Co-funded by the
Erasmus+ Programme
of the European Union

BauHow5

Alliance of Leading Research-Intensive European Universities
in Architecture and the Built Environment

Report & Evaluation:

Design Sprint on ‘The Circular University’

9 – 13 October 2017

A joint initiative of BauHow5:

CHALMERS UNIVERSITY OF TECHNOLOGY

ETH zürich

TU Delft

The Bartlett
UCL Faculty of the Built Environment
UCL

Technical University of Munich

In cooperation with:

ALLMANN SATTLER WAPPNER . ARCHITEKTEN
WWW.ALLMANNSATTLERWAPPNER.DE

vitra.

A design workshop on ...

...defining new concepts of circularity & testing fast-track design methods in architectural education

Initiating a design workshop according to specific methods is interesting in two perspectives. On the one hand, it offers an opportunity to tackle challenges, which have not been in focus so far. On the other hand, it is a testing ground to evaluate fast-track design methods in its applicability and use for architectural education. Today, complex problem-solving requires multidisciplinary collaboration and co-creation. Thus, the question arises, if architectural students are sufficiently prepared for this position and how they would act in processes like these. During the Design Sprint, we want not only to challenge a specific task, but moreover evaluate our hypothesis that architects have the skill set to work effectively in new formats of innovation and create promising outcomes as well as leverage design sprints and other formats.

The “Design Sprint on Circular University” is the first in a series of four workshops, which is embedded in an Erasmus+ Strategic Partnership project, “Strengthening Architecture and Built Environment Research (SABRE)”. The project seeks to test and improve capabilities in architectural education in order to create a new mindset and open up new career paths in creative industries.

The BauHow5 alliance together with renowned Allmann Sattler Wappner Architekten and Swiss company Vitra invited over

40 students and researchers in architecture and beyond. The challenge was to approach circularity from where we learn to design, and to raise the question of what a ‘Circular University’ would look like in all its possible dimensions? It was an exceptional week of discussions, work and new concepts. It was an insightful week into how fast-track design methods are adapted, what speaks for them, and what does not. And this week was captured in this documentation.

Yolande Schneider, Martin Luce, Uta Leconte,
Christos Chantzaras

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Executive Summary

Erasmus+ / SABRE

In July 2017 the Departments of Architecture from Chalmers University of Technology, Delft University of Technology, University College London - The Bartlett, and Technical University of Munich were granted an EU-Erasmus+ Partnership project for “Strengthening Architecture and Built Environment Research” (SABRE).

Together with the Department of Architecture of ETH Zurich as associated partner the four faculties form the BauHow5 Alliance. The joint proposal foresees four related intellectual outputs, conducted by each participating faculty, to support innovation and creativity, through partnerships and transdisciplinary approaches to higher education of architecture. For a duration of three years, the activities within the outputs will feature problem-based and experience-based learning approaches, involving real-world issues, and will aim to provide students and researchers with a skill-set, which allows them to succeed in a highly complex, dynamic and uncertain environment. The intellectual output of TUM Department of Architecture focuses on Architectural Entrepreneurship and the testing of suitable fast-track formats for creating a new mindset. The Design Sprint on ‘The Circular University’ in October 2017 is the first approach to test and improve capabilities in architectural education.

Defining new concepts of circularity

Since 2009 more people are living in urban than in rural spaces. The construction sector consumes the largest share of raw materials and resources in the world, which are decreasing rapidly. The circular economy is about to tackle everything and define new business models. Producing differently to consume less. Designing for disassembly or deconstruction. Re-directing waste into a cycle as a resource. Is the focus on physical-bound concepts, buildings, materials, value chains and the economy enough? Why not approach circularity from where we learn to design and research? Can it be viewed as a virtual concept, related to knowledge, skills, principles of acting & experiences, which are channelled back into university-like settings?

What would a ‘Circular University’ look like in all its possible dimensions?

Choosing the Design Sprint

To approach the quest for a ‘Circular University’, we decided on the method of a Design Sprint. The method, developed by google venture as the essence from hundreds of other applied appro- aches, is known to “solve big problems and test ideas in just five days”. For our big question in a new field, for the testing aspect and the span of five days, the method seemed appropriate to be run with students at Technical University of Munich (TUM). At the same time, it served as test run to see how students of architecture would perform in this setting and what effects on the overall process could be observed.

The five days of the Design Sprint were scheduled as follows, from 10 a.m. to 5 p.m.:

- Day 1 // Monday — Context
- Day 2 // Tuesday — Target
- Day 3 // Wednesday — Decision
- Day 4 // Thursday — Prototype
- Day 5 // Friday — Interview & Present

After the final day and the presentations, the teams were given additional time to iterate their work, integrate comments and submit their results as a documentation. 5 out of 6 teams finalised their work accordingly and were granted 3 ECTS points for completing the module of fast-track design methods.

Teams & Works

To foster interdisciplinary work, the call for applications was open to students in their 5th semester or higher, studying Architecture, Landscape Architecture, Industrial Design, Management, Civil & Environmental Engineering, Science and Technology Studies, or Politics and Informatics. We received over 80 applications including cover letters and a short CV. 40 of the applicants were chosen for the Design Sprint, from which 35 completed the five days.

- 35 participants
- 72% female / 28% male.
- 40% bachelor degree / 60% master degree
- 77 % TUM student / 20% incomings / 3% other university

The participants assembled in 6 teams with 5-7 members and were named according to their developed concepts. The scope of work ranged from mainly physical solutions (e.g. a spatial) and hybrid approaches merging physical aspects with the

virtual ones, to completely virtual approaches (e.g. an application)

- Team Extroversity // Embodiment of an Open & Transparent Knowledge Hub
- Team CreaTUM // Development Centre for a Circular Society
- Team CollectTUM // Interactive Recycling Concept for Universities
- Team ACT // Activate a Circular Turn with Students' Projects
- Team TUMcloud // Your Virtual Space to Share Ideas & Knowledge at University
- Team X-eyes // Augmented Reality for Connecting Students on Campus (documentation not finalised)

At the final day of the sprint, all teams were running 5 rounds of interviews, presenting and discussing their proposals with invited deciders and users. Afterwards each participant, decider and user were allowed to vote for his or her favourite contribution (no votes for oneself) with the following result:

1. TUMcloud / 2. CollecTUM / 3. CreaTUM

Evaluating the Sprint

Overall, the format of a sprint has been well accepted by the participants. The majority regarded the method as an important extension within architectural education and would opt for it as an integrated module. Especially the time limitation given for each day and task were well appreciated by the students as a tool to work more effectively and focused, and to be able to experience an 'after-work-mode'. On the other hand, the structured process seemed to impede in-depth discussions and was sometimes hard to follow, especially when assigned to a defined task with a given way of doing. Due to an over-representation of architectural students, interdisciplinarity could not be achieved as intended. According to the results of our evaluation, the satisfaction rate was significantly above average (n=35, strong agreement + agreement):

- On concept, consciousness and target of circularity: 83%
  On workload, process and future implementation: 73%
- On collaboration, interdisciplinary and integration: 61%
- On results & willingness to pursue idea further: 69%
- On benefits to apply skills and use new insights: 84%

As a future perspective, a format like a Design Sprint should be integrated more often in architectural education. Not only does it help to develop the existing skill-set further, but it is also an opportunity to quickly immerse in current and future topics deriving from the industry, environment or the public domain. By creating new approaches, Design Sprints can be a viable form of research in a fast-changing and complex world.

Chapter 01

Design Sprint Process & Methodology

Knapp, J., Zeratsky, J., & Kowitz, B. (2016). Sprint: How to solve big problems and test new ideas in just five days. New York, a.o.: Simon & Schuster.

Design Print

The design sprint is a structured creativity method to work on specific questions within a given time frame. It is based on the theory of design thinking, to work holistically and interdisciplinary in a team from the perspective of a designer and with the focus on the user or client. The notion of design thinking is strongly related to industrial design and an emphasis on process. Google Ventures, the venture capital arm of Alphabet, Inc. investing in the fields of life science, healthcare, artificial intelligence, robotics, transportation, cyber security and agriculture, condensed the design sprint approach out of an extensive analysis of existing methods and techniques. The most suitable ones for digital technologies and software were combined to a sprint format of five days. After being implemented and successfully run at internal projects, it was made publicly available with the conviction to be also applicable to big problems beyond technology, software and applications.

http://www.gv.com/sprint/

Process

Structuring Day 1 to Day 5

The Design Sprint is recommended to last five days according to a pre-defined agenda. The teams assigned to a design sprint shall cover different disciplines and departments, such as IT, engineering, marketing, strategy and finance. The teams work on a given problem and work intensively for five days on an approach for a possible solution. The Design Sprint is not meant as a one-stop-operation, but considered as a starting week for accelerating problem awareness, understanding and definition. After one sprint usually the teams continue working on the solution approach for several weeks and come together again for iteration in a next-level sprint. The agenda divides the five days into context analysis, target ideation, decision and concept, prototyping and presentation. Each day is further structured with small tasks and time frames according to the day's topic. Another constraint is set for the day length, to only work between 10 a.m. and 5 p.m., but totally focused and immersed in the challenge.

MONDAY // Day 1 - Context

TUESDAY // Day 2 - Target

WEDNESDAY // Day 3 - Decision

THURSDAY // Day 4 - Prototype

FRIDAY // Day 5 - Present

MONDAY // Day 1 - Context

10:00 Intro // Why – Who – How

10:30 Context & Goals // Catch long-term goals
Opening Position 1: Amandus Samsøe Sattler - Architecture & Circularity
Opening Position 2: Mikala Holme Samsøe - Processes & Sufficiency

11:30 Assembling Teams / Small Break

11:45 Get to know / Emphasise with the team / Exchange perspectives
Relevant methods and tools to be used
Start at the end: Your long-term goal
Make a map for your long-term goal

13:00 Lunch Break

14:00 Getting started In the field
Check out the TUM Area
'How Might We Notes' by the participants / Reframe problems
Update list of sprint questions // Updated long-term goal

15:30 Food for Thought

15:45 In each team: Assemble notes / Organise & vote
17:00 In each team: Pick a target toghether with the decider

17:30 Opening Position 3: vitra - Raphael Gielgen
18:00 Get-together Drinks / End of Day 1

Detailed agenda with minor adjustments to the original Design Sprint schedule.

TUESDAY // Day 2 - Target

10:00 Narrowing Down the Target

10:30 Lightning Demos // Ideation
Research and analyse great solutions // one per each
Present to team // 3 min & always capturing

11:45 Food for Thought...

12:00 Focus & Divide
Who will do what in the following days
Who shall be invited for Friday (interviewed people, other stakeholders, etc.)

13:00 Lunch Break

14:00 The Four-Step Sketch / Ideation
Individually: Notes – 20 min
Ideas – 20 min
Crazy 8 – 8 min
In team: Solution sketch – 90 min

16:30 In each team: Assemble Idea
Review Loop with deciders

17:00 End of Day 2

WEDNESDAY // Day 3 - Decision

10:00 Intro / TZ Visit

10:15 Recap & Focus

10:45 Sticky Decision for Final Concept

11:30 Elevator Pitch (1 min)
Application

12:00 Application
Fake Brand Names

13:00 Lunch Break

14:00 Make a Storyboard // Tell a Story
Re-assemble the existing, sketch the new
Make it nice

16:30 In each team: Present Your Storyboard

17:00 End of Day 3

Detailed agenda with minor adjustments to the original Design Sprint schedule.

Thursday // Day 4 - Prototype

10:00 vitra is calling (and mcbw 2018 as well)

10:10 Review & revise the storyboard

10:50 Walk to TZ

11:00 Prepare to prototype
Pick the right tools (computer, board, model, space)
Divide and conquer
makers - do the prototype
stitcher - bring everything together with style
writer - provides words & story with contsistency
collector - gets everything you need (footage, icons, etc.)
interviewer (preparing Friday's interviews)

11:45 Prototype (also in DDL, TZ or RL possible)

13:00 Lunch Break with "Weißwürste" (if better, do not break the flow)

14:00 Prototype

15:45 Stitching / Check for Synthesis

16:15 Finish Up the Prototype / Trial Run with Facilitators
Prepare Presentation and Interviews

17:00 End of Day 4

Friday // Day 5 - Present

10:00 Get ready to present!
Prepare your interview area

10:30 Interviews
Conducting interviews and collecting feedback
5 rounds of 20 min + 10 min recap each

13:30 Lunch Break // All together

14:30 Final Get 2 gether and presentation of works

15:00 Vote

15:15 Winner

15:30 Feedback of Design Sprint / Questionnaire
ECTS requirements

16:00 Be Proud // A Big Thank You // End of Day 5

Detailed agenda with minor adjustments to the original Design Sprint schedule.

Placing Some Rules

During the entire week some basic rules were explained to keep engagement and work concentrated. No phone calls were allowed in the working areas, a dedicated space was assigned for calls. The teams were reminded to keep their work sessions focused, and not to break out individually. As the agenda was structured in 60 to 90 minutes sessions with at least 15 minutes breaks in between it was quite feasible for the participants. The input lectures and general Q&A sections were held in the designated facilitator area. This change of location had additionally the effect to take a physical distance to the works and discussions in the sprint area. One final important rule was the strict time limitation for each day. Though we did not accurately achieved to finish each day at excactly 5pm, it was generally welcomed and much appreciated to call it a day after intense 7-hours-work. The underlying assumption reflects, that productivity and creativity decreases after this time duration without significantly improving the projects. A sufficient time to rest and relax is vital to run a sprint successfully over five days.

No phone calls / texting in the team (if you have to, go to the phone area)

No laptop required in days 1 to 3 (face-to-face, thoughts, drawings win)

Focused work, focused breaks (keep the flow while working)

Come-together in the facilitator area

No work after the end of day! (drop your pen at 5 p.m./except day 1)

Guidelines for the work session.

Applying Techniques & Tools

Each day techniques and tools were explained to the participants for application in their work. In the first three days, no digital tools or equipment were necessary; the main tools and materials were markers, chart paper, cards, post-its and pins. All participants were encouraged to work visually for everyone in the team and not to use personal notebooks or individual writings. Externalisation and sharing of thoughts and knowledge for discussion was fundamental. The research conducted throughout these days was concentrated on analogue ways as interviews and conversations, only for specific time frames online search was allowed, but limited to not weaken team dynamics and face-to-face communication.

On the fourth day, the section of prototyping, digital tools, laptops, and software were allowed. On the fifth day, the teams were free to choose a presentation mode to best communicate their project. Two groups presented in a completely analogue way, three with slide presentations, and one in a combination of presentation and interactive application.

Teams at work

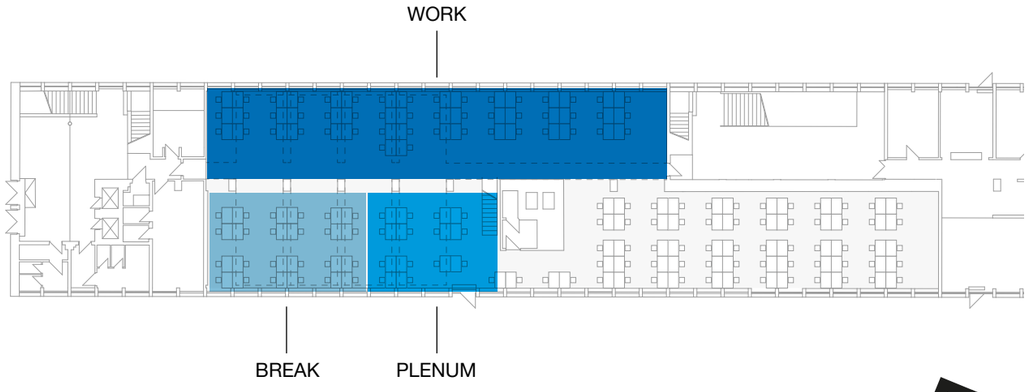
Teams at work

Setting the Space

Space is elemental for creative workshops as the design sprints. It needs to take people out of their normal environment and place them into a studio, shop or lab like setting, to foster creativity, communication as well as engagement and exploration.

For the conducted design sprint, the main studio area of the Department of Architecture was chosen, the “Weisser Saal”. During the semester break, the entire space of 600 sqm net could be used. For work, break and facilitator roughly 300 sqm were necessary. The remaining areas were only used for the final presentations to have sufficient privacy for all teams, as the presentations were held simultaneously.

The workspaces were set up for team sizes between 5-7 people and equipped with markers, paper, cards, pins and pinboards, and simple modelling materials. Throughout the week, coffee, refreshments and healthy snacks were provided.



TUM „Weisser Saal“ turnded into a design sprint area.

The „Weisser Saal“ of the TUM Deparment of Architecture is the central studio area for bachelor students in their first two semesters.

Break area

The break area was separated from the working area, but within the same space.

Plenum and facilitator area

The facilitator area was the central stage for input lectures, Q&A sections and additional instructions.

Chapter 02

The Circular University Challenge & Inputs

Co-funded by the Erasmus+ Programme of the European Union

BauHow5

Alliance of Leading Research-Intensive European Universities in Architecture and the Built Environment

Call for Participation:

Design Sprint on ‘The Circular University’

October 9 – 13, 2017

A design workshop on defining concepts of circularity:
5 interdiciplinary teams, 5 days, 3 ECTS.

BauHow5 alliance together with renowned Allmann Sattler Wappner Architekten and Swiss company Vitra invite you to join our first ‘design sprint’ for students and researchers in architecture and beyond.

The sprint is a phased five-day process with key-notes, work sessions and reviews for answering critical questions through analysis, design, prototyping, and testing ideas with customers.
Since 2009 more people are living in urban than in rural spaces. The construction sector consumes the largest share of raw materials and resources in the world, which are decreasing rapidly.

The circular economy is about to tackle everything and define new business models. Producing differently to consume less. Designing for disassembly or deconstruction. Re-directing waste into a circle as a resource. Is the focus on physical-bound concepts, buildings, materials, value chains and the economy enough? Why not approach circularity from where we learn to design and research? Can it be viewed as a virtual concept, related to knowledge, skills, and principles of acting and experiences, which are channeled back into university-like settings?

How would a ‘Circular University’ look like in all its possible dimensions?

Challenge these questions in the Design Sprint at TUM Department of Architecture. If you are motivated to challenge the existing, are curious to learn new methods and like to work in interdisciplinary teams, daily from 10 am to 5 pm: **Apply now!**

We are looking for applications from students, 5th semester or higher, studying

- Architecture
- Landscape Architecture
- Industrial Design
- Management
- Civil & Environ. Engineering
- Science and Techn. Studies
- Politics and Technology
- Informatics

Apply at
dekanat@ar.tum.de
until September 22nd, 2017

by submitting a short statement or idea, why you should participate and a sample of your work, which best shows your way of thinking as PDF (max. size 5 MB).

For any questions:
dekanat@ar.tum.de

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CHALMERS · ETH zürich · TU Delft · The Bartlett UCL Faculty of the Built Environment · Technical University of Munich TUM

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ALLMANN SATTLER WAPPNER . ARCHITEKTEN

vitra.

Beyond Circular Economy

Since 2009 more people are living in urban than in rural spaces. The construction sector consumes the largest share of raw materials and resources in the world, which are decreasing rapidly. The circular economy is about to tackle everything and define new business models. Producing differently to consume less. Designing for disassembly or deconstruction. Re-directing waste into a cycle as a resource. Is the focus on physical-bound concepts, buildings, materials, value chains and the economy enough? Why not approach circularity from where we learn to design and research? Can it be viewed as a virtual concept, related to knowledge, skills, principles of acting & experiences, which are channelled back into university-like settings?

How would a ‘Circular University’ look like in all its possible dimensions?

With the sprint workshop the students should be encouraged to think beyond economy and production processes.

Input Lectures

The participating students were introduced into the different topics by insight lectures. The lectures were held in the plenum and lasted for 10-15 minutes. An important point was to look from different perspectives and industries. From the Department of Architecture, Martin Luce introduced the overall topic and project. From the architects' side, two approaches were presented. Amandus Sattler, founding partner of Allmann Sattler Wappner Architekten, emphasised the re-use of buildings and refurbishment as well as re-programming of spaces as major task for the future. Mikala Samsøe Sattler, architect and strategic consultant, explained the concept of sufficiency, not only to circulate material but to consume and use less. Alessio Franconi from the TU Delft/ University of Venice gave a deeper insight into industrial design for circularity. Raphael Gielgen, Head of Research and Trendscouting from vitra, shared his experience of the changing world of work, and what major transformations our knowledge society is facing for future developments.

Based on the insight lectures the students entered the discussion and started to explore the different notions of circularity. The problem definition or statement was kept open, in order to foster various creative approaches.

Mikala Holme Samsøe is giving an input lecture on suffiiciency in society, and the act of managing as quest for design.

Amandus Sattler talking about the importance of existing structures in the built environment.

Allessio Franconi presenting his research on design for circularity.

Raphael Gielgen sharing one year of discovering spaces of innovation and inspiration.

Amandus Sattler on

Transformation of the Existing towards Circularity

Mikala Helme Samsøe on:
The Future of Workplace and the Circulation of Knowledge

Samsøe og

Process and Sufficiency

DESIGN SPRINT TUM 13.10.2017

MIKALA HOLME SAMSØE
ARCHITEKTIN MAA BYAK
MA INNOVATON & LEADERSHiP (LAICS)

MÜNCHEN - KØBENHAVN

agenda

Samsøe og

1. PROCESS:
- Roles
- 4 Models for managing change and development
- What the minister did not know...

2. SUFFIZIENZ
- Approaches to sustainability

3 QUESTIONING
- Questioning prevailing assumptions

ATTITUDES FOR DEVELOPMENT

Decision **Attitude**	***Design*** **Attitude**
Accepting the question	Questioning the way the problem is posed
Assume the best alternatives are forehand	Searching for new alternatives
Defined and stable situations	Undefined and insecure situations
Rational and defined process	Liquid and open process
Models = representation of reality	Models = tool for thinking

Nach Boland & Collopy (2004)

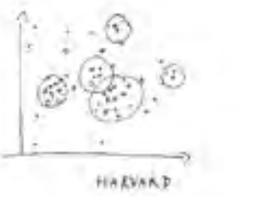
ETH Zürich
Game rules

HARVARD
Network

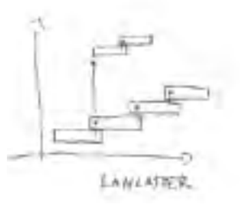
LANCASTER
Rationel stage gate

MIT
Real Time Planning

ETH Zürich
Game rules



HARVARD
Network



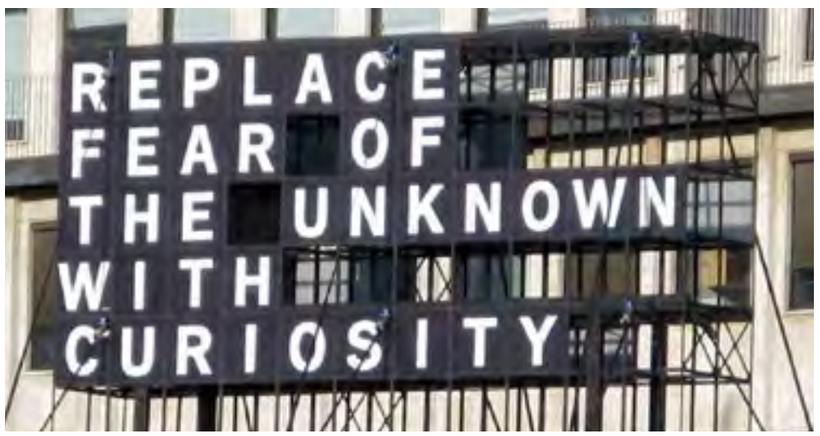
LANCASTER
Rationel stage gate

MIT
Real Time Planning

Campus and Study Environment. Samsøe 2011

Raphael Gielgen on
The Future of Workplace and the Circulation of Knowledge

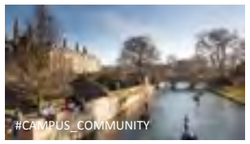
THE ART OF CONSTANTLY REINVENTING THE PERSONAL FUTURE



The illiterate of the 21st century will no be those who cannot read and write, but those who cannot learn, unlearn, and relearn.

Alvin Toffler

MAP YOUR FUTURE

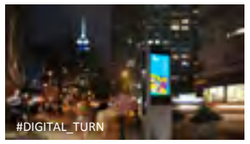


ENCOUNTERS
EXPERIENCE
IDENTITY

INNOVATION
STARTUP_CULTURE
ENTREPRENEURSHIP

WELL_BEING
EMOTION
BIOPHILIA

FLEXIBILITY
INFORMALITY
OPTIONS



MOBILE_WORKING
AGILITY
CONNECTIVITY

MEMBERSHIP
SERVICE_ECONOMY
FASTNESS

FREELANCING_TALENT
PURPOSE
LEADERSHIP

WHEN IT WILL BE DONE? YOUR ARE LEARNING TO ACCEPT THAT THE ANSWER FOR SOFTWARE PROJECTS IS NEVER paul ford , what is code

Alession Franconi

The Future of Workplace and the Circulation of Knowledge

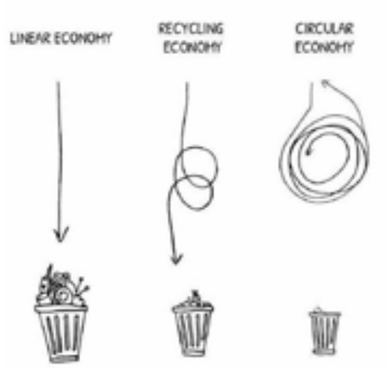
What is the Circular Economy?

Circular economy is receiving increasing attention worldwide as a way to overcome the current production and consumption model based on continuous growth and increasing resource throughput.

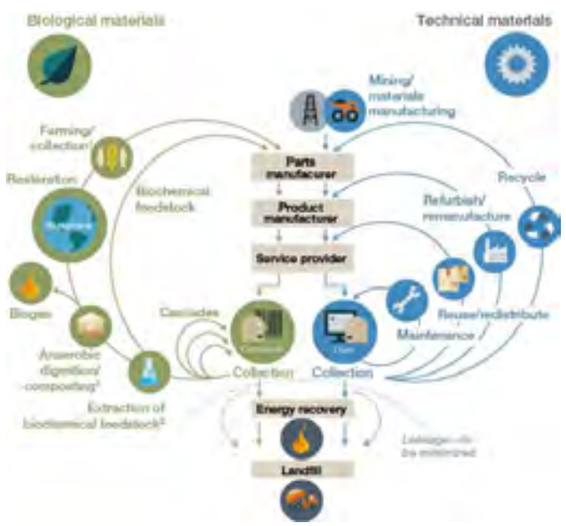
The ultimate goal of promoting CE is the decoupling of environmental pressure from economic growth.

The implementation of CE worldwide still seems in the early stages, mainly focused on recycle rather than reuse.

Ghisellini et al. (2015)



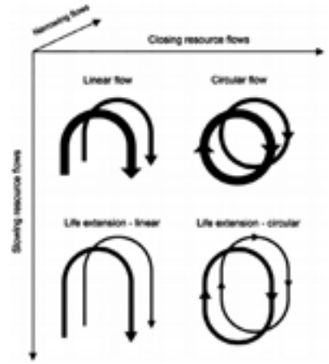
How Circular Economy works?



Ellen MacArthur Foundation circular economy team 2012

Circular approaches

Materials in a circular economy are seen, not as a disposable commodity, but as a **valued asset to be tracked and conserved for reuse**, in rather the same way that financial capital is invested, recovered as revenues and re-invested. Materials are produced and manufactured into products that enter service where they remain for their design life. In the circular model, disposal at end of life as landfill or waste is not an option. Instead the product is reused in a less demanding way, or reconditioned to give it a second lease of life, or dismantled into its component materials for recycling.



Categorization of linear and circular approaches for reducing resource use. Bocken, N.M.P., et al., 2016.

Ashby M., 2016

Design strategies for Circular Economy

Design strategies to slow loops

Designing for long-life products

- Design for attachment and trust
- Design for reliability and durability
- Design for product-life extension
- Design for ease of maintenance and repair
- Design for upgradability and adaptability
- Design for standardization and compatibility
- Design for dis- and reassembly

Philips
Schiphol Airport

Ecovative

Design strategies to close resource loops

Design strategies for close the loops

- Design for technical cycle
- Design for biological cycle
- Design for dis- and reassembly

Desso

Riversimple

Bakker, C.A., et al. 2014

Chapter 03
Teams & Works

CollecTUM
Interactive Recycling Concept for Universities

X-eyes
Augmented Reality for Connecting Students on Campus (documentation not finalized)

TUMcloud
Your Virtual Space to Share Ideas & Knowledge at University

Extraversity
Embodiment of an Open & Transparent Knowledge Hub

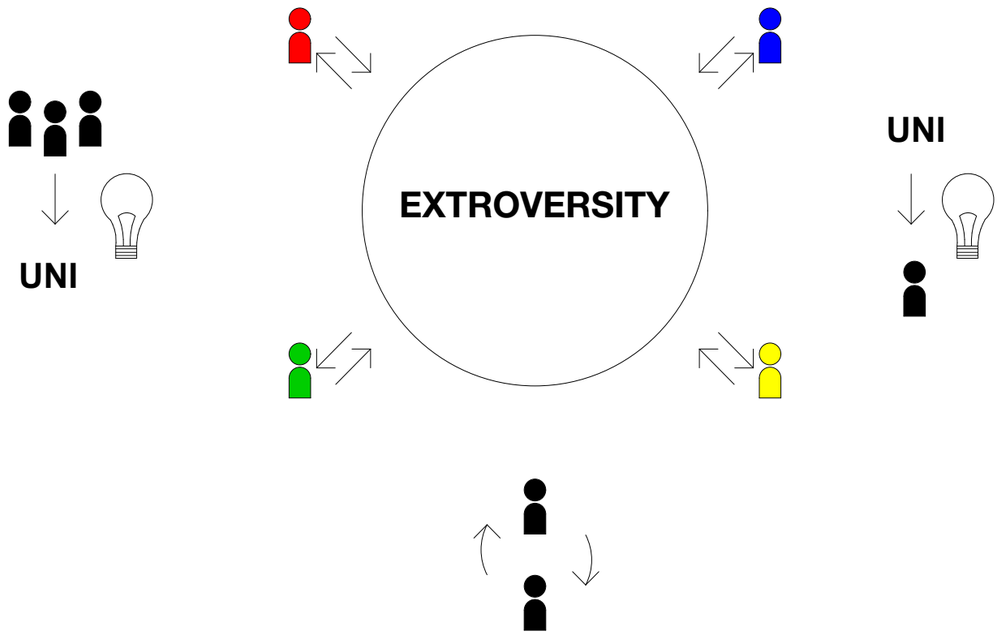
ACT
Activate a Circular Turn with Students‘ Projects

CreaTUM
Development Center for a Circular Society

Extroversity

Embodiment of an Open & Transparent Knowledge Hub

Thomas Doleschel
Louise Daussy
Christina Risinger
Constanze Buckenlei
Klint Berdica
Matteo Carotta



Introduction

Why did we participate ?

