been present in all three seminars. This continuation is another way of nurturing a design thinking orientation on campus and keeping more people talking about how to implement design thinking.

UEBA ACADEMIC WORKSHOP

Summary of design thinking tools used

	Form and define	Introduction to design thinking Marshmallow tower
	Explore	Who? What? How? Why? Personas
	Create	Brainstorming Brainwriting Letter to Matrix scale
	Prototyping	Introduction to prototyping and building a prototype, working as a group Presentation of prototypes
	Evaluation	Reflection

Team

Veronika Nekolová, Barbora Paholková and Miroslava Prváková who had all attended the Dresden workshop.

Attendees

19 teachers, 11 from UEBA, eight from other universities in Bratislava: Comenius University, Pan – European University and Slovak University of Technology, drawn from medicine, informatics, commerce, business management, psychology, design and architecture.

Pre-workshop organisation

As well as trying to pass on design thinking principles and processes to our academic colleagues, we had two additional aims:

- To improve the participants' transferable competences and soft skills including creativity; teamwork; flexibility; 'learning to learn' and problem solving.
- To increase understanding of interdisciplinary education and design thinking.

The facilitation team, led by Veronika, was responsible for the organisation. Additionally, business student, Patricia Doková, ran direct mailing as well as supporting other activities and freelancer, Marek Bellay, worked on marketing and photography.

In line with other academic workshops, we focused on various elements to ensure that the workshop was successful. These included preparing and briefing team members, recruiting participants as well as planning the workshop content and developing a robust time schedule.

Based on our Dresden experience, as well as our delivery of the Talentway programme, see later, we chose the design thinking tools that we felt would be most effective to meet our objectives given above.

These included warming up by building a tower of marshmallows, brainstorming; persona development; Who? What? Why? How? questions; brainwriting; letter to Grandma; matrix scale; prototyping and presentations

Workshop management

Our groups covered four challenges:

1. Social innovations including Roma children via integration into primary schools.
2. Financial literacy of older people.
3. Apathy in old age.
4. How to motivate the college students to be active in the teaching process.



UEBA - workshop participants



UEBA - workshop group

SECTION 4: EXAMPLES OF USING DESIGN THINKING IN AN HE CONTEXT

This final section comprises two practical implementations of design thinking.

The first describes how the International Cooperation Center (ICC), Maria Curie-Skłodowska University (UMCS) has implemented design thinking to improve existing services and develop new ones.

The second describes the Talentway programme, developed by University of Economics in Bratislava (UEBA), to incorporate innovative techniques into the teaching process.



UMCS IMPROVING MANAGEMENT PROCESSES

Tools summary

	Form and define	Individual interviews
	Explore	Braindumping Brainwriting Brainstorming Clustering Filtering: 'to forget', 'for later', 'to develop'
	Create	Braindumping Brainwriting Brainstorming Idea development board Dot voting to prioritise
	Prototyping	Prototyping chosen ideas Testing with clients
	Evaluation	Final review

Team

Olga Pliszczynska-Mokijewska, Joanna Górk, Magdalena Pokrzycka-Walczak, Diana Skwarzynska and Matgorzata Potudniuk

Background

The International Cooperation Center (ICC) is the central administration unit at UMCS. The unit is leading the DT.Uni project as well as supporting academic staff to develop and implement international projects. This case study covers how design thinking has been used during weekly International Research Projects (IPR) team meetings. The implementation of new innovative tools is spearheaded by Olga Pliszczynska-Mokijewska, Director of ICC.

Through early exploration we, as the IPR team, found that one of the main barriers to implementing design thinking tools was time. In response, we have

begun to embed the approach in our day-to-day working practice. In particular, design thinking tools are used to facilitate the team in generating new ideas to develop and improve existing processes in our daily work as well as finding better solutions to challenges.

Process

The outline of our process is shown in the table above and is described in more detail below. The following describes our process in more detail.

Explore – interviews

One of our challenges as the IPR team was to find ways to increase internal support for researchers in research project application and management. To start our design thinking process, we empathised with our users by conducting more than a dozen interviews with researchers from our university representing three key groups:

- those engaged in international research projects;
- those engaged in research projects, but not international; and
- those not engaged in the projects at all.

Primarily our current support includes call selection, preparing applications for the call and project implementation and management. We based our interviews on these activities, devising the following questions:

1. What kind of international research projects have you implemented?
2. Have you prepared the project application without any support?
3. Have you received support from other researchers at the Faculty (eg, mentor, team colleague)?
4. What was the most problematic aspect in the process of applying and implementing the project?
5. How did you overcome these difficulties? (alone and/or in cooperation with ICC?)
6. Is it possible to avoid these difficulties in the future? How?
7. Are you considering applying in the future for other international research projects?
8. What could you do differently by applying in the next round of competitions?
9. Do you think that applying for international research projects is difficult? If yes, why?

10. What factors encouraged you to submit your application?
11. What factors do you think contribute to why your peers do not apply for support?
12. Do you think that as a university, we support scientists enough in the process of applying for international research projects?
13. What other activities could we implement to increase the number of applications submitted and improve their quality?

It took three people a few months to complete the interviews as they were an additional, non-priority task.

Explore – establish the challenge

The second step was to define the main problems and challenges as well as considering suggestions for improvement. Here, we combined the findings and ideas from the interviews with those from our own experience and observations.

As part of a brain-dumping process, we shared the information on a flipchart using sticky notes and clustered similar items. We then moved our thoughts into one of three groups:

- 'to forget' (impossible to implement or no influence by our team);
- 'for later' (inspirations, not urgent, original ideas); and
- 'to develop' (most important, ideas for improvement and implementation)

This exercise took approximately 15 minutes and resulted in a list of ideas on sticky notes, as shown below.

Create – Idea Development Board

From the 'to develop' group each team member chose one idea which was in their opinion the most valuable. The four ideas chosen were:

- to standardise IPR's support;
- to change the way colleagues are informed about research calls;
- to organise meetings and information sessions with IPR; and
- to help find partners for researchers.

We then used Idea Development Boards (IDBs) to expand our selected idea by drawing or describing it, defining resources and investments needed for implementation and pointing out crucial elements. After 10 minutes we had four IDBs - see following.

