

Report & Evaluation
Design Thinking Lab
‘Workspaces for DigitalYOU’
22 – 24 November 2018

A joint initiative of BauHow5:



The Bartlett
UCL Faculty of the Built Environment



In cooperation with:



IBM **Watson IoT**





Contents

Executive Summary	04
Process & Methodology	09
Input Lectures	18
Teams & Results	21
BelAI	25
DANA	43
Space Match	81
Emoji Cup	103
Wow	127
Evaluation	149
Imprint	160

Executive Summary

A design workshop for visions of tomorrow's workspaces with architecture, management & information technology

The way we work is rapidly changing. Social and technological drivers transform how we interact. What are potential scenarios of working, co-creating and innovating together beyond the spaces we know today? How will we work in the future and how will we need to adapt our physical workspaces to incorporate the digital? What can the disciplines of architecture, management and information technology contribute together in this challenge?

Context of the Design Thinking Lab

In the third activity at TUM, the focus was directed towards future workplaces and how the working processes in consulting industries are transformed. Together with international consulting firm Boston Consulting Group and information technology company IBM Watson IoT, a 3-day design thinking lab was conducted with Master's degree students from architecture, management and information technology. Workspaces for the future were thought from a people, technology and building-driven perspective. The 24 participants were asked to explore 'Workspaces for DigitalYOU' and create compelling workspace experiences in the digital and physical world.

Process of the Design Thinking Lab

The design thinking lab followed the IBM Enterprise Design Thinking Field Guide and was facilitated with one person for each team. The structured agenda foresaw design challenges, tools and time frames for the duration of three days. The 24 participants were assigned prior to specific teams to ensure an interdisciplinary mix of students.

43% female / 57% male
100 % master degree
82 % TUM student / 18% incomings

The teams were facilitated throughout the three days by one researcher of the BauHow5 Alliance or one design thinker of IBM:

Day 1 // Context & Challenge

Day 2 // Ideation & Concept

Day 3 // Prototype & Pitch

After 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 finalized their work as team.

Teams & Results

The results ranged from workplace devices, ethically & empathy driven AI and digitally augmented spaces for meetings.

Team BelAI – knowledge management tool with empathy driven AI

Team EmojiCup – An every-day, easy-use element to rate and communicate comfort at workplace areas

Team SpaceMatch – Application to provide new workspaces for a collaborative future

Team WOW – Augmented reality glasses to adapt unfamiliar environments into temporary consulting workspaces

Team Click! – Augmented reality glasses to communicate digital transformation processes

Team DANA - the Digital Architectural Needs Assistant / a digital assistant connected to a cloud-based database

Evaluating the Design Thinking Lab

The evaluation showed a high satisfaction rate with 24 cumulated replies of “agreement” and “strong agreement” (number of participants n=24):

Concept, consciousness and challenges for future workspaces increased: **68%**

Workload, process & future implementation were feasible: **63%**

Collaboration, interdisciplinarity and integration increased: **83%**

Results & willingness to pursue idea further were satisfying: **67%**

Benefits to apply skills and use new insights occurred: **71%**

The structured method according to IBM's Enterprise Design Thinking Field Guide led to thoroughly elaborated concepts and documentations, which mostly related to digital products and services. The strong user focus and work with personas offered a new approach for architects, but on the other hand limited more visionary and alternative approaches. The graphical tools used (e.g. post-its) constrained to some extent the visual skills of architects. The strong facilitation by experienced designers had a very positive impact on the results and shall be considered in future formats.

In addition to the picture documentation, Boston Consulting Group created a short video to capture the final day of the workshop.

[Watch on Youtube](#)





Chapter 01

Design Thinking Lab Process & Methodology

connecting Architecture with Industrial Design. Especially in terms of work there will be a big change in the future. People will work in new ways together, will find new forms of collaboration and because of that, architecture and design have to react to these changes. Designers have to find new ideas working together and connecting work with the digital. For me the Design Thinking Lab would be a great chance

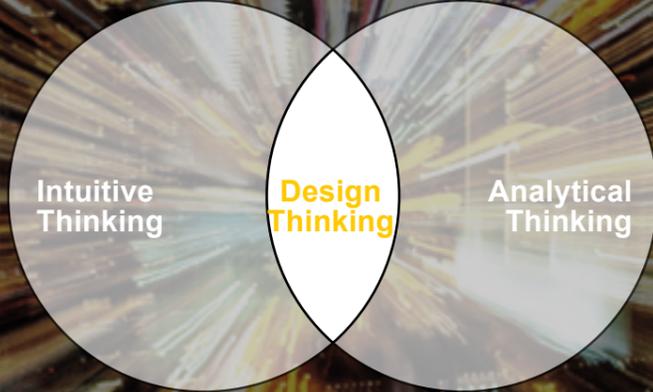
The thought of the rapid digitalization preoccupies most of us today. From the position as a future architect I could already observe the impact on today's working spaces in planning as well as in daily office work. Even though I mostly tried to interweave the digital workflow with the actual surrounding I am sure that there's still a lot of unused potential in this area.

THE GREATEST THING TODAY

forms of living and forms of working. When thinking about work specifically, we have to develop solutions for changing work environments. The typical static office building scenario is outdated and needs to be questioned – a more flexible and non-location based working space has to be explored. How will work change in the near future? What issues that we face today will define the way we will work? How does digitalization and automation processes shape our work flow? My interest lies in the way we can use

Discussing innovative workspace design is finally perceived as a pressing issue - not just by the workers, whose every-day-lives are directly impacted by that, but by the highest levels of management in big companies. According to *Architectural Digest*, "eighty-two percent of participants said that a workplace must exhibit innovative design in order to truly foster a culture of innovation where they can do their best thinking."¹

Working with challenges that includes humans is never easy, especially not when it's related to change! That's one of the things that makes this such a complicated situation and moreover a very relevant topic now technologies are evolving rapidly fast. What should a company do when change is needed due to technological disruption?



BauHow5 SABRE ERASMUS+

Project for Strengthening Architecture and Built Environment Research (SABRE)
Output 2 - Architectural Entrepreneurship

HYPOTHESIS

Architects can work very effectively in **new formats of innovation** and create a great output, if involved more. The skill set of architectural students can **leverage design thinking labs.** Or not.

O P E N I N G V I E W S



Dr. Pe-Ru Tsen
BCG
Global Digital Workplace
Strategy Director



Dawn Ahukanna
IBM Watson IoT
Design Principal and
Front-End Architect



Dr. Kerstin Sailer
UCL
Associate Professor
Social & Spatial Networks

Agenda @BCG

22.11. // Day 1 – Context & Challenge

- 08:00 Get-together / Morning Coffee
- 08:30 Welcome
Felix Baerstecher / BCG Head of Recruiting
Andreas Dinger / BCG Senior Partner & Managing Director
Sherri Thomas / IBM Director and Head of Watson IoT
Center Munich Global HQ
- 08:50 Intro Christos Chantzaras / TUM
- 09:00 Opening Position 1: Dr. Pe-Ru Tsen / BCG
Human-centric workplace experience
- 09:20 Opening Position 2: Dawn Ahukanna / IBM Watson IoT
Designing Connected Buildings with IoT (tbc.)
- 09:40 Opening Position 3: Dr. Kerstin Sailer / UCL
The social logic of workspace:
Insights from architectural research
- 10:00 Team Assembling acc. colour of name tags (6 teams of 5)
- 10:15 Intro Enterprise Design Thinking / Laura Dohle
Getting Familiar with Facilitators
- 12:00 Iteration I – Engagement
- 13:00 Light Lunch / Buffet
- 13:45 Frame and Re-frame the Problem
- 15:00 Coffee Break
- 15:30 State the Problem
- 17:00 Iteration II - Exploration
- 18:00 End of Day 1 / Drinks

Moving to TUM (with your work & tools)

- 19:30 Guest Lecture @ Vorhoelzer Forum
Dr. Kerstin Sailer / UCL
The Real Use of Space: Evaluating How People Work

W I T H F A C I L I T A T I O N



Laura Dohle
IBM UX Designer,
Watson IoT /
Facilitator



Luca Tausel
IBM Connected Spaces Business
Developer, Watson IoT /
Facilitator



Kasimir Forth
Managing Director LOC /
Facilitator



Svenja Laing
IBM IT Specialist -
Software Services, Watson IoT /
Facilitator



Marie Strid
Senior Lecturer Architecture
Chalmers University /
Facilitator



Christos Chantzaras
TUM Architectural
Entrepreneurship / ARI /
Facilitator

Agenda @Vorhoelzer Forum

23.11. // Day 2 – Context & Challenge

- 08:00 Get-together / Morning Coffee
- 08:30 Intro Recap + Agenda for the Day
- 08:35 Food for Thought: Comfort-as-a-Service in
Office Buildings / Svenja Laing / IBM Watson IoT
- 08:50 Recap Your Problem
- 09:30 Ideate
- 11:00 Iteration III - To Facilitator
- 11:30 Focus on One
- 13:00 Light Lunch (own treat)
- 13:45 Food for Thought: How To Pitch / BCG
How To Prototype / Laura Dohle / IBM Watson IoT
- 14:00 Develop a Concept & Story
- 15:15 Coffee Break
- 15:30 Storyboard Your Concept & Think of a Prototype
- 17:00 Present Storyboard Concept to all
- 18:00 End of Day 2

24.11 // Day 3 – Prototype & Pitch

- 08:00 Get-together / Morning Coffee
- 08:30 Review & Revise Storyboard & Prototype
- 09:00 Prototype (also in DDL, TZ or ARIspace)
- 12:00 Iteration IV
- 13:00 Light Lunch (own treat)
- 13:30 Developing Pitch Presentation & Prototype
- 15:00 Trial Run / Prepare to Pitch
- 16:00 Clean-Up Spaces / Evaluation of Workshop
- 16:45 Get Ready to Pitch
- 17:00 Pitch to Jury
- 18:00 Jury Session
- 18:30 Winner & Drinks // End of Lab

22.11. // 08:00
The Boston Consulting Group
 6th floor
 Ludwigstraße 21
 80333 Munich

23.11. + 24.11. // 08:00
TUM Vorhoelzer Forum
 5th floor
 Arcisstraße 21
 80333 Munich

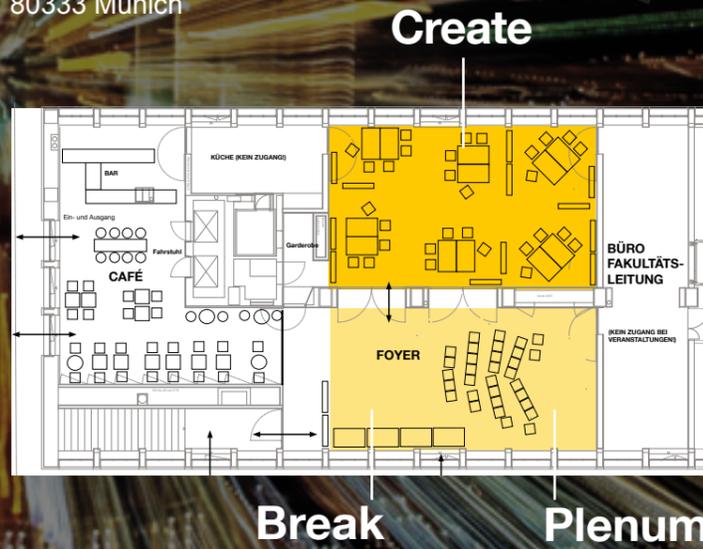
Location

For documentation purposes and dissemination, we will take pictures and make recordings of the three days. If anyone prefers not to be seen or visible, please inform us at the start of Day 1.