First of all, because of curiosity. And we were already curious :
Some of us created student associations who are always eager to learn more about the subject and to get to know different perspectives. Others, built 1:1 scale projects in wood or cardboard, with a circular way of thinking and designing. (Where the materials came from, how to use them efficiently, how to reuse them, etc.). For others, it offered the opportunity to extend personal researches in the field of renovation, sustainability or building industrially and modularily.
So we all heardabout circularity before and were more or less familiar with the subject, having read about or worked with it already. And we wanted to learn more about it.

Secondly, we liked the idea of challenging the existing university and making it a better place by developing new concepts. We think that universities have to rethink their way of distributing information and the way of teaching the students. As a powerful hub of information recycling.

Then, we shall not consider architecture as a self-sufficient world. It is fed with people, surrounding environment, and with others disciplines. So the opportunity to participate in an interdisciplinary approach, to redefine problems and solutions, concerning the cycle of resources, in construction and maintenance of architecture in an urban context, attracted us.

Therefore we welcomed the Design Sprint as a new technique to create something unconventional by thinking outside the box.

What do we think on circularity ?

As started above, this subject is very important to us. We think, circularity is the only logical way of thinking economics, politics, and everyday life. It's the only solution to our world's problems.

Indeed, nowadays, taking care of ressources, and even producing something with waste, is important. In the future there will be too many people for too few resources and we have to learn now how to circle the processes that operate on our planet. Not only the production or building industry but every part of economy and life itself has to shift. The universities should be entitled to be pioneers in this process showcasing the possibilities of the future.

As future architects and designers, we think it could be interesting to consider the existing structures or typologies there are, in order to re use a pre-existing energy. And also how to design buildings that can lead the users to a circular attitude.

image 1: creative group work

What lead us to our concept ?

What is the primary function of a university? For students, it is to learn. For teachers, it is to convey knowledge to the students. So university is first about knowledge.

Then, we wondered how this knowledge circulates between students and teachers. And the answer was ; in a linear way.

However, top-down teaching and the obligation to write an exam at the end of each semester only leads to a gain of short-term knowledge that is forgotten shortly after the exam. Students should always be encouraged to use the information they get to work on projects that can have a real life outcome. Also, we thought that often teaching and the processes at university are still to conventional, not encouraging students enough to create something new and better.

We realized that much more interactions could happen ; between students and teachers, but also with companies, high schools, even the neighborhood, and so on.

That's why we started to imagine how might university avoid waste of informations. How to see circularity with, this abstract topic, really important for university.

Abstract and Context

In short words, our concept is about thinking about Knowledge as a valuable Asset for everyone, and about University as the institution managing it:

> How might university avoid waste of knowledge ?
> How can knowledge flow circular between student, teacher, companies, neighborhood, everyone ?

In first place, the university has to lead a change in society aiming to became the connector in a network of communities dedicated to the continuum of questioning and improving knowledge.

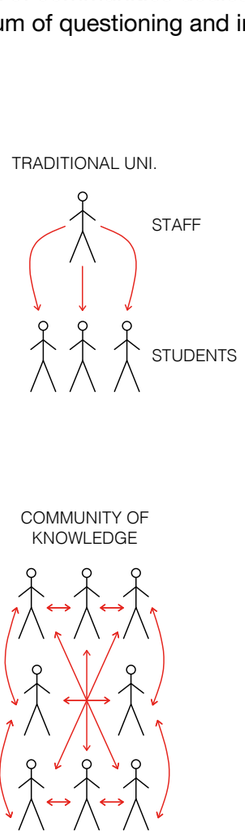


image 1: knowledge flow

Circularity keeps the asset alive, valuable and accessible, the university empowers the flow. Although it's easy to stack with the development of a fascinating abstract system, we strongly believe that to archive our aims for the Circular University, redesigning the physical links between the building (contains the functionalities) to the city, its landscape and to the citizens is an essential step to make knowledge accessible and ultimately experiencable by/for everyone.

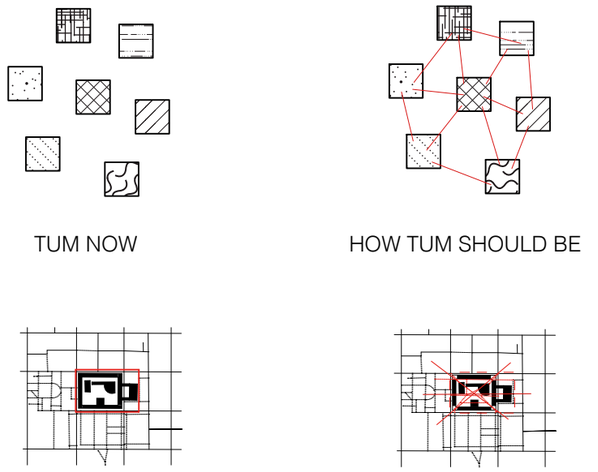


image 2: connectivity

The context was the Technical University of Munich. It is a big campus which brings together different fields in a mixed buildings complex.

Those buildings have only one physical link into the first floor. So they are finally independent entities, constituting a kind of surrounding wall inside the city. Alltogether, they form a new independent entity. Containing a courtyard, it is almost completely impervious to the city.

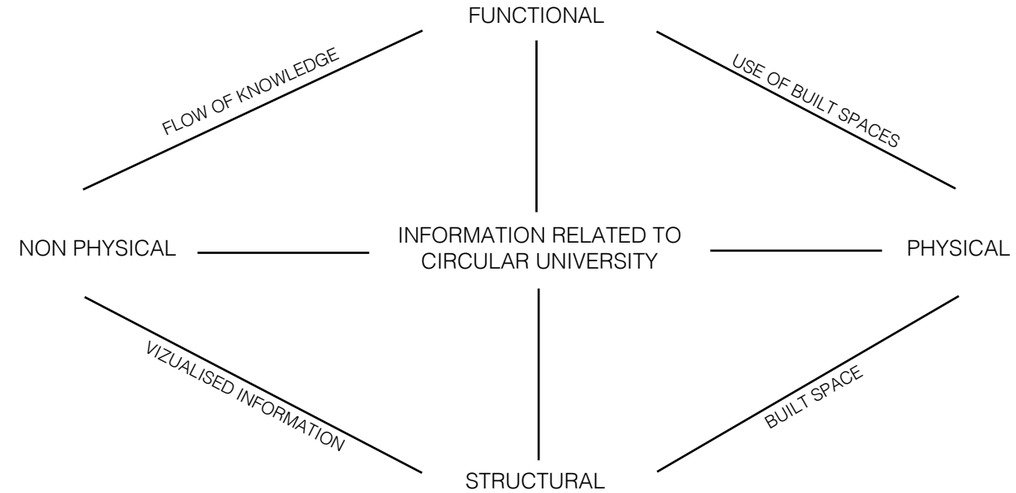


image 3: information in the Circular University

Concept

What is a circular University? First of all, we had to step into the understanding and defining of this question. Therefore, we asked ourselves:

What is circular?

Thought the reasoning process we ware able describe it as a loop, a circuit, in which the iterated use of resources does not decrease the value of products/informations/materials but keep it equal or even raise it in the process.

What is a University and what role does it play in our society?

The university is a so called ?knowledge hub?. Different departments researching and developing ideas, models and projects. Questions are arised and problems solved. While breaking the linear flow of knowledge, in which static actors are processing information and sharing in one direction, its competitor, the circular flow foresees different communities, connected to each other by the university collaborating to maintain, create and spread knowledge.

So, what is a circular University?

Ideally, a circular University is a place where information and knowledge are created and processed. It should be a place where every community (different user-groups) can contribute with its own expertise and uses generated knowledge when needed. A circular University as just defined does not exist on a regular base. We need to rethink, restructure and redesign the University as a whole to make it accessible and perceptible by everyone. Extroversity embodies the concept of an open and transparent knowledge hub that is made possible by changing and enhancing the architecture of the University by starting from the shape of its container. Architecture and Design as a tool for transformation will give us the possibility to change the experience for all citizens. We want them to enter and use the University to find partners, open up for other projects and to stay curious about what will be the questions and the trends in the world of tomorrow.

We discovered the linear process of generating and using knowledge and information. For example, it is mostly the case of the students, which are taught on different subjects, respectively topics, which are for them matter of understanding, learning, and experiencing during their studies. After graduating, students bring with them the acquired knowledge out into the society and to the industry. So far a linear process. If the former student will not come back to the University as a teacher or lecturer all information that was gained during the studies and enhanced while working/researching outside, knowledge and expertise isn?t flowing back in the loop of the University-structure.

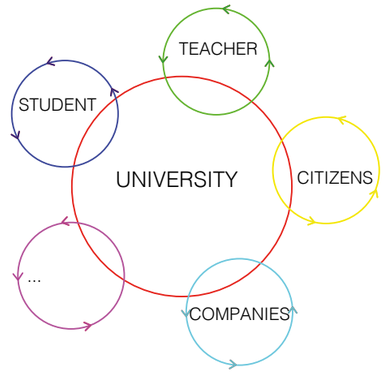
Another example of linearity in the flow of knowledge applied to postgraduate education is reflected in University by the ?s structure is often closed towards the social neighborin-genvironment. Universities often do not confront themselves with the direct environment. Universities even do not really interact with the neighborhood. In our opinion this behavior led and still leads to miss some of the goals and advantages presented by our concept of circular university:

1. Young entrepreneurs could gain a lot from the good network and infrastructure.

2. Schools of high classes could use the University as an inspiring place for future planning.

3. Open lectures could be announced to the outside or even be held outside University.

To make a circular University become true we have to empower the cycling of information through the different communities and back to the university to gain insights and knowledge from the active outsider. Concretely we image that this could be possible by connecting people to this institution by reshaping the space, the rooms, which are elected to contain the future activities.



WHAT

Our concept for opening up the University focuses in first place on the architectural, spatial, and ultimately structural components of a University. As an element of visual impact, architecture is speaking to everybody while becoming part the landscape.

Consciously or unconsciously we all perceive the size, material and attitude of a building in our surrounding, starting from this point within the initial impression of a building, we invite people to have a look, to stroll around and discover the unknown, the unexperienced. We want to give students, young entrepreneurs, interested people and the industry the opportunity to find in the University a hub for meeting up and to exchange ideas or knowledge. We don‘t want to work behind closed doors, we want to show projects and workflows to give people the possibility to react on it.

By changing the physical working-surrounding we change the behavior of people and therefore the end-result. Inspired by the MIT research Lab that is constructed in such a way, that people do need to take the stairs to walk by various laboratories and experiencing what is happening within other departments or floors. To ignite a new energy and empower connectivity within the building and beyond the walls.

HOW

Making entrances visible in a way that people feel welcome to come in and qualified to use the building or even the campus is the first step.
Creating communal spaces like parks, atriums, places that attract people from different backgrounds.
Using glass as a material to be able to physically make rooms transparent and projects/ people visible. Creating open spaces within the University where exchange can easily happen.
Making digital visual in space for the communication between the communities steping in the university enables accessibility to information for everyone. In this manner the project aims to get substantial advantage from virtual/digital information to empower the quality the physical space for the good of the whole community of the Circular University.

Entrances

1. Accessibility

We focused on new entrances for several reasons. First, the TUM building signifies a big rupture in the urban tissue of bicycle and pedestrian paths. Despite there being one north-south axis on which the complex can be crossed, this opportunity is not much used by citizens, because of the campus‘ closed appearance and the problem that it doesn’t lead anywhere, non-TUM affiliates want to go. It is solely an internal pathway.

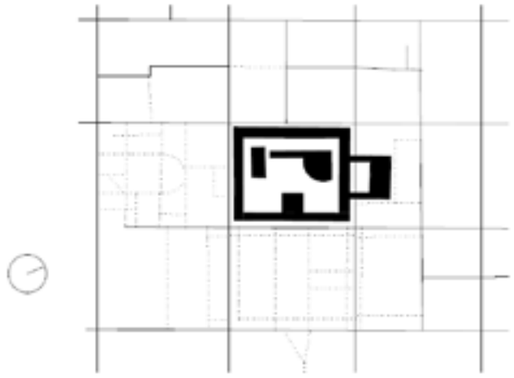


image 1: pedestrian and bicycle paths around TUM

To ensure that new knowledge can enter and flow in the Circular University, we want to make the campus part of the urban tissue again. (image 1)

So, one radical architectural solution is to cut open the corners of the university building and make the building accessible. By choosing the corners, we ensure that they are visible from all points near the building. The open corners will make it easier to enter and cross the building for non-TUM affiliates by being very visible and inviting.

2. Visibility

We want to make these new entrances beacons for TUM in several ways: First, their gaudy apperance will make the building well visible, attract people‘s attention and portray the university as a place that can be experienced by anyone interested. (image 2)

Also, we see in these new public entrances the possibility to display information on public offers, new achievements and interesting facts about TUM. They will show exciting architecture to catch anyone’s attention and to attract them. Inside the welcoming areas, students, professors and especially visitors will be informed and already provided a view into the inner courtyard, which, again, is an invitation to spend their time there. (image 3)

image 2: the entrace, street view

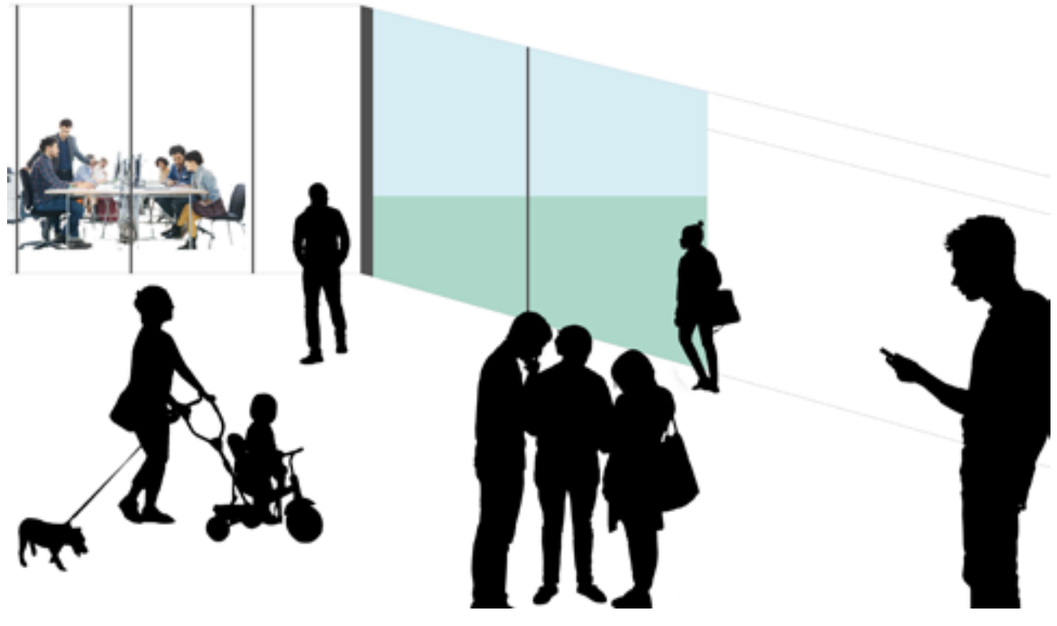


image 3: the entrance and the university from inside

The Courtyard

Another feature of our concept on the circular university is the public courtyard situated inside the present university. We imagine it as an easily accessible active garden, where citizens mingle within the academic atmosphere of “garden” lectures and student chatter.

image 1: the new university courtyard as a public space (project video screenshot)

Our image of the courtyard contains digital information screens situated in such a way that, the later emphasise the character of natural structures. Tree trunks wrapped in info-screens could serve as an example.

image 3: the courtyard as seen from the entrance

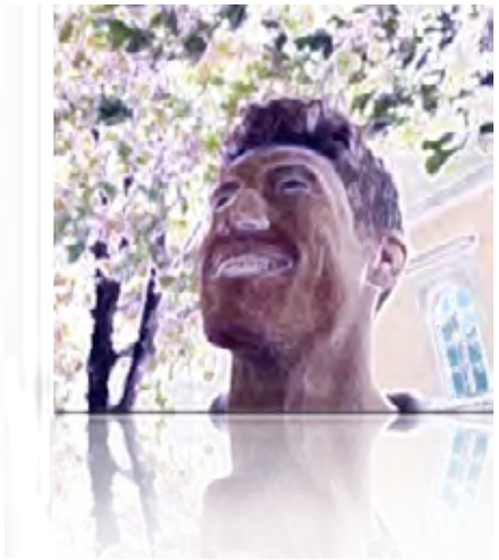


image 4: person in the new courtyard

Group Rooms / Workspaces

When entering the buildings, big open workspaces with glassed walls will catch your eye. Immediately you will see what people are doing in there. You might see a group of students working on a microprocessor for a distance measure device, or you might be attracted by a small group building a robot for mounting facade parts because you are an architecture student specialized in modern facade sytems. So what you do is you go to these people, ask them about their project and share your knowledge about the subject. Everybody in the university – even if you are just a visitor – is encouraged to do so due to an open environment caused by a sophisticated interior architecture concept.

This leads to a continuous exchange of information, not only between students from the same degree but also with students from different faculties and people from the outside who are just interested in what is going on at university. Again, these people can also contribute because they have some good ideas as well and maybe even experience in the work environment.

When people like these meet, exchange and work together on projects, new information is created. This information can instantly be documented by devices available in the workspaces. So the university is fuelled with new information which is spread all around the building to attract new participators.

image 1: people with different ideas exchange information.

image 2: groups build and the university is fed with information

So, in the end, the information that was generated and fed into the university is spread out to the people, not only to the students at the university, but also to people who just pass by and are attracted by information screens at the big entrances. This is what makes the flow of information circular.

These workspaces are located at prominent spots in the university buildings. A whole ground floor full of such spaces could be imagineable. In this way, people from the outside could be attracted even more by having a glimpse through big windows oriented to the streets. But of course, also other storeys can be used for this purpose.

What we don't like about the current situation at TUM is the fact that there are not enough open workspaces. Often, admission is restricted to a certain group of people. Without entering a code nobody can enter the rooms.

Our idea is to have workspaces spread across the campus that can be accessed by anyone. To prevent chaos, there could be a booking system assigning groups to available working spots. Nevertheless, there should also be spaces that can be used without a need of booking. Everybody should be able to contribute!

image 3: group rooms (project video screenshot)

The video

To explain our ideas in an interesting manner, we produced a video durin the Design Sprint.

The video shows a person, Tom, approaching the new TUM for the first time, being attracted and entering the building. He meets Constanze, who, too, is not a TUM-affiliate, but likes to spend time in the green courtyard and who volunteers to show him around campus.

Here, Tom learns about how TUM students learn and engage and how everyone is welcome to join the new Circular University by sharing their knowledge.

https://goo.gl/xq2Lr7

https://goo.gl/xq2Lr7

The Design Sprint

Process

DAY 1

After having been welcomed through various talks about the topic of circularity within architecture, we got inspired to think wild and pitch ideas on how University can become circular.

Using different methods, we concluded with the topic of changing the linear flow of knowledge to a circular one.

image 1: first ideas

DAY 2

To strengthen our idea, we were researching comparable architectural projects that were realised and are known as a showcase project for innovative spaces.

DAY 3

The final concept was put into a storyboard to

1. understand different steps of our idea
2. understand the workflow and outcome of the idea
3. visualize all steps a stakeholder would go through within the process

DAY 4

Prototyping various scenes respectively elements to demonstrate our concept. Preparing the presentation and the workflow how to present the topic of a circular flow of knowledge and it can be realised at TU of Munich.

DAY 5

Day of presentations to people, who were not connected to the workshop yet. We gained good insights and suggestions on how to make the concept more tangible.

image 2: first concept

The Design Sprint

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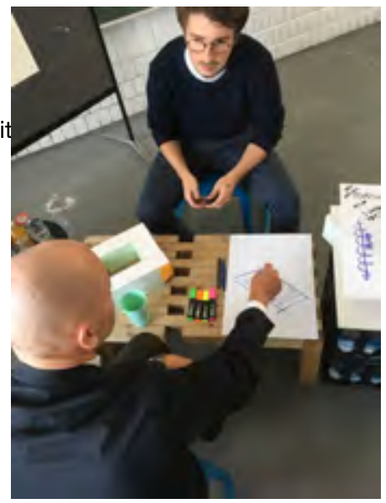

image 3 and 4: feedback from experts

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Conclusion and Feedback

When presenting our concept to five people with different backgrounds, we got good comments on how to proceed and how to refine the project.

One of our interviewing partner for example suggested to write down a business modell since although the direct stakeholders of our concept are various people and user-groups but we need to convince the University to restructure this institution. Two positions need to be defined: the person who uses (and to what extent) and the person who cares about it

Another one is convinced about the idea to restructure rooms respectively departments and create new co-working spaces or hubs. It seems to be a valuable step to develop personality and to get the chance to cooperate.

A third interview-partner suggested us to stay more open and not too much defined yet. The concept we were presenting is interesting, since a circular economy won't solve our planets problem, but to change the consume pattern will do. Therefore we need knowledge and talent as a base.

Use human-cantered methods to find out who is the the stakeholder in this concept.

The Design Sprint

Personal Statements

„The input about circularity was not altogether new for me. What I did learn was a lot about Design Methods in all their variety. The idea of doing rough prototypes was new and exciting to me.“

„I learned what circularity is all about, especially in the context of the built environment but also in the bigger picture. The guest speakers provided great insights in their field of work. I learned new design techniques like design thinking and the implementation of a design sprint itself which showed me that it is possible to create a product in a really short amount of time. By generating a lot of different ideas and afterwards focussing on specific points and reiterating we created a prototype in only a week.

I am not sure if the topic was ideal for a design sprint because it was really broad. It was hard for me to focus on one specific goal. It is always easier for me to work on a smaller task on which you can concentrate more. In the end our prototype was pretty vague because we looked at a lot of different things. But sure, this could have resulted from a mismanagement in our group.“

„A more conclusive view on the process of circularity itself and as a partaker in this process a different way of thinking how to tackle rising problems in these very challenging times. This statement --“

„I was eager to discuss about current developments of circularity within the environment of a University. The topic itself isn't really new for me, still, I wanted to find out how University can actively play a role. Therefore, I would have loved to reflect better on how modifications would affect current structures and change these. What is the base we need to work on, to see changes on a long-term“

„What best worked for me in this workshop was the working atmosphere. It was very dynamic, and especially challenging at the end. The group as well was of a dynamic nature, being composed of students bringing with them different views on problem solving. As for improvements in this run on the general, nothing grave really comes to my mind, being that organisation wise it was very well structured.

What i took with me from this a experience is a more conclusive view on the process of circularity itself, and as a partaker in this process a different way of thinking how to tackle rising problems in these very challenging times. I only wish we could have had more times with our mentors. Being new at this particular workshop, for most of us it was difficult to be on track. The many questions that arose in my opinion needed more responses. So a full time mentor for each group could be an example.“

„During this design sprint, I discovered circularity in a more global meaning. Not only in areas like the building construction, or design, process, in which I already heard about circularity, in a concrete way. Indeed, thanks to different workshop, I had to built 1:1 pavilions in wood or cardboard, and so think in : How to reinterpret an existing object, and insert it in a new context ; versailles ? How to re-use pieces and debris of elements ? How to imagine an efficient design ? How to re-directing waste into a circle as a resource ?

This time we worked on circularity of knowledge. Thus, something abstract. This experience make me realized that circularity is more than a new way of producing building, objects, and so on. It's a new way to think, even intellectual topics like knowledge in university, but also politics, or economy.

Therefore, the team work experience was also really great. However, I would have wished more interdisciplinarity. I also enjoyed the different conferences, maybe it could have a bit more.

Finally, I would have wished more time to develop the idea, even if the short time force us to be more efficient. Cause it was to short in my opinion to get familiar with the topic and then develop correctly an idea.“

CreaTUM

Development Center for a Circular Society

Signe Veinberga
Dimah Zidan
Victoria Silva
Laura Schütz
Ramsés Alejandro Grande Fraile
Alice Cluzeau-Tomatis

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Introduction

When on the first day of the workshop our team met for the first time, we started discussing on the topic of circularity and what it meant for each one of us. We noticed that our individual understandings of circular economy differed. Whereas some of the team members had already worked on the subject before and therefore had a more profound knowledge concerning the topic, some others were exploring it for the very first time. The following quotes are excerpts of the team members motivation letters:

“I already worked on the principle of cradle to cradle. I want to continue my research on the subject and discover new aspects of the circular economy. Therefore I want to participate in the workshop.”(Alice Cluzeau-Tomatis)

“Having read the information on the workshop, I felt a strong interest in learning more about circularity and the ways it could change the university environment. Brainstorming, discussing and designing principles and structures for circular processes in knowledge-based surroundings sound like a challenge I would like to engage in.”(Laura Schütz)

“I have attended several key-note lectures about Circularity in the building industry, including one by the Belgian deconstruction office Rotor. I took part in an interdisciplinary team at a one-day ‚Makeathon‘ held at TU Delft, to design a circular approach for wastewater reutilization in urban areas.” (Ramsés Grande)

Although we had different understandings of circularity, we had our interests set on the same notion: the need for a new design strategy adjusted to the system of circularity. This notion is best expressed with one of the group participants‘ words:

The survival of humankind under the implicit premise of endless resources in a planet with limited capacities is unviable. It is therefore of great urgency to reset our current systems towards a more sustainable development, in order to minimize the impact of climate change and to avoid uncontrolled fight over water and other resources. A circular economy, as opposed to our current linear system of production, consumption and disposal, provides a solid guideline on which to redesign our value-chains towards a more sustainable economy. Especially in the building sector, accountable for a considerable amount of GHG emissions, designing new approaches towards reutilisation and recycling of construction materials and optimisation of building processes can contribute significantly to cut down our GHG emissions.

Group discussion during the Design Sprint seen from above

However, these processes require a new approach on the traditional ways in which the Built Environment has been made. Researching these new approaches, from Cradle2Cradle to Deconstruction, and teaching future designers about them, is fundamental at Architecture faculties right now, as the upcoming generations of architects and urban designers will be in charge of implementing the shift in the building sector. For this reason, taking the design of a Circular University as a starting point is the best option to start making a change towards a circular economy.

The precedent notion led us to our concept. We felt the desire to create a link between society and students in order to start a change from a linear towards a circular society. We started from the idea of inserting education or at least knowledge and skills into a closed circle from which everyone benefit. This was the starting point of our CreaTUM project.

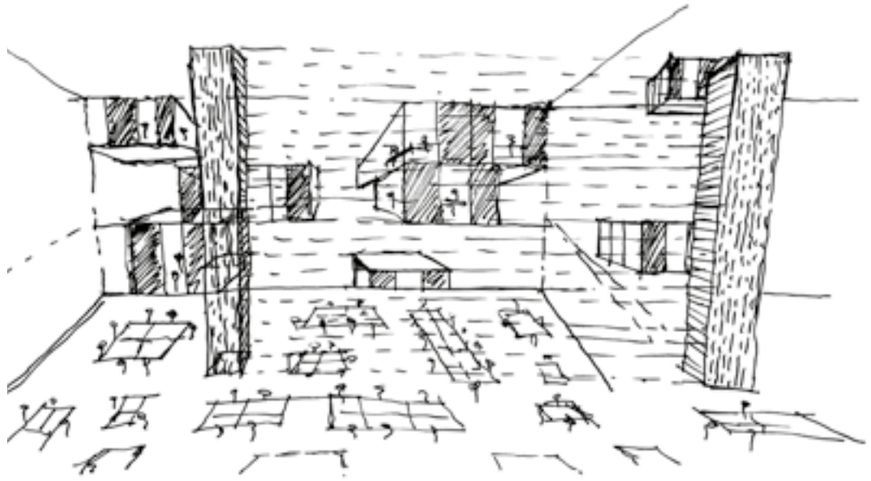
Executive summary

The Design Sprint's title was called 'The Circular University'. It implied that the idea of a circular economy should be applied to the realm of the university. Naturally we started the week by trying to grasp the terms "circularity" and "circular economy". We learned that a circular economy is, as opposed to a linear economy, a system in which the formerly spread sequence of "take, make, dispose" is abandoned and the products that would usually turn into waste are refurbished or recycled in order to be reinfused in the circle of production. Previously useless waste becomes a valuable resource in the model of a circular economy.