Creation - brainwriting

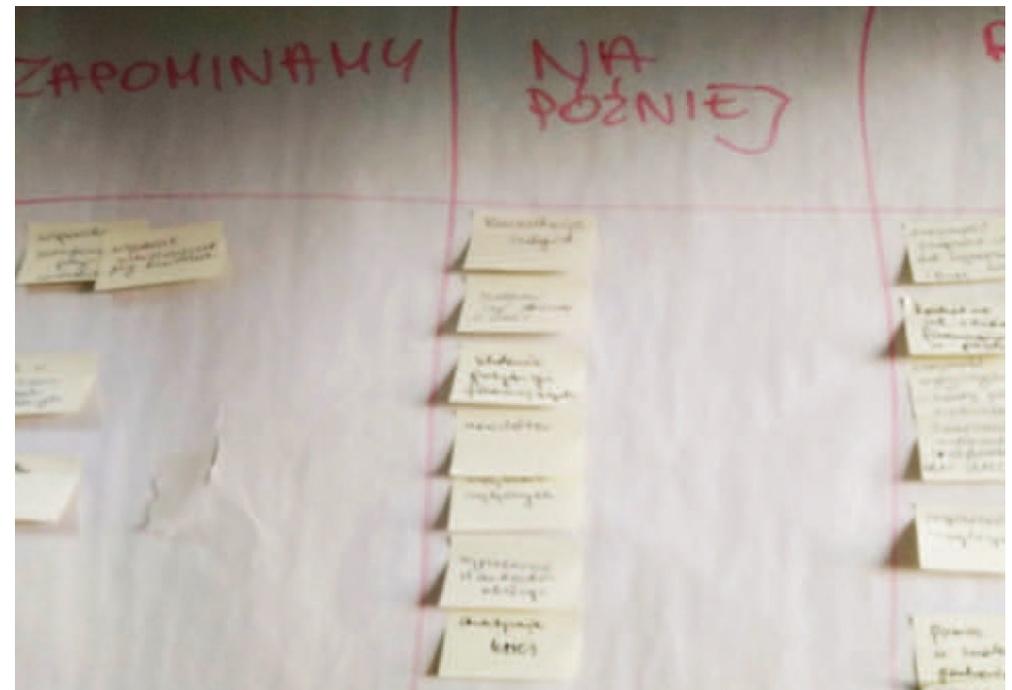
For our next phase we used brainwriting. Each person had three minutes to write their ideas on sticky notes developing the initial concept from a given IDB. These were then shuffled and passed around the group for further ideas to be added by a different person. We all commented on every IDB taking 12 minutes in total. These are shown above.

Creation - prioritising

For the final stage, we used dot voting to decide which idea to implement first. We each had six votes: three for the most important IDB; two for the second most important; and one for the least important.

Outcome

Two months on, the team are developing and implementing the ideas selected in the above process. At the time of publication, we have focused on the two most important IDBs, based on the dot voting: customer service standards and an outline of our service offer across three stages to support colleagues raising funds for a given project and its implementation.



UMCS - idea selection board

Evaluation and conclusions

All participants found it an extremely useful process. Design thinking techniques work reasonably well in teams that consist of employees with different backgrounds and experience. It helps to open minds, exchange good practices and learn how to work in a more creative and divergent thinking way.

It also shows strengths, talents and weak points, helps to identify an individual's role on a team as well as improving soft skills and communication between team members. The tools are an excellent technique for improving team management. Using them has changed the quality of the ICC team meetings, enabling us to develop fresh ideas for complex challenges and helping to engage every team member.



UMCS - idea development boards

UEBA - USING DESIGN THINKING IN TEACHING

Team

Veronika Nekolová, Barbora Paholková and others.

Introduction

This case study shows how UEBA has incorporated innovative techniques into the teaching process. It is important to note that there is no absolute difference between the roles of teacher, researcher and manager in the Slovak education system so that lecturers undertake duties in each area. Further, the education system in Slovakia has its own peculiarities as highlighted in the vignette below.

The Talentway programme

In 2011, UEBA's Faculty of Commerce joined the 'HITECH Zentrum in der Region Grenzüberschreitenden' (HITECH Centre in the Cross-border Region) project. This was led by Technische Universität Wien (Vienna University of

Technology) and included Wirtschaftsuniversität Wien Institut (Vienna University of Economics and Business).

This collaboration led to our development, in 2012, of the Talentway programme. We started with interdisciplinary clubs where industry partners provided project assignments for students. Further key stages are shown in the following timeline.

Timeline:

2014 – Talentway programme is accredited by the University.

2015 – introduction of the principles of project based learning and design thinking to develop new subjects for the Faculty of Commerce.

2016 onwards – workshops and training for lecturers at UEBA.

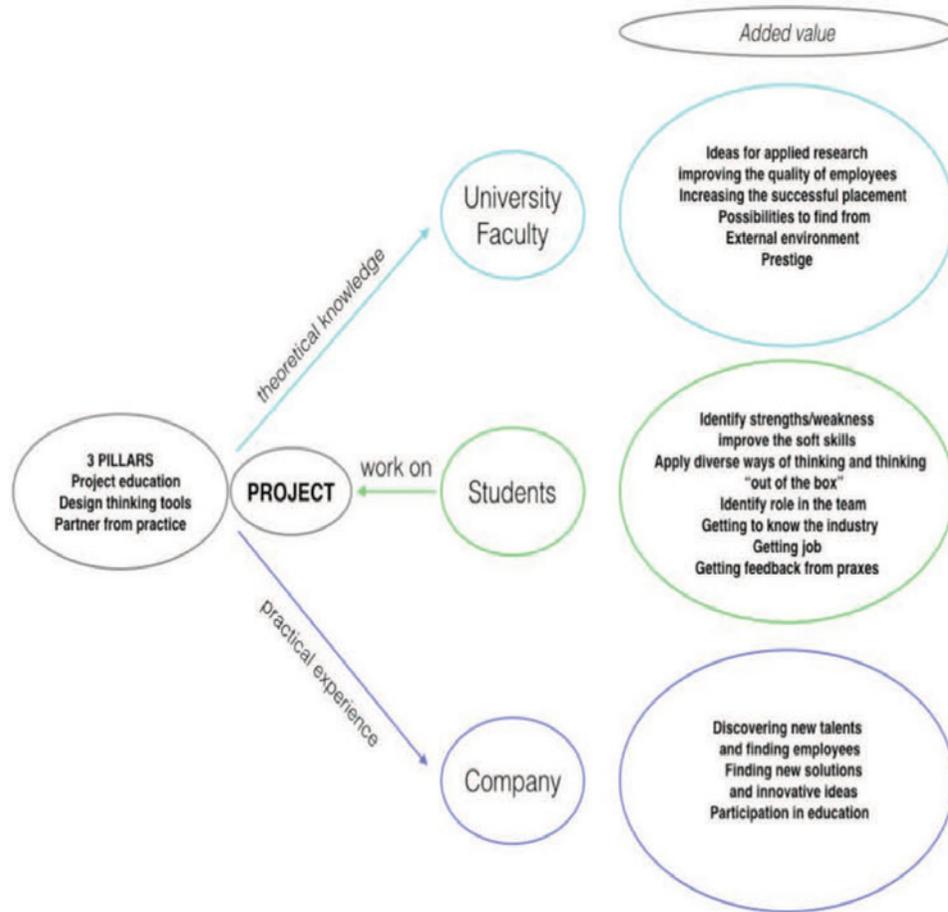
2018 – UEBA collaborates with other universities to further develop project based learning and design thinking teaching as well as involving students in interdisciplinary teams and projects across universities.