DDL/TZ Computer Room ARIspace

Prototype DDL/TZ only with Safety Briefing



Design Thinking Lab 'Workspaces for DigitalYOU' November 22 – 24, 2018

W E L C O M E

Alina
Christopher
Franz
Isabel
Matthias

David
Jonas
Natalia
Stelios
Susanne

Christoph
Danqing
Julian
Lubna
Philipp

Carsten
Isabel
Leopold
Nicolai
Tianxi

Asli
Lukas
Matthew
Paola

Ekaterina
Jais Skovgaard
Jose
Yonne-Luca
(Klara)



In cooperation with:



8 seconds



9 seconds



18 minutes



F A C E T O F A C E W I N S

Focused work, focused breaks.
 No phone calls/texting in team.
 Come-together in the plenum.

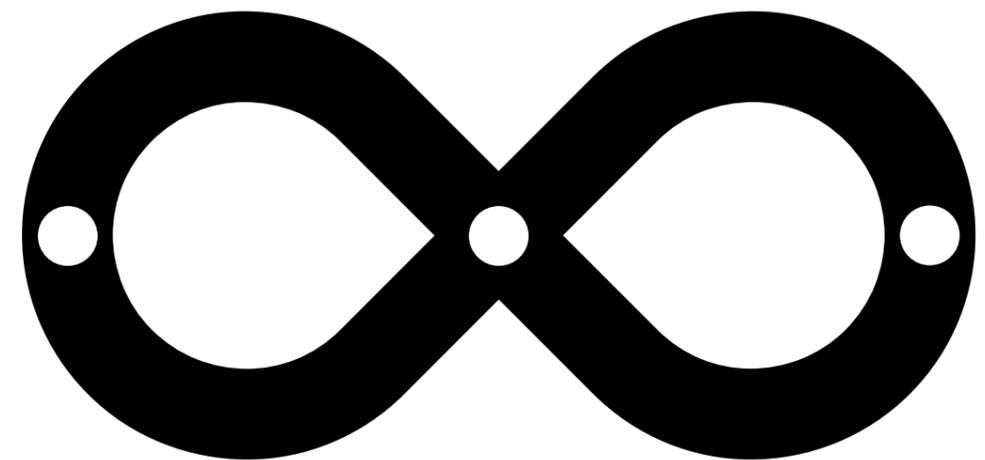




Enterprise Design Thinking: The Loop

UNDERSTAND USERS' NEEDS AND DELIVER OUTCOMES CONTINUOUSLY

At the heart of Enterprise Design Thinking is a behavioral model for understanding users' needs and envisioning a better future: a continuous loop of observing, reflecting, and making.



OBSERVE

Immerse yourself in the real world to get to know your users, uncover needs, learn the landscape, and test ideas.

REFLECT

Come together and form a point of view to find common ground, align the team, uncover insights, and plan ahead.

MAKE

Give concrete form to abstract ideas to explore possibilities, communicate ideas, prototype concepts, and drive real outcomes.

Chapter 02 Design Thinking Lab Inputs

(Excerpt)





Chapter 03

Design Thinking Lab Teams & Results

Copyright © 2018 by the respective teams or authors. All rights remain with the teams. No part of the presentations, concepts, slides, images, pictures may be reproduced, distributed, or transmitted in any form or by any means, without the prior written permission of the respective author. The teams are responsible for their content.

Team WOW



Team
Emoji Cup



Team
BeAI



Team
DANA

Spacematch



Concept Report

'Workspaces for DigitalYOU'

belAI knowledge management tool

Team Click!



Executive Summary

How will we work in the future? What will we do when all work has been automated and accomplished by robots and artificial intelligence? The Design Thinking Lab for “Workspaces for DigitalYOU” led to many interesting questions and approaches to our future working environment. Arguably the most important and relevant topic regarding this outlook is definitely artificial intelligence. Possibly the greatest invention of human kind, yet pessimistically viewed as humans last invention, A.I. is already performing multiple tasks in our daily working life.

During the workshop it became clear that we wanted to focus our attention on A.I. since our interest in this technology and the vast amount of possibilities to integrate it in applications seem infinite. We used our questions that we had about the future as a driving force to develop solutions to our present-day problems and decided that an ethical approach was another way of integrating our interests into this technology. The intersection of ethical decisions and artificial intelligence arose since we thought that at the moment the greatest objective is to make A.I. ethical and unbiased.

The product that we eventually developed is unique in a way that it collects and evaluates data, makes it accessible to users, matches the user to a possible field expert and suggests a meeting in a spatial entity. belAI arose out of the idea that knowledge should not only be harnessed but should help users see multiple approaches to a problem. The ethical part obviously seemed essential, since matchmaking has to be unbiased and as statistically sound as possible. The potential of combining a technological application with a spatial entity is extremely high and can create different types of scenarios lead to various outcomes.

Our product belAI had to incorporate a space since we believe true inspiration can only come from direct interaction.

Considering our vision for belAI, it was important to gain an understanding of the current knowledge management market and alternative solutions that have already been presented harnessing the potential of artificial intelligence. A fair number of newcomers have entered the competitive sphere in this field. The emphasis they place on employee engagement and value-driven workspaces was the main reason these actors were selected and analysed in terms of the technologies they utilise, the key features of their products and the type of competition they present when compared to belAI. Nevertheless, the concept provides a unique solution with the introduction of a designated space for connection, continuous learning and the fostering a sense of purpose. The goal was not limited to creating another productivity-enhancing tool, or simply managing the problems of a particular day or week in an organization. From the early stages, a long-term approach was emphasized, one that would allow it to become integrated in the organizational culture and have a larger impact in how employees view their role in the promise that the elimination of knowledge silos brings with it.

Documentation of the Workshop

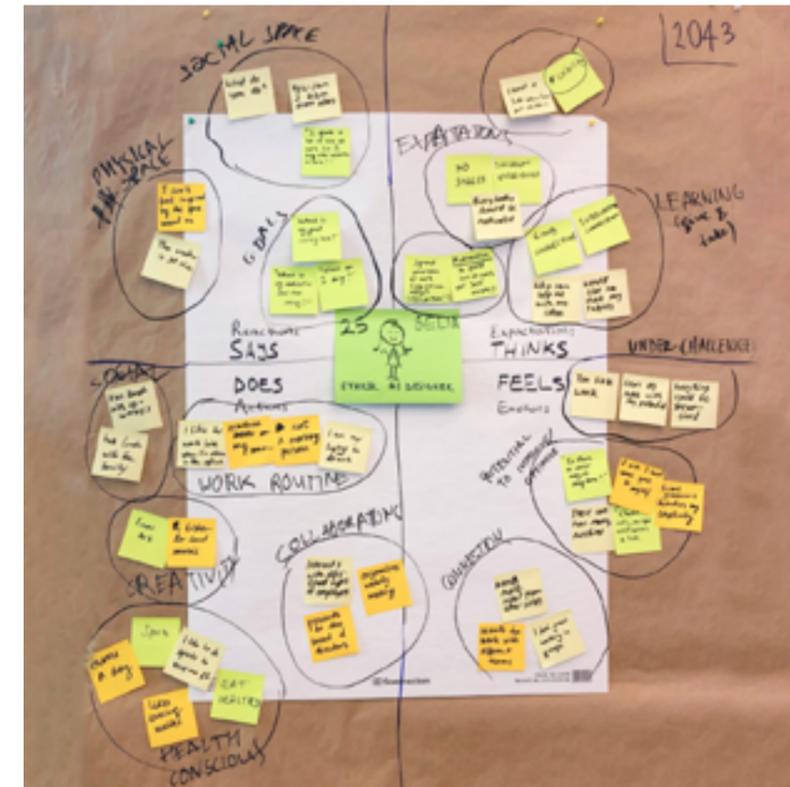


Image of the Emathy Map

Empathy Map

The three-day workshop was about using the Enterprise Design Thinking Guide from IBM to develop a concrete idea of what our workplace could be look like in the future.

It started to find a fictitious user. For this purpose, a so-called empathy map was created, in which the group has defined characteristics of its user, such as job title but also activities and thoughts besides the work, in order to generate as holistic as possible image.



Image of the Scenario Map
Copyright © 2018 by Team belAI

Scenario Map

After a potential user was found a Scenario Map was created. This map should show how the workflow of the user looks like and explain the possible places you need to improve to improve the user’s life. In the specific case of Belia a certain day was considered to find out where the „pain points“ could be.

As was the case after the first step, a short round of presentations was held after each work session on the respective topics, where each group briefly presented their work status and afterwards had the opportunity to receive feedback from the plenum.

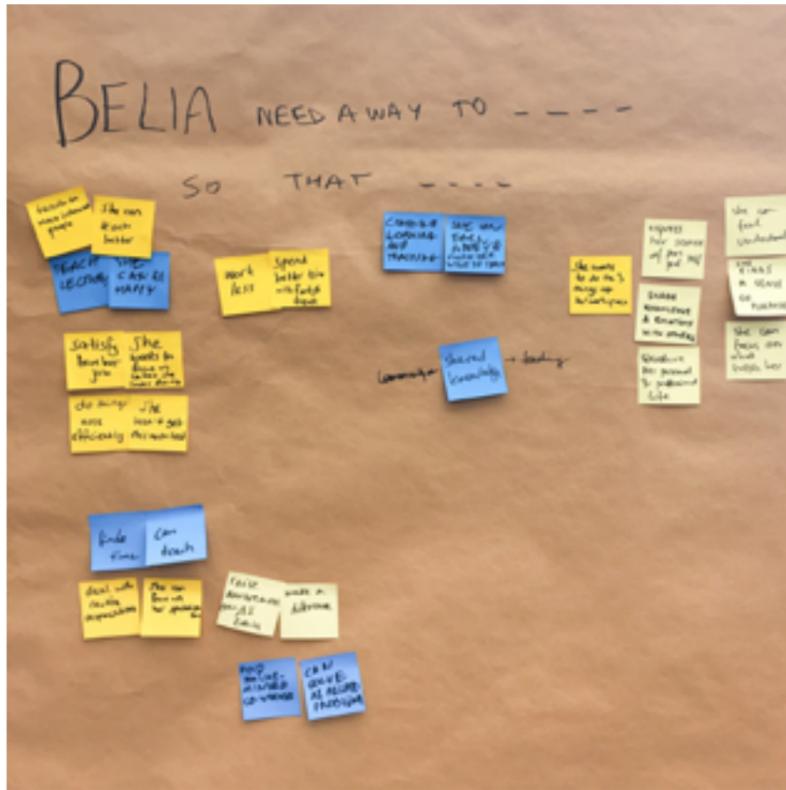


Abbildung 1 Bildunterschrift, Autor etc

Big Idea

Once the team had a clear idea of the user's problem, they tried to figure out the big idea to solve the problem. With the help of brainstorming, everyone has tried to produce as many different ideas as possible, and then to come up with a good idea together. True to the motto quantity instead of quality.