Having understood the concept of circularity, we wondered how this system could become a valuable part of university structures as well. Whereas in economy "money" and "products" are the items of exchange, we at university have a quite different currency, the currency of knowledge which is achieved by conducting research. Identifying "knowledge" as the value we produce and exchange at university, we set our minds on the idea of how might we (HMW) make our knowledge useful to society which we as students are part of. Instead of keeping it inside the university structures, where it can not acquire its full impact, we wanted to find a way to make it accessible to the rest of society.

That was the initiating thought behind "CreaTUM". It is our vision to reuse and refurbish one of the university buildings and make it into "TUMs Development Center for a Circular Society". This physical space would provide a huge hall and co-working spaces on five levels, as well as workshops (for building prototypes), cafés, restaurants and bars. The center is meant to be a place where students and people from outside of university meet and exchange their knowledge and ideas on society's issues. The citizens of Munich and the students of TUM could meet in an informal atmosphere and work on their ideas in the co-working spaces. We believe that by providing a space like this major societal problems could be solved. The exchange of knowledge and the accumulation of skills and interests is what would make CreaTUM a unique place. The vision is about "creating" concepts and prototypes that are products of interdisciplinary as well as cross-generational work. We believe that with the knowledge we have and the experiences from the outside people we can reach a whole new level of innovation."CreaTUM" is a vision we would love to become reality. We are convinced that our project tackles the very core of the upcoming transformations in the university system and is therefore an essential part of a circular university.

CreaTUM Development Center for a Circular Society



Vision for a co-working space for the CreaTUM Development Center

The Concept

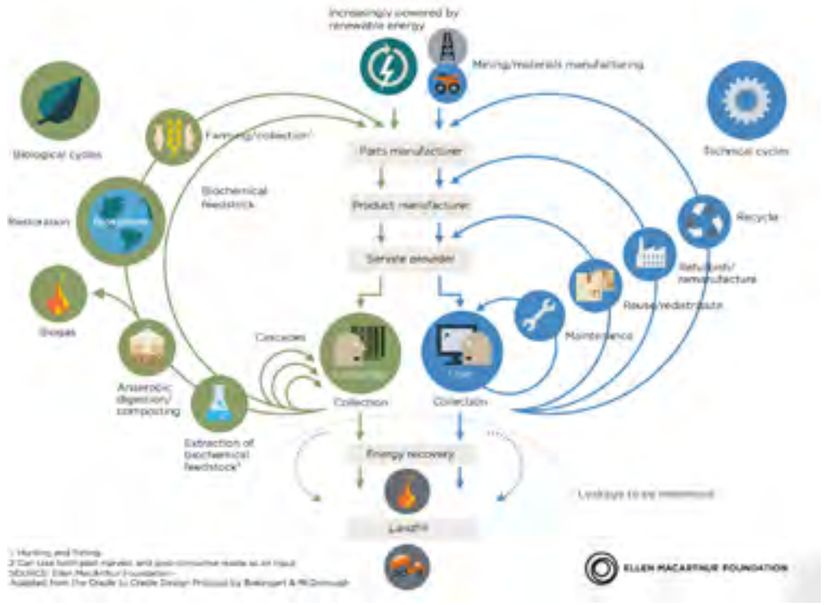
The production processes nowadays function in a linear way, in which material resources are transformed into products, that are later disposed and become waste. This system relies on finite and precious natural resources, it generates ever-growing amounts of wasted materials which are then no longer useful to the industry. This model of linear production is limited and not sustainable.

But there is a very suitable alternative to the linear model which is called: circular economy. It relies on a production process that is designed for the avoidance of waste generation. In its process, products, materials and resources are kept useful and valuable throughout the production/consumption cycle. This model tries to use as few natural resources as possible, while still functioning properly, it tries to enhance and prolong the usefulness and value of its products and subproducts and to minimize the system's output of waste.

One of the main institutions that defined the term "circular economy" is the Ellen MacArthur Foundation. They state that in a circular economy two different types of cycles are to be distinguished from one another: the technical one and the biological one. In the technical cycle, the products lifespans are supposed to be augmented through maintenance. After being used by the consumer, the technical product itself can be reinserted into the economy through sharing, reusing, refurbishment or recycling. In the biological cycle, the products are reused by the consumer and afterwards will be transformed into new resources for the industry.

The Ellen MacArthur Foundation and some other institutions have been addressing the need for a circular economy for almost a decade now. Yet circularity as an abstract applicable concept to other spheres of modern life has not yet been systematically discussed. The Design Sprint: "The Circular University" at TU München is one of the first attempts to extrapolate circularity from the economics sphere. The first day of the design sprint, the groups were presented with the following task: to think and answer to the question „what does a ‚Circular University' look like?".

At first, our group focused on discussing how universities, taking TUM as an example, work nowadays. Identifying graduation as a linear process, we analysed that the students enter university, create massive amounts of knowledge – made tangible through dissertations, projects and models they write or design – and then leave university, taking with them all the knowledge they developed over the years, hence all of their work is transformed into waste: the thesis and projects are rarely made accessible after they are handed in and the models are usually destroyed or literally thrown away.



Circular Economy diagram by the Ellen MacArthur Foundation, distinguishing between the biological and the techinical cycle

„How Might We" exercise: Brainstorming on a circular university

In this linear system, students, teachers and researchers, who should be making use of each other‘s knowledge, do not have a platform to communicate and exchange their knowledge.

Furthermore, we identified that the university, as a public institution that responds to society, is not fostering the circularity of knowledge throughout its „external“ sphere. Students themselves have little access to other students‘ research and knowledge, and society even less. Nonetheless, as a publicly financed institution, TUM‘s research and development should also affect society - and we as a group believe that in a circular university the relation between its internal processes and the outside world should also be clearer and stronger.

Concluding, the group decided to answer the question „what does a ‚circular university‘ look like?“ with a system for knowledge circulation. In the circular university, knowledge is produced by its internal role players (such as students, teachers, laboratories, researchers, services – like the library – and administration offices) and circulates through them, in what we called the „internal sphere“. The external sphere of the circular university, on the other hand, shelters other role players, such as public and private institutions, the government, civil society and companies. Knowledge, that may come from the internal or from the external role players, shall then also circulate through the external sphere.

This circulation from university to the external sphere and back takes in consideration that not only knowledge might be “re-infused” into the university by the external role players, but also financial aid derived from societal recognition in order to maintain the circularity within university. With this general concept of a circular university in mind, our group then narrowed down its theme and tackled a more precise and objective target. We decided that we would design a link between students, the university and society.

After many discussions, attempts and fails, our group concluded that this link should be a physical space called CreaTUM: a development center for a circular society.

In order to connect students, university and society in order to circulate knowledge, our group developed a circular system, in which each of these actors relate to each other in different ways. CreaTUM would be a center for the visualization and solution of societal problems, fostered by TUM, financed by society and integrated mainly by students. In CreaTUM;, society‘s institutions, such as the government, NGOs and other institutions display challenges – formally, data on current topics, such as waste production, climate changes, housing shortage, massive health issues and so on. These challenges are then perceived, analysed and worked on in interdisciplinary teams.

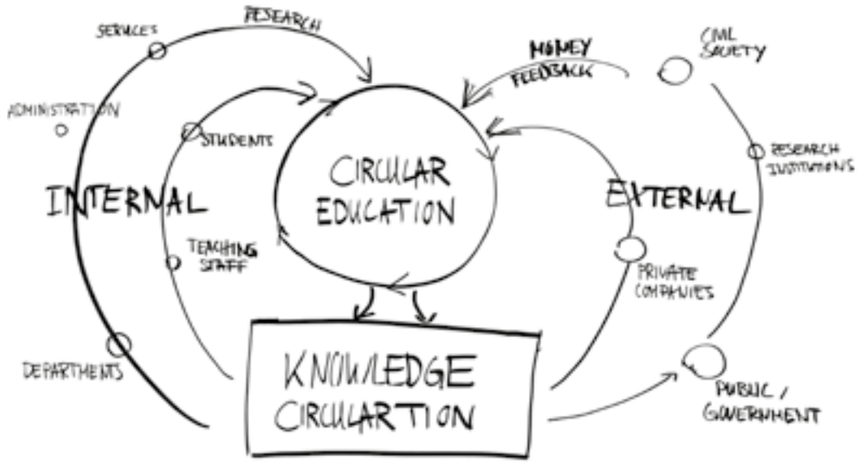
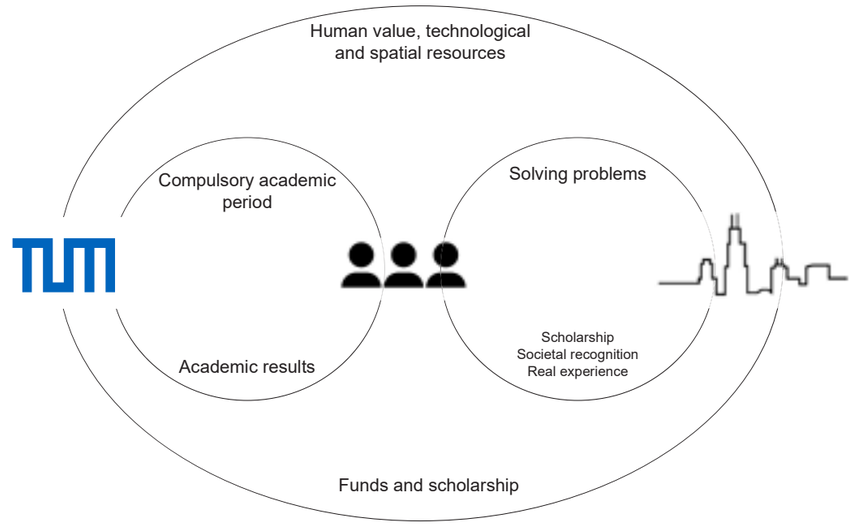


Diagram on knowledge circulation at a circular university, with internal and external knowledge loops



CreaTUM concept - fostering knowledge circulation and value creation between students and society

The knowledge circulation starts with the fact that data collected outside TUM would be accessible in CreaTUM, and continues to happen as students, who engage in CreaTUM, match up with different students in interdisciplinary teams to deal with this data.

In order to motivate students to engage in the projects at CreaTUM, a semester-long project could be a mandatory part of their curriculum at TUM. to develop a solution for one challenge of their interest in a multidisciplinary way, working either in a group for the whole process, or meeting with different people throughout the process.

In the end of the student‘s activity, the product of their work should be an applicable solution to be used by society – either a prototype, a concluded research, a project – to help mitigate real life problems. As „society“ receives this help, it contributes to CreaTUM with financial aid and the creation of opportunities for students to engage in its institutions. The government and civil institutions would participate providing financial aid, which would be administered by TUM and given to CreaTUM as scholarships, maintenance, infrastructure and funding in general. In the same time that TUM would request academical results from its students, it would also be providing them with „real life“ working experience, an opportunity for students to see their knowledge being applied and making a practical difference in other people‘s lives.

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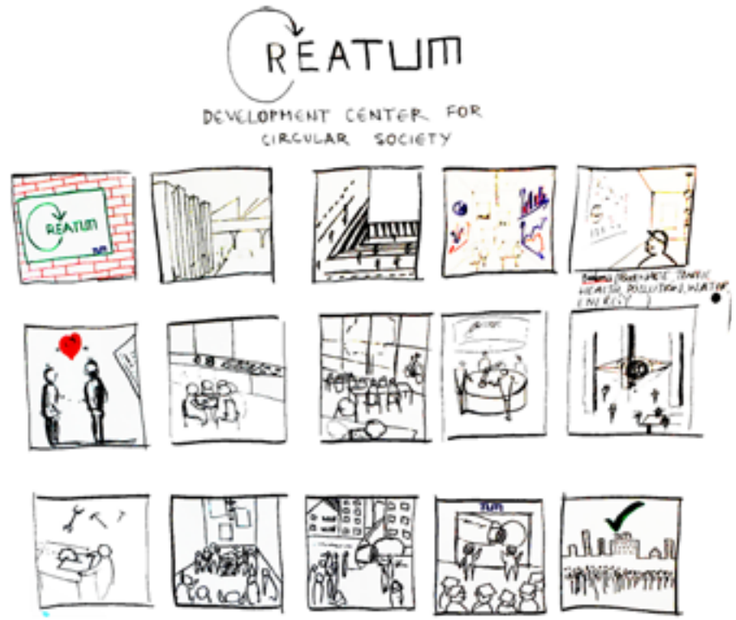
Conceptual sketch on physical and digital interaction between university and society



Storyboard showing user expierence in CreaTUM Development Center

From High Voltage House to CreaTUM Center:
Circularity in the Built Environment of TUM´s Main Campus

1.TUM´s Main Campus´ expected development

TUM´s Main Campus or “Stammgelände”, as the name implies, is situated at the heart of Munich´s city centre, in the district of Maxvorstadt, an important city expansion promoted under King Ludwig I of Bavaria at the beginning of the 19th century. Aiming to modernize the medieval city centre, the Maxvorstadt housed several new institutions and public buildings, ranging from the famous “Alte Pinakothek” and “Neue Pinakothek”, to the new “Polytechnische Schule” (forename of today´s Technical University of Munich), founded in 1868 by King Ludwig II of Bavaria.

Throughout its almost one hundred and fifty years history, the Technical University of Munich has grown steadily, contributing significantly to the Industrialization of Bavaria, by educating and training all kinds of engineers, architects and scientists. Due to a growing demand in the second half of the 20th century, the university promoted the development of additional university campuses in the outskirts of the city of Munich, such as “Campus Garching” and the “Wissenschaftszentrum Weihenstephan”. Gradually, several of the fourteen faculties left their location in the Main Campus for larger and newer infrastructure facilities.

As of today, four faculties remain in the Main Campus, the ones being: Management, Civil Engineering, Architecture and Electrical Engineering.

The university‘s development vision foresees to reallocate the Faculty of Electrical Engineering to the Campus Garching in the following decade, with the construction of a new faculty expected to begin in 2018. However, a concept for the future use of the buildings left behind in the Main Campus does not exist yet.

This fact constitutes one of the starting conditions taken into account by our team at the beginning of the Design Sprint: How can the physical environment of a university be managed in a more circular way, taking into account the rapid changes in the higher education sector due to digitalization, growing demand or modernization?

2. Left behind: The buildings of the faculty of Electrical Engineering

The faculty of Electrical Engineering at TUM´s Main Campus is based around two main areas: The so-called “Wienandsbauten” and most of the buildings in the “Nordgelände”.

TUM‘s Main Campus in the Maxvorstadt district

The High Voltage Haus of the faculty of Electrical Engineering

2.1 “Wienandsbauten”

The “Wiendandsbauten” or “Wienandsbuildings”, named after the Architect and TUM Professor Rudolf Wienands, who designed and built them between 1992 and 1995, are a building complex situated in the inner courtyard of TUM´s Main Campus. They not only house part of the chair offices, working rooms and a power plant of the Electrical Engineering faculty, but also accommodate a student cafeteria and the Audimax (Auditorium Maximum), accessible for all students. Due to its location and functions, the “Wienandsbauten” stand at the centre of the Main Campus, attracting a large number of students from all inner-city faculties in their daily routine.

2.2 “Nordgelände”

Situated across the Theresienstraße to the North of the inner courtyard, the “Nordgelände” or northern area encompasses seven buildings, out of which six (the exception being the materials testing laboratory of the Faculty of Civil Engineering) are currently under use by the Faculty of Electrical Engineering. These are: three office buildings housing chairs, a large experimental hall, the “Nordbau” with offices and several lecture halls used by multiple faculties, and the High Voltage House.

3. The High Voltage House: Hopeless waste or future potential?

The High Voltage House is a five storey building situated at the corner between Theresienstraße and Luisenstraße, delimiting one of the edges between the university campus and the residential blocks in the Maxvorstadt. It was designed by Werner Eichberg und Fran Hart and built between 1957 and 1963. It houses a large, five storey tall hall, in which high voltage experiments can be conducted, as well as five storeys of working rooms in the back part. Due to the high electric voltage produced inside, the building was built with thick brick walls, almost no windows and with a limited amount of steel. The building is separated from the street at its basement level through a stone trench. Protruding inside and outside the roof of the building, a large metal antenna provides the building with a characteristic appearance.. However, with the expected displacement of the Electrical Engineering faculty towards Campus Garching, buildings specifically designed for Electrical Engineering, such as this one, will be left without a clear function. The question whether and how such buildings might be redeveloped in a Circular University, taking the High Voltage House as our example, became our subject of investigation.

4. From High Voltage House to CreaTUM Center

After determining our concept for a circular university, with “Knowledge Management/Circulation” standing at the core, we moved on to translate our vision into the physical realm of our university´s Main Campus.

The CreaTUM‘s facade interacting with passing by pedestrians

Our aim was to create a space at university, designed to raise awareness and to foster knowledge amongst students and researchers on the topic of circularity, as well as being an example itself of a circular process. On the one hand, the space would be allocated in a repurposed building, exemplifying the potential for maintaining and reusing physical infrastructure and thus enlarging their useful lifespan. On the other hand, the activities taking place within our envisioned space would not only contribute to exchange knowledge, but to help redistribute and reuse knowledge produced by university outside of the academic realm, that is, applied to solve and improve society´s challenges. That way, the concept of “Knowledge Management/Circulation” would take place by creating and applying knowledge loops among students, researchers and society and vice versa. For these reasons, our Design Sprint challenge led us to repurpose the High Voltage House into “CreaTUM Hall: Development Center for a Circular Society” at TUM.

4.1 CreaTUM Center: Development Center for a Circular Society at TUM

In our vision for the coming decade of TUM as a circular university, the High Voltage House becomes the center of TUM´s Circular University Strategy, combining a physical space with a wide range of programmes and activities, devoted to lay the foundations for a circular society.

A circular society is understood as a society, whose economic model is the circular economy, and in which material and immaterial resources are embedded into closed loops that maintain and extend their value. Among these resources, the reuse and redistribution of knowledge and information are key to maximise the gain from investments in public education and research. The concept for “CreaTUM” is born out of the idea, that especially students, but also researchers, can “create” additional value for society with their ongoing work as part of their education at TUM. But in order to make this knowledge valuable and accessible for society, a new academic programme, the “CreaTUM Programme” is launched in combination with the workspaces in the CreaTUM Center, that allows students to work for one semester as part of their Bachelor programme on a project related to societal challenges, such as energy, mobility, health, food, housing, etc., in an interdisciplinary team. The programme will be run at CreaTUM Hall. This way, it will become a physical space for societal value creation at TUM, as implied in the combination of the verb “to create” and “TUM” into “CreaTUM”. The building will be redesigned to adjust to the different stages of the CreaTUM Programme:

4.2 Hall for Societal Challenges

As CreaTUM Center will be the physical space for the CreaTUM Programme. The initial stage of the programme will be the team and challenge finding, which will take place in the building‘s former High Voltage Hall, renamed as the “Hall for Societal Challenges”. Taking advantage of the five floor tall hall, this space will serve as a space of encounter for students and society with the topic of Circularity and with societal challenges. The large inner walls of the hall will become an interactive screen on which societal challenges will be displayed. Students and visitors entering the hall will have an opportunity to be confronted with current societal problems in a new and direct way. The interactive environment will allow to access and visualize information about a certain challenge, to compare it with similar challenges, and to read about current projects worldwide working on this issue. An essential feature will be the possibility to see whether and how TUM´s students and researchers are working on that particular issue. As part of the CreaTUM Programme, students will be able to match in interdisciplinary teams based on their preferred challenges displayed in the CreaTUM Hall. Students will have access to this platform as an extension of TUM´s digital platform TUM Online, and could be available in the form of an app. CreaTUM Hall will also offer open working spaces in connection with gastronomic facilities, such as a cafeteria, in order to attract not only students but also visitors with different interests. The hall offers the potential to be used as a venue for special events, ranging from lectures about Circularity, the presentations of student projects, to entertainment events such as concerts, theatre or films. Alternative functions during the night could extend the use of the space, for instance as a Jazz club.

View in to the Hall for Societal Challenges of our model made from reused the High Voltage House bricks

A successful example of a space of the Department of Architecture open to the public is the Vorhoelzer Forum, which combines lecture and event spaces with a café at TUM´s Main Campus rooftop.

4.3 Working and prototyping areas

The CreaTUM Programme allows students to apply their knowledge and skills into developing projects that will address a societal challenge and help improve it. Therefore, once a student team is built around a defined challenge, they will be granted a working space in the working and prototyping areas of the CreaTUM Center. These will be located in the former office spaces distributed throughout the five storeys of the building, and will have a visual connection with the CreaTUM Hall. That way, a permanent connection between the challenges being displayed in the Hall for Societal Challenges and the student projects working on their solutions will be created. The working areas are designed according to current developments in the working space sector, taking inspiration from co-working areas and makerspaces. An important feature will be the fact, that they will also provide with the necessary physical and digital infrastructure to prototype and develop project ideas. For this purpose, the basement level of the CreaTUM Center is repurposed into a prototyping and testing area, in which sophisticated machines can be used to build the final products.

Two additions contribute to making the CreaTUM Center a point for interaction between university and the industry. On the one hand, partnerships with companies delivering software and machines can be agreed to provide free access and instruction to their products for students working on their projects. On the other hand, available working spaces at the CreaTUM Center can be rented to external companies working on related sectors as part of a co-working concept, fostering the creation of spill overs between industry and university partners.

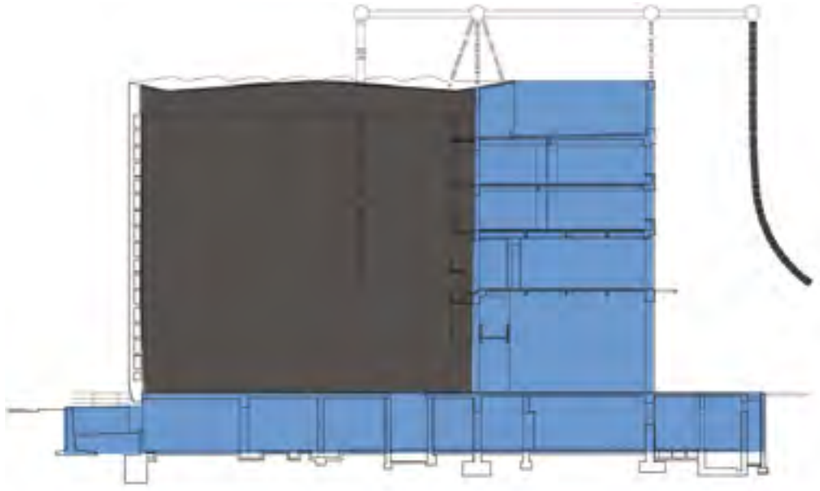
Finally, the CreaTUM Programme envisions to bring the results from the student projects into the real world. For this, collaboration with organizations from the public sector and civil society are fundamental throughout the process, from challenge definition, data recovery, testing and implementation in real life. For this, the CreaTUM Center offers a meeting space in which different stakeholders involved in the projects can work and exchange their knowledge.

5. The CreaTUM Center prototype: a circular model

As in every Design Sprint, an important element of the process is the creation of a prototype that simulates the features of the designed product or space. In our case, we designed a model for the CreaTUM Center that would showcase the spatial qualities and materiality of the Hall for Societal Challenges and of the working offices, as well as their interactive environment. In order to take our concept of a circular university a step further, we decided to build our prototype entirely of reused materials and digital software at hand. This was achieved by lending real bricks meant for the renovation of the High Voltage House from the construction works on site, and using them to build our CreaTUM Center model. Digital screens hanging from the ceiling were made from our name tags provided by the organization of the Design Sprint on day one, as well as by inserting our phone screens behind cut-out walls. The furniture for the working rooms was made from cardboard and the cut-out people were made out of post-its. The digital content displayed in the Hall for Societal Challenges was projected through the Department´s beamer, and connected to one of our laptops.

The model reflected the impression of being in a large, enclosed space with no windows, isolated from the outside world. On the screens illuminating all four walls, society´s challenges were displayed, offering a new perspective on the outside world for visitors and students.

At the end of the Design Sprint, the model was taken apart in its original pieces. The name tags returned to the participants and the bricks were taken back to the construction site, exemplifying how a circular model can be created and dismantled within less than twenty-four hours, leaving zero waste behind.



The High Voltage House section and ground floor plan, blue - private, grey - public areas

6. Replicability and scalability: potentials for redevelopment of university buildings

The aim of our Design Sprint challenge, repurposing an empty university building into a center for societal value creation through student projects, is meant to serve as a starting point for TUM´s Circular University Strategy, a holistic vision on TUM´s future physical and digital development. We believe that our concept of CreaTUM Center can stand at the core of TUM´s “Nordgelände” future redevelopment. As analysed in the previous chapter, the departure of the Faculty of Electrical Engineering to Campus Garching will leave several buildings empty. A circular approach towards their future will significantly contribute to minimize greenhouse gas emissions and reduce construction time, compared to building new facilities. For this, the existing infrastructure needs to be adjusted to new forms of demand. It is advisable to look at the remaining Faculties in the Main Campus. For instance, the Department of Architecture has already manifested its interest in acquiring new facilities, due to its expected growth.

But also rapid changes undergoing in the way higher education takes place might offer new opportunities for redevelopment: On the one hand, a trend towards more multi- and interdisciplinary education. The physical and organizational structure of faculties might have to be gradually replaced for inter-faculty clusters, with working spaces for both students and researchers from several faculties.

On the other hand, changes are underway with regard to teaching methodologies. A theoretical and lecture-oriented way of teaching is being replaced by ever-more applied and student-oriented forms of learning. Finally, advancements in the digitalization of education may no longer make physical presence required. On the other hand, companies are becoming aware of the benefits of continuous education for their employees in times of rapid technological innovations, and are seeking the connection with universities.

For all of these reasons, university campuses throughout European cities will be faced with the challenging task of upgrading their outdated physical infrastructure, often dating to the second half of the twentieth century, for new functions necessary for twenty-first century education.

Furthermore, university campuses situated in inner-city locations might have the potential to help relieve critical functions for their cities, such as housing shortage or energy and food demand, by providing new forms of housing, energy and food production, in a compatible way with the main function of the university. In conclusion, we believe that the future circular university will be fully integrated in multiple ways and loops in its city, acting as a true “univer-city”.

View in to the hall for Societal Challenges of our model made from reused the High Voltage House bricks

View from the working spaces in to the hall where challenges are being displayed

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The Design Sprint

DAY_BY_DAY

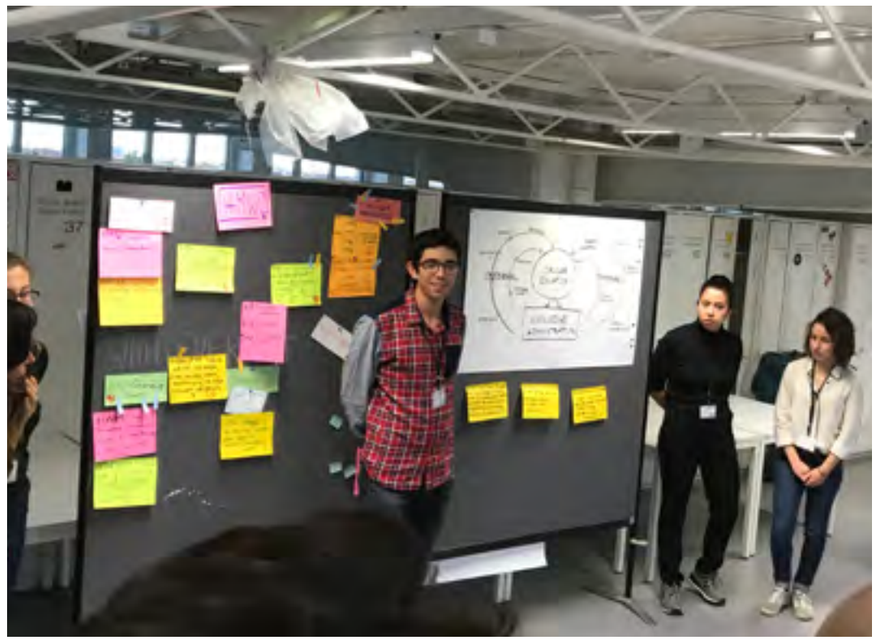
MONDAY // Day 1 // **Context**

In a welcoming atmosphere, we were introduced to the context and goals for the upcoming week. We had a lecture from Amandus Samsoe Sattler about architecture & circularity and Mikala Holme Samsoe introduced us to processes and sufficiency. Both lecturers showed another approach for circularity, how they have used it in their professional life and relevant examples for our topic.

Throughout the week we were instructed to follow a few rules. For example, we were not allowed to use phones around the working area and we only used laptops from the 4th day on. The group agrees that it was much more productive and time efficient to draw and write thoughts by hand, and even better not to have the cellphone's distraction. We reunited in the facilitators area every morning, and finished the work day at 5PM by dropping our pens. It was great to have a strict plan to follow, even when a few obstacles, like time limitation for discussions, or challenges to strictly follow the rules appeared.

First of all, we were divided into groups of 7. Our group, in particular, was a very mixed group, in the sense that no nationality was repeated: we had participants from Brazil, Egypt, France, Germany, Iran, Latvia and Spain. It was nice to get to know people from various background and nationalities. Some of us were regular architecture students in TUM, others were exchange students. It was challenging and exciting at the same time to work with so many different people, all of them having their own perspectives and experiences. It was definitely beneficial for the group work. After that we met our facilitator Alessio Franconi - Industrial and Ecological Designer. He was a helpful actor in our creative process in the workshop, and we appreciated his presence, comments and critics very much.