Thus, Talentway is based on three pillars: project-based learning; design thinking tools; and industry partners. The system and relationship between university, student and company is shown in the figure below.

The Slovakian education system

The education system in Slovakia has its special features as described below. These are based on interviews with three senior managers in two Slovakian universities undertaken in 2018 and combined with our own experience.

- In general, course content and delivery methods are fixed by a particular individual, leaving little room for manoeuvre or input for other lecturers.
- Teachers are unwilling and/or unable to incorporate innovative methods into the learning process. Overall, their motivation is low.
- Those teachers who are visionaries tend to conflict with authorities who do not support 'unusual' concepts. There is a lack of encouragement for innovative approaches.
- Most lecturers use 'standing at the front of the class' teaching methods and are conservative in their approach.
- The availability of training materials implementing innovative methods and processes is almost non-existent. This applies across all levels: elementary; high school and university education.
- There is a big divide between universities and businesses: universities focus on developing students' knowledge in their field of study, while businesses require students to develop a broad mindset in order to deal with complex problems.
- Students are reluctant to challenge authority. This makes it difficult to provoke debates between teachers and students as well as among students themselves.



Talentway relationships

Design thinking in courses

In addition to the Talentway programme, we have implemented design thinking tools in the three courses: Innovation Management, Professional Practice and Business in Practice. The number of students studying the courses range from 140 to 250. In delivering the courses, students work in groups of 4 – 6 on projects set by our industry partners.

The design thinking tools that we use include:

- Brainstorming;
- Brainwriting;
- Persona;
- Who/What/ Why;
- Letter to grandmother;
- Prototyping

Courses also include project-based learning.

Evaluation

In 2018 we conducted a survey to evaluate our use of design thinking tools and project-based learning. We discovered the following barriers to implementing design thinking processes in the current UEBA education system:

- ability to influence a change in the mind-set of the teachers, managers (eg, department heads, Deans and Vice Deans) and students;
- strong hierarchical structure;
- unfamiliarity with new teaching methods;
- fear of change;
- financial costs (materials for design thinking tools);
- education costs: training for management and teachers; and
- classroom equipment (adaptation to teamwork, IT technology, PC, presentation software).

However, we have also found many positive aspects, advantages and benefits as below:

For the faculty/department:

- to recognize and apply different ways of thinking;
- to become more effective in diverse ways of thinking;
- to discover new talents in interdisciplinary research teams;

- to adopt new, innovative ideas for applied research prestige;
- opportunities for applied research due to the inclusion of companies into the learning process;
- a constant flow of true-to-life background information from several companies; and
- an increase in prestige due to the higher quality of study programs

For students:

- to recognise and apply diverse ways of thinking;
- to identify own strengths and weakness;
- to improve soft skills such as critical thinking, divergent thinking, teamwork, cooperation, creativity and thinking outside-of-the-box;
- to identify one's preferred role in the team;
- increased success rate in their search for their first employment; and
- understanding of industry and receiving feedback from experts and employers.



UEBA - researchers and managers workshop

For businesses:

- to acquire new ideas and different points of view;
- to discover new talents and gain new proven employees;
- to improve the quality and education of future employees.

Training

Key to using these new techniques and processes is training and investigating their implementation in the workplace or education. Therefore, we have been organizing workshops for academics, researchers and management staff since 2017. These cover project-based learning; design thinking and their application in university departments. Between September 2018 and March 2019, we have trained 103 people with participants from nine universities and 17 faculties.

These workshops have established several research groups as well as teams of teachers who would like to develop design thinking and project-based learning at a local level.



UEBA - a prototype from an academic workshop

OBSERVATIONS AND RECOMMENDATIONS

Introduction and overall observations

This handbook is intended as a practical guide for managers using design thinking in a higher education context. The DT.Uni project has involved nearly 200 organisers, facilitators and participants across Europe, providing clear evidence that embracing design thinking tools experientially in a 'learning by doing' environment is very effective.

Across the board, feedback from the 11 workshops described above has been very positive. Almost all participants have enjoyed the design thinking process and felt enthused as a result. In particular, using design thinking tools changes mindsets and ways of working. It encourages learning to be negative/positive (kill/keep ideas) as well as helping people to leave their comfort zone. Finally, by fostering the notion that the result does not need to be perfect, it promotes faster working.

This handbook describes our joint experience of producing 11 design thinking workshops as well as two other examples of using the design thinking process, tools and techniques in a higher education management setting. Combining this body of practice-based work with reflections and lessons learnt, has provided us with a number of insights into the value and implementation of design thinking for HE managers. Throughout this handbook we discuss these as well as highlighting some of the barriers that we have observed in trying to implement design thinking on a day-to-day basis.