Needs Statements

Subsequently, a concrete statement was generated to keep the focus on the actual needs and goals of Belia.



Abbildung 1 Bildunterschrift, Autor etc

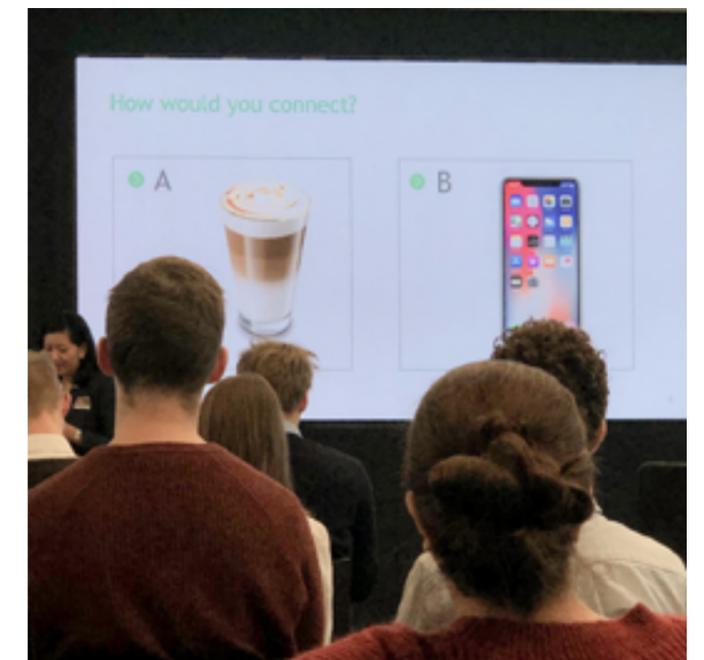
Storyboarding

In order to present the best ideas and the results, a storyboard was created. In six steps is shown as short and tight as necessary but as precisely as possible what it is about and in what way that can help the potential user.

At the end of the workshop, this story was worked out and in addition with a prototype, to pitch in front of the audience and the jury.



Impressions from the Workshop



The Prototype - A Movie about belAI

The prototype for the pitch at the end of the three-day workshop was to convey the complex idea within a very short time. Therefore, it was obvious to do this with the help of a video, which in the short time can provide a lot of content through picture and sound.

As a stylistic device for the video, the method of „explanatory video“ has been used, in which certain scenarios are described by means of drawings and these are placed and moved by hands in front of the camera to give the spoken content a visual background.

The video explains step-by-step, with a fictitious person, called Belia how the developed concept is used and what the qualities and the result are.

Image 1-2: “This is Belia. She is a knowledge worker, specifically an artificial intelligence designer. She is working at the client’s site as she comes across a problem in her project that doesn’t know how to solve. She wonders who will be able to help her with this challenge. With that in mind, Belia turns to the project slack bot and types in a short description of her problem.”

Image 3: “Later in the day, she receives a calendar invitation, with what seems to be an invite to the Well of Knowledge. Using artificial intelligence, the well of knowledge matches together employees based on their common interests and needs.”

Image 4-6: “On Friday, Belia meets her matches in person and also, colleagues from other branches who’ve been invited. They’re able to discuss and share ideas in an environment that provides cozyness and a feeling of trust, where they feel comfortable to teach and learn from each other. Allowing for a more personal connection, just like you would talk around the bonfire.”

Image 7: “Throughout the exchanges Belia and her matches have and their feedback, the well of knowledge gathers further data and is able to improve its match-making abilities in the future, becoming more unbiased, ethical and representative as it goes along.”

Image 8: “After the insights shared and received on Friday, Belia is a wiser employee coming to work on Monday, feeling more content and more connected with her work and her organisation.”

Screenshots of the Movie



Image 1



Image 2



Image 3



Image 4



Image 5



Image 6

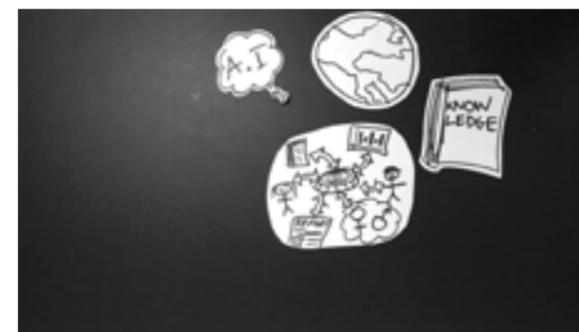


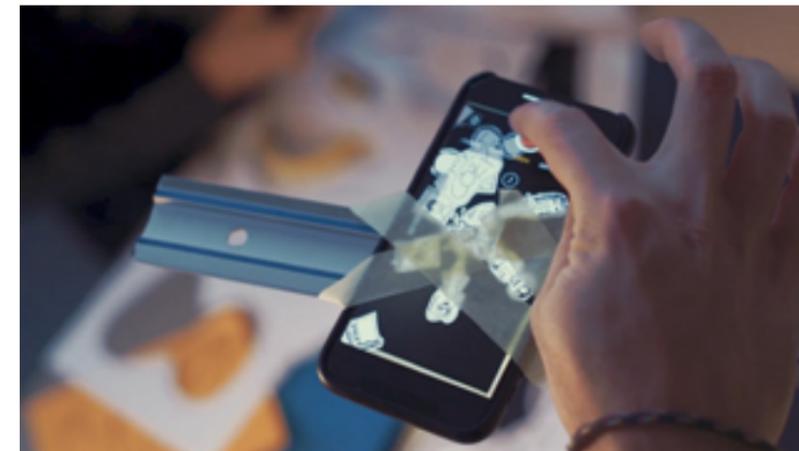
Image 7



Image 8



Making of
„belAI the Movie“



Detailed Context and Concept

Context

The wealth of a company is not only based on its total assets but more importantly on its employees that develop products or solve problems through their experience, intellect and knowledge in their respective field. At the moment, this accumulated knowledge of all employees might already be harnessed in a way that it can be accessed and tapped into, but it is not cumulated and then offered to its users in a setting that leads to a personal interaction with other individuals. Data might be collected already with AI-powered knowledge-sharing platforms such as Guru, Unika or ThirdEyeData, but not in a way that matches users according to similar interests and suggests informal meetings in a physical space.

In the current context the allocation of knowledge, the access to this source and the distribution of information, skills and information is inefficient in terms of its possible outcome.

The databases that exist are usually set up in a way that they collect data produced in a company's environment such as project documentations, employee information from internal systems and online social media platforms. Out of this metadata the software analyses and establishes so called experts in specific fields that exist in the enterprise and some of the platforms than offer conversation tools with which the user can ask questions to the experts. These platforms do not seem to serve the purpose of an intelligent database though – to provide information and approaches to unformulated questions. These silos of knowledge are yet to be linked in a way that both expert and the user posing a question benefit from. Knowledge-sharing platforms

do not seem to generate any new insights. It seems that information is simply collected and provided to the user, arguably without sparking new ideas. Given the fact, that people gain positive feedback from sharing their knowledge with others and arguing that people feel the necessity to share their experience, thoughts, insights and ideas, there is no perfect solution for this need at the moment. Every person has a different mindset, has different skills and a different range of knowledge. There is no method of bringing people together to discuss a specific question or a specific topic in an informal environment that relates specifically to its participants. There might be correct answers to specific questions but there is no food for thought that might lead to a question that was not even considered in the first place. There is no venue where people can gather to discuss for instance a problem that might relate to another person of a different skill set.

There is no tool that matches users within the enterprise based on their common topic of interest for instance. The advantages of having these matched users put in a room together also do not seem to have been explored yet. AI-powered knowledge-sharing platforms that exist today surely provide specific information that the user might be looking for. During this process the user is not engaged in an experience that might lead to a very different output. The benefits of a physical environment that allows for more feedback than a chat interface are yet to be addressed.

Concept

The concept consists of two components. The technology that is needed and a physical space.

Technology

The technological aspect is the framework and the foundation of the concept and provides the necessary information for the second component. It is a database that stores all information circulating in a company and its accumulated knowledge. The data is gathered similarly to other knowledge-based platforms from multiple sources like online publications, internal papers, business emails and social media.

The technology has the capability of linking the users input to its database and to connect the user to others to find a match, specifically tailored to the users input. It brings matched users together and suggests and sets up a meeting between them. Since the programming of algorithms is done by humans, it is prone to bias. This is countered by training the machine using statistically sound methods that do not limit its decisions to a specific elite group of people. The technology is self-learning and becomes more exact and relevant with each usage. More importantly it relies on feedback provided by its users to improve itself. The experience is developed over time and becomes less biased the more feedback it receives. It learns from its users to become more ethically correct, since users can immediately react on how they were treated.

Space

The second component of the concept is of a physical nature. It is a crucial part of the experience since it provides a setting that makes a personal interaction possible. The technology generates the match and brings the users together, the actual desired outcome however is only possible in the designated space. It is an informal setting that contrasts with the typical office environment and allows its users to feel comfortable and relaxed. The space delivers perfect conditions in terms of lighting, temperature and other factors to ensure a maximal wellbeing. In order to achieve

this, it relies on sensors to determine the current situation. It is also capable of adapting its settings to a user's specific profile by accessing the database.

The space is comparable to a bonfire scenario, where individuals come together and discuss stories, ideas, interests and thoughts in a friendly atmosphere. The space is also capable of not only providing specific settings for users; it can be programmed for different scenarios that could lead to various outcomes.