After the introduction part, were started to discuss various important things such as what would be our main plan, goals and challenges for the whole week. Our discussion led towards the topic of the circular university. We discussed about what was important for us, which processes were working well, what we would like to change, what did not work, how would we make it different, what we would improve and the fact that the university system is very linear at moment. Later on, we divided all challenges in two groups - changeable and not changeable (improve). With that we could sum up which of the subjects could go in the same topic and how many topics would we get in total.



End of day one: presenting our first thoughts on knowledge circulation

We realized that there is physical and digital processes which need to be improved or changed. Already by having all those statements we were able for the next step reframe quickly many HMW - standing for "How might we" - questions to turn those challenges into opportunities for design. Having many questions and topics, like aspects for social, economical, environmental issues, knowledge and symbiosis, we needed to choose one specific direction for our project. We all voted for a question that we thought would be interesting and challenging for us to develop in the next upcoming days. All of us voted for what we had called the "Knowledge Administration" topic: all of us agreed that the student knowledge have not been used properly during the university time and it did not prepare the students for a life outside studies - with a real life experience. Throughout the discussion about study processes between university and outside world, we created a new butterfly diagram which is based on Ellen MacArthurs circular economy diagram and was used as our base for all upcoming process during the workshop. In the diagram we closed existing loop merging internal and external process through knowledge administration.As a next step we collected our main ideas and prepared to present our work to the other teams and to the deciders. Through all team presentations it was already possible to identify similarities between others and us: it was clear that different groups had also realized that one of the process that needed to be improved was the knowledge usage.

TUESDAY // Day 2 // **Target**

As everyday, on Tuesday we all gathered together in facilitators area and got an introduction for the day. We warmed a bit up with the yesterdays discussion and tried to narrow down our target with the help of the questions - Who?, What? and How? For the next 20 minutes everyone did a research about topics that were still not clear or relevant examples. We presented our results to the group and each of us could find some inspiration for our project. As we were 7 team members and each of us had a different thought on the matter, it was important to also work individually. So in this first day of designing, we tackled some tasks individually, spending 20 minutes on sketching our challenge or vision, and afterwards explaining that to others.

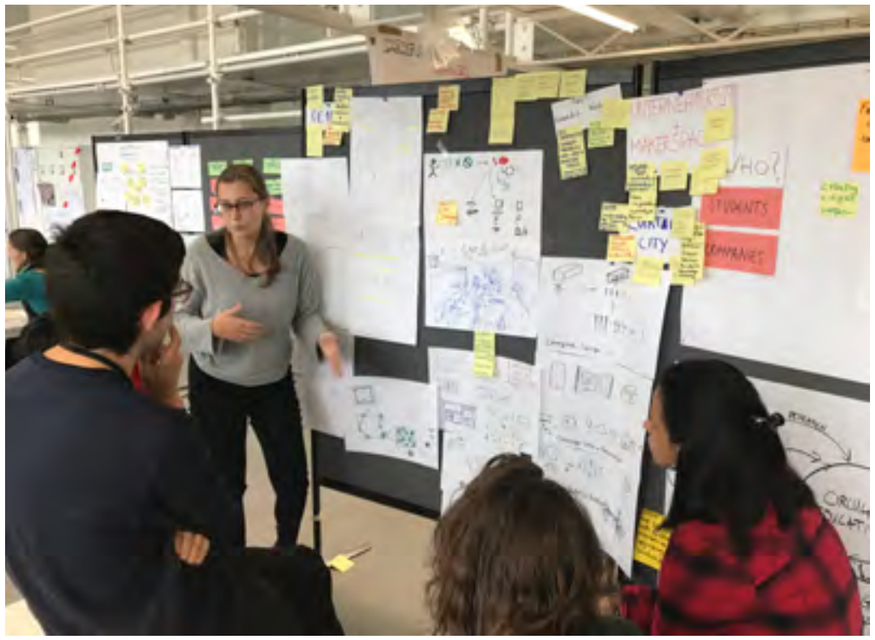
In that way we discovered that some of us had imagined our project as a space, some of us as a digital or physical system and some of us as a process that combined both. We gathered, collected all main points what we thought would be important. And by end of the day, after many discussions, we already identified our project as a physical space combined and connected with a digital technologies, that creates a system for knowledge circulation.

WEDNESDAY // Day 3 // **Decision**

One the third day, we faced the challenge of making the final decision: chose on what would our product be and what we wanted to show as the final prototype in our presentation.

At the beginning of the day, our focus was to make our target clear and create a name for our product. At this point we decided to make stronger relation between university - students - society through CreaTUM Development Center for a Circular Society. As we knew that the Department of Electrical Engineering will move out from the northern site of TUM‘s Campus, we understood it would be necessary to use that part of the built environment in a circular process. We studied the floor plans of the all building on the site more closely. In this moment, the red brick building – with an empty hall bigger than 900 square meters and which stood on the corner between Theresienstraße and Luisenstraße – caught our attention. it‘s physical and location features made it a privileged building for our purposes. So without a doubt, we decided it would be the perfect place for the center to exchange all the data that is relevant at the moment. We visited the building‘s surroundings and interior, to have a better notion of its proportions, interior spaces and relation to the urban context.

As a next step we created a storyboard with our logo for the CreaTUM that explains the student‘s movement through the center and how the knowledge circulation process would be approached (university - society wise).



Laura is explaining her vision of the CreaTUM space

Victoria explains the storyboard

THURSDAY // Day 4 // **Prototype**

On the day when we created the prototype, the first step was to review and revise the storyboard, to make it as clear as possible, define exactly what we saw as our final product and how in particular we wanted to create it. We are were aligned that we needed to create a strong and dynamic space as a core for the CreaTUM. After we divided the team into 5 groups - responsible for a model making, collecting all ideas together in a presentation, writing down our story and working on the last details and preparing for the next day‘s interviews.

By the end of the day we had a model - an interactive, spacious hall, with floating screens and projected data on the walls. We discussed details of our project such as what was important to say and to show in the interviews, with the team members and our facilitator Alessio. He gave us tips on how to lead the interview and clarified that they were not supposed to be a mere presentation, but more importantly, the interviews should test our prototype through the participants‘ experiences and reactions to it. The group understood that we should focus on hearing what the interviewed guests thought and how they saw it, and how relevant our project would be for them. Furthermore, we needed to keep in mind not to fall in love with the prototype and to build just enough that others could understand our main idea following the „80/20 curve“ diagram.

FRIDAY // Day 5 // **Presentation - Interview Day**

In the final day, it was important to get feedback from others who have not followed the group‘s whole process and had just arrived as a new user with an open mind to help improve our idea. Overall, the main goal on this final process was to try to get as much information and feedback as possible from our customers.

The first interview was with possible real life customer - Kesmat, a student from LMU. After the first interview, we knew what we needed to improve or show differently. We took notes on what each of the interviewed guests considered important issues and qualities on our project. As each of them had a different background, sometimes they perceived the same aspects in opposite ways, but many comments were very similar throughout the interviews.

After the interviews, it was interesting to see the final work of other teams, and how they had developed their ideas through out these 5 days.

We cannot end documenting our process without mentioning some of the names, who were a great help to us during this week.

Discussing details with our facilitator Alessio Franconi

Firstly our facilitator, Alessio Franconi, was of great assistance, partly because of his expertise in the field of Circular Economy, and partly because he understood how to keep us focused and working in the right direction. Especially in times when we were drifting off topic or were simply stuck, his advice was valuable.

Secondly the organisational leaders of the Design Sprint were big motivators. Christos Chantzaras, Martin Luce and Andreas Marx would keep motivating all the groups and were very attentive to keep everyone satisfied. They would remind us that it is normal to fail and we shouldn‘t be afraid to do so, because what is important is to take the criticism and build on it. They definitely was an important link that kept everything going according to plan, contributing to make this week a success.

Thirdly to have the renowned architecture firm, Allmann Sattler Wappner, as a main supporter of this sprint was another bonus that gave us practical insights on circularity, which we as students were missing. Starting the week with Amandus‘ presentation of how in his office circularity has been used and having Kevin come in each end of the day gave us an outside perspective on how clients would perceive our ideas and prototypes. The input we got from them in the evening, was the first thing we discussed each morning and on which we based our plans for each day.

Making it into the 3rd place was great after all the hard work. But what was even greater and more rewarding was the fact Amandus Sattler stated that CreaTUM was his personal favourite. That really meant a lot to us coming from an influential architect like him, because we saw that he had understood our project and believed in it. All of these names mentioned above contributed to us having a very productive week and a great working atmosphere, which resulted in a positive work dynamic.

Since day one it was easy to get to know everyone, the fact that each one of us came from another part of the world made it even more interesting. Also the fact that four of seven members of the group were exchange students, gave the TUM students a fresh look and an outside perspective on the university. From the get-together we also got to know that we were all motivated to participate in the Design Sprint. So building on this common ground helped us through the week. We were very tolerant, listening and building on everyone‘s contributions.

What worked, what not?

Having such a strict timeframe to develop the whole task was an amazing exercise. We as Architects usually deal with designs that are never really finished; a design can always be changed or improved, because there is no right answer, only ever different possibilities, and we tend to get lost in the details or in discussions. Having a limited amount of time forced us to make choices and stick to the most important ideas in a brutal way that was, nonetheless, very relieving.

Some instructions during the sprint were not clear enough in order for everyone to understand what the task was. A lot of times we got out of the facilitator area early in the morning without exactly knowing what we were supposed to do. Maybe showing an example while explaining the task would improve the students productivity. That way we would lose less time trying to understand the task.

The facilitators were really helpful, especially whenever we were spending too much time on endless discussions or not going in the right direction. Alessio helped us immensely with examples and assertive guiding in these situations. The facilitator‘s and deciders comments on the presentations of each day were also very valuable for our development.

Happy team on the last day after the result from the whole week of the Design Sprint

Having a very international group was very enriching, and brought different repertoires and backgrounds to the group discussions. The week was a bit exhausting, there were times of motivation and also times of a complete absence of it. It is possible that the competition format – although it does have its positive aspects and fast results – many times drew away the attention of the participants from what was really being discussed on the workshop. That happened because we would compare our work with the other groups‘ based on what we thought to be the deciders‘ opinion. It would have been better if we had judged our work based on what we discussed together, benefitting from the feedback and ideas from all participants.

To sum it up, the workshop was a really great expierence for all of us and the Design Sprint was indeed a very interesting and useful learning process that we would like to have more often at Architecture Schools. The Design Sprint also made clear for us that the topic of circularity is of utmost societal relevance and should be integrated in the university curriculums. To add up, more interdisciplinary work at universities is needed in times of complex societal challenges. In the words of one of our team members: “We all need to collaborate because it leads to inspiration. Inspiration leads to innovation and so we create a better place for everyone to live in.“

A.C.T.

Activate a Circular Turn

Nils Fischer
Lena Ohmstede
Diana Maria Sionta
Theresa Thanner
Lara van Iterson
Lars Wüstemann

Introduction

What we think on circularity

As cities expand, they have shown us the repercussions regarding our ways of living and the use of urban and suburban spaces, particularly the consequences of the unsustainable growth of cities and economies all around the planet and the expenses of maintaining the momentum this growth has had. By 2050, three quarters of the population will inhabit in cities. Cities are also a main engine for economic growth, as about 85% of global GDP is generated by cities nowadays. Such rapid growth puts a massive pressure on urban resources, carrying capacities, and life quality. The factors and parameters which relate to mentioned topics, haven't had the importance they should've had in the practice of Architecture, industrial design, and Urban planning until not so long ago.

How we define our ways of living is bound to these practices and it is crucial for mankind to change radically the way architecture, industrial design, and urbanism have been implemented. Architecture, industrial design, and other practices need to be changed on all levels of scale. From the future urban plans, to the very details in buildings, preparing them to be adaptable to any changes in its program and capable for re-use and recycling of elements, and even the life cycle of every product, no matter its use or lifespan. The world needs design that is efficient regarding all aspects (or at least most aspects) of sustainability.

Some studies suggest that pollution is linked to 7.7 million deaths a year around the globe, and that the cost of pollution is around 225 billion dollars a year, so there is a clear necessity in using resources more efficiently in order to reduce waste, and emissions related to the manufacture of products the we, mankind, use through all our lives. So, if the practice of architecture and industrial design defines in many ways the functionality of cities, referring not only to a city plan, per say, but as well on a smaller scale, we, architects and industrial designers, have an incredible role to play in the development of a solution for the problematic, which the world is facing. Cities can no longer remain an unnatural environment. They must adapt and incorporate

The circular economy diagram

The system diagram illustrates the continuous flow of technical and biological materials through the 'value circle'.

the very natural processes they've tried to suppress, this in relation to the fact that cities mostly work on an input/output system regarding energy and resources. We need to reflect on the urban-metabolism, which cities can no longer possess, due to the impact that it clearly has in our life and environment.

These, and many more aspects, must be in consideration while undertaking the massive task of meeting the demand for urban spaces the future of cities hold. Around three billion people will need a new home in an urban environment in the next fifty years. So truly all efforts are needed, and it was of our biggest interest to be able to contribute on this matter, since we truly considered that this workshop is one of the many steps that we, architects, should take if we want to be able to achieve the requirements the future of cities hold.

Why we participated

Nils Fischer:
“I think most of my life I’ve been aware of my surroundings, regarding other people, animals and the environment, and have been trying to live in the most interactive way possible. But especially in the last few years while studying architecture I got to know a lot more about how to interact with my surroundings and focused on topics like sustainability and in this context also circularity. During my study year abroad in Barcelona I visited a 5-day workshop on the topic of circularity that was focused on economy and urbanism, which I liked and where I learned a lot. So when I got the email of the design sprint that focused on a circular university I immediately wanted to take part, because I think that the institution where we learn about circularity should overall be circular itself.”

Lena Ohmstede:
“I participated in the Circular University because sustainable design is a major concern of mine. I like to deal with questions concerning reduction, sharing, durability of products to find out how to sensitize the public to sustainability without threatening to abstain. In this way I try to do my part as a designer to strengthen the post-growth economy. Moreover I ware curious on the design sprint method and hoped to get fresh impetus from other fields.”

Diana Maria Sionta:
”Concepts like recyclability, deconstruction and designing for disassembly are notions that have existed for years, but nevertheless only few designers seem to take them into consideration. The idea of introducing these concepts through the educational system could help their future application and stimulate creative ideas in that direction. Furthermore, circularity will shift our economy from a linear resource consumption based economy, towards a circular one with the reuse of materials that will simultaneously minimize the environmental impacts. The whole notion of recycling is a phlegmatic issue that concerns the present and the future of our planet. Consequently being part of this workshop materializes my academic desire in becoming an architect who will respect the environment.”

Theresa Thanner:
“The Design Sprint was a great and unique experience for me. I started into the workshop week without any idea what I am going to do exactly. The subject of circularity was the reason why I applied because I think that this is a really important aspect the society should focus more. The first time I got in touch with this subject was in my ERAMUS year in France where I joined a workshop about recycling. We had to reuse old things and give them a new function, a second chance, to be used again. I took a huge metal box and transformed with my team into a sofa.“

Lars Wüstemann:
“The importance of circularity in relation not only to economy but as well to society and culture and sustainability is growing drastically, though not as fast as it should if mankind will find a solution for the problems of the urban population of the future, so that is where a project such as the Circular University takes a role in accelerating the learning process regarding the topic of circularity and the role that it has as one of the necessary solutions for our future. Merging interdisciplinarity with a complex schedule to learn as much as possible in the given amount of time. If we, as people, would like to take part professionally in building a better future, the design sprint is surely a step in the right direction to accomplish that”.

II Executive Summary // Abstract

The context and the concept explaind in short words.

An University is a complex system defined by many actors such as students of all levels, academics, administrators, just to name a few. It is ,as well, defined by parameters such as schedules, space-, material- and energy-usage, again, just to name a few. So as technology evolves, the way we gather information becomes more broad in terms of results and this has showed us that is clear that most systems in the urban context could be substantially improved, not only regarding efficiency but as well, sustainability. This meaning that the university, although it has been for the past few decades at the forefront of technological advances and efficiency in a city like Munich, through modern information gathering methods have shown that it still could, and has to improve in certain aspects regarding circularity, a term in society not used as often as it should be used. The faculties of architecture and industrial design, for example, have a material-usage incredibly high and a dramatic amount of material waste. There is clearly opportunity for improvement regarding recycling and waste-distribution. Another example is the space efficiency, where there‘s a giant demand for workspace within the faculties but still the percentage of time certain rooms are in use contradicts the efficiency that an institution, such as an university should have.

So, as stated at before there is still room for improvement in many aspects in a complex institution such as the Technical University in Munich, since is what is needed to overcome the challenges the future holds for mankind.At the Circular University we analysed and discussed the aspects mentioned before and many more, which challenge sustainability and circularity within the university, such as the social, anthropological, psychological, and economical factors, to name a few. Eventually, we ended up with a quite broad spectrum of factors and aspects that need and should be redefined and redesign. So that’s where the main question of the design sprint started to take a role regarding the bases of the project: how do you achieve circularity in the university?

First thing that it was realized: Circularity is not only something to be achieved. Almost as hard as achieving circularity is maintaining it. Circularity is a model, that if achieved, it will constantly

Overview of our notes: We used large boards to structure our thoughts

be challenged by new factor taking role in the institution, new emerging technologies, new methods of transportation, new social aspects, etc. So the main question of our project evolved from “How can circularity be achieved?” to “How can circularity be achieved and maintained?”. How to always keep an eye on the ever changing aspects that define circularity? So instead of directly answering this question we tried to define what that entity would be like. An entity that has the purpose of achieving and maintaining circularity: An organisation by students and for students, dedicated to achieved knowledge and development of skills through experience and interdisciplinarity with the sole purpose of achieving and maintaining circularity within the university.

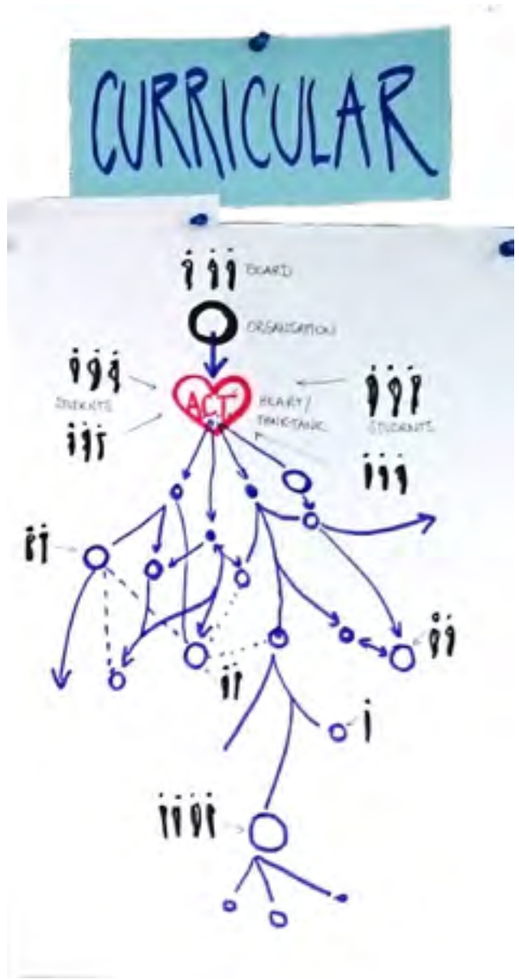
An Organization that dedicates itself to using resources in the university as efficiently as possible. Going from factors such as time, space, information and skills to resources and materials. Truly using the whole potential an institution so complex and powerful as an university could have in terms of circularity. Various groups of students would undertake on an specific issue each semester, developing a project that brings a possible solutions to the given issue related, of course, to circularity, if not to sustainability within the university. Working with all levels of expertise, and learning from the experienced, to then become the experienced and teach others the knowledge and skills they‘ve developed throughout their studies. As well, working interdisciplinary, mixing different kinds of knowledge and skills, giving the project a bigger chance of being successful, as well, as giving the group different approach possibilities to the given problem. Always keeping an eye out for circularity.

III The Concept

What lead us to the concept
Since we, ourselves are aware of everyday life at the university as students, we can estimate what runs well and where is a need for improvement. Especially relating to circularity, there are many optimization possibilities for the processes and procedures. Therefore, there was no shortage of new ideas regarding how to takle various problems. In this, it was important to us to strength social cohesion among the students. After all, we notice by ourselves everyday how difficult it is to get to know students from other disciplines, find out which useful skills they have or how to work interdisciplinary on valuable projects. That lead us to develop A.C.T. for solving exactly that problem and close that circle of knowledge.

Keep it pumpin´
A.C.T. – Activate a Circular Tum – is an organisation that will make student´s dreams come true by creating a strong community that works interdisciplinary and extracurricular. As we all know it is hard to get in touch with students from different departments and to work with people with other education levels as Masters, Phds or even professors. There is so much potential and ideas that need to get together! A heart that combines all the creativity and ideas is missing! A.C.T. will be this heart: we want to foster a circular and symbiotic system by giving students a place to work and realise their ideas. It will be a non-profit organisation where the subject-specific knowledge of different students will create new things.

How does it work?
A.C.T. is a community from students for students with the support (if needed) of several professors and maybe external enterprises. There will be no longer a horizontal hierarchy. The aim is to work vertically together with all education levels. To achieve great solution every idea and knowledge is needed. The second point is to work interdisciplinary, with students from several faculties.



A.C.T. is heart that combines all the creativity and ideas in university and connects students in valuable projects

Keep it pumpin´

Token that uses holograms for giving informations about new projects

Examples of possible A.C.T. products

The A.C.T. bracelet combines the community

Communication is one of the key points of our organisation: monthly feedback meetings of the project groups is planned to have a good exchange of ideas and to turn the ideas into reality. A.C.T. will work circular, we want to respect the environment, to work sustainable. Due to the work in this organisation your knowledge will grow, also interdisciplinary. It will be about to give this knowledge to new student who are going to join the organisation in the future. It will grow by itself. It will be a self-sustaining circularity.

A possible project will be a garden at the Campus: Architects will be needed to design it. Landscape architects will say what will grow, what not. Climate students are about to create a watering system. The next step might be a café where the student can sell their self-raised and prepared food. So we are going to need Economic students to make the business work. The compost can be used for the garden again. And so on, and so on,...

This is just one of many possible ideas that could make the TUM more sustainable. With the support of the students there will never be a shortage of ideas.

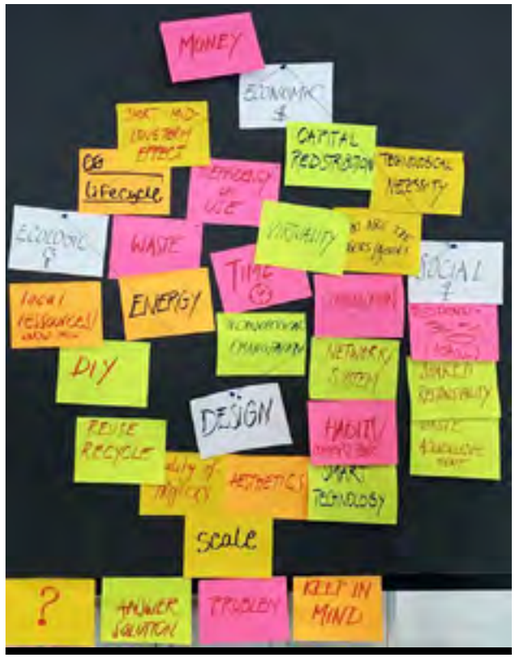
Circular projects can be developed with the teamwork of all participants. With the help of several Professors larger projects could be realised and needs can be satisfied:

It is summer, the students need sun chairs and a pavilion at the campus. A easy and sustainable solution could be wood constructions. The only problem is how to realise or how to pay. So there can be the possibility to involve the higher levels, the professors. With their support student ideas can become semester projects for which the students will receive credits, because it will be a challenging work with a lot of effort.

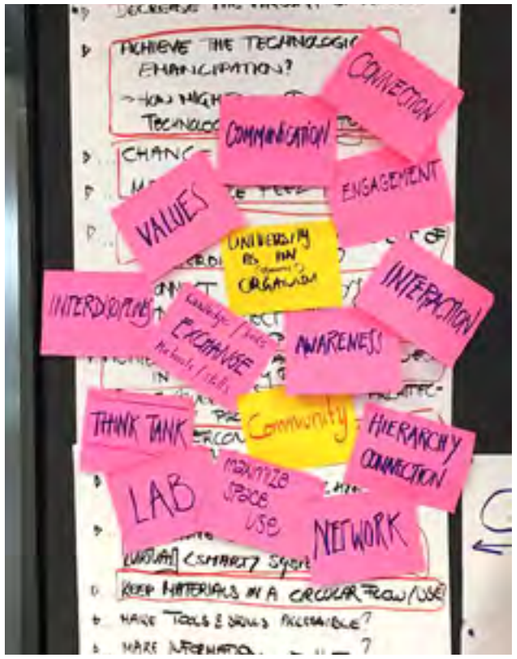
A.C.T. will become a part of the University!
It is important for the team to get together and to discuss maybe once a month. This will be the base to work circular. This means to avoid plastic trash, to recycle, …

The students get to know about A.C.T. by a small gadget that gives informations about new projects. A hologram shows progress and makes students curious

IV. The Design Sprint



Ouverview of categories



Phlegmatic issues

Day 1
The first day was all about assessing the existing situation by exposing the issues and problems within the university and trying to find prospective solutions, that would enhance a circular university.

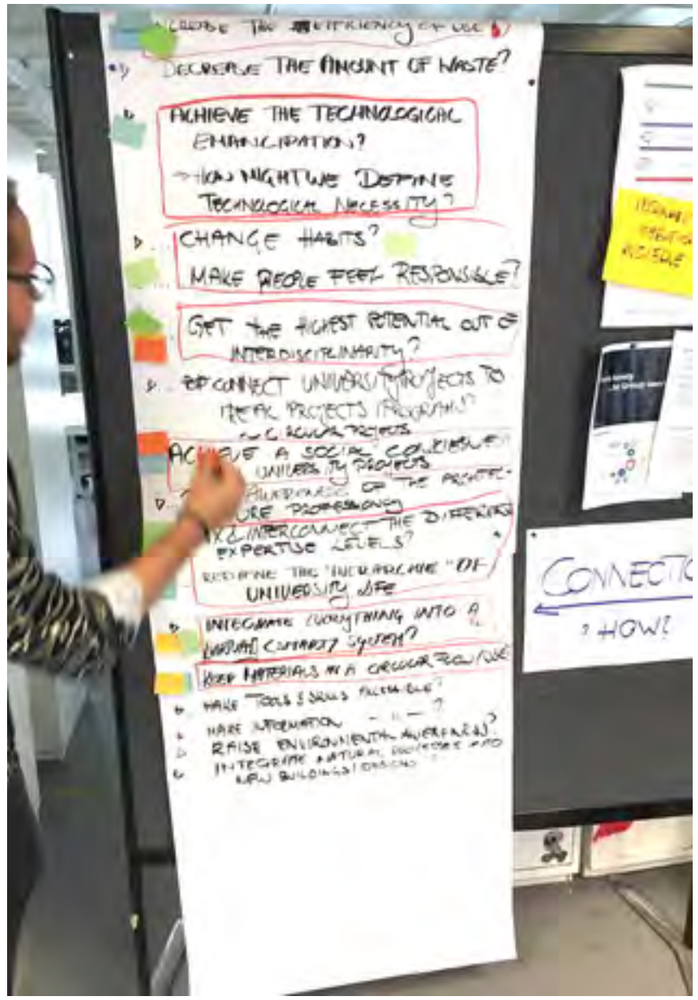
Through this process we realized that everything falls into 4 categories: Economic, Social, Ecological and Design.

By reframing these thoughts in ‘How Might We…?’ we concluded that the following questions revealed the strongest points. (see picture on the right)

‘How Might We…’

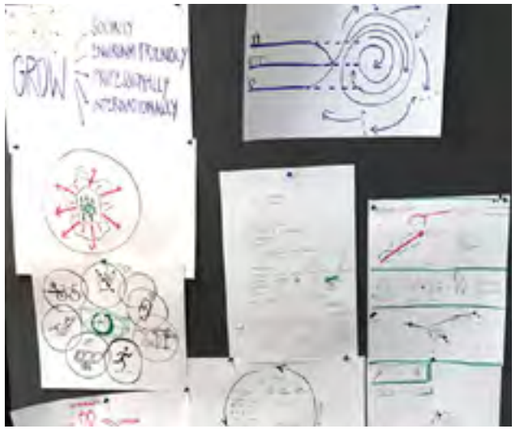
- ...get the highest potential out of interdisciplinarity?
- ...mix & interconnect different expertise levels?
- ...increase the efficiency of use?
- ...keep materials in a circular flow/use?

Therefore, the most phlegmatic issues were concerned with the matters of interdisiplinarity, interaction, hierarchy, connection, exchange of knowledge, skills, materials, ect. and how all these could interact and activate a circular university.



“How might we..“ questions for pointing out our main focus to go on quickly in the design process.

Extracurricular projects



How to bring circularity into university

University as an dynamic organism

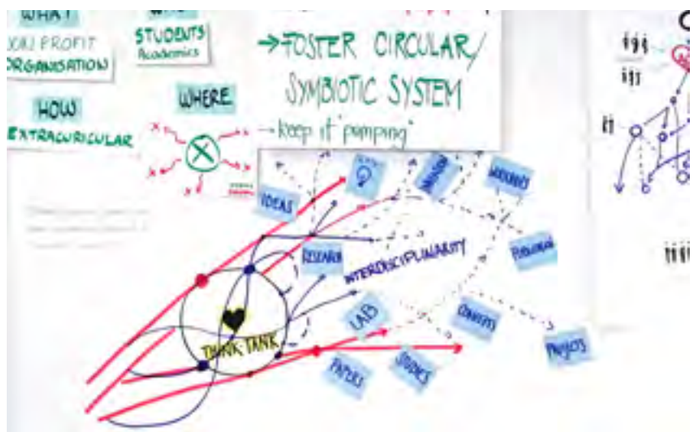
Day 2

By narrowing down the target, our proposal focused on creating a dynamic organism – organization within the university that will deal with real life projects in order to achieve circularity that will expand and evolve throughout time, instead of creating one specific ‘static’ circular product.