Group working and forming groups

In his seminal work 'Change by Design', Tim Brown emphasises the importance of groups in design thinking, particularly those combining people from different disciplines and backgrounds (Brown, 2009). Accordingly, an aim of the DT.Uni project is to facilitate interdisciplinarity working to create producers of knowledge.

As described above, our workshops have emphasised working in groups, with some organisers devoting a large degree of effort into this area. This will be even more important in a normal work environment, where different levels and disciplines need to be trusted and respected to form functioning and fruitful teams.

We have observed that many aspects of the design thinking process actively facilitate group working. For example:

- Methods, such as, brainstorming and brainwriting, encourage interdisciplinary discussions and allow all group members to present their ideas. Further, groups tend not to be hierarchical and trust has formed in groups relatively quickly.
- The process encourages peer reviews, so that group ideas are discussed and assumptions challenged and/or tested in a relatively safe environment.
- In developing solutions, group members felt that they would not have arrived at such effective solutions individually.
- Group working allows a solution (or solutions) to arise from the consideration of an array of ideas and ways of combining thoughts and experiences that is far more than just one idea on its own. Further, the user (rather than the designer/idea creators/manager) is firmly at the centre of thinking throughout the process.

However, particularly in our workshops, the positive aspects of group working may result from the people involved not working together on a daily basis and where new working relationships are temporarily formed with no 'history' (good or bad) dominating group dynamics. If the group is subject to persisting relational tensions, the challenging nature of the design thinking may block ideas and stifle creativity. We also encountered situations where the attempt to use design thinking outside of workshops was resisted and seemed to be seen as a threat to decision-making power and 'preferred' ideas or trajectories.

Prototypes of solutions – testing ideas

Nearly all workshops have culminated in building a prototype as a means of hands-on shaping and testing of ideas. In a workshop or normal working situation, the prototype can be used as the basis of an explanation to help sell the idea through the institution, particularly levels of senior management, or get useful and relevant feedback from colleagues and/or potential users.

Furthermore, the model also provides an opportunity for storyboarding the user experience of the solution and/or the production of videos or pitches to visualise the proposed solution. This can help promote the benefits of the proposal in a time efficient and resource effective manner.

Managing workshops and implementing design thinking

Design thinking requires participants to accept methods that they may feel are alien. These include an appreciation of its divergent – convergent nature, moving out of one’s comfort zone and feeling safe to challenge and question, particularly in relation to assumptions. This needs to be recognised and may require careful handling in workshop or work-group situations.

As evidenced in the number of design thinking toolkits (see glossary, references and bibliography) there is a plethora of tools and techniques. This can be difficult when organising a workshop or running a management session where choosing the right tool or technique can be the difference between success and failure.

In defining the initial challenge and workshop format, the above shows a number of debates on how prescriptive versus how flexible the process should be. Indeed, as mentioned above, the relatively large body of literature regarding design thinking may imply that the process is codified and fixed. Our examples show that it is flexible and adaptable to the prevalent situation.

Further, design thinking allows exploration of a situation to identify the actual challenge, which may not be the starting point envisaged originally. However, it can be perceived that this will be time consuming or tedious for people who are keen to get on. This is explored further below.

It is also important that the overall process or a particular tool is well explained. Instructions need to be clear and easy to understand and ideally appeal to different learning styles, eg, oral and visual. Care should also be taken to check and recheck that a proposed solution addresses the identified challenge and meets user needs.

Reflection on using design thinking with students has highlighted that the different tools and techniques clearly map on to different types of learners and learning styles. Also, the design thinking techniques such as personas, empathy map, test grid and customer/user journey maps can be combined with more traditional management tools to develop new materials for small business management students.

Facilitation

At times we have found that groups did not work together effectively. Tensions arose from outspoken and dominant members, people not listening and confusion and mini-conflicts regarding instructions. The design thinking process is intense, with strictly time-bound tasks, and some people did not respond well to the pressure. In our experience, these disruptions could mostly be smoothed over with good facilitation, but group dynamics do need to be monitored to ensure effective delivery.

Related to this is the level and style of facilitation. Some groups (eg, undergraduate students and participants not previously exposed to such a creative working environment) may prefer a degree of direct facilitation and a sounding board to check that they are on the right path. Others may prefer to be left to get on with the task in hand.

We have also observed, occasionally, friction arising when design thinking experts and novices are trying to work together. Here the expert tends to want to control the process and define how it should be done rather than embracing the benefits of organic development. This can be compounded with language issues – different words are used to describe the same thing, eg, the phases of the process, or a different amount of emphasis was given to a task, or the keeping or killing of ideas. This is not always simple to resolve and can result in a direct (more linear rather than creative), task-focused approach to find the shortest route which may not provide the best solution.

Final thoughts

Undoubtedly, a major advantage of design thinking is the generation of many ideas, with the user at the centre, which are then filtered in a rational manner leading to a solution that meets with the user’s approval as well as the constraints of the environment. Further, developing a prototype takes the focus from the problem and allows consideration of how the solution is going to be used and the context of its application.

However, despite its benefits, design thinking can be seen as a time consuming process. This view may have been compounded by attending workshops delivered over a number of hours or days. However, as discussed by UMCS above, valuable solutions can be derived in a short timeframe. Further, ensuring that the right problem is being solved through exploring the challenge or prototyping the solution to demonstrate thinking and benefits can save a lot of time in the long term.

In conclusion, our advice is try it! It may change your working life for ever.

GLOSSARY OF DESIGN THINKING TOOLS

The following provides an outline of tools used in the workshops described above. More details and templates are provided in the DT.Uni output 'Applying Design Thinking - a workbook for academics and researchers in Higher Education', developed by TU Dresden (Bruchatz et al., 2019) and available from the project website at umcs.pl/en/dtuni.htm and https://tu-dresden.de/ing/maschinenwesen/imm/td/ressourcen/dateien/forschung/eBook_2_0_English.pdf?lang=en

5 x Why? - investigate an issue by asking 'Why?' five times to arrive at the root cause and define the challenge.

Brainstorming - generate ideas without the constraint of feasibility or practicality.

Brainwriting - build on ideas through gathering thoughts from others in a group.

Clustering - group ideas according to emerging themes.

Customer journey - consider the user or customer of a product or service and map their touchpoints over time.