An example could be an employee thinking about rising property costs in a city and how to find an appropriate price for buying or renting for a client. Instead of matching the employee with a colleague that is specialized in real estate, the platform might suggest a computer scientist with an architectural interest and background, who has written papers on cities densification potentials. The platform suggests a meeting in the space which automatically prepares itself for the two users. It could, for instance, augment the paper that the computer scientist wrote in a manner that would make it highly inspirational for the employee and emphasize the mostly untapped market of adding additional stories to buildings with a 3D model filling the entire room. A possible outcome would be, that the computer scientist could write an algorithm on which exact buildings could suit the client's needs in terms of size, location, building type and other factors (Mühlhaus, Seifert, & Petzold, 2019).

The technology could possibly act as a form of host that might moderate the discussion based on common interests of the users. It could initiate thoughts and would provide the users with all relevant information on discussed topics. The space would also allow for virtual participation of users not physically present.

Market and Competitor Analysis

Introduction to Knowledge Management and Artificial Intelligence

Given the rapidly transformative nature of the digital revolution, organizations today are consistently trying to reach for the next technology to deploy in order to maximize their innovative potential. However, capturing their digital capabilities, transforming data into information and then finally into knowledge, is not the only relevant element when it comes to forging new paths towards digitization. These digital capabilities should be coupled with leadership capabilities if this transformation is to be successful (Krcmar, 2015). In addition, the knowledge accumulated must not only be shared but also governed to ensure a fair representation in organizations and institutions.

In this context, discussions at the crossroads of two not particularly novel fields, namely knowledge management and artificial intelligence, have emerged in recent years in industry and academia alike. Even though feeding, maintaining and updating internal knowledge management systems is not always seen as an efficiency-enhancing tool by most companies, consistent knowledge management and sharing, when performed effectively, has been continuously shown to increase productivity (Spohrer & Banavar, 2015). Knowledge Management has evolved from a conventional or traditional approach of “deploying centralized data repositories in an organization to gather organizational knowledge” to one relying on “knowledge network infrastructure” in a way that fosters exchange and collaboration (Lee & Lan, 2007). This has been referred to as a “community of practice”, in which individuals sharing an interest in the same topics dedicate themselves to a common practice within a mutual timeframe (Keyes, 2006). The latter approach,

known as KM 2.0, encourages participation, knowledge flow and content creation relying on faster feedback loops, in short one that favors “inclusivity instead of a mutual exclusivity” (Dalkir, 2011). The ever-growing importance of establishing a single source of information in companies facing highly complex environments presents an opportunity for KM practices in the 21st century. Given the immense amount of enterprise data being generated continuously, the potential of artificial intelligence can be harnessed to augment the tacit knowledge available in organizations today and more importantly, to give way to a faster, more efficient elimination of knowledge silos (Fluss, 2018).

Key Players

When it comes to optimizing organizational content management, enterprises typically prioritize their servicing goals: improving customer experience, advancing the use of self-service, increasing customer engagement while at the same time reducing their effort in the utilization of products and services. Therefore, more and more attention is being paid to how artificial intelligence can be incorporated in these external-facing knowledge management systems. On one hand, companies provide solutions that ensure a more effective completion of tasks in areas such as technical support, customer user communities and partner support. On the other hand, the so-called internal-facing knowledge management applications deal with internally generated content in companies over time, turned to knowledge and shared among all levels of the organization in areas such as the identification of subject-matter experts, opportunities for project collaborations, the process of capturing and documenting tacit knowledge, employee training and virtual technical support, among others (DMGConsulting, 2018). However, it is often the case that the solutions provided by these companies involve a combination of

the external- and internal-facing knowledge management solutions. Ensuring an availability of the so-called intelligent knowledge – relevant, accurate and reliable information in real-time – enhances communication channels, increases productivity and in turn makes for improved processes across numerous

departments. A selection of players that have seized the newly recognized opportunities AI offers in the knowledge management market is presented in Figure 1. They are then placed in a competitive landscape indicating the type of competition and their position in the market as displayed in Figure 2.

Company	Founded	Location	Target Audience	Product
comaround	1999	San Francisco	Knowledge workers	Knowledge™ (AI-powered search)
colloquia	2014	San Francisco	Knowledge workers	AI-powered search engine
Gong	2015	San Francisco	Sales Teams	Conversation Intelligence
GURU	2013	Philadelphia	Enterprise-wide employees	Revenue Empowerment Network
ThirdEyeData	2010	Santa Clara	Enterprise-wide employees	Virtual Agent based on cognitive computing
Unika	2018	Irvine	Knowledge workers	AI-powered Intelligent Knowledge Assistant
Verint	2002	Melville	Enterprise-wide employees	Knowledge Management

Figure 1



Figure 2

Technologies and Features

Audiences targeted by the competitors listed above vary from knowledge workers to enterprise-wide employees to (more specifically) sales teams and contact center agents. The products they offer indicate the centralization of knowledge across numerous platforms utilized in all departments as a starting point, to then expand into features including optimized information search, subject matter expert location, usage analytics or even gamification components relating to content creation and sharing. ThirdEyeData and Unika have strived to realize solutions that mimic human-like interactions between the user and the system. Relying on Microsoft's Nature Language Processing technology, Unika has delivered an artificially intelligent conversational tool that can be deployed in numerous devices, in different languages, always available to accommodate the users' questions in real-time (Unika, 2018). Furthermore, the Virtual Agent solution presented by ThirdEyeData harnesses the Watson technology developed by IBM, based on the IBM Bluemix cloud infrastructure to access data from various sources like project documentations, employee information stored in internal knowledge management systems as well as social media to provide accurate and timely answers to users' questions while continuously learning and improving over time (ThirdEyeData, 2019). An additional platform, GURU, uses artificial intelligence to introduce text- and voice-based suggestions to users (GURU, 2018). Similarly to ThirdEyeData, their software can also be used to identify relevant experts and make suggestions in specific contexts.

As employees often tend to direct their questions to internet instead of intranet searches, Colloquia developed an AI-powered search engine to be integrated with internal content management systems that allows users to tap into a larger pool of resources and obtain faster results at the same time (Colloquia,

2019). Companies such as Comaround and Verint have put a larger emphasis on improving the customer experience. The former is based on Microsoft's Azure technology for cloud computing, which is integrated with their AI-based Knowledge Management Software (KMS) to offer what is coined as 'intelligent knowledge' (Comaround, 2019). In this particular example, another feature that has been incorporated is a gamification system to supply knowledge workers with feedback on the type of content they create and share. Going one step further, this solution allows organizations to become part of an experienced community serving as a learning environment for users across a multitude of enterprises, democratizing the learning experience across individuals and devices alike.

Market Share

The opportunities presented to the knowledge management market by artificial intelligence technologies have quickly directed attention to the field, revitalizing the market and challenging the solutions offered by established actors in the industry. The market value has been estimated at approximately \$207 million as of 2016, predicted to reach \$1,230 billion by 2025 (Zion, 2018). Key market segments are usually identified as following: knowledge management process, knowledge management systems, knowledge management mechanisms and technologies, and knowledge management infrastructure (Zion, 2018). The overview presented here has focused primarily on knowledge management systems and their technologies. North American based companies, with key participants such as Bloomfire, ComAround, IBM Global Services and KMS Lighthouse dominating the market, are anticipated to obtain up to 36% of the global market share until 2030 (DMGConsulting, 2018). On the

other hand, given the rate at which young companies are entering the market, it proves more challenging to quantify their presence and analyze the potential of their future growth pathways. Nevertheless, the emphasis placed on employee engagement and value-driven workspaces has brought these newcomers into the center of the competitive sphere, as demonstrated by their service-offering to customers such as Spotify, BuzzFeed, Slack, HomeAdvisor and Shopify, among others (GURU, 2018). Based on the competitor research undertaken, the products listed in Figure 1 resulted to be the ones approximating the vision of belAI, due to their AI-powered solution development and their transparent communication of their approaches. However, belAI differentiates itself with regards to two aspects characterizing it, making it a unique solution, as explored in the following section.

Competitive Advantage – belAI

Given that the belAI project developed from a more abstract context to an evolving concept to a high-level prototype, the motivation stemmed from a more people-central approach, which also provides the starting point of differentiation for belAI. As our working environments become more complex – especially when it comes to functional connections between users and innovative technologies such as artificial intelligence – it is important to rethink employee engagement and value alignment in the working community. In order to preserve but also foster a sense of purpose that guides employees to stay connected with their day-to-day activities, belAI seeks to redefine two aspects related to knowledge management: collaborative problem solving and continuous learning. The goal was not limited to creating another productivity-enhancing tool, or simply managing the problems of a particular day or week in an organization. From the early stages,

a long-term approach was emphasized, one that would allow it to become integrated in the organizational culture and have a larger impact in how employees view their role in the promise that the elimination of knowledge silos brings with it. Such mentality is complemented by the introduction of a physical space that allows for a face-to-face interaction of employees in an informal, flat-hierarchy environment. The presence of a designated space where these conversations can take place is a unique feature of belAI in the ranks of AI-powered knowledge management systems. Taking this step, it fosters an environment where employees are offered opportunities to have their voices heard, expand their knowledge and connect with like-minded individuals. As it has been detailed in previous sections, the outcome could vary from establishing synergies to the ideation of innovative projects to simply an exchange of perspectives that stimulates critical thinking. The crucial aspect in this environment is tapping into the collective knowledge as a strong asset for individual and organization-wide continuous improvement at the same time. Additionally, belAI is the first system that raises the question of ethics when it comes to the deployment of artificial intelligence.

Conclusion

The contrast between technology-driven and employee-driven environments is growing starker while at the same time the lines separating humans from machines are becoming blurrier. Just as a continuous specialization and diversification has been achieved in terms of roles and responsibilities in an organization, it is now more important than ever to redefine and thoroughly understand the fitness of an individual compared to that of a machine in relationship to a problem and consequently to problem solving approaches. The knowledge that is accumulated over a company's lifetime can be centralized

and utilized just like examples of solutions presented in this report have shown. However, experiences cannot be machine-learned. The motivations, perspectives and collaborations of employees form another realm of collective knowledge, one that can only be tapped into by encouraging designated spaces where these interactions take place. Their outcome might not always be quantifiable, but such value-driven, equitable environment opens the door to shaping a community that we want to be a part of in the future; one where artificial intelligence augments our capabilities, it does not limit them. belAI would offer a great starting point towards that direction.

Personal Statment

Our team, composed of students from the departments of architecture, management and bioinformatics, experienced an engaging and inspiring learning environment not only during the workshop itself but also during the countless discussions, exchange of ideas and perspectives surrounding our project. Each step of the way built upon the final concept; however, this is only possible to

realize retrospectively as the process comes full circle. In other words, the collaboration did not have a linear nature but involved a lot of pivoting, learning and adapting as the idea was being developed. The interdisciplinary setting combined with constructive feedback loops was characterized with challenges and profound insights alike, making for a unique workspace and enriching experience.