It is about an organization in which students from different educational levels and faculties will interact all together in order to achieve something bigger and more meaningful than just university projects. Examples of possible projects that could be created by this organization have already been mentioned in the Chapter ‘The Concept’ (page 8).

As shown in the lower pictur in the left the TARGET is the ‘University as an Dynamic Organism’, WHOse participants are mainly students and in some cases professors, and HOW they achieve their goal is through real projects, workshops, interdisiplinarity, ect. So WHAT they achieve is circularity, social growth, sustainability, expertise and professional growth.

The A.C.T. concept shown in a storyboard



Why does the heart exist?

Defining the concept

Day 3

The third day was mainly about creating a storyboard that would explain our idea. (upper picture in the left)

Our story begins with a freshman student who has just been accepted at TUM. While entering the main campus he finds himself in a central location where an exhibition with circular projects created by the A.C.T. (Activate a Circular TUM) organization is being held. The student gets intrigued. He wonders what this organization is, what they do and why? So once A.C.T. has captured his attention he wants to become part of it, so he subscribes. While working on a specific project he cooperates with students from different faculties and levels. There is diversity and interdisciplinarity. Feedback discussions are held monthly with the participation of all members. Through this process not only circular projects materialize themselves, but also personal development is achieved. The A.C.T. organization is about creating a self-evolving and expanding organism that will stimulate circular projects indefinitely.

Examples of some of the possible products created by A.C.T.

Day 4
By reviewing the storyboard we were drawn to the conclusion that it would be more practical if all the information concerning A.C.T. could be concentrated into one futuristic gadget that would be offered to the students on their first day at TUM. So the physical exhibition area is replaced by a digital gadget. The gadget we designed is a futuristic bracelet with a hologram that informs the members about the completion of projects or new upcoming ones, so they can participate if they want. It also notifies you when you are close to a product that has been created by A.C.T. Similar notifications would be some other functions of the A.C.T. bracelet.

Furthermore experimental interviews were conducted in order to be prepared for the final interviews of the following day.

Day 5
On the fifth day we got to put our idea on the field to get a feedback from experts and clients, regarding our project. Apart from that we had the chance of interviewing around thirteen students and present the idea to them in order to get a more broad feedback of the project. After presenting the idea to each student individually we manage to quantified their opinion regarding our project. The results were promising: 50% of all interviewed students said they would like to take part in such an organization; 65% said they would take part if some kind of revenue was involved (such as ECTS); but the most importantly 100% of the interviewed students said that such a project should exist at the university, meaning there is an acknowledged need for an organization as A.C.T.

The experts gave us constructive criticism, thanks to their experience in the field of circularity. We were happy with the reactions and opinions regarding the project. They all mentioned certain experiences they had when they were students, and how all of them could have been more easily possible if there had been an organization making sure to keep projects that contribute to sustainability and circularity constantly being developed.

Amandus Samsøe Sattler interviewed by Theresa Thanner

Interviews on day 5 gave us the opportunity to verify our concept

What worked, what not
The Design Sprint method allowed us to solve the circular university challenge using quick validations without wasting too many resources on other unneeded solutions. By creating quick prototypes, we got actual feedback and saw quickly if there is a real potential for the solution we've created. The design sprint combines time pressure, teamwork and user feedback.

Sometimes it was a bit difficult to take right decisions because we had not enough time for intense research. Nevertheless, the little time forced us to work interdisciplinary and progress as quickly as possible.

As a team we worked very well. All group members were included in the decisions we made. We worked cross-functionally and inspired and supported each other. All in all it was a productive week with positive results.

Statement of each

Nils Fischer:
"Thanks to the many presentations of people with a lot of expertise on the topic of circularity and the help of them while working on the task with a tight time schedule, I learned a lout about circularity and overall how to apply this knowledge to any kind of field, in this example our university.

The work in interdisciplinary teams helped me improve my skills to understand different work approaches and fostered communication. It was not always easy to come to an understanding, although most of the time we had similar ideas.

The organisation of the whole event was very good as the time tables were almost always met and the work progress was mostly clear."

Lena Ohmstede:
"Circular University was a challenging project in an interdisciplinary team with an important issue. I had a great time with passionate students from architecture. The teamwork was very inspiring and I think everyone could benefit from different points of view within the team. We collaborated, ideated and came up with amazing ideas for a futuristic Circular University. As the only Designer in my team, I really enjoyed being responsible for the product design part in our project. From an industrial design point of view I highly recommend taking part of this high speed ideation project."

Diana Maria Sionta:
"The theme of the workshop as well as the approach through the method of the Design Sprint were really interesting. Introducing circularity through the educational system is a great idea and I think that this workshop was a first good step in that direction. I would really be pleased if this workshop would actually contribute to the future development of a Circular TUM."

Theresa Thanner:
"The Design Sprint Workshop was based on teamwork, what I really enjoyed. We worked in a group of 5 to 7 people from different education levels and departments. I really liked the open discussions with the team and the feedback of the instructors and the final presentation every day at 5 pm. We had a really great progress due to the freedom of creativity. Everything was possible and every idea had a chance.

The end presentations, that were like an interviews, have been a fantastic experience how comfortable presenting can be. We did not have the feeling of being under pressure and we were at the same level as our client.

As conclusion I would like to say that it was a fantastic week where I learned a lot about teamwork, turning an idea into a project and of course about circularity."

Lars Wüstemann:
"Throughout the five days we had the chance to intensively work on our idea and develop them to point where the result could be perceived as clearly possible. It was an intense week, but it certainly paid off, meeting so many people who were interested in sustainability and circularity as well; getting to test our ideas with a good team of organizers and facilitators, who took care of us achieving the planned goal. So, overall it was a great experience and a good challenge to undertake in such an amount of time, just learning as much as possible about a topic that really should interest us all."

COLLECTUM

Alexandra Niedermayr
Jin Peng
Julia Micklewright
Cosku Özdemirci
Helena Julia Brückner
Fulei Lin

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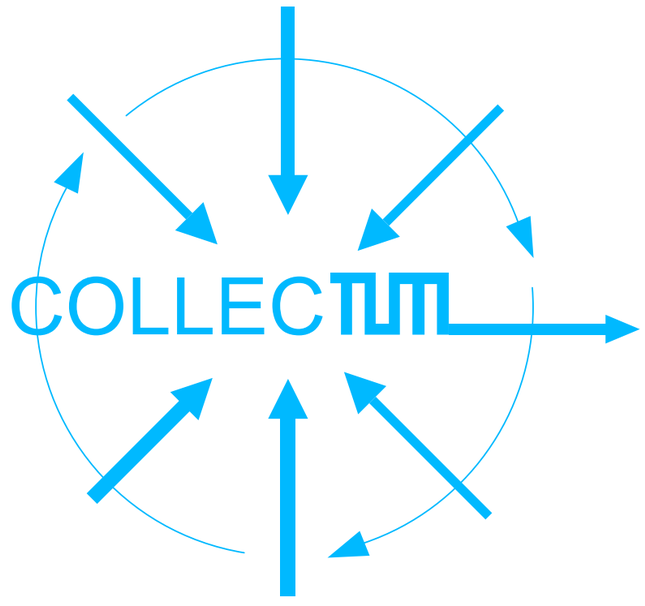


Logo CollecTUM

PART ONE
INTRO

Discussing *circularity* within the campus is a very current topic. We often heard about *circular economy* outside the campus, like in an environmental policy or in development plans from the government. However, circular concepts could come from the university but they are rarely done within the campus. We think that *circular university* is an interesting topic, but not all students do really care about reusing paper or recycled staff.There are lots of ways in realizing circularity in university and there are plenty of topics to be explored. Compared to the *linear economy*, which is producing – using – deposing, the circular economy is more sustainable and has more potential to be integrated into a new lifestyle. We want to do something meaningful, just right here in the university – the most familiar environment for students.

What do we have in university? This is the first question we asked ourselves. We have users, which are students, teachers, researchers and so on. We also have spaces – spaces in buildings, outdoor spaces; some are visited often but some are not. We have visible resources – water, electricity, chairs and so on. We also have invisible resources – knowledge in everyone's mind. How might we apply circularity to these topics?

We suggested starting this exploration with something tangible and physically touchable, which could be visible resources for recycling and upcycling. After all, this is the immediate image which comes to people when they talk about *circular economy*. So we asked ourselves: Why are we not going outside the classrooms to see what was there on the campus? We traced to the end of the *linear economy*, looking for something we could improve. But what captured us the most where the bins themselves.

Yes, normal bins, with different kinds of garbage inside.

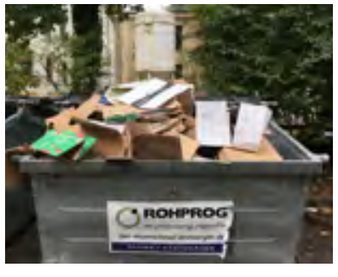
Could we see a logic behind? What's inside is garbage.

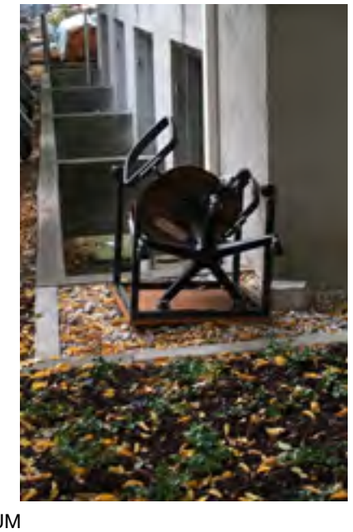
We spent years in university and got so used to them. After all this time we completely lost our sensibility for their appearance. The logic though, that garbage should get disposed in a bin is completely right. But the problem is that we throw something away without even a second thought. And clearly, we don't take the effort to think detailed about what is happening with all those waste. It's simply because we know that we don't have to care ourselfs. Anyway there is a waste sorting system that is responsible for the whole city of Munich and its garbage.

We noticed that this was the right topic for us to start *circularity* in university. The aim was to change the logic from worthless garbage to valuable garbage, worth to be recycled and upcycled. The process of repairing, recycling and upcycling could become a totally new image.

For this, we developed a circular system called *CollecTUM,* which involves and encourages every user on campus or even outside campus to take part of. It creates profits, as well as jobs for university and students. We suggested the process to be visible and to some extent related to people's personal interest, so that participation in this system can be assured. We try to lead people to a different thinking about garbage through this system and get the first incentive to a circular *economy*.

Bins at TUM nowadays



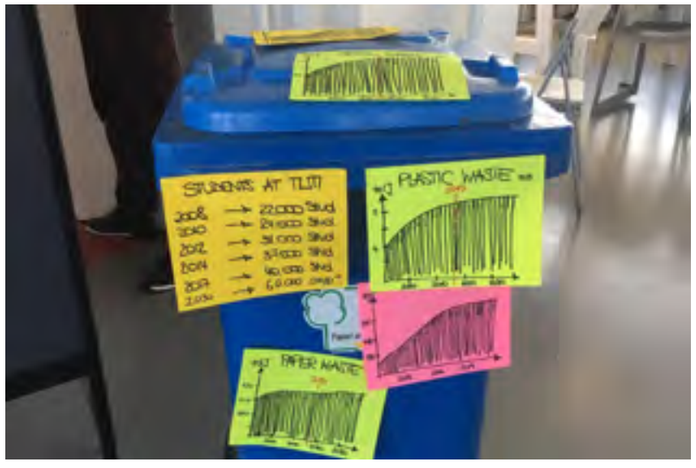


Typical university waste

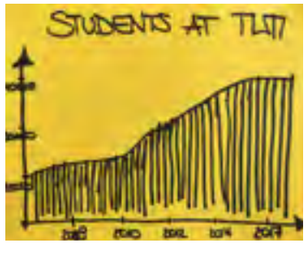
PART TWO
CONCEPT

The project *CollecTUM* challenges the excessive waste arising's at the Technical University of Munich. We - as the Design Sprint team - noticed that every semester, not only in the faculty of architecture but on the whole campus, loads of waste gets produced by students, institutions, visitors and also the staff

According to the information we got from the campus manager, the team came to the realization that for example, plastic waste was rising from 4,34 tonnes in 2014 to 9,18 tonnes in 2016. Additionally, paper waste increased from 4,382 to 5,18 tonnes and metal waste from 22,69 to 23,3 tonnes in only two years. It's alarming how much waste gets disposed on the campus without leaving any profit behind.



Trash bin at TUM showing facts about the current waste situation



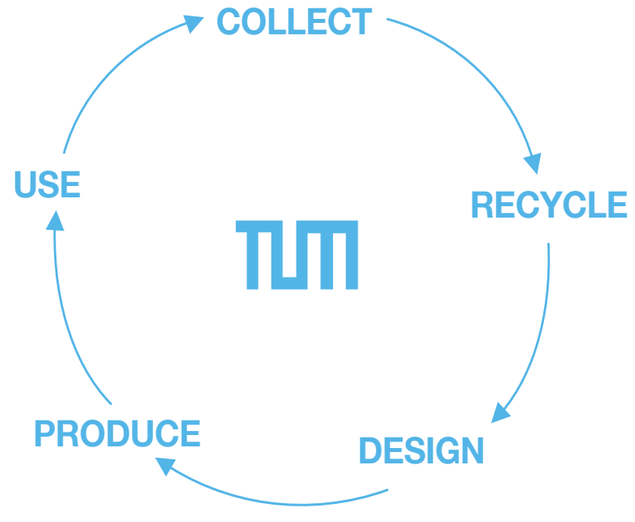
We asked ourselves in five phases, how we could transform this linear consumption into a profitable circular and self-sufficient system. The research led to a new absorption of our daily behavior in our current situation. Particularly striking is the fact, that the waste bins and containers have not developed until today.

Even though we are directly in the changes of the digital area and never been more innovative than at the moment. While everything else is becoming more and more innovative, sustainable and digital, the only upgrade that the trash bin experienced, is the waste separation, recycling. We noticed this as a fundamental step which urgently had to be tackled.

What would happen, if we had a data-based system where all the waste would get sorted and ranked, to then be upcycled to a new resource? Similar to the model *Cradel to Cradel* from Michael Braungart or *Waste to Wealth* from Peter Lacy and Jakob Rutqvist.

And what if the new resource would then result in a new object used on the campus itself, basically as a circular system? The aim is to transform student waste into student wealth and institutional waste to institutional wealth.

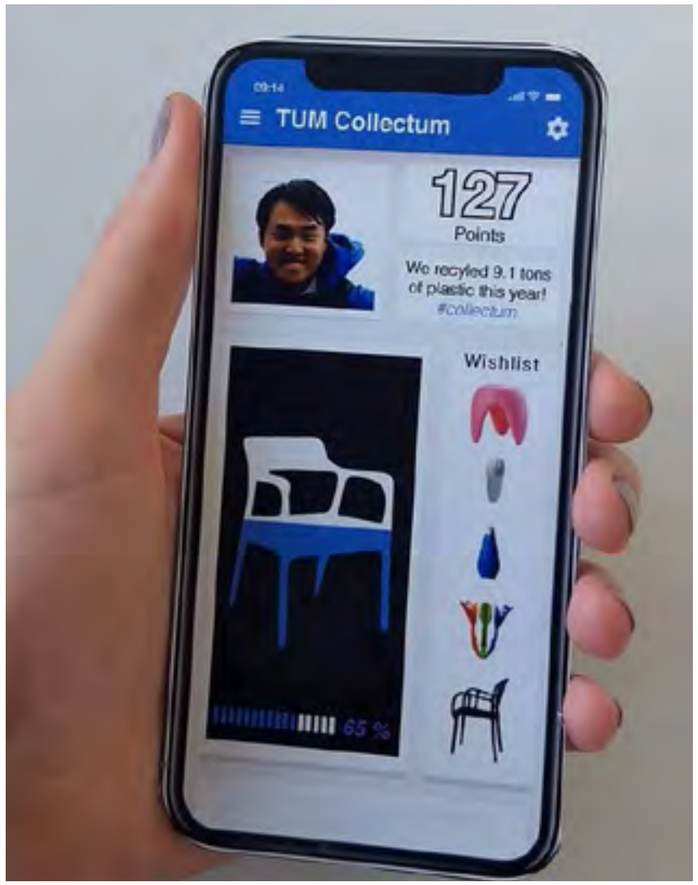
The circular system of *CollecTUM* is based on five main links in a circle. Firstly, the waste will get collected and stored, in a second step the waste will be recycled to a new resource. This resource is used for the fabrication of a new object based on a specific design created by students or other individuals.



Five main links in the circular university

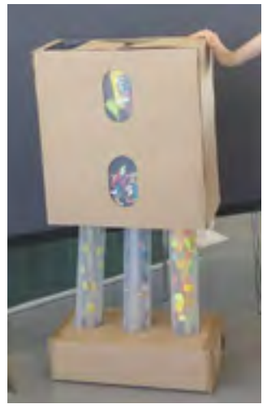
The key in the whole process is our new developed *Tube,* which will be used on campus instead of the current bins.
In contrast to these notorious old trash bins, the *Tube* is a more attractive and clean device with various applications. It lures the consumer by showing him what he/she can achieve with the already collected waste.

Once the waste gets thrown away, the customer earns points. The amount of points achieved will be displayed on a small screen on top of the *Tube* and will be booked onto the consumer's personal TUM account. This account is used as a provider for the *CollecTUM* system. Here the student gets informed about his credit status, his resource status and the newest designs from the *CollecTUM* catalog.



CollecTUM personal account

1.The *Tube,* therefore, functions as a Smart-bin. In the first step of the whole process, the trash gets scanned, verified and sorted according to its materiality. It can be sorted into plastic, paper, metal or other waste. The device has an included function to shred the divided waste directly into flakes for an easier transport through the tube lines.



Bin: front and back side

2. The tube lines are connected (similar to water pipes) to a central collecting point on campus. Once they arrive the flakes get prepared for the process of upcycling. In case of plastic, the flakes will be washed and melted into a raw filament used for 3D printing or other workmanship.

Concept vision for 2030

3. For the step of manufacturing, we suggest using the workshop devices by Dave Hakkens in *Precious Plastic* which require a minimum of space. These devices can be easily managed and low in maintenance.
When the filament is ready, a design file is needed for further progression. For this, we could collaborate with the *faculty of industrial design* and the *seminar furniture and product design*. Furthermore, personal designs developed by individuals are also welcomed to be realized. Within this step, new jobs for students are offered, which results in a self-supplying university. From students, for students! From the university, back to the university!

Precious Plastic by Dave Hakkens

4. Within the next step, we developed two possibilities to proceed. Either products from the university get repaired or new products are created.

In consideration of a lower energy use, the university is encouraging the students to investigate into the repairing and reusing of objects. For example, if a chair gets broken, a specific replacement part will be designed and printed to repair it. With this process, the lifespan of the chair can be extended and additionally money saved. The object stays in the university cycle. Thereby a circular university system is created!
Simultaneously to the first process, the second one is focusing on a wider distribution and on creating and selling new objects. According to that, the designers get the opportunity to not only distribute their products to the inner cycle of the university but also introduce and sell them to the public in the TUM shop, as its own brand.

To close the cycle, both systems are resulting in 100% recyclable and upcyclable objects.

From the *Tube*, back into the *Tube*!
From wealth to waste, from waste to wealth!

Precious Plastic by Dave Hakkens

recycled plastic products

PART THREE
PROGRESS

DAY 1

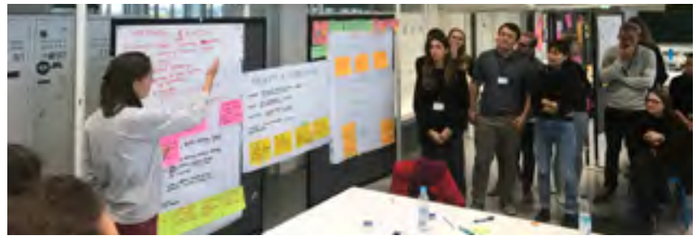
After being familiarised with the upcoming week organization, the team members had to get to know each other. Even though our team was mainly composed of architecture students and only one landscape architect, our diverse international backgrounds brought a variety of point of views into discussions. Soon a team synergy grew and multiple ideas emerged.

The apprehension of the question was a tough task. The concept of a *Circular University* had totally to be defined as the presentation only, deliberately, gave us a vague idea of what this could mean. As very concrete minds, we decided to list the subjects within a University which could be thought in a circular way and identify at the same time the actors in universities which we should consider.

The identified actors were mainly students and professors but also technicians, researchers, guest professors, part-time students. We also wanted to include in the reflexion next generation students and inhabitants of the neighborhoods. Ultimately we chose to concentrate on students as they are the most numerous actors and spend the most time at University. Moreover, we could more easily relate to their needs.

The main topics which could be subject to a reflexion were identified as energy, waste, use of space, mobility and knowledge. These are the themes we considered as not sustainable enough in a University. We implicitly considered circularity as a way to make a system more sustainable by avoiding waste of products or energy. As students, we felt that the institution where we spend the most of our time should participate in our wish to live more sustainable lives. Thanks to the presentations given to us about *Circular economy* we had an insight of the opportunity for a sustainable system given by a circular process. Knowledge was also included in the reflexion as an unavoidable question in an university, but we could not directly relate it to sustainability. Luckily our fellow design sprint team perfectly covered the opportunities related to this question.

By the end of the first day, thanks to a vote within team members we identified two main questions: “How might we recycle / upcycle / reuse waste created in the University?” and “How might we makes the most of the under-used spaces considering disregarded spaces and use through time?”



Presentation at the end of the day

DAY 2

When it can to choose between the two identified questions, a consensus was difficult to find. We instinctively turned towards space usage as this is what we are familiar with and our imagination can portray these problematics with ease. After reflexion and discussion, we decided to make the most of the opportunity to think about society challenges and focus on something else than architecture. Therefore, we thought that reflecting on the use of space would be remaining within our comfort zone as architects and not force our imagination in a new dimension.

We were very moved by the amount of waste we produced as architecture students by making models and constantly printing designs on large papers. We realized that, even though recycling of waste had been going on for many years, we knew very little about it and didn’t feel like we were making the most of this system. As architects, we are used to design, considering building matters, this waste was for us material which could be reinjected in design processes to avoid loss of this value. It seemed to us that a *circular University* should be able to do self-supply of its own produced waste.

After this decision was made, we needed to explore the possibilities of this topic. It was, therefore, necessary to evaluate the present situation of waste management on campus. By sharing tasks, we explored the disposal and management of waste on the main campus, by the Institution in charge to direct it to the town recycling system and existing experimentation of onsite waste transformation.

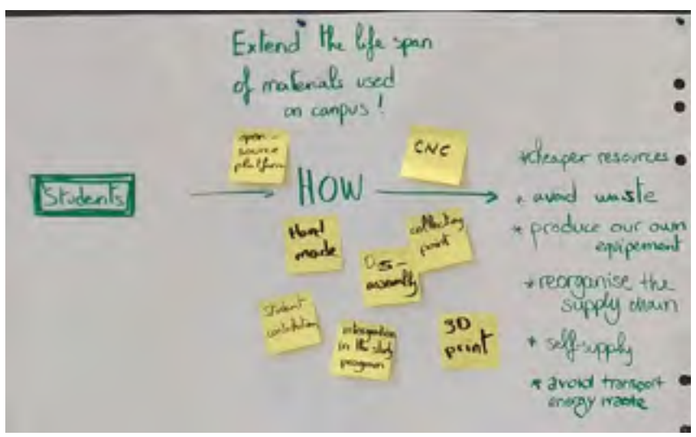
We found out that there were many dumping areas of disregarded building material and also many different colored bins all around the buildings to separate recycling materials. We appreciated also the effort recently made by the Department of Architecture to introduce recycled reusable cups.

In terms of management of waste, we got in contact with figures responsible for all the waste collecting on campus and later on, they provided us with statistics of material used in the TUM campus. This allowed us to have a better idea which materials were massively thrown away by students and the large quantities this represented. Thanks to this we chose to concentrate our research on paper and plastic as these represented the largest quantities.

Our researches enlightened us on the work of *Dave Hakkens*. The project Precious plastics allows individuals, thanks to simple and small machines, to recycle by themselves plastic packagings. This enables an individual to reuse directly the material of his waste and make it into something new of his own design. We believed this local recycling cycle empowers the individual and makes him aware of the value of matter thrown away every day. This appeared to us that it would be extremely beneficial to make the most of student-initiatives to recycle within the campus and promote student designs by creating objects reusable within the University.

Getting inspired online by Dave Hakkens

Thanks to this step we reformulated the main goal of our project: *“Extend the lifespan of materials used on the TUM campus”*. We were able to define the following graphic suggesting possible solutions to reach our aim:



Brainstorming to find the concept

These goals clarified, there was still a lot to discuss about *how* this process would take place. In an individual session, each tried to draw his own scenario of a possible application of our system. The main ideas which stood out of this process were a necessary redesign of bins which aesthetics hadn’t changed for many years, a necessity to make the process transparent to educate and explicit the system put in place, integrating student designs from designing chairs to create studying products which put forward student action, prefer reuse and upcycling which require less energy than the recycling process, use 3D printing as a tool to repair thanks, to small elements, larger pieces of furniture in order to use as less matter as possible.

These various aspects were summarized in a graphic explaining the process of reusing / upcycling / recycling within the campus thanks to student action in order to self-supply the University with study equipment. The idea is that the value still contained in the waste is directly reinjected in the University life to benefit the students.

An idea which was always there on the side was also to integrate neighbors from the university in the process by eventually allowing them to dispose their waste on campus and then buy the transformed products. Moreover, we wished to fully integrate the student not only through creating designobjects or repairing his own furniture but also by creating student job to run the process.

First storyboards, created by all group members at day 2

DAY 3

The third day was the day, where all of our ideas got concrete. On this day, we had to make a clear decision about our main topic. And way the decision is made was actually a great way to improve group synergy. Through various activities, we were on track at the end of the day.

The day started with the recap of what we have been doing for the last two days. In the recap part, we discussed our two main topics again and everybody explained which one is more important for them and why. Of course, we could have discussed the same topics over and over and would not be able to land on just one. That is why the next step was very crucial for us: “Sticky Decision for Final Concept”. For the fast decision we did not want to discuss it again, so we voted for it. And in the end, our topic was chosen: *“Upcycling and reusing waste in the university”*.

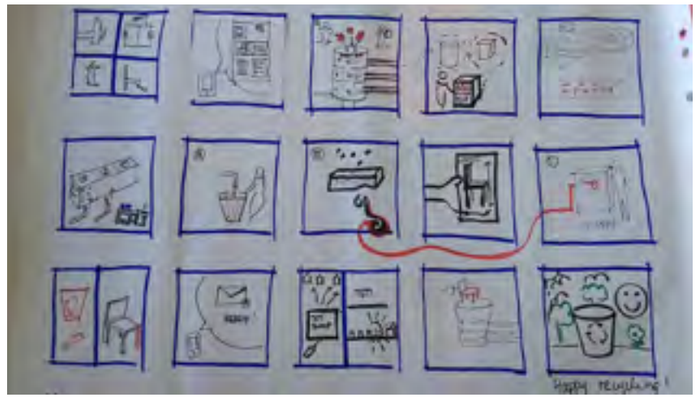
We started out by discussing different methods to “upcycle and reuse” our waste in the university. How to achieve a complete circular system was a hard question for us and frankly, we did not always have the same opinion. At this point, our task was to put our storyboards from yesterday together and create a new and improved one. Although we, as group members were on the same page about our topic, it was also clear that all of us had a different approach to the same subject.

Through our different sketches, we had various creative ideas and we did not decide for just one, but we combined them all into a whole. We started out with the idea of *“Collecting Spider”*, which was a breaking point for us because our theme got concrete. All our ideas combined, we decided to build a waste-collecting-net with bins around the campus, which would be collected in a center and turned into new objects or used in order to repair objects. To motivate people to participate, we came out with the idea of an app, which tracks your contribution with the help of a point system, so you will be able to “buy” objects from the system with your gained points.

With all the new decisions made and all the new specifics of our project coming together, we all created a new storyboard, which explained our process step by step.

At the end of the day, we had a round of decisions for the image of our project. For the prototyping on the next day, we decided, that we will be building our bin and the app to complete it. And the name of the project was chosen: *CollecTUM*.

After our presentation to other students and instructors, we got very good feedback and ended the day with a great achievement and a concrete goal.



New and final storyboard at day 3

DAY 4

The fourth day was the most intense day of the whole week, as we had to produce our prototype in just a few ours. Thanks to the instructions, we knew that we had to meet snap decisions and build our prototype in a way, that it is not perfect but explains our idea.

From the early morning until the afternoon, we did not break our workflow, as instructed, and worked as a group. While one team member was preparing for the interviews for the last day, one member did the presentation papers and others created the interfaces for the mentioned app and built the prototype. It was a really good group work and a reason for that was the intensive schedule of the Design Sprint. The limited time allowed us to stay motivated for a long time and split the work in a productive way.