Dot voting - each person has a number of dots, split according to their top three (or so) ideas or solutions.

Explain to a stranger - outline a challenge for a person who is not familiar with the issues.

Keep/Kill/Try/Learn (or Trash Bin, Suitcase, Mincer) - sort ideas according to various categories to filter those that are worth discussing or taking further.

Letter to (also known as 'send a postcard' or 'write a tweet') - express the challenge and solution in a few words.

Mindmap - sort information according to themes to build a picture of an issue or problem..

Peer review - feedback from people outside of the development team.

Persona mapping - build a picture of a typical user, their hopes, dreams and fears - may use interviews or Who?, What?, How? and Why?

Prototype - a model of a solution that can be tested on potential users to test validity.

SCAMPER - (Substitute, Combine, Adapt, Modify, Put to another use, Eliminate, Reverse) helps to generate ideas for new products and services through consideration of how existing ones could be improved.

Who, What, How and Why - Answers questions such as 'Who is the user?', 'What are they doing?', 'How do they proceed?', 'How is the user motivated?', 'Why does the user do this?'

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APPENDIX I: TYPICAL CHALLENGES IN A UNIVERSITY ENVIRONMENT

Design thinking – how might we use design thinking...

- to enable staff to work together effectively in short-term projects?
- as a tool to work through issues such as the 21st century office and teaching space demands in 20th century buildings?
- within a project management process?
- to motivate colleagues to use it as an innovative approach?
- to solve work related problems using design thinking processes?

Administration – how might we...

- better understand the needs of staff, students and external stakeholders?
- develop new strategies?
- support the development of curricula incorporating interdisciplinarity, innovative teaching approaches as well as the needs of stakeholders
- improve the efficiency of processes and procedures, eg, recruiting and enrolling international students?
- manage workloads and the work/life balance more effectively?
- improve staff management and motivation?
- redefine job roles?

Research – how might we...

- develop international research?
- create and develop a research strategy?
- build a management system for research?

Students – how might we...

- encourage students to speak up and express their own opinions in a hierarchical culture?
- help more students to participate in active learning, student governance and initiatives?
- involve international students in academic activities and associations?
- improve student motivation?

Academics – how might we...

- promote communicative competence across specialty fields for teacher training in using Content and Language Integrated Learning (CLIL) in higher education?
- build new teams?
- establish new facilities such as teaching and learning centres?
- develop learning formats for lifelong learning?
- work with teachers who are unwilling to use new techniques?
- set-up new types of learning activities, eg, project based learning or design thinking?
- modernise the curricula?
- promote inclusivity?

Knowledge transfer – how might we?

- keep up to speed with new thinking, learning and research?
- work across different disciplines, areas of expertise and/or with external organisations?

Internal systems and processes – how might we?

- identify and improve the quality and speed of our internal and external information flows?
- establish efficient and user-oriented processes, exam and course administration?
- enhance staff accountability?
- design and launch a new software system?
- juggle conflicting demands such as chaotic systems; multiple deadlines; implementing new working models and managing complex projects?
- manage resource pressure
- ensure we spend time effectively and on the right ideas?

Internationalisation – how might we...

- become multicultural and more attractive to international students?
- modify our educational offer and administrative systems to assimilate international students?
- integrate international students and researchers into our academic community?
- deal with uncertainty in our environment and surrounding society?

Project management and team building – how might we...

- manage projects more effectively?
- build self-organising teams from individuals?
- bring together experts from different departments to establish common processes?
- support interventions where team members do not share common goals?
- facilitate cooperation between different departments or faculties?

APPENDIX II: EVALUATION OF THE BCU INTERNATIONAL WORKSHOP FOR MANAGERS IN HE

The following provides details of the evaluation of the design thinking workshop for managers held at Birmingham City University in November 2018. The organisation and delivery of the workshop is described in the BCU international workshop (Section 1) of this handbook.

The survey was managed, run and analysed by the team from UEBA comprising Anna Veszprémi Sirotková, Barbora Paholková and Veronika Nekolova.

Methodology

The survey comprised three parts: finding out about people before they arrived in Birmingham; detecting change in attitudes and perceptions before and after the workshop; and general feedback after the workshop.

The full questionnaire is provided in Appendix III. This shows which questions were asked twice, as well as those asked once only. Before the workshop we ascertained general information such as job role, age and area of speciality, as well as motivation for attending, experience of design thinking and the change-measure questions. Following the workshop, the survey comprised the change-measure questions as well as exploring the plans of attendees to use design thinking in the future and their thoughts regarding the workshop.

Respondents completed the questionnaire online. The original survey elicited 32 responses. This dropped to 24 for the follow-up, with only 20 providing comparison information. Responses were processed in an Excel workbook, using pivot tables to analyse the results as appropriate. Our findings are presented below.

Shortcomings of our survey include the relatively small sample and the number and ambiguity of some of the questions. Due to variations in English proficiency, some misunderstanding of the questions has been detected.

Findings

Demographic of participants

Our participants, age range 30 to 62, were from a range of disciplines and held various management related positions at our partner universities. Their primary academic interests and fields of work varied from biochemistry to the sociology of art and entrepreneurship. Roles included dean, director, associate professor, project manager or head of department or service. Importantly, this meant that the creation of interdisciplinary teams was a realistic ambition for the facilitators.

Motivation and challenges

When asked for their motivation in attending the workshop, responses were varied with many providing more than one factor. Clustering resulted in seven themes as shown in the following list:

- Improvement in my managerial work 55%
- Learning design thinking techniques 55%
- Self development 25%
- New experience 20%
- To learn something new 20%
- Improving the quality of or developing workshops 15%
- I am part of the DT.Uni project 5%

This shows the top two factors being 'improving my managerial work' and 'learning design thinking techniques'.

Participants were asked for up to three challenges that they would like to address. The various responses are summarised below and given in more detail in Appendix I.

Management	improving strategic, project and communication management;
Research	building support teams, event organisation, research project management, internationalisation;
Human resources	organisational structure, empowering staff, improving effectiveness and teamwork, reducing bureaucracy, knowledge management, implementing design thinking;
Administration	lack of suitable office space, reduce costs and lack of finance, modernisation, improving IT systems;
Students	creating attractive and interesting courses, motivation, how to improve skills.
Environment	uncertainty, interdisciplinary work projects.