Authors:

Matthew Dueck, Paola Iljazi; Lukas Prestele

Bibliography

- Colloquia. (2019). AI-powered Search Engine for Knowledge Management. Retrieved from <https://www.colloquia.com/>
- comaround. (2019). Methods for Knowledge Management and Self-Service Success. Retrieved from <https://www.comaround.com/en/knowledge-management-best-practice/-why-kcs>
- Dalkir, K. (2011). Knowledge Management Tools Knowledge Management in Theory and Practice (pp. 292): Massachusetts Institute of Technology.
- DMGConsulting. (2018). Knowledge Management Product and Market Report. Retrieved from <https://www.dmgconsult.com/2018-knowledge-management-product-market-report/>
- Fluss, D. (2018). Knowledge Management is essential in the world of AI. Retrieved from <https://community.verint.com/b/customer-engagement/posts/knowledge-management-is-essential-in-the-world-of-ai>
- Gupta, S., Kar, A. K., Baabdullah, A., & Al-Khowaiter, W. A. A. (2018). Big data with cognitive computing: A review for the future. *International Journal of Information Management*, 42, 78-89.
- GURU. (2018). The Revenue Empowerment Network. Retrieved from <https://www.getguru.com/product/overview/>
- Keyes, J. (2006). Knowledge Management, Business Intelligence, and Content Management: the IT practitioner's Guide. USA: Taylor & Francis Group.
- Krcmar, H. (2015) Informationsmanagement. Berlin: Springer Gabler.
- Lee, M., & Lan, Y.-C. (2007). From Web 2.0 to Conversational Knowledge Management: Towards Collaborative Intelligence. *Journal of Entrepreneurship Research*, 2(2), 47-62.
- Sanzogni, L., Guzman, G., & Busch, P. (2017). Artificial intelligence and knowledge management: questioning the tacit dimension. *Prometheus*, 35(1), 37-56.
- Sicular, S., & Brant, K. (2018). Hype Cycle for Artificial Intelligence. Retrieved from <https://www.gartner.com/doc/3883863/hype-cycle-artificial-intelligence->
- Spohrer, J., & Banavar, G. (2015). Cognition as a Service: An Industry Perspective. *AI Magazine*, 36(4), 71-86.
- ThirdEyeData. (2019). An Artificial Intelligence based Knowledge Management System. Retrieved from <https://thirdeyedata.io/case-study-using-artificial-intelligence-for-knowledge-management-2/>
- Unika. (2018). Unika's AI-Powered Intelligent Knowledge Assistant. Retrieved from <https://www.unika.ai/>
- Zion. (2018). Knowledge Management Market by Offering; by Organization size: Global Industry Analysis, Size, Share, Growth, Trends, and Forecast, 2016 - 2025. Retrieved from <https://www.researchandmarkets.com/reports/4601005/knowledge-management-market-by-offering-by>
- Mühlhaus, M., Seifert, N., & Petzold, F. (2019). USP Urban Strategy Plaground. Retrieved from <http://wp.usp.ai.ar.tum.de/>

Design Thinking Lab 'Workspaces for DigitalYOU'

Susanne Dreyer | David Habermann | Jonas Heiberg Larsen



Executive Summary

The way we work is rapidly changing. Social and technological drivers transform how we interact. What are potential scenarios of working, co-creating and innovating together beyond the spaces we know today? How will we work in the future and how will we need to adapt our physical workspaces to incorporate the digital? What can the disciplines of architecture, management and information technology contribute together in this challenge?

The workshop Design Thinking Lab 'Workspaces for DigitalYOU' hosted by the BauHow5 initiative in collaboration with The Boston Consulting Group (BCG) and IBM Watson IoT took place between the BCG headquarters in Munich and the Vorhoelzer Forum at the Technical University of Munich (TUM). The workshop lasted over three intense days, and included daily group presentations along with multiple guest lectures by highly skilled experts.

The teams were composed of international participants with various backgrounds including informatics, architecture, management and industrial design which made for an unique team dynamic. The team DANA started out with five members from different fields. Each team was assigned a facilitator to help increase the creativity and avoid blockades. After the team assembly in the BCG headquarters the groups were introduced to the concept of Enterprise Design Thinking by IBM.

During the workshop we got many insights from advanced researchers, practitioners, experienced design thinkers and IT-leaders. These insights lead to the initial product changing many times. In the time after the workshop the DANA group have improved the concept and developed the overall business model and plan for DANA. The group have developed some different features which can help improve DANA, and its customer base. Furthermore a analysis of the closest competitors, implementation strategy, potential partners along with a time horizon (Gantt-Chart) and a rough estimate of startup costs and revenue model.

The workshop and report writing have been a great opportunity for us as a group and we have learned alot from the workshop and our collaboration.

Process

During the three days of the Design Thinking Workshop we used different methods based on IBM Enterprise Design Thinking to develop a concept according to the topic "Workspaces for a DigitalYou".

We started the workshop after a general welcome with some introduction lectures regarding to the topic. Dr. Pe-Ru Tsen gave us some insights into BCG and how BCG is creating a human-centric workplace experience. Afterwards, Dawn Ahukanna gave us some insights into IBM Watson IoT and how they design experiences for connected building. Followed by a short presentation of Dr. Kerstin Sailer from UCL Bartlett about the social logic of workspaces. This gave us an overview of current workspace developments.

After these short presentations, interdisciplinary teams were assembled by using color tags. Our team consisted of: David an architecture student, Jonas a Management student, Natalia an informatics student, Stelios, an architecture graduate from London and Susanne an industrial design student. As a start of the workshop part Laura Dohle gave us a short introduction to Enterprise Design Thinking by IBM and introduced the first method of the workshop.

Empathy Map

The first method we used to develop a concept was the Empathy Map. The Empathy Map gave us the possibility to define a specific user, in our case Ana, a 35-year-old architect and project leader who lives together with her cat. To gain knowledge about Ana and her thoughts, feelings and behavior we created a diagram with Ana in the center and the following points around: think, feel, do and say (Fig. 1).



Fig. 1: Empathy Map

Now, everyone wrote down what she or he knew about our user Ana and the field she works in. For each observation we used a sticky note and place it in the appropriate quadrant to keep the information (Fig. 3). Afterwards, we clustered the notes to identify relationships between them. [1]



Fig. 2: Working Process

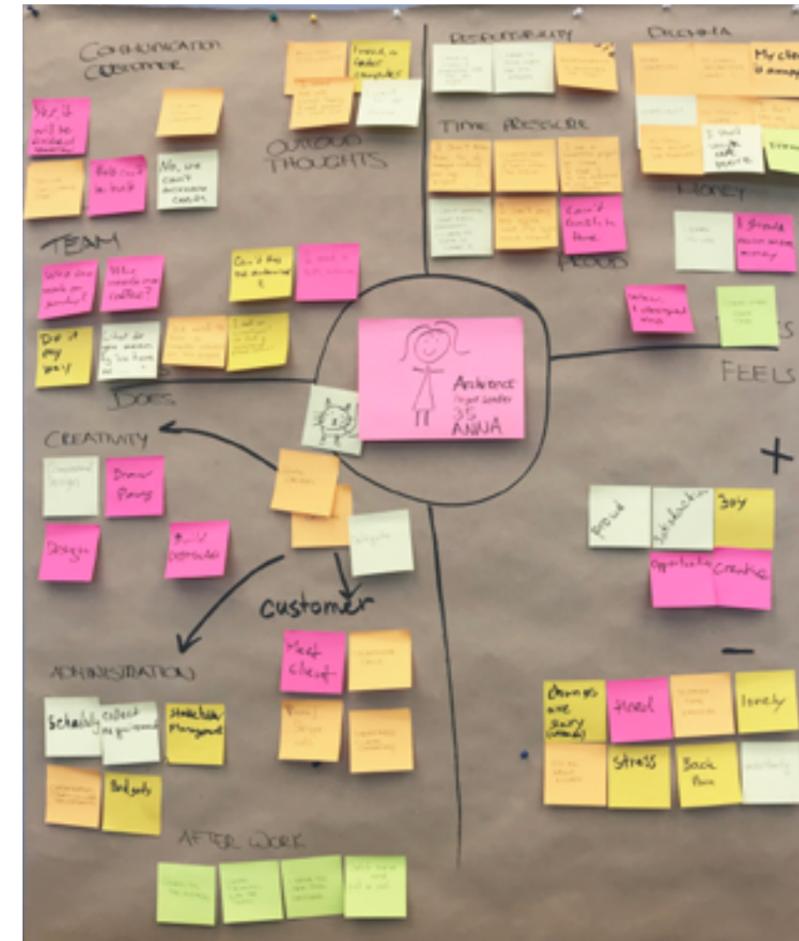


Fig. 3: Empathy Map Ana

We figured out that a big part in Ana's life is her job. There she has to be creative, draw plans, build models, design houses and delegate multiple employees simultaneously. She has to meet clients and companies as well as dealing with administrative tasks, like budgeting or scheduling. That's why she has a lot of customer communication, where she always stays positive even when big changes have to be made. Next to this, she tries to keep the project team together with motivational sayings, even if they have to do late night shifts. Ana feels a lot of pressure and responsibility in her job. She is often in a dilemma that she would like to be more creative and have more free time instead of having responsibility and late-night shifts. In addition, she is worried about her future and feels that she earns too little. But when a project is finished Ana is very proud of her achievements and the finished project. In her free time Ana likes to meet up with friends or go to the fitness studio, but she often feels lonely as well. She just lives with her cat and has the wish for a family (Fig. 3).

With the help of the Empathy Map we could imagine Ana's life, her daily work experience and her motivations and goals. The method helped us to synthesize our knowledge about the specific user group of Ana and gave us a common understanding of who she is. [1]

As-Is Scenario Map

The next method we used was the As-Is Scenario Map, which should give us a better understanding of Ana's working experience in order to identify areas of improvement. For this we drew four lines with the headlines phase, doing, thinking and feeling (Fig. 4).