About the prototype, our decision was to build the waste-bins to show a picture of how it can be in the future. As the bins today around the campus and all over the world are not doing anything, our multi-functional and futuristic waste-bin demonstrated a great difference next to a current bin. In addition to that, we also wanted to explain the point system through our app, because not only the upcycling-system, but the motivational side to our project was very crucial. As in today’s world recycling and upcycling is not done by everyone, we wanted to bring the upcycling to a new level by gamifying it, so it would be used as an app on a daily basis and will give people the idea of contributing and gaining things every single time. So in addition to our waste-bin, we also designed an add-on for the existing TUM-App, which would show your contributions and points. In this way, not only the physical side but also the social side of our project were prototyped, which enabled us to demonstrate the combination of both and their use in real life.

DAY 5

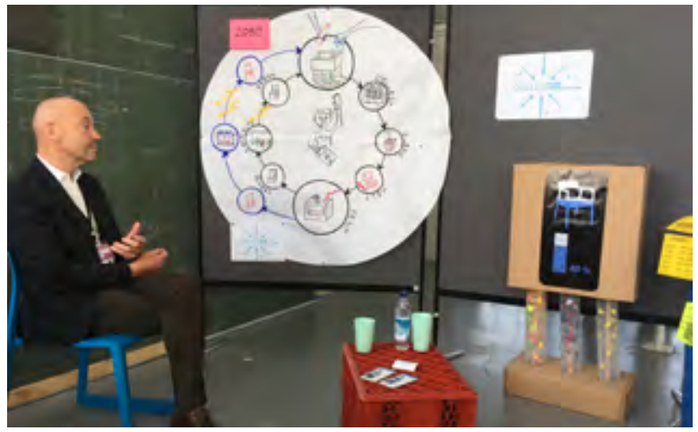
One thing we could say did not exactly turn out as expected as in the interviews. We probably performed too much of a presentation to our guests and then asked them for their point of view. We did not really understand the interview format these exchanges sessions should have taken even though we had very interesting responses from our guests on our project. The exchanges with these different actors raised various questions.

First of all our system of points to encourage people to throw their waste in our recycling bins and not elsewhere could actually encourage the act of throwing away in order to obtain a new product. The general objective should be, in the end, to change the linear consumption system of using and then disposing to a more circular system where things could be reused. Even though recycling is a beneficial process, it is still a process requiring a lot of energy, we should aim at a no-waste system. To raise the awareness of this our system should probably not reward the student for throwing away but the opposite, he should feel proud to reuse a maximum a product. An idea we had at this point would be to create a startup pack for incoming students at University providing reusable packagings to encourage students to avoid single-use wrapped products.

A limit we realized of our recycling process is also its durability in time. The risk with a circular system is that the system requires initial waste to function so this encourages waste production. Our system is a response to the waste production today but if we aim at a no-waste society then our process would run out of initial matter or at least this one would diminish. We acknowledge that our solution is not a long-term one but a response to today's situation which is going to evolve into a lower-waste society; at least we wish so.

Then another philosophical limit was brought up: the gamification promoted by our app. To encourage action today do we necessarily need an app and points which encourages to always have better results? Could the simple aspect of a transparent process which we see every day be enough to raise awareness of the question? Are apps the only way to reach populations today? This question also appeared taking into account the production of other teams which for many introduced an app too.

Final presentation in front of all the participants



Guest interview with Amandus Sattler

Guest interview with Lei Jie (architecture student)

PART FOUR
REFLECTIONS

Alexandra Niedermayr:

“During this year’s design sprint “The circular university” at the TUM we developed from a wide range of different ideas a concept and in conclusion a prototype for our final design.

Everything in only five days! Therefore a highly organized, but also quite tough schedule was unavoidable. This pushed us to work with more efficiency and to use every minute we had to develop our design further. Thereby, I think the attendance of supervisors was needed, once because the whole five days were kind of an experiment, but secondly also because they were the persons who forced us to stop at some point, so that we are only concentrating on the key principles of our concept and design.

Finally, we were capable to cut down the design process from the time we are normally used to at university to the minimum. For me it was a big satisfaction to see what we could produce in such a short time. Besides I also enjoyed working in the group and experiencing some very inspiring conversations about the topic we had.

For my future studies, I hope to integrate this concept also in the daily practice.”

Cosku Özdemirci:

“The Design Sprint was very different than I expected, as it was an unknown concept to an architecture student, I was positively surprised. The process itself was very intensive, but worked very well in the end. For the first time, I get to make fast decisions instead of working on a project for a long period. And making fast decisions also brought a great conclusion, that we were able to see after 5 days, which was fascinating and very satisfying for me. I now believe that the concept of “Design Sprint” is a very effective method and brings out the creative side of a person. I would loved to use this method for my further studies.”

Helena Julia Brückner:

“Studying architecture for a few years now, I have learned that developing a design concept can be never-ending. During the Sprint I have learned that this process helped our team to quickly define goals and decide on a product plan for the CollecTUM. During the five days I enjoyed the third phase the most, a point where we already decided on the theme ‘handling waste’ and explored them in further detail through storyboarding towards a prototype.

I was surprised how the audience reacted when we presented our concept and how many new good ideas fed into it. I suppose that a combination of Sprint and Feedback from outside results in a satisfying end result.

Jin Peng:

“I think Design Sprint is an excellent way to come out and develop an idea quickly with different minds from different disciplines. It is an effective short training for people working in design areas, because it encourages us to build up a concept within a week and to explain the concept as best as we can. Less tedious discuss appeared in the process when we followed the guidelines. Facilitators also helped a lot when we got lost in discussion. Generally, the Design Sprint provides a basic framework that allows creative thinking to be developed in a short time.

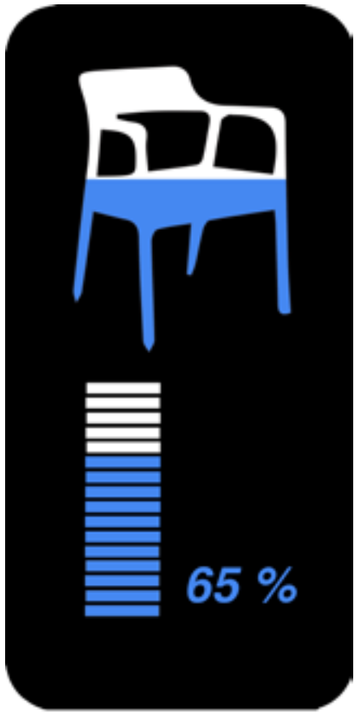
The result is though not perfect, but is essential for continuous exploring about the concept. Through the opinions from guest critics, the concept get revised again and again, which is also important for a design. What can be improved is that the whole framework of Design Sprint can be explained more specifically before the start of idea so that all the guidelines to be better understood by everyone and make the discussion more efficient. “

Julia Micklewright:

“I found the design sprint’s condensed format extremely energizing and inspiring. The rhythm created by the facilitators allowed productiveness and fast thinking essential for a dynamic group work. I believe it was a great opportunity to reflect on a new topic which was not directly linked to architecture but allowed creativity and thoughts about society’s challenges.I will, in the future, keep in mind the structure of the sprint to organise group working sessions and manage teams. I also have been very influenced by the reflexions made on our society and will benefit from on an everyday basis. ”

Lin Fulei:

,,What a great week ! The design sprint has truly been a rewarding experience within my personal university career. Not only working within an interdisciplinary team has taught me different ways to approach this topic that was indirectly linked to my major. Throughout this short intensive period, I was fascinated by the results achieved throughout time constraints and fast decision making! In addition, I was rather surprised by the effectiveness of the schedule structure and satisfied with our team´s result. Thanks to our supportive mentors who have made this great event possible, I will definitely pursue this technique for my future case study challenges.”



Team CollecTUM: (from the left to the right)
Jin Peng
Fulei Lin
Julia Micklewright
Helena Julia Brückner
Cosku Özdemirci
Alexandra Niedermayr

TUMcloud

Your Virtual Space to Share Ideas & Knowledge at University

Andra Pop-Jurj
Antal Strausz
Maruša Turnšek
Felix Krauth
Svenja Nevermann
Philipp Merbeler
Sarah Weiner

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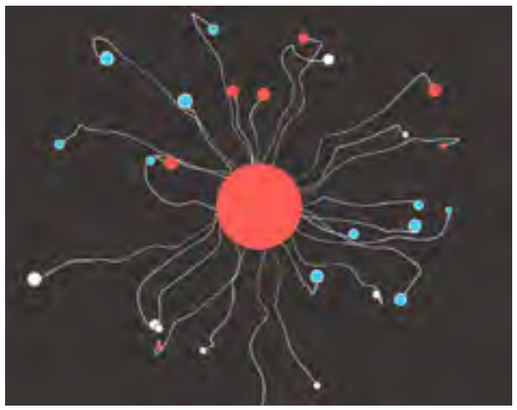
Abstract

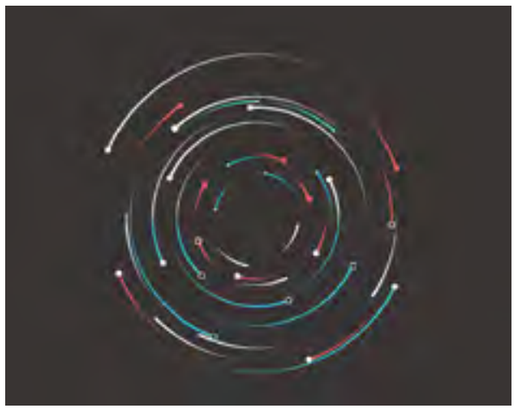
The circular economy is about to tackle everything and define new business models. Producing differently to consume less. Designing for disassembly or deconstruction. Re-directing waste into a circle as a resource. Is the focus on physical-bound concepts, buildings, materials, value chains and the economy enough? Why not approach circularity from where we learn to design and research? Can it be viewed as a virtual concept, related to knowledge, skills, and principles of acting and experiences, which are channeled back into university-like settings?

With the Project „TUMcloud“ we tackled the circularity of knowledge in an academic context. We proposed and prototyped a virtual space in form of an mobile application to share and reuse ideas. The goal is to achieve a true circular university that avoids the waste of knowledge and fosters the creative forces ermerging from collaboration amongst diverse and open minds.

Together with UnternehmerTUM the idea is now taken further to validate possible business models

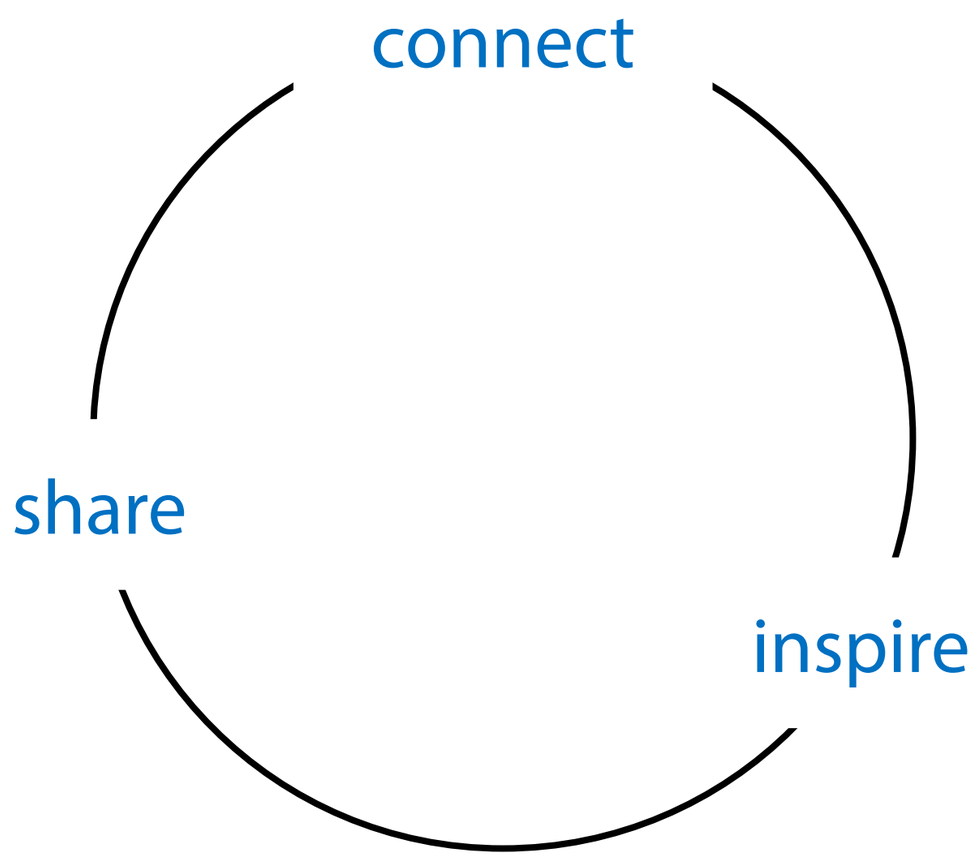


the **linear** university



the **circula**r university

Philosophy

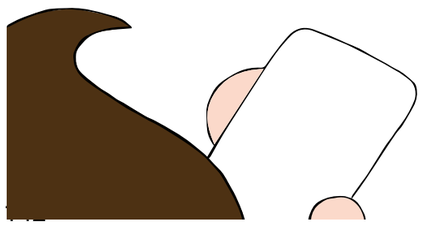


STOP DUMPING KNOWLEDGE

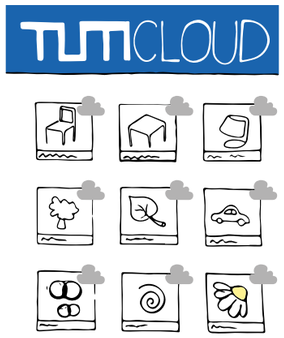
Concept

We are going to explain our concept by telling the story of Bob and Frank. They are both students from the TUM and they would have not known about each other if it wasn‘t for our platform.
So we have Frank, who just finished his Master thesis in biomedical science.

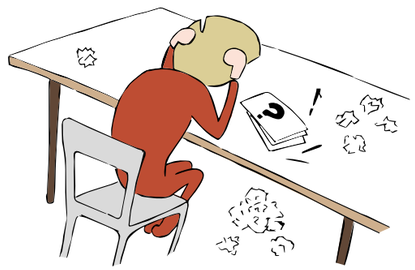
He has been using TUMcloud throughout his studies. As every student gets a TUMcloud account when getting enrolled in university and they are also required to upload their work for consultation and evaluation through this platform. He has been using it for documenting his working process and to upload his final projects. Now that he has succesfully finished his thesis and since he is also really satisfied with it, he would like to help other students, just like others have helped him so many times.



He always uploaded every step to every project, because he knows, that he can help others and also get recognised by companies or other people who would like to work with him in the future.

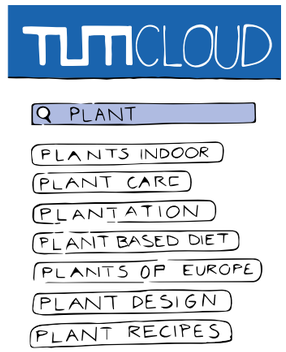


And then we have Bob who is in his third year of a Bachelor in Renewable Resources. He has just gotten a new assignment but he does not know where to begin and cannot find the much needed inspiration, he istuck.

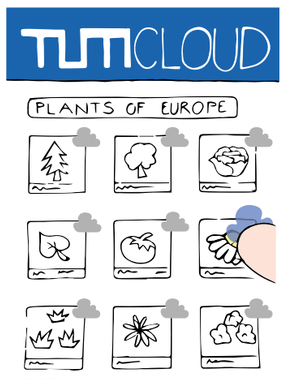


But he remembers that the TUMcloud, has always been on his side.

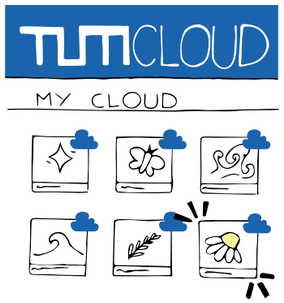
So he opens the app and searches for inspiration simply by entering keywords about his assignment and relevant projects appear right away.



He finds some interesting and inspirational so he saves them on his cloud - his personal collection of projects - so that he can inspect them later in detail.



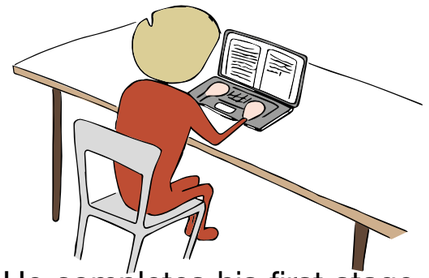
Here he can always come back and check out how others solwed similar problems.



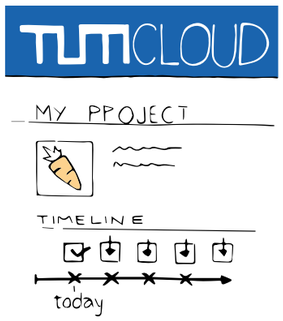
One of the projects that he liked is Frank’s project. Bob reads it through, but he doesn’t completely understand it, there are some details that have to be cleared for him. As the email address is there, he decides to contact the author and ask him to take some time to debate the topic.

Frank is happy to help, as now he is finished with uni and is taking some time off before working. They make an appointment and he explains his project to Bob.

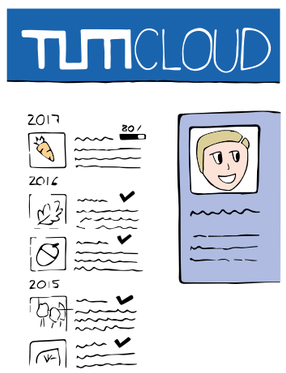
The conversation really inspires Bob so he rushes home to work on his assignment. He is getting ahead and works his way through the subject.



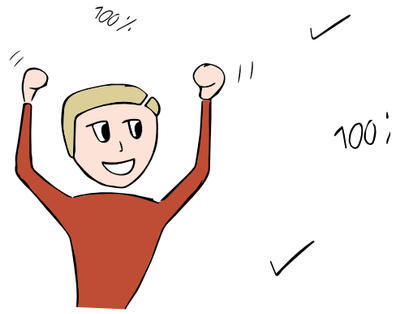
He completes his first stage onsame day and uploads his progress on TUMcloud, so other students can also see how far he is. His supervisors are also regulary checking his updates so the meetings can be more effective.



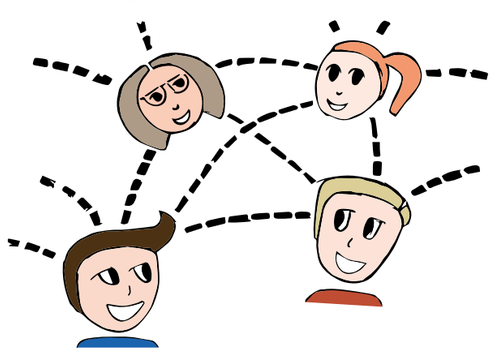
He’s done that with every project so far so he already has a timeline of all of his projects and the intermediary steps.



Bob has finished his assignment and he is happy not only because he has succesfully completed his assignment but also because he now knows Frank.



Throughout the process of uploading, getting feedback, helping others and geting help from others he also expanded his network, met with students from other faculties, who are going to help him get the job he always wished for and maybe also gained some friends.



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The Design Sprint

DAY 1

On Monday we started with our first day. A warm welcome was followed by an introduction to theconcept of design thinking and the circular economy which gave us a deeper understanding of the process and its importance. The speeches of two architects about their work and their views on circularity served as inspiration. We found that quite thought-provoking and could not wait to start creating.
After the briefing we were given some hints that could help us decide which problems we could tackle. The northern part of the campus and the fact that it will be an empty space within five years were mentioned. This meant we could approach the issue of cirularity with a spatial initiative which could even tackle Munich's residential crisis. A virtual expansion or other improvement of the campus were just as possible.

Interdisciplinary groups were formed so we could finally start sprinting. We started off by writing down all the resources an university has and all the subjects we might want to work on to explore problems we could tackle. After some brainstorming in the spirit of design thinking we cameto the conclusion that the main resources students have access to are immaterial ones such as time, energy or knowledge. We understood the university as a source of material resources and personal contacts due to the physical space it embodied, access to educated people etc.

The main themes we seemed to be interested in were connectivity, accessibility, self-analysis, business thinking, collaboration, networking, and spatial optimization Our main focus was finding linear problems regarding knowledge. The next step would be trying to create a loop in order to break up the linear system. We started by stating what we conceive as pressing issues such as the weak link between university and companies, the transition from studying to working, learning superfluous things we will never use after graduation, and the lack of information regarding other students works. Hence, we concluded that a lot of work and knowledge done and aquired at university gets dumped.

We thought this aspect had a lot of potential, so we narrowed our focus down to reusing knowledge gained at the university more efficiently while also achieving a higher standard of education.This was followed by working with the the HMW method – how might we achieve our goals. We listed problems to which we tried to find solutions. We were interested in finding a way to improve the sharing of competences, maximizing the use of students' projects and making them more transparent. The university should become part of a long-term work life by improving communication between university and industry, revolutionizing educationsystems by making them circular, getting more professors involved to target real projects with student teams and last but not least how to accept failure as a productive part of the process.

We had quite many problems to address so we decided to vote for the ones we were most passionate about. The most important ones were the following:

- to stop wasting knowledge
- making students' projects more transparent
- getting companies more involved with the university.

DAY 2

The second day was all about our target. At the beginning we had some time for the last decisions. Since we were all really passionate about our interests we only succeeded on deciding which one we would tackle on the second day, namely the waste of knowledge.

The following step was the research – finding some examples that work and presenting to the rest of the group why they are successful and how exactly they work. Each one of us pointed out what they found interesting about every project. We thought that WeWork had an interesting way of boosting productivity and encouraging collaboration. We also liked how ImpactHub enables flexibility and integration. However, we the 80-20 method they use at Google and the community Pinterest creates were considered relevant and inspiring.

This informative session was followed by determining what our goal was going to be and how we would achieve our vision. We agreed to use available resources instead of starting with a blank page. Our idea had the potential of being approached from a variety of perspectives: it could have been implemented through a physical concept as well as by creating a virutal workspace.

DAY 3

The main challenge of the 3rd day of design sprinting was to have a clear idea which could be pitched in a minute. This meant establishing who we wanted to reach, what exactly we wanted to achieve and how we were going to do it.

We all agreed on students being our main target. However, we realized quite early on that we would inevitably have to involve the professors as well. Eventually, it might even reach out both to internal and external experts, alumni and even to the public. The goal was however clear: we were going to create a network through which competences could be shared and through which collaborations would come alive. Our aim then was to come up with a platform that would then create a community - a collective genius. Our solution would enable transparent workflows, it would work like a market of competences and ultimately become an archive of knowledge, information and solved assignments.

We tried to come up with a name but CreaTUM seemed too static. TUMcloud was more suitable.

After the lunch break we had some time to visualize how we would reach our goals. We did some drawings and schemes which we presented to each other. With them we actually got the first image of how the platform and the workspace could look like.

That led to the part of creating the story board. We felt the problem we were tackling was a rather personal experience all of us have been through so diagrams might not have been the best way to explain it. Therefore we decided to tell the story of Bob who has difficulties starting on a new task. We included some ideas of how the app could look like. The storyboard was accompanied by the name that we finally chose (TUM Cloud), logo - minimalistic white name with TUM-blue background and our motto - to create, inspire and make it bigger.

It was almost the end of the day so it was presentation time. We explained the storyboard and got some useful feedback from the listeners: they thought it would be good to give this system a rating option, which would help the user to find the most useful project and also a verification option so that the reader could know how reliable the source is. . They also made us explore our options on how we are going to make the students upload their project and pushed us to find some other possibilities and features that this app could have and how could we expand beyond university.

It was almost the end of the day so it was presentation time. We explained the storyboard and got some useful feedback from the listeners: they thought it would be good to give this system a rating option, which would help the user to find the most useful project and also a verification option so that the reader could know how reliable the source is. . They also made us explore our options on how we are going to make the students upload their project and pushed us to find some other possibilities and features that this app could have and how could we expand beyond university.

DAY 4

The fourth day was all about prototyping. At the beginning we decided to divide the work: some of would work on the prototype while others woud prepare a presenation of our work. We also decided to use the story from the day before, as we thought it was the easiest way to explain our concept. In the mean time we also had to find the persons for the next day's interviews. The application-making was the most intensive part. Besides making the layout and creating its appearance, for the user to really get the right experience, some projects had to be included. These projects had to contain a cover photo and a description.

We considered possible connections among different universities as well as companies. The storyboard part required the whole story to be vectorised so that it could be nicely presented on our slides. We generally managed to do everything on time but a few final touches had to be finished after 5 P.M.

DAY 5

On the fifth day we conducted five interviews.

Our first guest was Tonderai Koschke, a student. She agreed that the system we use today needed some changes and was delighted to hear about something that would challenge people to share their knowledge. She could see herself using it but had some doubts. She really liked the fact that it encouraged the interdisciplinarity and the fact that one could get feedback. She was unsure about the security of one's data. She thought that the problem might also be, that the students would not want to share. However, the submission of an assignment through this platform would be mandatory, which could be a possible solution to this problem.

The next interview was with Klaus Puchta, an employee of the department for Architectural Informatics who knew quite a bit about the existing systems, Moodle and TUMonline. He gave us a valuable piece of advice: using the data available through the existing paltforms could be rather complicated since they work differently.

This was followed by an interview with a representative of AECOM. Our guest was not at all familiar with the system of the university so we approached her by inquiring about the challenges she faces daily at her workplace with regards to communication and collaboration. After explaining our concept she thought we addressed a very important problem a lot of people are facing today. This interview made us realize that such a platform could be relevant for companies as well. She thought it had a lot of potential. The motivation and interest of students in uploading their projects was however questioned once again.

The fourth interview was with an architect. This time it did not work out exactly as planned because Mikala Samsøe challeged our approach and concept from the very beginning. We did not manage finish our presentation but we did however learn a lot out of it. Her critical feedback was definitely of value and we realized we needed to be careful with how we approach the public and most importantly, we needed to question our virtual solution and to clarify who our public was. Mikala was taken aback by how almost each group had a virtual or digital approach to existing problems.

She thought some knowledge is dumped for a reason and that we shoudl rather encourage our generations to ask their peers for feedback face to face, to communicate more in real settings and not just through online platforms. In her opinion, it is real experiences that should inspire us, not resources found online.

Furthermore, Mikala thought it was sad that we all tried to solve our problems with technology, which is nowadays very inexpensive, something that anyone can do. She thought the quality and the future lies in the analog and the real life experiences. We appreciated her advice but decided to question our idea ourselves and we backed its relevance by reanalysing the public we were trying to reach, namely the students of generations to come.

For the fifth candidate we changed our tactics and devoted more time to the application itself so that our guest, Amandus Sattler, had more time to experience it. We also decide to devote less time to the presentation and more to the feedback. Once again, we tried to present it in a way that is relevant to his proffessional life so that he could relate to the problem we had identified.

Overall we thought that the interviews at the end were not as effective as they could have been had they taken place at the start of the week. Furthermore, since our targets are mainly students, we would therefore have to talk to many more students about it.

Interviews were followed by short final presentations of all the groups. We used a shorter presentation than during the interviews and focused more on the app itself. We presented the sceenshots and at the end also gave those who were interested opportunity to test it.

After the last presentation it was the time to vote. It was a hard choice as a lot of ideas were really good and had a lot of potential.

Having won the design sprint with our TUMcloud, we have to admit that it was a rather surprising confirmation of the relevance of the problem we had identified during that week. We were extremely happy as it was a confirmation that our idea really had potential.

Vitra, here we come!

Individual Statements

I am absolutely satisfied with this weeks‘ achivements. We were all very motivated and full of ideas and i think for the tight schedule this helped us. I liked that at the end of every day we discussed the current state, which always helped to go further. I could also imagine this method for the design phases for some projects in my studies.

Antal Strausz

I really am happy I got the opportunity to participate as it gave me a chance to get to know this completely different way of designing and reaching the goal in such a short time. It also brought the whole circularity concept to my attention much more.

Maruša Turnšek

At the start, I was extremely curious as to whether this design sprint would prove efficient and I have to say I am positively surprised and inspired by the strategy of design thinking. I find it great to see such interdisciplinary events being organised at TUM and I think circularity was a highly relevant topic that should receive more attention in our education. All in all, I am intrigued to see how design thinking or even a design sprint would benefit our architectural design process.

Andra Pop-Jurj

Der Design Sprint hat mir eine neue Denkweise für effizientes interdisziplinäres Arbeiten aufgezeigt. Die geniale Arbeitsathmisphäre und unser super motiviertes Teams waren für mich ausschlaggebend, dass wir am Ende wirklich so ein gutes Ergebnis präsentieren konnte. Mich macht es wirklich stolz Teil dieses Projektes gewesen zu sein und ich hoffe, dass es davon in Zukunft mehr geben wird!.

Sarah Weiner

I loved the “colorful” mix of students from all kinds of majors, the Design Sprint was more challenging and interesting than other projects at the university. Working with students from a different academic background showed the real potential of team work. Furthermore I liked the time slot of this years’ Design Sprint. The lecture free time allowed students to fully concentrate on the challenging projects and exercises. I would love to keep on working on the same project during a subsequent Sprint. Thereby interested groups could develop their projects further and go into a more detailed design stage. *micdrop

Philipp Merbeler

A innovative task, motivated facilitators and amazing teams - that is the combination which probably can and will solve the problems of the future. I will absolutely use any chance I get to participate again in similiar events and I will also implement the methods we have learned in my everyday work.

Felix Krauth

The circular university was a unique experience to me. I especially enjoyed the work in our interdisciplinary team. Group members with a wide variety of educational backgrounds grew together even in this short time developing a prototype with great efficiency.