When asked about what they hoped to gain from their attendance, 13% of our attendees expressed interest in design thinking. However, many participants were interested in specific topics related to their responsibilities, such as staff or student motivation, teamwork, process organisation, professional development and management.

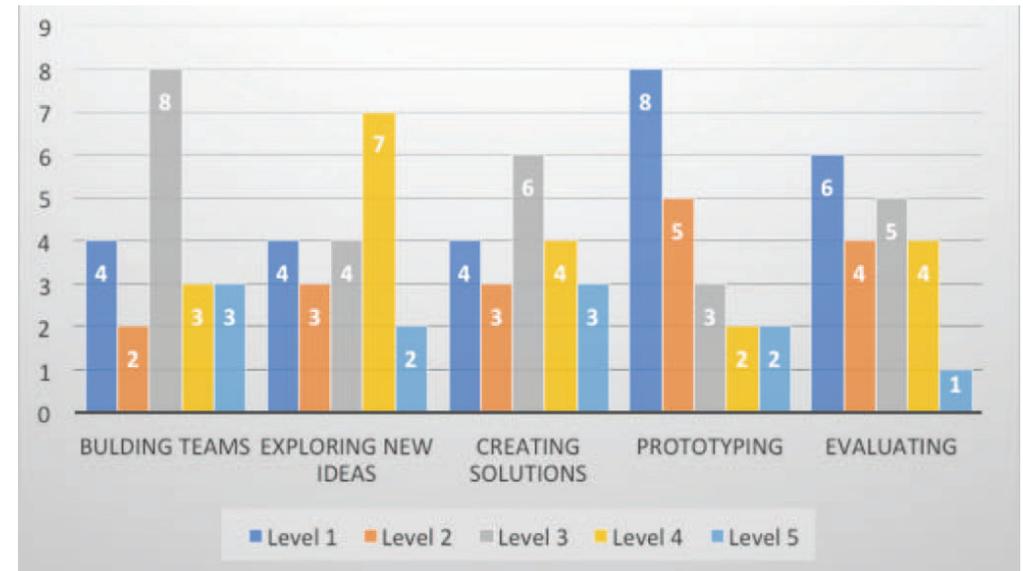
There was a high level of interest in innovation and how it is managed in a higher education context. Participants also reported on the best innovations in their institutions as well as funded projects supporting innovation currently running in their universities. Some participants had external industry partners contributing to the implementation of design thinking methods in teaching.

Current knowledge of design thinking

In terms of design thinking experience, prior to our workshop, responses revealed:

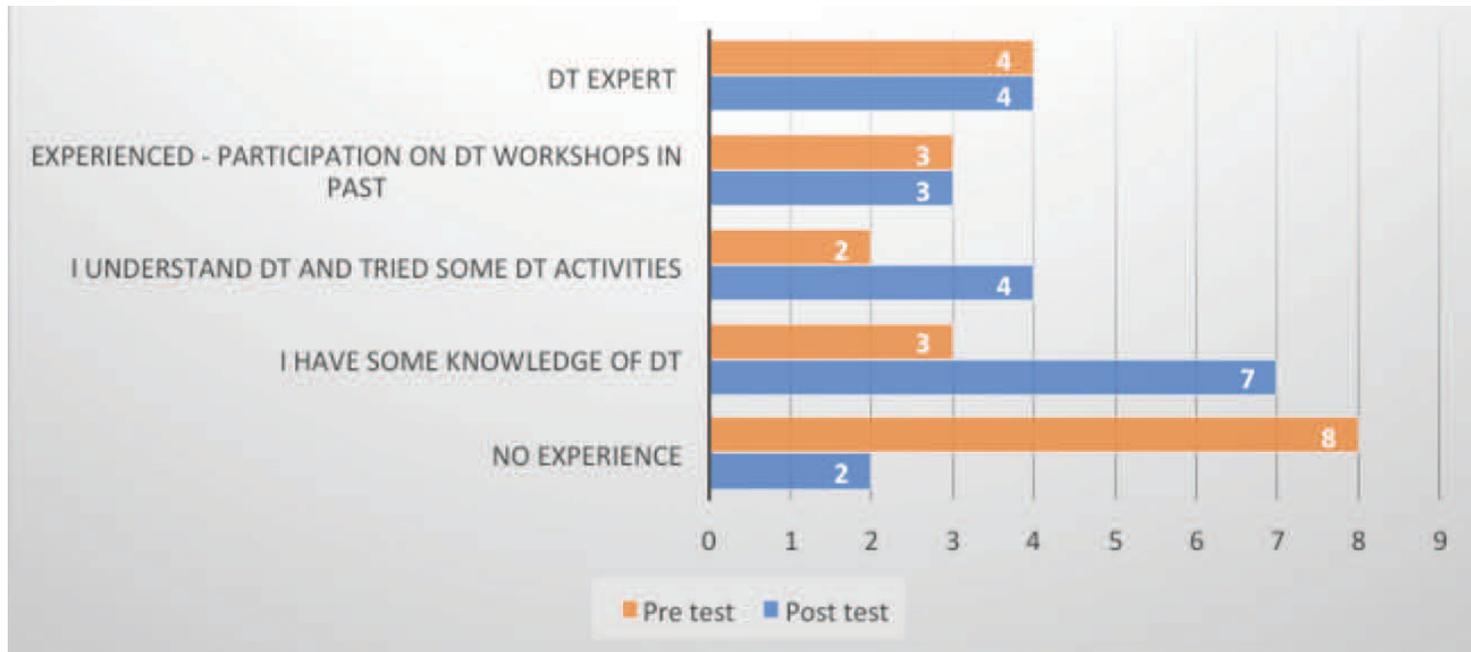
- no experience 45%
- some experience 30%
- regular use 10%
- experts 15%

indicating that 75% of attendees were relatively inexperienced in using design thinking techniques.



Pre-workshop understanding of design thinking

To explore current usage of design thinking we chose five features: evaluating, prototyping, creating solutions, exploring new ideas and building teams. We asked participants to indicate how much they used them in their current work using a 1 – 5 scale (1 not a lot/often, 5 a lot/always). The results, given in the graph below, show exploring new ideas (average 3) coming top, followed by building teams and creating solutions. The lowest average level (2.25) was reported for prototyping.