Fig. 4: As-Is Scenario Map

Then we collected our knowledge in these areas about Ana's work on sticky notes and arranged them on the board. Afterwards we clustered similar sticky notes, refined the order and sorted them into phases/areas. After that, we highlighted positives and negatives of Ana's working experience in the architecture office (Fig. 5-7). [2]



Fig. 5: As-Is Scenario Map Ana - Part 1

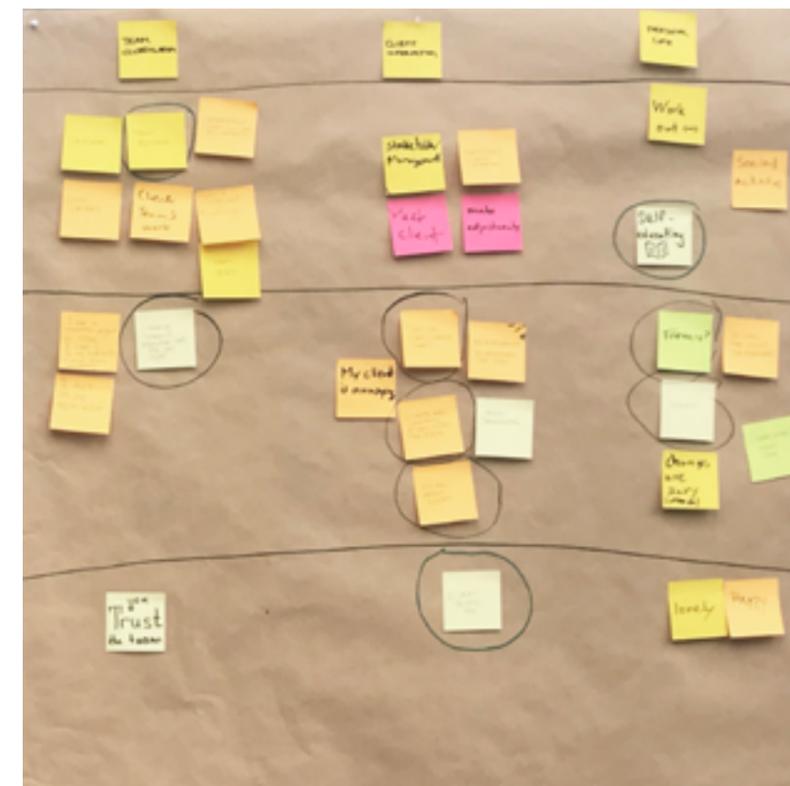


Fig. 6: As-Is Scenario Map Ana - Part 2



Fig. 7: As-Is Scenario Map Working Process

To separate our knowledge in different phases we used on the one hand the different phases of an architectural design and on the other hand the different stakeholders in a project. In term of the architectural design we distinguished between competition, planning and construction. During the competition phase it is negative that Ana feels stressed because of too much work and too less time. But after she has finished a competition she is proud of her achievements and happy that she had some time to work in a creative way. In the planning process we could find many negative points, which lead in uncertainty. There are too many restrictions and requirements Ana should know, as well as to many new topics like BIM, where she needs a specialist. Furthermore, there are many tasks and changes from the client, that have to be fulfilled. In the next phase, the building phase, positives and negatives go hand in hand. On the one hand is Ana happy to see the building growing but on the other hand she is satisfied by all the documentation work and her responsibility. Coming now to the stakeholders side. There we separated between Anas working team, the stakeholders and Anas personal life. We could identify, that Anas experience with her working team is really good, except of the fact that Ana always has to update them over changes and check if they did their work correctly. The most challenging point however is working together with the clients, because there are many misunderstandings and changes happening all the time. But the clients trust Ana that she can manage this, what can be very stressful for her. Next to this, Anas personal life gets strongly influenced by her job. That's why she has negative fears about her future.

The As-is scenario helped us to gain a common understanding in our group about Anas working situation and her workflow. Especially for the non-architects it was very helpful to understand the working of an architect. Furthermore, it helped us to find out positives and negatives of Anas work in the architecture office. [2]

Needs Statement

After identifying positives and negatives of Anas current working situation, we could conclude needs out of them. To outline the identified needs, we used the Needs Statement method (Fig. 8).



Fig. 8: Needs Statement

In this way, a need can be reframed in different ways until the most suitable formulation for the need is found. [3] We started the method by summarizing our knowledge about Ana (Fig. 9). This helped us to find several Need Statements that represent different key elements of Anas daily working experience (Fig.10+11). These are as follows:

- Ana needs a way to share her knowledge with all contractors simultaneously so that everyone is always up to date.
- Ana needs a way to communicate her ideas visually so that she has less misunderstandings with the client.
- Ana needs a way to understand the clients needs so that she can avoid miscommunication earlier.
- Ana needs a way to include customers in the process so that a customer centered design is possible.
- Ana needs a way to integrate contractors earlier so that all the sides need fewer meetings.
- Ana needs a way to make processes more dynamic so that she saves time.



Fig. 9: Common knowledge about Ana



Fig. 11: Needs Statements Ana

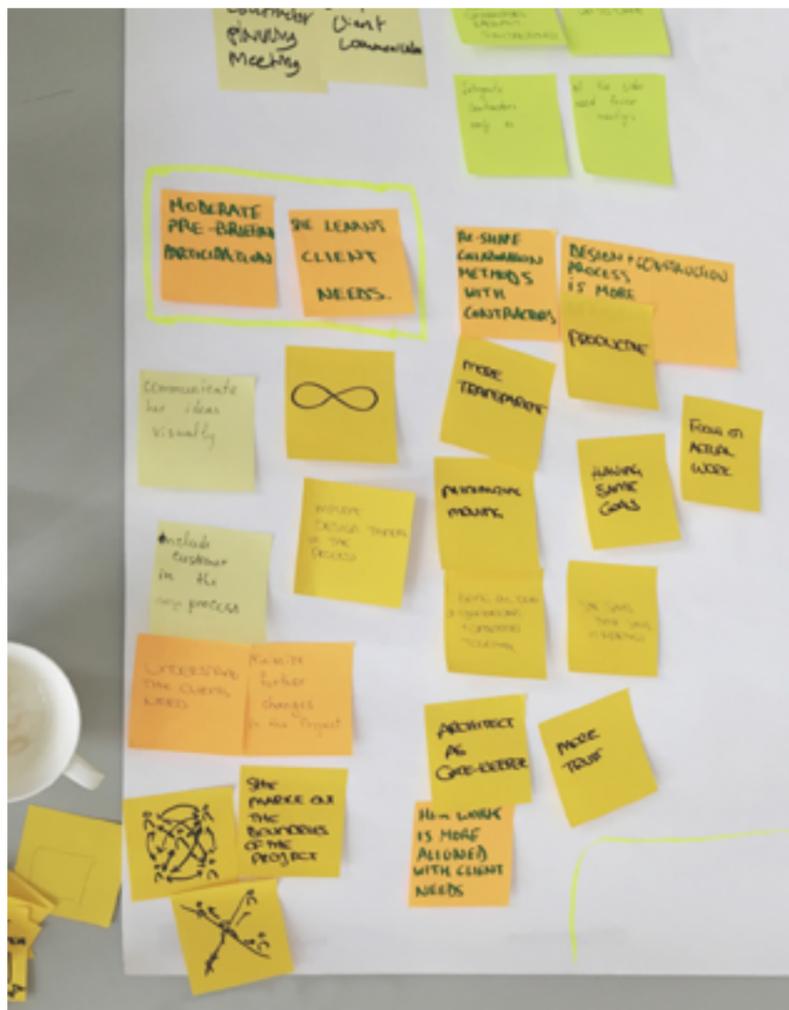


Fig. 10: First Ideas Needs Statements

After this method and with a lot of different needs statements we finished the first day of the Design Thinking Workshop. The first day helped us to understand the topic of future workspaces better, especially the guest lectures gave us a very good input from which we could start to work on our concept. Sometimes we had to struggle a little bit in between the methods, especially because not everybody was so familiar with the architecture industry, but until the end of the day we all had a common understanding about problems and needs of Ana as an architect. So we can see that the methods of the first day helped us pretty well to gain a common understanding about our target user.

With these needs in mind we started the next day and decided to create one main need statement out of all the statements for the further process. This turned out to be quite hard, why we decided to work on with two different, quite similar statements for the next method. They are as follows:

- Ana needs a way to moderate pre-briefing participation so that she learns client needs.
- Ana needs to reshape collaboration and communication with contractors so that she can focus on her actual work.

These need statements got reframed in the further process several times to a final need statement. The Need Statement method helped us to focus on a specific need and topic for our further design thinking process. It helped us to find a direction in where the project should go on.

Big Idea Vignettes

The next step was to create a Big Idea around the previous developed Need Statements, with the help of the Big Idea Vignette method. The big idea should describe the solution according to the user and how she is implemented. [4] To create some first ideas for our needs, we took around 5 min and created as many ideas as possible individually and shared them afterwards by using some key words and a sketch as a visual depiction (Fig.12).



Fig. 12: Big Idea Vignettes

We created realistic ideas as well as utopian ones, but all of them met Anas needs. After we shared all ideas, we clustered similar ideas (Fig. 13). The ideas were as follows:

One idea was to create a kind of mood board, where the client and the architect can share their ideas together, so that the architect knows better what the client wants. Another idea was to create a workshop format for architects and clients, where they can find already in the beginning of a project some ideas and concepts. This could help to engage the client more in the design process of a building and lead to less changes in the planning process. A more abstract idea was jail time. It has the idea to bring client and architect as long as necessary together in a room till they have design and agreed on everything. Another futuristic idea was a brain tv, which shows the architect an image of the building like the client has it in mind. Other ideas had been that the client designs his building on its own or the client has to become an architect for one day a week. The Drone Bee was to document silently everything in meetings and gives feedback to the client and architect. Archi-Go was the idea to create a game app that facilitate better understanding between architect and client. Furthermore, using VR to show the client the design and other digital solutions came up, like a platform, where contractors can accept changes immediately or a communication platform, like Slack. All in all, we had lots of different ideas how we could solve the problem Ana has.