Svenja Nevermann

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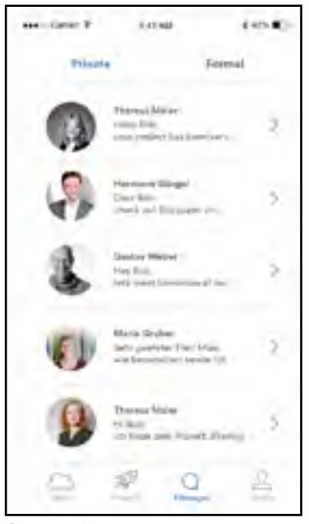
Appendix - The TUMcloud Application

Startingscreen

Homescreen

Sample Project

Personal Project List



Contact Page

Project Timeline

Inspiration Board

Profile Settings

Profile Timeline

Appendix - The TUMcloud Network

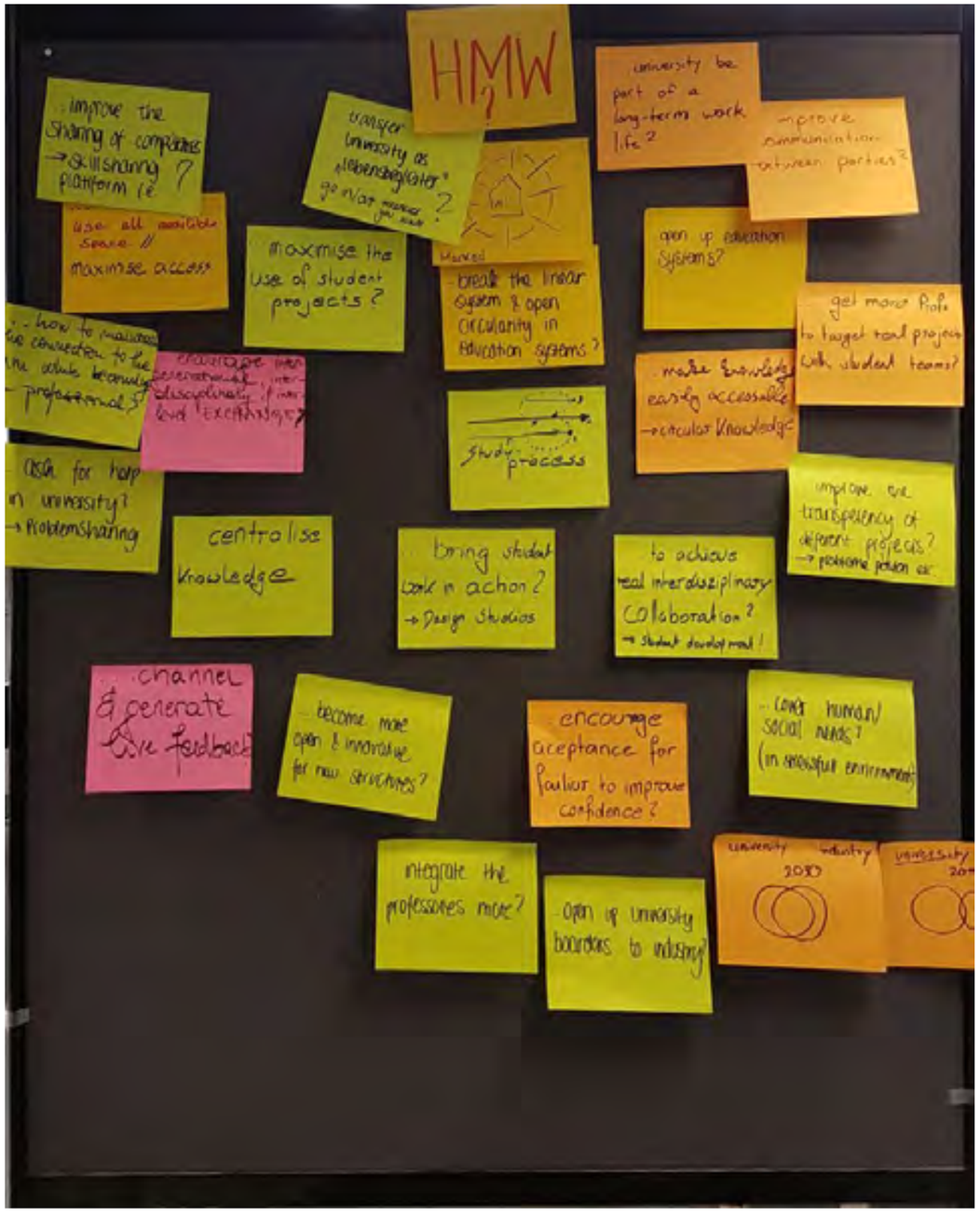
ETH

TU Delft

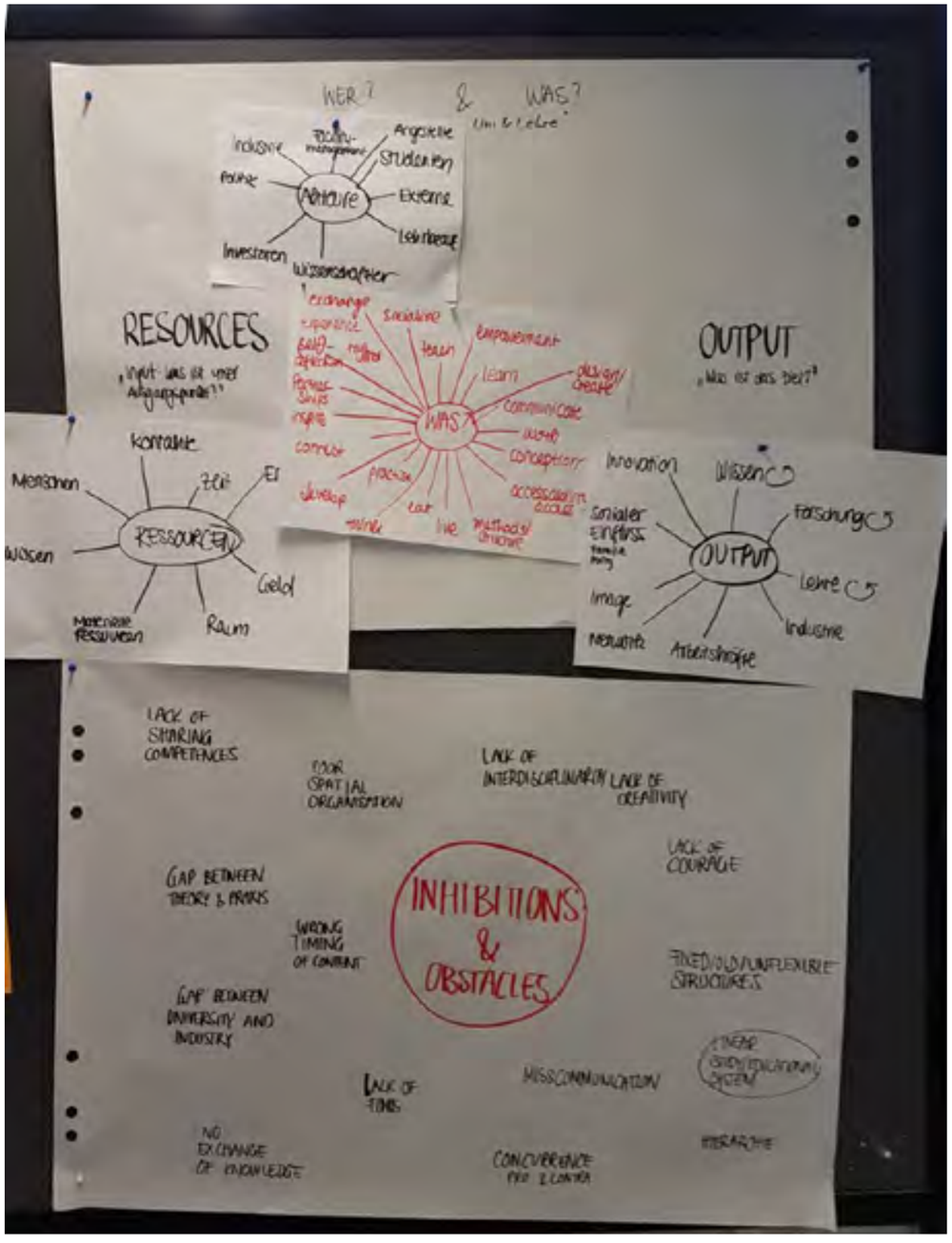
Vitra

TESLA

Appendix - design process

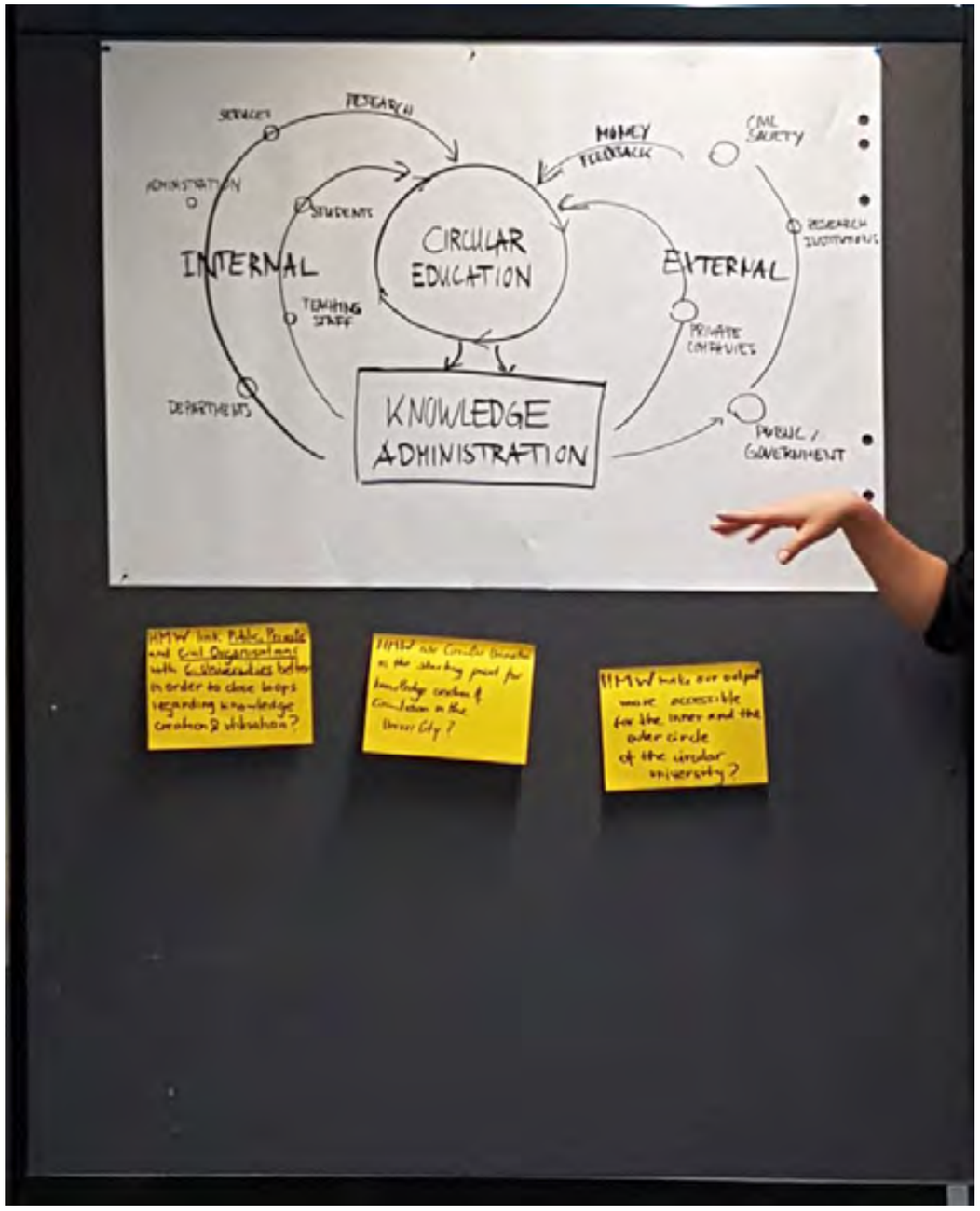


How might we....?

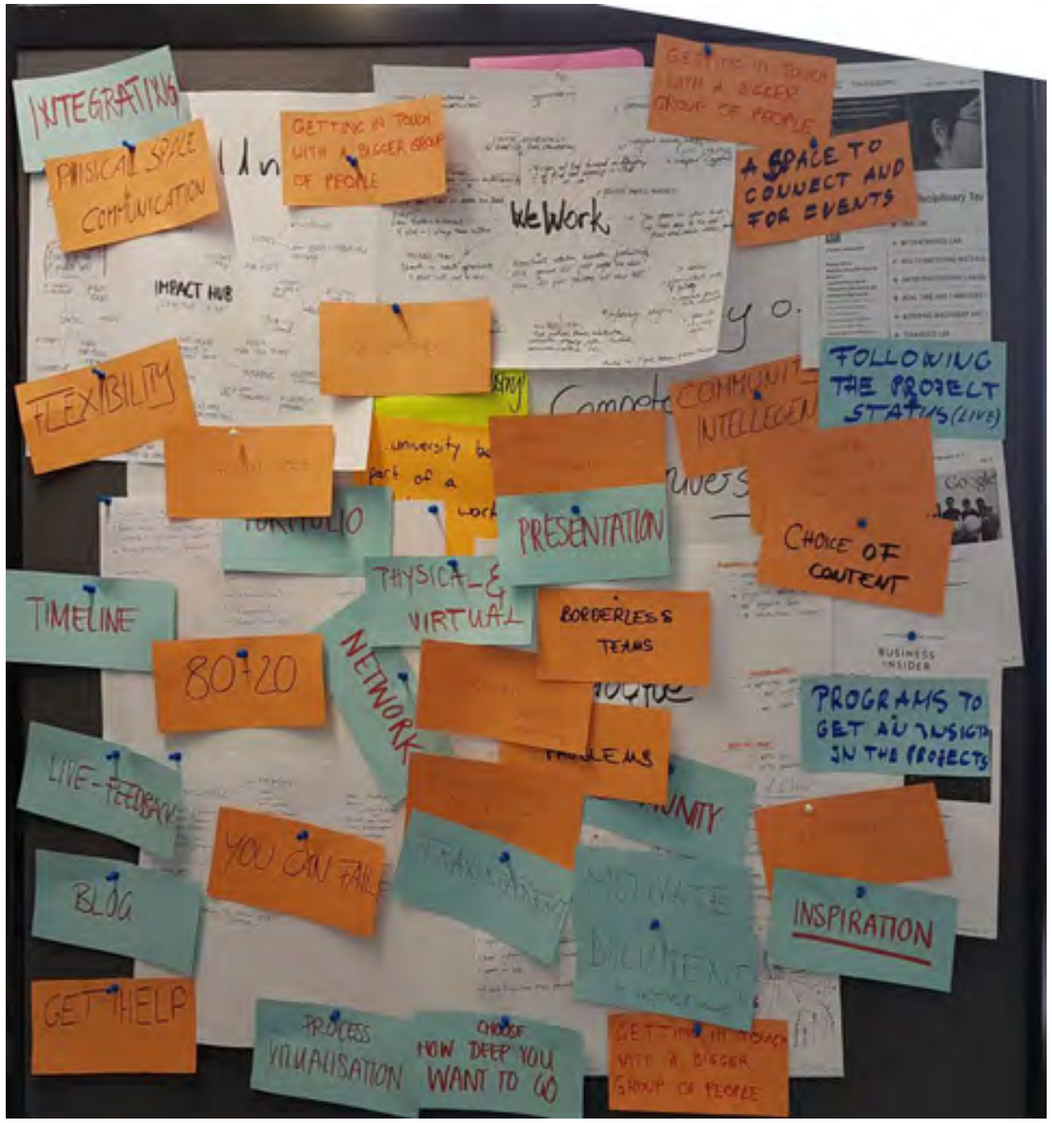


System Input/Output evaluation

Appendix - design process

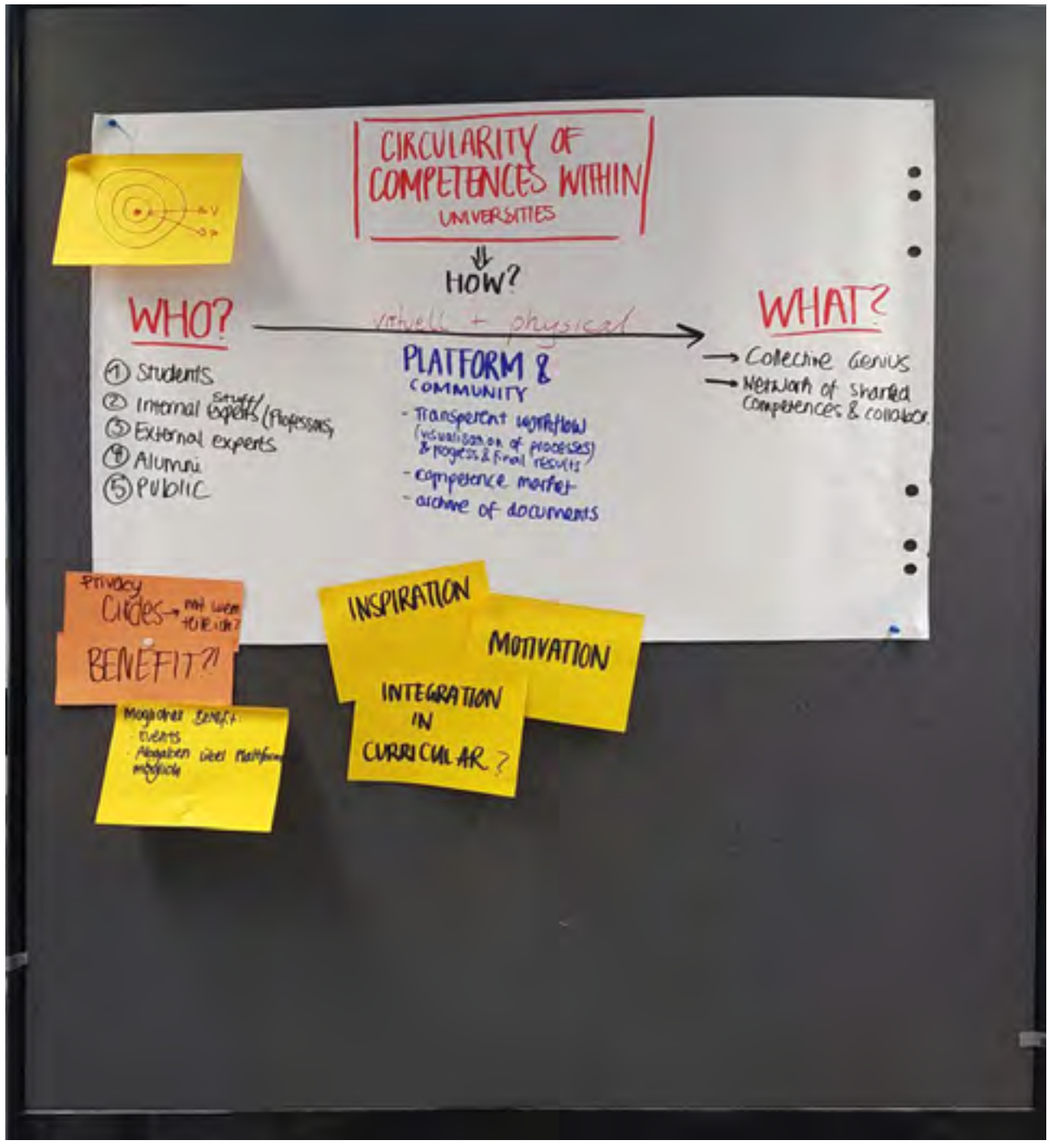


System Diagram

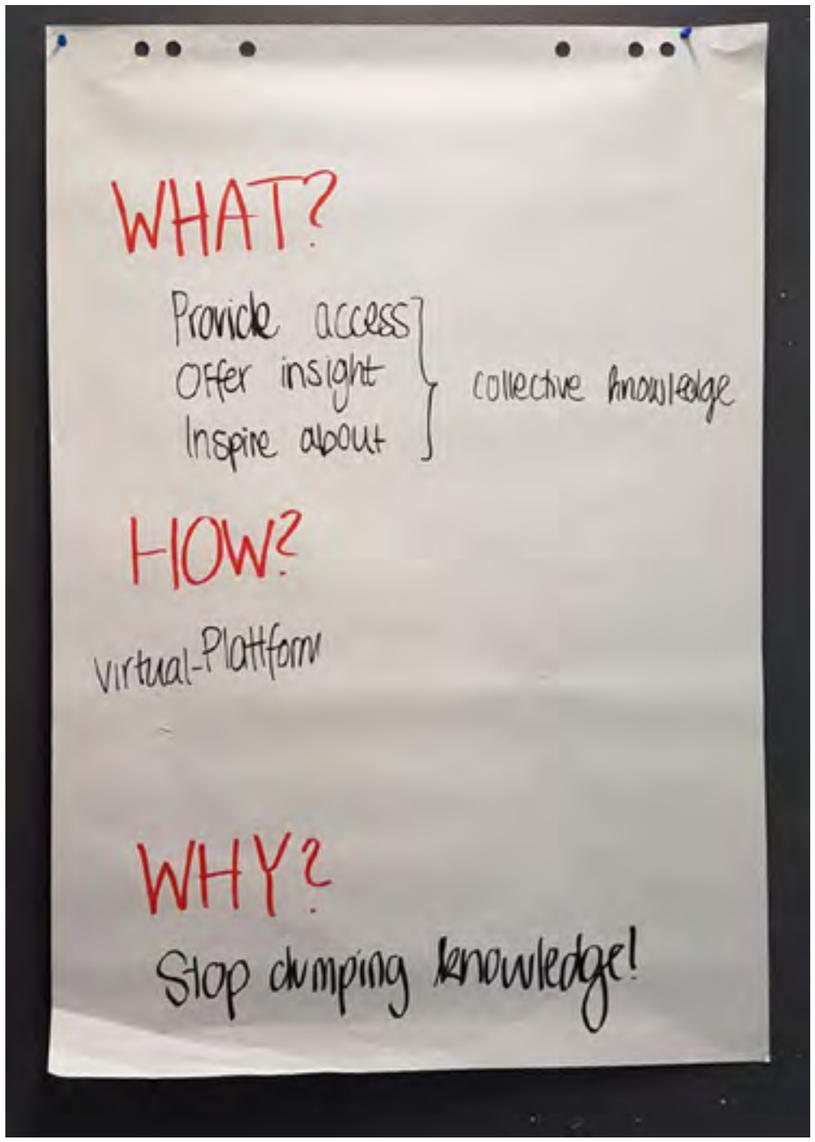


Precedences

Appendix - design process



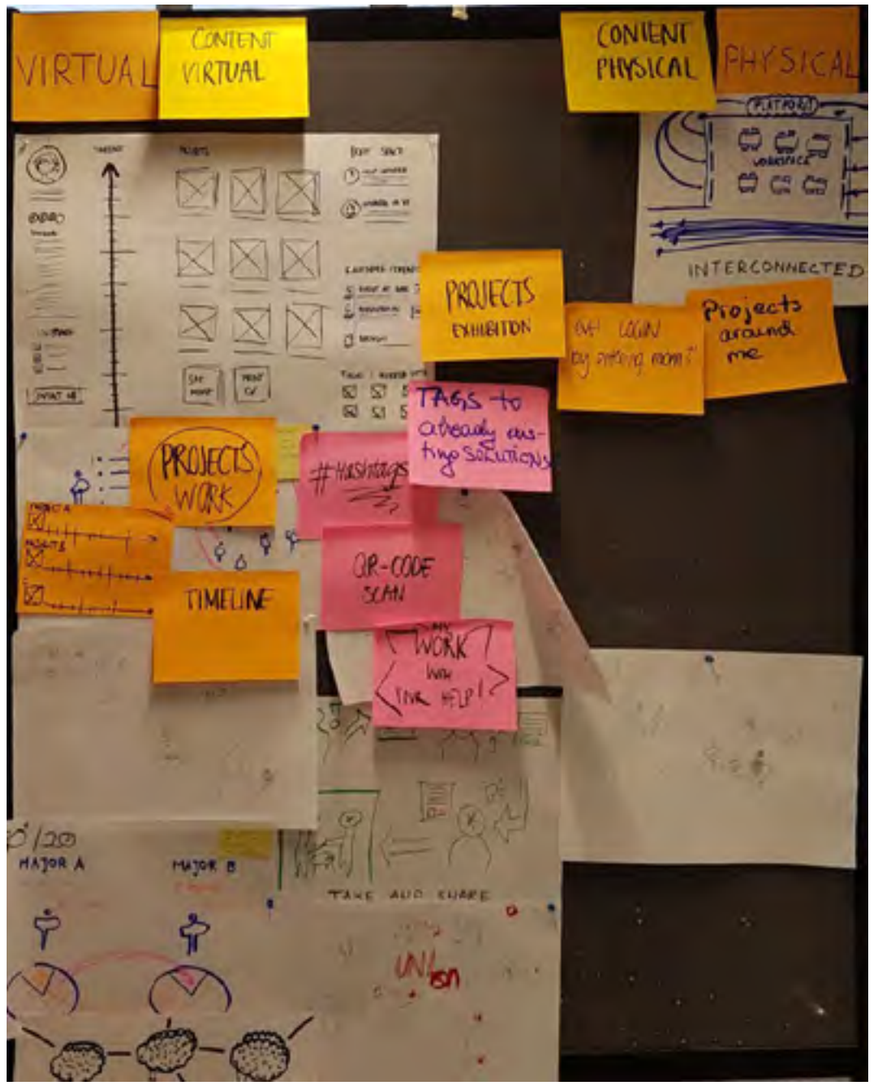
Who? How? What?



What? How? Why?

Appendix - design process

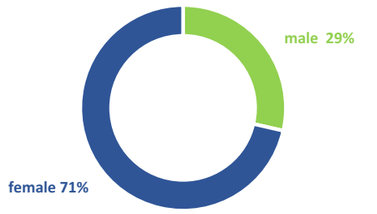
Sketched Storyboard

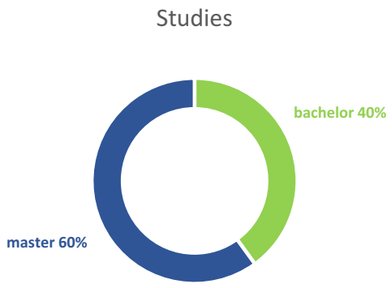


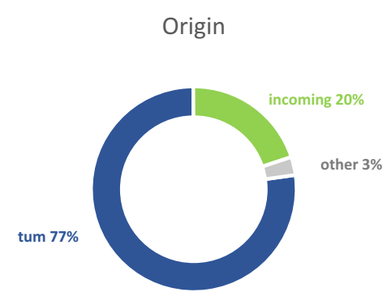
Solution Sketching

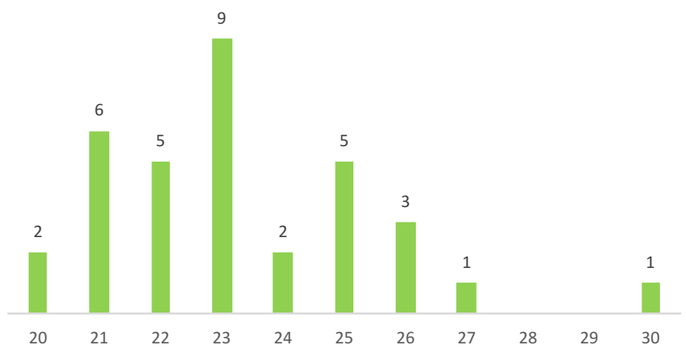
Chapter 04

Evaluation









Age of Participants

Team meeting on conducting the last day of interviews.

How Might We ... Or Not

The Design Sprint was evaluated extensively with pictures, video recording, interviews and a final questionnaire to all participating students. Overall the format of a sprint was well accepted by the participants. The majority sees the method as an important extension within architectural education and would opt for it as integrated module. Especially the time limitation given for each day and tasks, were well appreciated by the students to work more effectively and focused, and to experience an ‘after-work-mode’.

According to the results of our evaluation, the satisfaction rate was above average (n=35, strong agreement+agreement):

On concept, consciousness and target of circularity: **83%**
On workload, process and future implementation: **73%**
On collaboration, interdisciplinary and integration: **61%**
On results & willingness to pursue idea further: **69%**
On benefits to apply skills and use new insights: **84%**

It can be stated that a format like a Design Sprint should be integrated more often in architectural education. It is not only developing the existing skillset further, but also is an opportunity to challenge current and future topics from industry, the environment and the public.

Involvement of external stakeholders

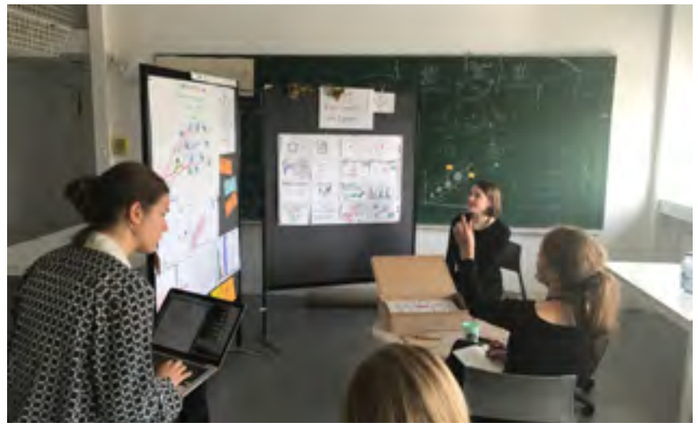
External stakeholders (other organisations) were involved in the implementation of the Design Sprint. Amandus Samsøe Sattler, Architect, founding partner or Allmann Sattler Wappner Architekten, was involved in the concept of the topic. He gave an input lecture on the first day and evaluated all presented works as a critic on the last day.