Experience before and after the workshop

We also asked participants to list the design thinking tools that they knew. Most popular were: brainstorming, brainwriting, persona, 'kill your idea', mindmap, WWWHW (What?, Where?, Why?, How?, Who?) and paper prototype. On average, participants were familiar with three tools. However, six reported no experience with design thinking tools and another six were familiar with seven or more tools.

Before and after the workshop comparison

Our first comparison shows the general improvement in design thinking experience of our attendees.

This shows a general improvement, though the one person whose experience had not changed after their week in Birmingham is a little concerning.

We also conducted a before and after test on our participants ability to identify design thinking processes. They were asked to choose from a list of 25 terms which described (before) or did not describe (after) the design thinking

workshop. Correct responses increased from 45 to 53% while incorrect responses increased from 15 to 28%. The latter may have been caused by a possible misunderstanding of the post-test question since it was diametrically opposed to the pre-test question.

We then posed 21 statements to measure the changes in our participants before and after the workshop. For each respondents were asked to rank their agreement on a scale of 1 to 5, where 1 indicated a low frequency and 5 a high frequency in their current work. The results are shown in the following table.

STATEMENT	Pre-test	Post-test	Difference	Difference (%)
I work at ideas and concepts until I deem them perfect	3.75	3.05	-0.7	-19%
I think teams are very important to create innovative concepts	4.45	4.65	0.2	5%
I often use a cooperative language style, eg, "also" instead of "but"	3.65	3.9	0.25	7%
I have fun dealing with complex problems and uncovering their different aspects	3.8	4.2	0.4	11%
I am very well able to anticipate what other people think and feel	3.65	3.75	0.1	3%
I feel uncomfortable using concepts where you learn by doing	2.1	2.05	-0.05	-2%
I often have trouble appreciating other perspectives	2.1	1.85	-0.25	-12%
I enjoy exchanging and incorporating ideas and concepts from other team members	3.9	4.35	0.45	12%
In order to structure intellectually open processes, I rely on a certain methodological set of strategies	2.75	3.6	0.85	31%
I am very good at spontaneously channelling my creativity to develop new ideas	3.15	3.75	0.6	19%
At work I rely on people with a background from different disciplines for my work	3.7	4.2	0.5	14%

STATEMENT	Pre-test	Post-test	Difference	Difference (%)
I am very good at analyzing the social team structure regarding roles and strengths of team	3.35	3.55	0.2	6%
I am good at letting people share their ideas and thoughts with me in interview situations	3.75	3.9	0.15	4%
I have problems with the extraction of an informed judgement from an analysis	2.2	2.1	-0.1	-5%
I never use haptic materials to present ideas or my own concepts	2.9	2	-0.9	-31%
I have difficulties with redoing certain steps of a process in order to come to a solution	2.25	2.25	0	0%
I like developing a variety of ideas for one problem and have no trouble discarding them	3.15	3.8	0.65	21%
I like dealing with different standpoints from different people	3.7	4.1	0.4	11%
I have difficulties adapting to the specific terminology of a different discipline	2	2.05	0.05	3%
I often use certain strategies when being confronted with failure	2.85	3.5	0.65	23%
If I see people crying, I have tears in my eyes	2.95	3.15	0.2	7%

Highlights include the most popular statements being:

- I think teams are very important to create innovative concepts
- I enjoy exchanging and incorporating ideas and concepts from other team members
- I have fun dealing with complex problems and uncovering their different aspects
- I am good at letting people share their ideas and thoughts with me in interview situations
- I work at ideas and concepts until I deem them perfect
- At work I rely on people with a background from different disciplines for my work
- I like dealing with different standpoints from different people

Additionally, the top six changes were:

- I never use haptic materials to present ideas or my own concepts (↓31%)
- In order to structure intellectually open processes, I rely on a certain methodological set of strategies (↑31%)
- I often use certain strategies when being confronted with failure (↑23%)
- I like developing a variety of ideas for one problem and have no trouble discarding them (↑21%)
- I am very good at spontaneously channelling my creativity to develop new ideas (↑19%)
- I work at ideas and concepts until I deem them perfect (↓19%)

Combined these indicate a high degree of valuing teams, different disciplines and different standpoints in our participants. All changes indicate a positive outcome for the workshop, if relying on 'certain methodological set of strategies' means embracing design thinking tools and techniques to help with problem solving.

Impact of design thinking approaches in the future work of participants

As a follow-up to our workshop, we wanted to find out if we had been successful in motivating our participants to disseminate design thinking among their colleagues and/or the approaches in their day-to-day work. In both cases the results were positive: with regards to working practices, 75% responded 4 or 5 as to their likelihood to encourage others to use design thinking processes. Just one participant indicated no plans to do so.

With regard to teaching, again 75% of our attendees are planning to use more design thinking in their classes, ranking their response at at least 4. The other 25% may be due to their not undertaking a teaching role. Further, participants indicated that they plan to use design thinking approaches in specific areas such as teaching; strategic processes; teamwork; managerial work; as well as to improve internal processes, design new projects and create new curricula.

With respect to their use of English, 15 participants (75%) saw a significant increase in their vocabulary and 95% agreed that they had practised formulating questions in English. All participants (100%) confirmed having practised working in interdisciplinary/inter-cultural contexts.

General feedback and recommendations for future workshops

The workshop was conducted in English, but English was not the first language for all the participants. This was highlighted in feedback with comments such as people should:

- slow down their speech to ensure greater comprehension;
- try to be clear and direct; and
- provide visual tasks to compensate for a lack of verbal skills.

Improvements suggested by the participants include:

- more warm-up activities;
- opportunities to discuss strategy and results with other teams;
- more involvement of the facilitators in direct contact with the separate teams;
- translation(s) of the task description when possible; and
- keeping to the schedule.

Participants appreciated speaking with native and highly competent English language speakers and it was perceived as a great opportunity to improve language skills. Other expressions and metaphors translated from other languages were considered as new and inspiring additions.