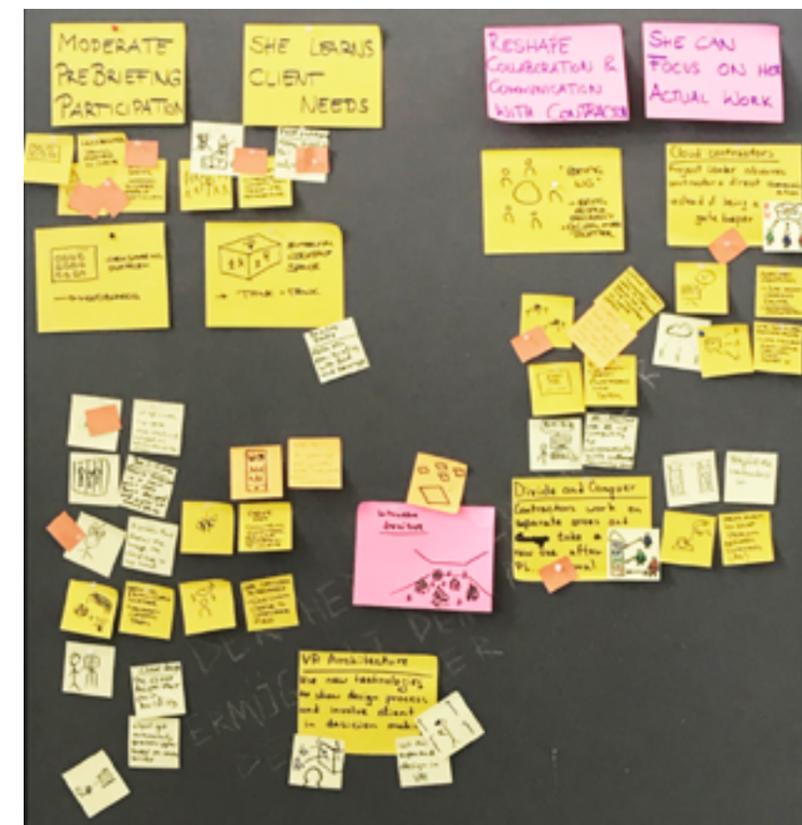


Fig. 13: Big Idea Vignettes Ideas Collection

After we collected all ideas, we all had the chance to vote for three ideas to find the one big idea, we all want to go further with. This big idea we wanted to work on was kind of a brain TV, which helps Ana to fulfill the needs of the client. The big idea method helped us to find a first big idea for our needs and as a result of this, we defined this idea a bit more specific (Fig.14) and redefined the need statement to fit better our big idea as follows:

“Ana needs a way to see the clients’ thoughts so that she can successfully fulfill clients’ needs.“



Fig. 14: Redefined Idea

Storyboard

The next step in the design thinking process was to relate our big idea to a story. For this we used the Storyboard method (Fig.15). Storyboarding works like a comic strip, we combined sketches with short sentences, which describe the interaction happening. [5]



Fig. 15: Storyboard

Before we started with the method, we created some common ideas about our big idea. As a result of this we decided to create a digital copy of Ana, called DANA, a digital architectural needs assistant. Furthermore, we redefined our need statement again as follows:

“Ana needs a way to automate project documentation so that she can focus on the creative work.”

To define more clearly what DANAs job is and how she works we used the Storyboard method. Each of us created one storyboard on his own and afterwards we presented them each other (Fig.16). They were as follows:

- Let’s meet Ana, Ana has a lot of different tasks to solve. That’s why she has Ana. A digital copy of her. This copy helps her e.g. sending out emails, documenting the project process and organizing her work. As result of this Ana has more time for creative work.

- In the beginning of a project a customer needs test get carried out. The information out of this get implemented in DANAS knowledge. Furthermore, DANA collects notes from meetings and sends out to-dos afterwards to the contractors. DANA also sends out notifications, tasks, advices, as well as reminders during the week beside from meetings. It is possible to get a Changes and Decision report from DANA as well as a budget overview. This helps Ana to have more time for creative work.
- Today a meeting just includes plans and models and Ana has to rework the whole meeting afterwards, like writing reports or sending out plans. In future a device called DANA will attend the meeting as well. It will document all the meeting, filtering tasks and summarize decisions. Furthermore, it will give tasks to the contractors and Ana will have more free time and time for creative work.
- DANA is collecting data in meetings, through reading regulations and other papers and through finding relevant data in the web. DANA analyses this data and learn from it. This is how DANA get her knowledge. Afterwards DANA can help Ana to organize her work, give Ana reports about important topics, as well as arrange meetings, write emails and do simple phone calls.



Fig. 16: Storyboard from each of us



Fig. 17: Final Storyboard

The Storyboard method helped us to find a more concrete idea for our big idea and we saw how we could implement our concept ideas into Ana's daily work life. The visual format of the Storyboarding helped us to understand each idea better and to come to final storyboard solution together (Fig.17). This solution was as follows:

“Ana is busy, that's why she creates DANA. DANA collects data, analyses meetings and helps Ana organizing further steps. DANA acts as a helping bot to organize Anas project e.g. DANA writes emails, organizes things or does simple phone calls. This gives Ana more time to be creative.”

With the storyboard method the second day of the design thinking workshop ended. The second day gave us a clearer idea about our concept and we could already work it out a bit. However one team member chose to drop out the workshop the second day, which drastically improved the team dynamic, and lead to an innovative and exciting idea direction. Also the expertise of the team advisor helped us to get back on track and start working on a proper concept. Next to this, we had a few really good inputs during the day regarding to prototype and pitch our concept the next day.

Prototyping

On the last day of the design thinking workshop we started to create a prototype of DANA (Fig. 18). The Prototype should give the abstract idea of DANA a concrete form and help us to communicate our idea better. For this we looked on four different topics concerning DANA and collected our ideas relating to this. To connect different related topics, we used strings (Fig.19). The questions we asked us were as follows:

- What are the benefits of DANA?
better documentation, more time, reminder, lostness
documentation, d, less manual work, assistance, less
coordination, better overview over project, more time for
creative work
- Which technologies can we use for DANA?
tablet, phone, AR, AI, computer, smart table, machine
learning, smart devices, speakers
- Where can we get DANA from?
IBM Watson, Alexa, BIM, Terminuter
- What can DANA do?
voice, text to speech, knowing regulations, keep track of
records, giving recommendations, i shows references,
budget, categorize inflow, note taking, make changes in BIM
- What makes DANA different to current solutions?
architect focused

As a result of this we defined the core technologies DANA uses, as well as a concrete concept of DANA, which will be explained more detailed in the following part (Fig.20+21). Out of this we created a first prototype of DANA, in the form of a role play.

The role play simulates a typical weekly project meeting in an architecture office. This weekly meeting is not a normal meeting, it is a meeting together with DANA. During the meeting DANA interrupts and gave advices or helped by open questions. Furthermore, DANA documents the whole meeting and summarizes it afterwards for all participating persons and distributes tasks to do for the next meeting.

The prototype itself helped us to see how our current idea of DANA works and how we could improve this idea for the future.



Fig. 18: Working on Prototype



Fig. 19: Working on Prototype



Fig. 20: Working on Prototype



Fig. 21: Working on Prototype

Playbacks

After every method we had a Playback to see what the other groups have achieved and to summarize our own observations and outcome. In addition, we got feedback from other participants which helped us to improve our concept and to see if we move in the right direction with our concept. [6] [7]

To summarize the whole process of the design thinking workshop, we had the chance to try out different methods to achieve a conceptual idea for a current need of an architect in an architectural practice, like our user Ana. The methods helped us to find a human-centered conceptual idea regarding to Anas needs. Even if sometimes we struggled a but with the final outcome of each method, we succeeded to narrow down all our ideas to one final concept, DANA.

Final Pitch

The final Pitch was the last part of the design thinking workshop. The pitch is about presenting the key message of a concept and giving an impression of what you want to achieve with your idea. One of the most important parts of the pitch is the storyline and how an idea gets presented.

For presenting our concept we used Simon Sineks Golden Circle. (Fig.22). It includes Why?, How? and What?. Normally a product presentation starts with What? is presented, followed by How? it works and finally says Why? the product was developed like this. After Simon Sineks Golden Circle, a product presentation has to start with the Why?, the purpose for a product or a concept. Followed by How?, the process how it works and tells finally What? the product exactly is. [8]



Fig. 22: Golden Circle

As a result of this we showed the problem Ana has in her daily architecture life first followed by the concept of DANA (Fig 23). In the end we played our prototypical role play in front of the audience to show them an example how DANA can work in the future together with an architect in an architecture office.

The final pitch was held in front of members of the architecture faculty, BCG and IMB, as well as in front of all other participants of the workshop and interested visitors. It was the final part of the three day design thinking workshop and enables us to get different feedbacks from different perspectives in relation to our prototype. Furthermore, we could practice our pitching skills. Sadly, we had some mistakes in presenting our prototype, which was caused by the lack of time practicing it and some technical issues before the presentation. For the future we could learn from this, that we have to check the technical situation much earlier and we have to practice our pitch more often to achieve a better presentation.

Besides presenting our conceptual idea to a wider audience, the best ideas of the workshops got a prize, which was determined by a Jury. This jury included members of TUM, BCG and IBM. We had the honour to achieve the third prize with our presentation, even if we had some mistakes in presenting our prototype.



Fig. 23: Final Presentation

Concept

In the following part the context and the main ideas of the concept of DANA will be explained and the first prototype of it will be shown.

Context

Meeting protocols and project documentation are two of the most time consuming tasks in the daily work of an architect. Typically, weekly four fixes with planners and clients take a big portion of the architect's working time. As time is one of the most precious resources, an automation of those processes can be a key factor to optimize productivity.

In Germany, the Honorarordnung für Architekten und Ingenieure (HOAI) regulates the architect's and engineer's services with the respective fees as well as defines the scope of deliverables and responsibilities the architect has to fulfil. The 2013 version of the HOAI explicitly added an obligation to document each and every service phase of a project. Specifically for Phase 1-3 (basic determination, pre-design and design), a summary, explanation and documentation became mandatory, as well as a detailed documentation of the construction process during phase 8. [9] Consequently, project documentation and especially meeting protocols became a necessary chore in order to legally cover the architect from any potential third-party claims.

Another pain point during planner and client meetings is the fact that certain information has to be looked up or researched and is oftentimes not readily available during the meeting. This means that certain decisions cannot be made during the meeting and have to be postponed to a later point in time.

During the workshop, especially during the first day, we identified needs regarding to this context. As a result of them we developed the concept of DANA.

Concept

DANA - the Digital Architectural Needs Assistant - is a digital assistant connected to a cloud-based database, which could retrieve missing information in realtime, preventing delays in the decision making process and making follow-up phone calls and meetings obsolete. DANA got developed to not only serve

as a tool to protocol meeting minutes, but also specifically understand architectural topics and actively support the architect in his workflow.

As displayed in figure 24, the assistant can be accessed through various readily available devices such as smartphones, computers, VR-glasses and smart speakers. It receives its input through audio and video. During the interaction DANA is in a constant feedback loop with the user and a cloud-based database which is constantly being updated and expanded. As a result, DANA is able to create interactive meeting protocols and perform live-actions during the meetings.

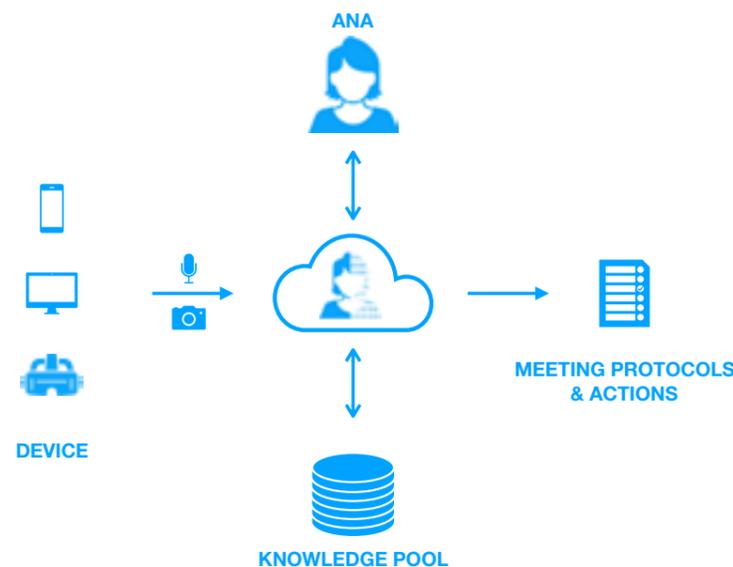


Fig. 24: Concept DANA

Prototype Concept

For the prototyping phase of DANA, we chose to create a dummy-conversation showcasing possible scenarios in which the user could interact with DANA. In order to give the user a convincing visual impression of how the final product could look like, we designed a mockup interface using Apple Keynote in connection with pre-recorded audio files from the IBM WATSON text-to-speech demo in order to simulate a real conversation with our digital assistant (Fig. 25). In order to directly address the audience, we let DANA introduce herself directly to the audience herself.