Kevin Cheng, Architect, Allmann Sattler Wappner Architekten, was integrated as a guest critic on Monday, Wednesday and Friday.

Mikala Homes Samsøe, independent Architect and Consultant, was involved in the concept of the topic. She gave an input lecture on the first day and evaluated all presented works as a critic on the last day.

Raphael Gielgen, Head of Research and Trend Scouting at vitra. He gave an input lecture on the first day and awarded the winning team a study trip to the vitra campus in Weil am Rhein.

Mark Böhmer, Nicolai Schneider, Katharina Rupprecht and Pedro Bernardo from AECOM Stratgy+, an architectural branch focusing on workplace strategies, were invited on the presentation day as guest critics, and reviewed the works.



Difficulties with project implementation

A five-day format has been well accepted by the students but required extensive preparation and researcher involvement for execution. Though successful in aspects of process and results, a shorter time frame may be more feasible for preparation, conduct and documentation.

Impact on partners, participants, target groups and stakeholders

The partners could benefit from creative ideas and working modes within a university setting. It can be stated that the formats are suitable to channel real-world problems effectively from practice to higher education.

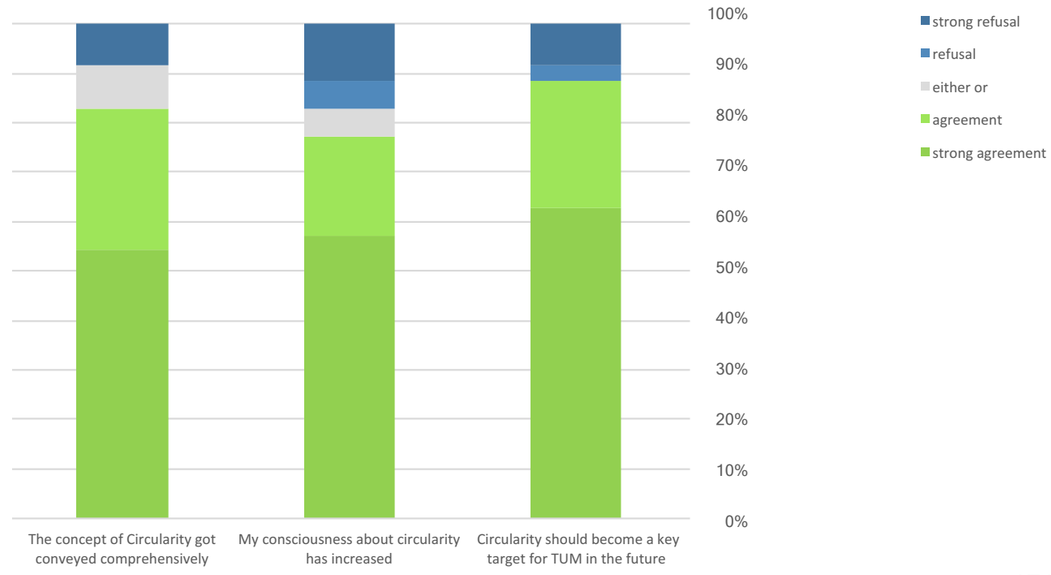
Furthermore, the partners could think of recurring formats to keep contact with students and researchers and use the formats as an opportunity for their internal advanced training programs.

The participants gained in a brief period of time an insight into new working formats, working modes and subjects. It is an important addition to the existing curriculum and helps bridge the gap towards practices in creative industries and the built environment.

For the involved stakeholders, the evaluation of the formats is highly valuable. So far only limited research exists, if the fast-track design formats lead to better creative outputs or innovation. Evaluating the benefits as well as the deficiencies will help develop better formats, and consciously avoid integrating passing trends/fads from the fields of management.

Dissemination (target audiences, levels (i.e. national, regional, EU etc.) + explain choices):

On Cicularity



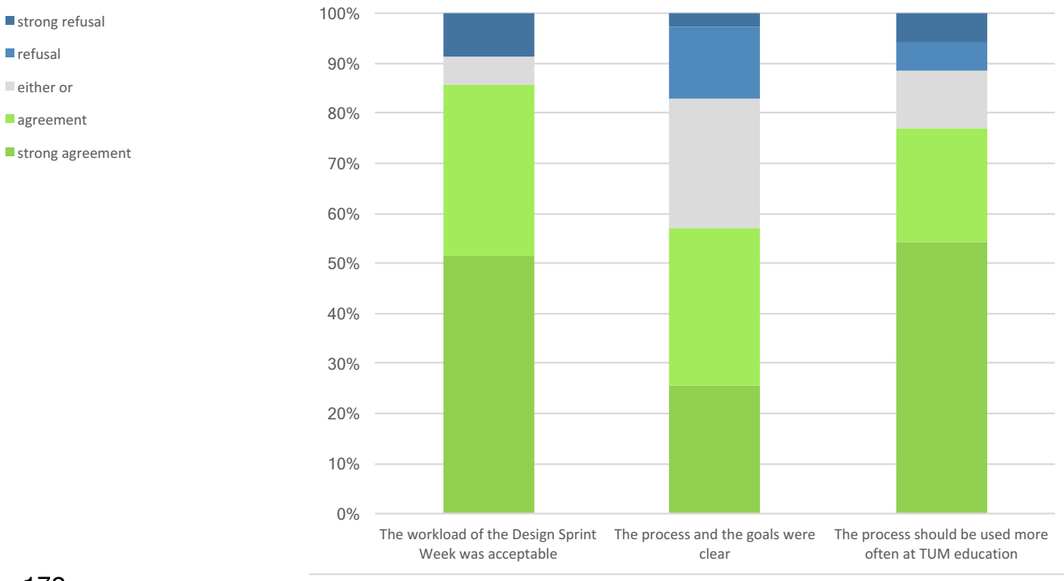
On Process

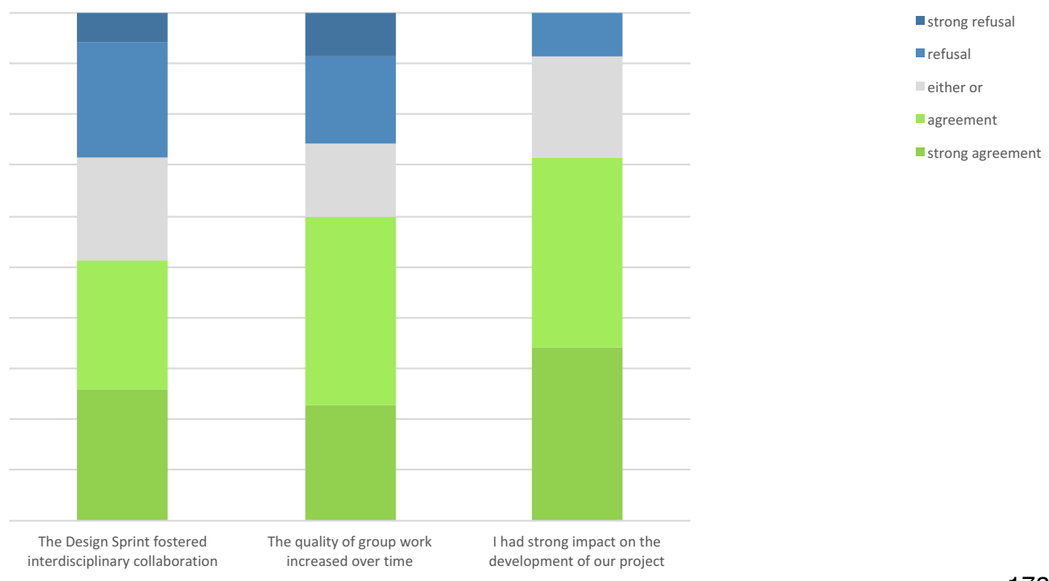
The structured process seems to impede in-depth discussions and were sometimes hard to follow, especially when defined exercises were given up-front.

On Collaboration

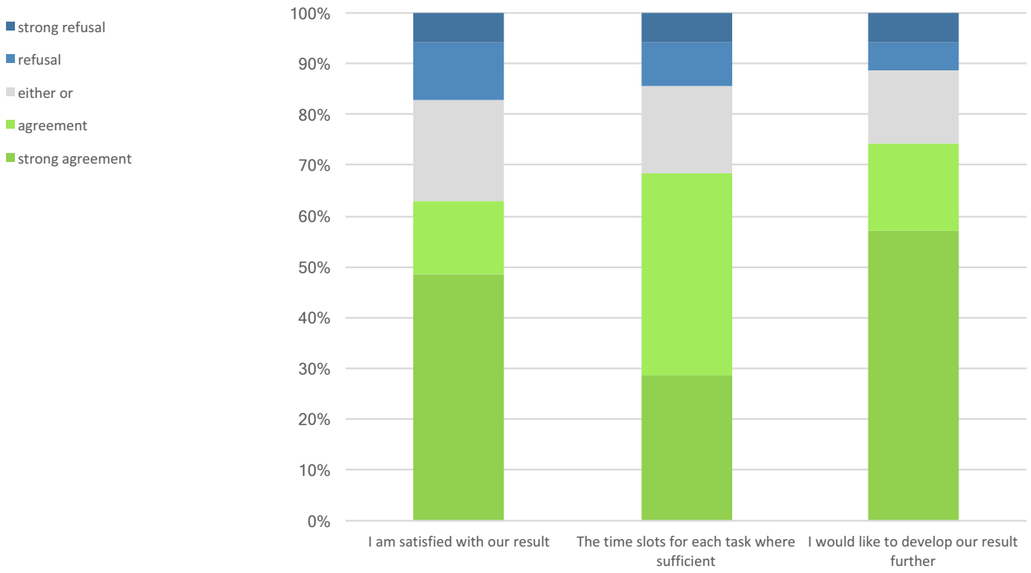
Due to an over-representation of architectural students, interdisciplinarity could not be achieved as intended.

One group out of six did not submit a final brochure after the sprint.

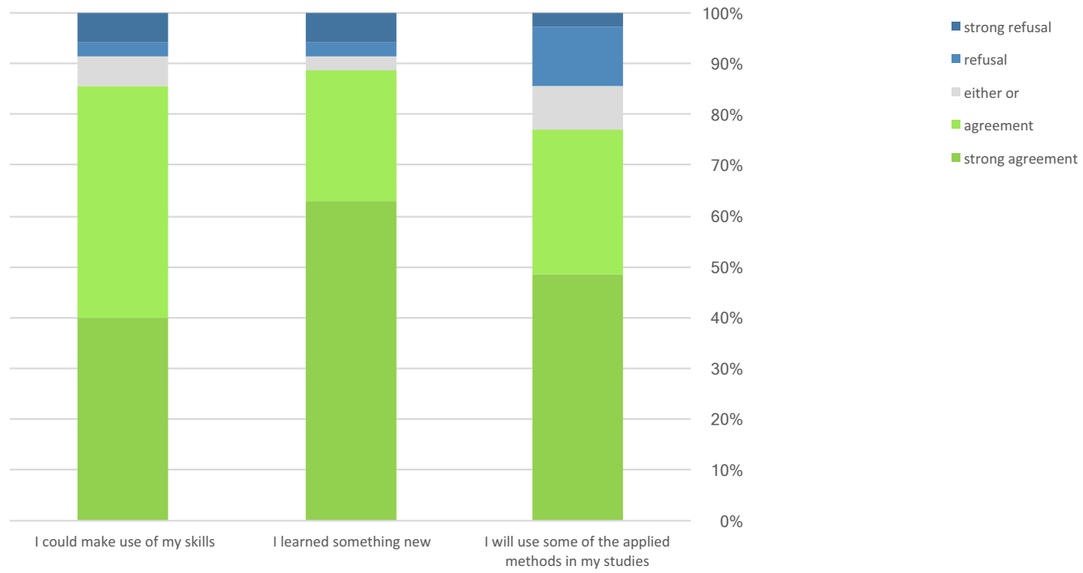




On Results



On Benefits



Evaluation // Design Sprint
'The Circular University' 9-13 Oct, 2017

BauHow5

Participants Feedback

(1= strong agreement, 2= agreement, 3= either or, 4= refusal, 5= strong refusal)

A. Personal information

Age ☐

Study Level Bachelor ☐ Master ☐ PhD ☐

Gender Female ☐ Male ☐

Origin TUM Student ☐ Incoming Student ☐ Other ☐

B. On Circularity

	1	2	3	4	5
B.1 The concept of Circularity got conveyed comprehensively.					
B.2 My consciousness about Circularity has increased.					
B.3 Circularity should become a key target for TUM in the future.					

C. On Process

	1	2	3	4	5
C.1 The workload of the Design Sprint Week was acceptable.					
C.2 The process and the goals were clear.					
C.3 The process should be used more often at TUM education.					

D. On Collaboration

	1	2	3	4	5
D.1 The Design Sprint fostered interdisciplinary collaboration.					
D.2 The quality of group work increased over time.					
D.3 I had strong impact on the development of our project.					

E. On Results

	1	2	3	4	5
E.1 I am satisfied with our result.					
E.2 The time slots for each task were sufficient.					
E.3 I would like to develop our result further.					

F. On Benefits

	1	2	3	4	5
F.1 I could make use of my skills.					
F.2 I learned something new.					
F.3 I will use some of the applied methods in my studies.					

G. On Wishes & Comments

G.1 Did the Design Sprint meet your expectations?

G.2 If not, what did you miss?

G.3 What worked in the process, what did not?

G.4 What can be done better?

G.5 Do you think this format should be applied more often? If yes: 5 days, 3 days or 1 day?

THANK YOU FOR PARTICIPATION!

Evaluation sheet and questionnaire used throughout all activities in Output 2.

Did the Design Sprint meet your expectations?

Open answers to questions within evaluation, n = 35 / 35 answers.

- not really, I expected a better method not directly related to google as well as a better picture of sustainability
- yes it was greatly organised and planned.
- in the beginning (first 2 days) I had problems to find the final result, but I liked to work with different methods. Group work is a really good thing but if the members don't have the same level of achievement, it is hard to find a common sense.
- 65%
- yes, but maybe a more precise question could be better.
- yes
- not completely
- absolutely
- Definitely, actually I had not a specific expectation, so it was lovely and a great experience. Thank you!
- not fully.
- absolutely! Make more of that stuff
- mostly yes, but in our team we couldn't manage to concentrate on one specific goal so we always worked conceptionally which I don't like so much and where I don't see my strengths.
- Before coming I had a few expectations and most of them I had possibly achieved through the design sprint, as idea generation in really small time or learning more about circularity.
- yes, in some extent.
- Yes, because my main motivation was to learn more about what is the circular economy and how can we use this concept in our daily life. But about the work group, I didn't expect this.
- kind of. The method and concept of the Design Sprint to foster collaboration is great.
- it was unexpected, due to the little information provided prior to the Design sprint. Yes, we developed concepts on a circular university, maybe less on circularity in the BE.
- I really liked the sprint, especially the enthusiasm of the guides for the sprint. It's an interesting experiment and it taught me and showed me a lot of CE projects and approaches which I didn't know. The lectures were great and the guests were really interesting!
- I didn't know what to expect, so it exceeded my expectations.
- Yes, it has been an ultra productive week!
- Yes, I would be happy if we could use this method in some projects in the future.
- yes :) good input! Good organisation
- I came in with no expectations. But it definitely wasn't what I had in mind. It was very informative and a very new approach.
- Yes! I was however positively surprised by the content, organisation and motivation of the participants and organisation committee.
- not that much.
- yes, I was hoping for a dynamic, inspirational environment! This is what I found. I was also very happy to reflect on something other than architecture. And a great thanks to the design sprint team.
- yes because it was a sprint so that forced us to be efficient. And I learned so much about circularity.
- In most ways it did.
- yes and exceeded it
- it was even better than I expected. In the beginning I was not sure in which direction it would go and if it would be fun. It was intensive but great fun.
- it exceeded them. I didn't believe so much could be done in only 5 days. It really was a good presentation of this sprint method
- 100%
- yes I did
- yes it did. The goal was more less the 80/20 graph and the circularity was achieved.
- yes

If not,
what did you miss?

Open answers to questions within evaluation, n = 35 / 20 answers.

- event about sustainability was not sustainable itself
- more interdisciplinarity. more degree variance (bachelor-master-phd) graph motivation and “teamwork”. Team dynamics
- the circularity needed to be more conveyed. Too much about business models and achieving a business solution to sell. Group work didn’t work in the way it should and the help of the organisers came a bit too late, but then we could work a bit better in some points
- diversity, feedback
- the interdisciplinarity was unfortunately not a quality in our group.
- I wished the exchange with other partner unis. Would have been nice to focus a bit more.
- more other students
- probably the problem lied in the team and in my personal abilities. The process was organised well.
- Overall I think sometimes was hard to understand what is our goal, but I think in a mean time it was a good challenge and every team created quite different projects.
- I missed a more cooperative atmosphere. I still can’t understand why the workshop that tackles circular economy (which has so much potential for exploring new and more collaborative and horizontal methods and should be based on dialogue) was a competition. the students might have had less pressure and better development if they weren’t competing and striving to win.
- In fact, it was quite difficult to start to work with people you didn’t know before. So sometimes, it was difficult to understand every point of view. But I guess that it’s a point of the game and I think it was a great experience.
- interdisciplinarity! It can only be considered a partly success; you failed to bring more disciplines into the projects. This was definitely a negative aspect that I had not expected.
- a little bit more time to connect with the members of the other teams.
- One could tell the Design Sprint is still at its beginnings at TUM. It can really get better though! I would like more of this!
- a break in the middle days. The communication between team members.
- more interdisciplinary teams.
- I miss time
- I expected a bit more interdisciplinarity. Unfortunately most participants were architects.
- in next design sprints maybe try to bring more departments professions together.
- more time, two weeks/ 10 days. Further development during the upcoming semester.

What worked in the process, what not?

Open answers to questions within evaluation, n = 35 / 35 answers.

- groupwork completely collapsed
- time frame. Clear tasks and rules
- time limit worked “drop your pens at 5p.m.” exact timeline what to do when
- not: communication, collaboration, feedback. Worked: stick to the timetable
- group of 5 people max., 6-7 is too big. The topic was very interesting and the working methods efficient. The lectures were very important and useful.
- the groups can be enriched by different faculties.
- pushing members of the group with less interest in the topic and interdisciplinarity was requiring a lot of energy.
- everything =)
- the work together in a team, sometimes we got stuck, but got good support, also from the advisors.
- discussion often did not work out successfully
- interview-phase was a little bit unclear. But very useful. Project is to be continued.
- because of the lack of time we always started to work on points that were later put away again. I need more time to think about a problem, before starting to produce.
- it was good that almost everything was scheduled so we would always know how much time left. It was great to hear also the opinion of all professionals.
- to have to be practical and make decisions instead of fostering infinite discussions is great. Drop the pen at 5p.m. also. Stress and demotivation due to competition.
- the interdisciplinary interests work but communication of ideas was difficult sometimes. It was interesting to take part in this fast week. To learn new methods of working.
- getting people together physically doesn’t mean that people can really get communicative with each other.
- teamwork worked very well. Also the process itself worked. All teams managed to get to a concrete result! Collaboration with ASW and Vitra was great. More cross-pollenisation between the different projects during the process.
- the beginning was maybe too hard. After the great introduction we went to the tables and just started saying ideas to the air… it felt very not productive and very strange with completely strange people. I would have started with some games just to get to know the person in front of you. It could have changed all of the dynamics in the group and then the brainstorm process maybe could be more productive.
- the time slots were sometimes too short and sometimes too long, it should be a bit more adapted to the tasks, the requirements were quite strict so you really had to do what was expected in the time frame. E.g. storyboard, you had to do the storyboard.
- worked: new tasks leaded to solutions. Didn’t: sometimes too less time for work.
- I think our group worked great together, it was also good to get feedback every day. I don’t have any complains.
- everything worked out good
- the music that played to force us to stop was actually very effective, because it made us move forward.
- what worked: the tight time frames. Communication, idea development.
- worked: quick decisions, detailed discussions. Not: opinions get good understood and respected.
- I loved the rhythm and dynamics of short, structured working sessions. I appreciated not having to do extra work at home.
- the results in one week were great! So that has worked. But not enough fields and hard to work with people you don’t know at all.
- in my opinion the first days were a bit confusing. We had so many ideas, but we got stuck in discussions.
- the interviews were not really as possibly planned cause we didn’t really know what was expected.
- sometimes the time was a bit short, but it forced us to have fast decisions.
- the time schedules were very good as we could easily get lost in the process and give too much stress on maybe not so important thing.
- sometimes a bit smaller group would allow a higher productivity.
- the different skills people in the group had, could be used in a good way. Sometimes our ideas were just too different.
- groups were practically randomly made. Risk of too many different interests was together
- the multidisciplinary approach, the explanations of the workflow.

What can be done better?

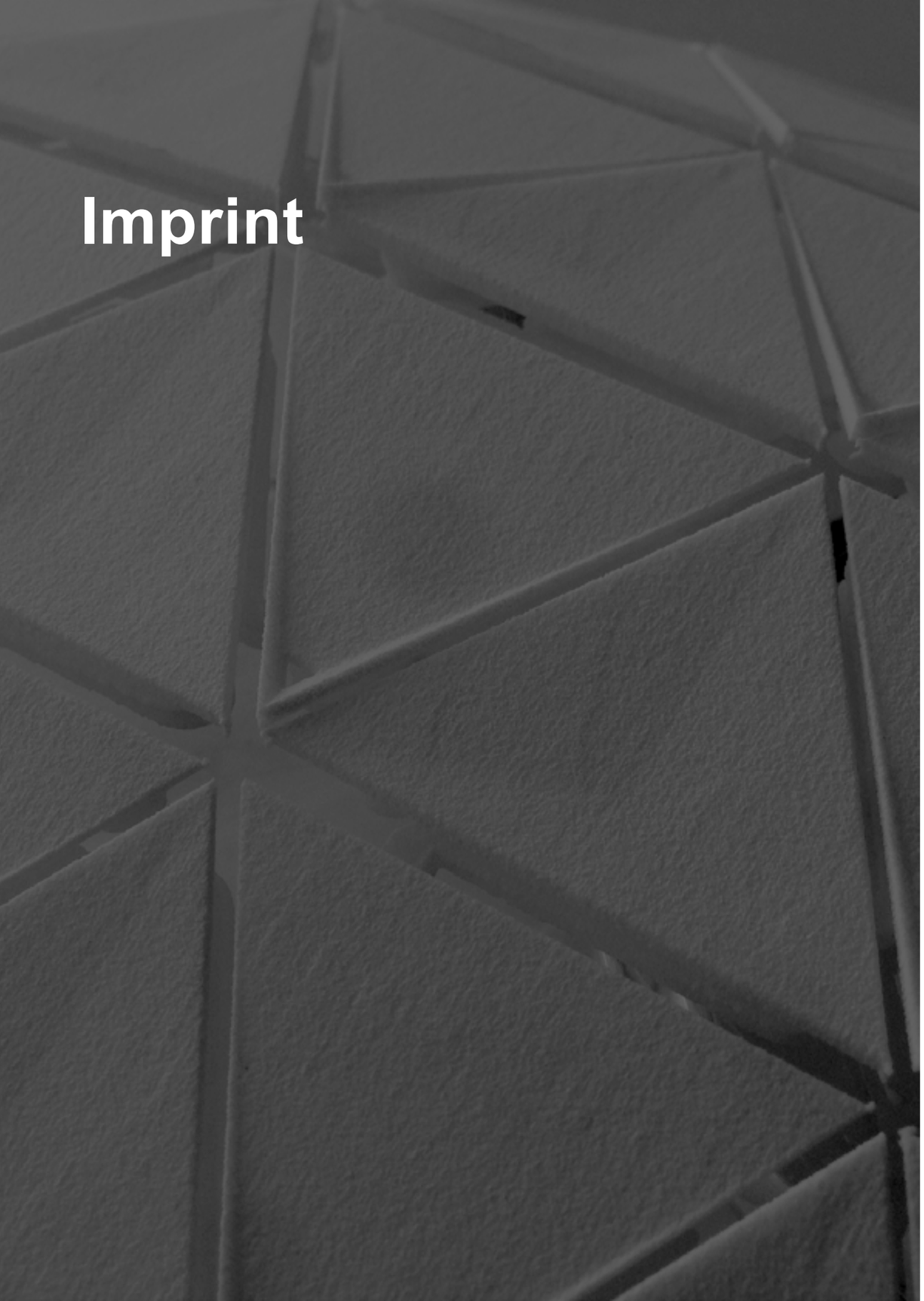
Open answers to questions within evaluation, n = 35 / 28 answers.

- more people from other areas, wasn't very interdisciplinary
- I think, if there are 90 applications for this workshop it is necessary to get the most out of the different disciplines. There were too many architects. Also already do the group via "zufallsprinzip"
- feedback
- more students from other departments than Architecture.
- the goals were not very concrete, so it left a lot to the students. I think that deciders could show more ways to solve the questions or choose the right questions.
- mixing the groups to focus on interdisciplinarity.
- sometimes a more precise description of the task.
- smaller groups. Not more than 5 people.
- I think it would have been nice to maybe have the professional speech every day. To get more inspired and also it was sometimes hard to understand our goal.
- some tasks weren't clear. For instance, maybe if everyone had seen the sprint video tutorial for the interviews, it would have been better.
- the definition of circular economy must be better defined from the beginning. And maybe more advice about how we can work together.
- But I do think that fostering collaboration doesn't simply mean gathering students with different academic backgrounds together. How to use rules to push people to listen to others' opinions is also a big thing needed to consider.
- Simply saying that you need to listen to others doesn't work.
- the organisers could … some more logistical help from HIWIS, that way you would be more chilled at the end of the week. It could be felt that you got tired.
- a lot of the time got wasted with talking in the air without conclusion making. Maybe it was a problem in the dynamic of the team, but maybe with more constructive support with the process and somebody to guide closer it could have been better.
- the explanation on what the final requirements and results should look like.
- the interviews at the last day didn't make that much sense. Was like everyone thought it would be the sense to present the project. The method interview wasn't reached.
- having more students from other departments.
- more input at an earlier stage from experts, designers.
- decreasing the number of people in a group.
- maybe invite more people to the presentation day to give an insight to everyone about the work done. Also it would be nice to have more interdisciplinary teams.
- more advertisement to get more participants of other disciplines.
- first day was a bit too long. Social connection could be more promoted especially between the groups after the sprint days.
- the teams should be more interdisciplinary, there were too many architects. With students from other faculties it would be more interesting and the results more surprising.
- the target for the interviews -> maybe some were not relevant for our project and we didn't get the feedback that could help us but at the same time it gave us some thought.
- I would just mix up groups from the beginning, so no choosing has to happen
- groups apply not students or a phase to make more harmonic groups
- organisations of workflow

Open answers to questions within evaluation, n = 35 / 35 answers.

Do you think this format should be applied more often?
If yes: 5 days, 3 days, 1 day?

- 5 days was a good time frame. I just think it should not be fixated so much on developing a product or a business model. Solutions for sustainability can‘t always be put in a business model. The way of thinking of the sprint very much stayed within usual TUM (the entrepreneurial University) way which is not how change will happen. Apart from that it was a great week!
- yes. 5 days or and 1 day
- 5 days is necessary to develop something especially if there are complications in the group.
- yes, 5 days, different topics
- yes 5 days. It allows interdisciplinary work about society problems that we need to resolve.
- yes I do. but I believe that less than 5 days would be too short and projects won’t evolve that much.
- yes at the beginning of each semester.
- 5 days! Yes especially during architecture teaching. Very effective time system!
- yes 5 days!
- jip! 5-day session is good. After the 3rd day, the team was set and we were able to work together.
- yes! 5 days is perfect. Maybe “sprint light” during semesters? 3 days.
- not sure if the outcome is worth doing it more often. Obviously you cannot produce working products in 1 week.
- I think 5 days is a good idea. 3 or 1 days couldn’t be effective. Because 1 day you start to just know the team and task. Thank you for creating this great workshop!
- yes. 5 days. But make the tasks (objectives of each moment) clearer.
- yes, because it’s really interesting to work with people who come from other fields. And the method was quite new. 5 days.
- yes 5 days.
- All three formats depending on the situation! I know other design universities in which this or similar methodologies are applied to foster different projects across faculty and students.
- 5 days is a good time frame. I would have mixed more people from outside of the architecture department and limit it to 2 architects per team + divide the teams in advance, so then each group would have as many as possible perspective points. And maybe then each team member would feel that he/she had an important place in the group.
- yes, at least every semester, 5 days!
- yes, I think it makes really sense and opens minds. Interdisciplinarity for all! Thanks!
- I think this method could be used in the early phases of a project, I found the 5 days intensive work good and progressive.
- yes, 5 days - good time slots from brainstorming to complete.
- yes, but 5 days because at some points it was a bit stressful to work quickly or to come up with ideas very fast so 5 days is enough time not to feel the hustle.
- 5 days! Maybe 3 days (Like a hackathon)
- yes. 4 days (2 days working + 1 day off + 1 day working)
- yes. 5 days seems right. I believe less days might leave the teams frustrated to not have been able to develop more of their ideas.
- yes but minimum 1 week (5 days) then it’s too hard to meet each other and understand how the group works the abilities and expectations of each.
- I think 5 days was good to get an idea of the principle of a design sprint.
- yes 3 days or more.
- yes, but I’m not sure how many days… depends on how much you want to achieve.
- yes, definitely! Everyone should be able to try this sprint at least once during their study. I think 5 days were just the proper length.
- yes, 5 days or longer
- yes it should. The duration depends on the theme and the goal of the workshop. I think 5 days was good in our case.
- yes 5 days
- yes, 5 days



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