Conclusion

The BCU international managers workshop aimed to increase the knowledge and understanding of the design thinking process, its tools and techniques as well as its benefits. Our findings indicate that this was achieved with significantly positive changes in using physical materials to present ideas, developing and then discarding ideas and a decrease in striving for perfection, among others.

Participants indicated that the tools and techniques, as well as working in groups, helped them to produce better and more advanced solutions than they would have if working by themselves and/or in their usual environment. The majority felt that their learning will help them to improve their managerial work and they plan to share their design thinking experiences with their colleagues.

Overall, participants reported that it was a great workshop to learn new things about design thinking as well as a fantastic opportunity to get to know STEAMhouse, Birmingham City University and the city of Birmingham itself.

APPENDIX III: BEFORE AND AFTER WORKSHOP QUESTIONNAIRE

Age:

Gender:

Job role:

Institution:

Area of work:

Proficiency in English:

Start of before workshop questions only

Motivation for participation in the DT.Shop:

Current experience with design thinking:

Current knowledge basis of DT:

Current application experience of DT processes:

List up to 3 challenges or opportunities which you currently face in your university work ?

What is your primary academic interest/field of work ?

Which area of work would you like to receive some new ideas for from your time with us in Birmingham?

Tell us about any design thinking work you have undertaken – this could be academic or practical.

We are interested in helping you innovate. Tell us about an innovation you have taken part in or an innovation you are aware of and would like to know more about.

Share with us an example of innovation from your university you are proud of.

Tell us about any funded projects supporting innovation currently running in your University.

How would you rate your current understanding of design thinking? (Indicate on a scale of 1 to 5, where 1 means that you don't currently do this very much and 5 means that this applies a lot/always to how you currently work:)

Building teams

Exploring new ideas

Creating solutions

Prototyping

Evaluating

Please list any Design Thinking 'tools' and techniques that you are currently familiar with: [open answer]

End of before workshop questions only

Start of after workshop question only

Design Thinking element: Description

End of after workshop question only

Before workshop question: Choose the terms that describe the elements of design thinking processes. (It is OK if these terms are new to you. We will ask for your views after the training to see which new concepts you have learnt about.)

[Post workshop question: Which of the following terms the terms that do NOT describe inherent elements of Design Thinking processes?]

all group work	creative process	designerly thinking
empathy	fuzzy process	interdisciplinarity
open perspective	role thinking	time constraint
analytical thinking	critical thinking	divergent thinking
error culture	hierarchies	iteration
open space	solution-based thinking	user-centered thinking
collaborative vocabulary	cross-collaboration	less thinking, more doing
feedback culture	immersion	waterfall method
organized thinking	team work	

Indicate on a scale of 1 to 5, where 1 means that this does not apply and 5 means that this applies a lot/always:

1. I work at ideas and concepts until I deem them perfect.
2. I think teams are very important to create innovative concepts.
3. I often use a cooperative language style, eg, 'also' instead of 'but'.
4. I have fun dealing with complex problems and uncovering their different aspects
5. I am very well able to anticipate what other people think and feel
6. I feel uncomfortable using concepts where you learn by doing.
7. I often have trouble appreciating other perspectives.
8. I enjoy exchanging and incorporating ideas and concepts from other team members
9. In order to structure intellectually open processes I rely on a certain methodological set of strategies
10. I am very good at spontaneously channeling my creativity to develop new ideas.
11. At work I rely on people with a background from different disciplines for my work.
12. I am very good at analyzing the social team structure regarding roles and strengths of team members.
13. I am good at letting people share their ideas and thoughts with me in interview situations
14. I have problems with the extraction of an informed judgement from an analysis
15. I never use haptic materials to present ideas or my own concepts
16. I have difficulties with redoing certain steps of a process in order to come to a solution.
17. I like developing a variety of ideas for one problem and have no trouble discarding them.
18. I like dealing with different standpoints from different people.
19. I have difficulties adapting to the specific terminology of a different discipline.

20. I often use certain strategies when being confronted with failure.

21. If I see people crying, I have tears in my eyes.

Start of before workshop questions only

What are your interests and hobbies outside of your work? (enables us to see the breadth of your interests)

What, if anything, is stopping you from innovating?

What are the barriers we can help you overcome?

What is the balance in your university between interdisciplinary practice and subject specific study? Score 0-5 (Where 0 means very subject specific and 5 means very interdisciplinary practice based)

[Interdisciplinarity - means the connection of different fields of study for example humanitarian study, natural study, social study. For example, Harvard University or Oxford University are both very interdisciplinary compared to the London Business School which much more subject specific.]

Who is the decision maker when it comes to the implementation of new innovative teaching techniques in your university? (Who is the person who makes the decision to use new methods in the subject?)

When deciding on the implementation of design thinking methods for your faculty or department, what do you see as the main motivator?

Do you have experts or external partners, from practice (companies) contributing to the implementation of design thinking methods within a particular subject and the educational processes.

If you answered yes, please specify the level of cooperation with the experts [where 0 means you do not cooperate with practice, 1 means a little and 5 means a lot]

Experts lecture

Experts participate on creating curricula

Internship/trainee in that companies

Mentoring/coaching from experts to students

Please specify where you currently have input from external expertise in design thinking and what their input is

What do you feel are the main problems/barriers to implementing design thinking methods in your university?

Please feel free to let us know any other information or views you may have on the topic of design thinking to help us plan the session to meet your needs. If you have a specific challenge or issue which you would like to specifically look at during the workshop please outline it below:

End of before workshop questions only

Start of after workshop questions only

Indicate on a scale of 1 to 5, where 5 is the top score:

I will be using more Design Thinking approaches in my classes.

I will encourage others to use DT processes

If you responded 3 or higher to either of the previous two questions, could you give us some examples of how you plan to implement design thinking in your work? (Open question)

Indicate on a scale of 1 to 5, where 5 is the top score:

My specific lexicon in design thinking has increased.

I practiced formulating questions in English

I practiced working in interdisciplinary/intercultural contexts.

As a communication exercise, explain how this workshop has contributed to your toolkit. (Open question)

In what ways can this type of activity contribute to your English language competence. (Open question)

Do you have any constructive criticism to make the workshop better? (Open question)

End of after workshop questions only