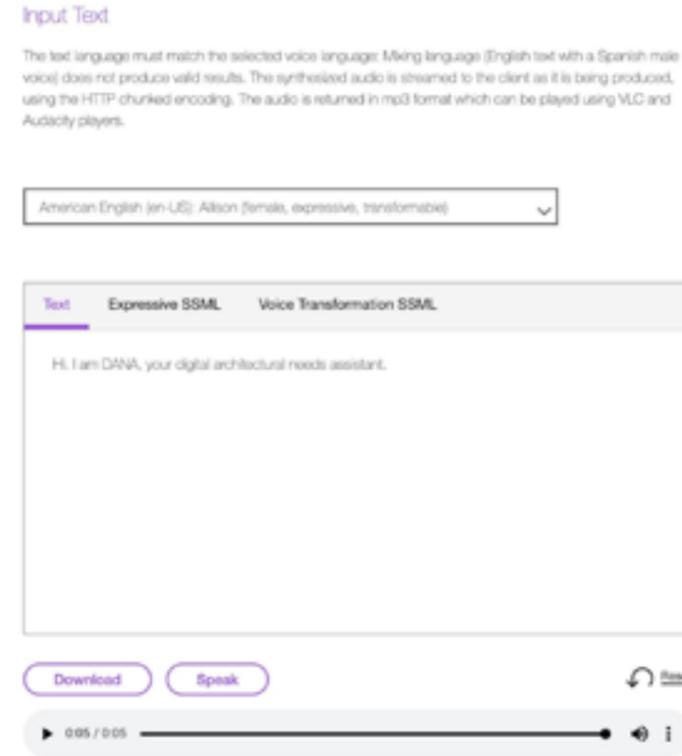


Fig. 25: IBM WATSON text-to-speech demo

The conversation itself was staged in a short role-play during the final pitch. In addition, the transcript of the conversation was conveyed to the audience in a messenger-style dialogue resembling Apple's iMessage app. The purpose of this design choice was create a visual prototype that the audience could relate to and easily understand. We took further design cues from voice assistants like Alexa and Google Assistant such as a microphone symbol to indicate when DANA is talking. We used Keynote to animate the icons as they would be in a real application.

We subsequently designed a logo which was intended to show that DANA is a 'digitalYOU' of the user. Therefore we used the vectorized portrait which we used symbolize Ana and turned the right half of the icon into binary code to show the digitalization of Ana creating DANA (Fig. 26).

We subsequently designed a logo which was intended to show that DANA is a 'digitalYOU' of the user. Therefore we used the vectorized portrait which we used symbolize Ana and turned the right half of the icon into binary code to show the digitalization of Ana creating DANA (Fig. 26).

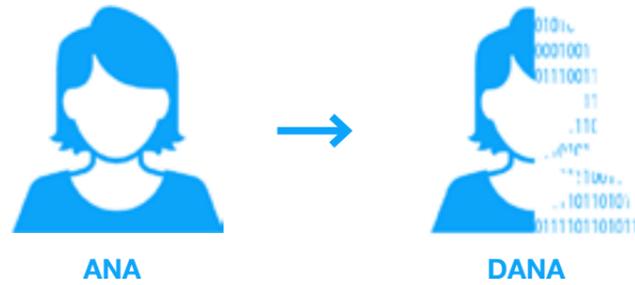


Fig. 26: Ana to DANA

The final pitch presentation contained three sample situations in which DANA could possibly interact with its users. DANA is triggered by the keyphrase “Start the meeting”. After recognizing this signal, DANA will give a short feedback and start listening. The first sample case contains a design change requested by the client. Anas employee starts to sketch the change. DANA will automatically recognize the drawing through its cameras, take a picture of the sketch and suggest to send it to the client for approval. A second employee notes that the discussed area is already undergoing construction and has been approved by the engineer. DANA recognizes the information and suggests to call the site to halt the construction works and forwards the drawings to the engineer for revision. In the third example, Anas colleague mentions that she needs informations on regulations regarding the building’s facade. DANA immediately searches the database for relevant regulations and finds related projects. Ana, the project leader then suggests that she will talk to the client about all changes in the next meeting. DANA automatically sets all topics on the agenda for the next client meeting. With the trigger-phrase “That’s it for today”, DANA knows that the meeting has finished and it automatically creates a protocol of the meeting. Within this protocol, all the information is organized into three categories: information, decisions and tasks. Each bullet point has assigned tags for the relevant stakeholders such as engineers, client and construction manager. Those tags makes searching for specific topics easier for future reference. The showcased examples only represent a fraction of the possibilities that a digital assistant trained for a specific field such as architecture can offer. Subsequently, through the benefits of automation, better coordination, knowledge sharing and constant feedback, DANA will expand its skill set automatically over time using AI learning methods. Therefore it has the potential to become a staple in modern architectural project management, freeing up time for more creative designs and innovative built environments.

Business Model

We in group DANA have chosen to focus on the “Application and implementation strategy” for the business model. Furthermore, we have looked at the potential partners, competitors and startup costs. Finally, we have constructed a Gantt-chart and plan for further development of DANA, which can be seen in figure 29.

Application and Competitors

DANA is a integrated cloud-based software assistant, which can help take over some of the administrative tasks of an architect. At this time there is no competition which can offer the same integrated experience as DANA can, however, DANA’s closest competitors can be seen in figure 27.

	SPEECH APPOINTMENT REMINDERS	STAKEHOLDER MANAGEMENT, RECOMMENDATIONS, COMMUNICATION	MEETING NOTES, COMPILE SUMMARY	AI MACHINE LEARNING TEXT-TO-SPEECH
DANA	✓	✓	✓	✓
ALEXA, SIRI	✓	✗	✗	✗
IBM WATSON	✗	✗	✗	✓
TERMINUTER	✗	✗	✓	✗

Fig 27: Comparison of DANA’s closest competitors

However, since DANA can do so many different things the customer adaptation is very crucial to implement correctly, this is due to peoples natural resistance towards new technology and change [10].

Implementation Strategy

Managing an implementation process and innovation requires an understanding of how new technology adaptation by customers [11]. A well-appraised theory is the technology adoption lifecycle that addresses how different groups tend to adapt to new technology.

When a new technology is introduced, the adaptation of the technology comes in waves. A popular theory within customer adaptation of new technology is Roger's theory of diffusions of innovation [12].

The chasm is in the group of early adopters wherein this group is considered 16% of the population is transitioning to new technology. It is at this point where the magnitude of people finds acceptance for the new technology [12]. The different adopter groups and percentages can be seen in figure 28.

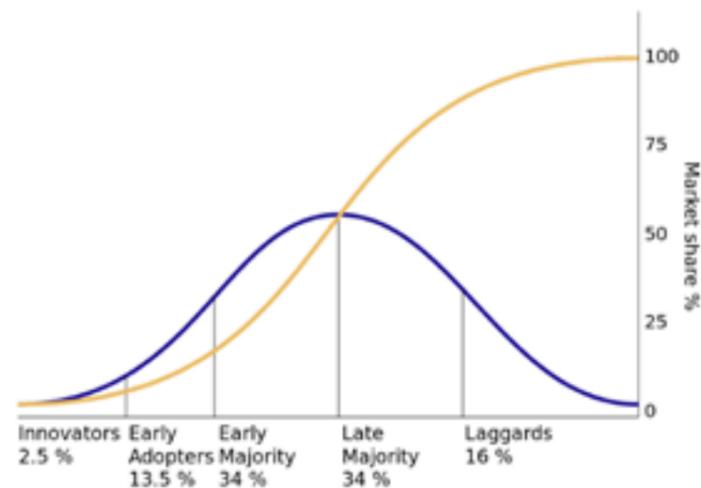


Fig 28: Graphic illustration of Rogers theory of diffusions of innovation [10]

According to Rogers, when the critical mass of 16% of adaptors is reached the rest of the adaptors will follow [11].

To successfully implement the DANA to the market, we must create a framework that can generate a momentum of the use of the innovation tools [13]. Thus, we must focus on showing the value of methods to at least 16% of the people, for the customers to see the value of DANA.

In order to get a point of entry to the market, we should focus on the architectural application of DANA first. When DANA have gotten a firm grip as an architectural assistant DANA and her applications can be expanded to new markets such as a personal assistant, whit bigger competitors such as Apple, Amazon, and Google.

- WP3: The final prototype of DANA will be tested at partners or selected end-customers such as Munich based architecture firms. Additional financing will have to be raised to file the final patent claims, whereafter it can be filed.

Deadline: December 31. 2020 DANA should be ready to launch.

- WP4: The final distribution channels should be developed, while this phase also serves as a buffer zone if any unforeseen obstacles occur in any of the previous phases. When distribution channels are done, and any obstacles overcome DANA is ready for commercial launch.

Deadline: Marts 31. 2021 DANA is launched and distributed to customers.

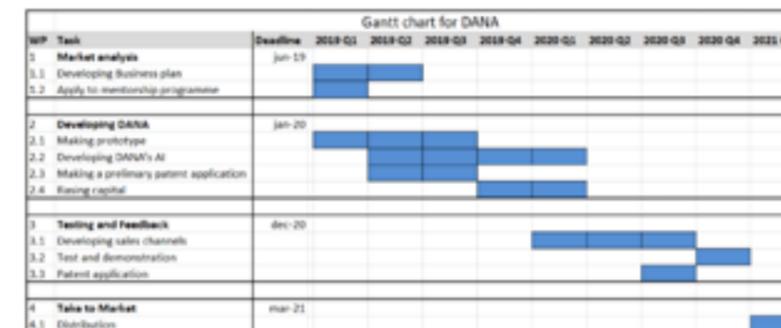


Fig 29: Gantt-Chart for implementation

Please note that this Gantt diagram and implementation plan stops when DANA is commercially launched. However, a long-term strategy and plan will of course also have to be developed. The long-term plan will also include expansion into the global market, expansion into the consumer market, and perhaps also the personal assistant market in other sectors than construction.

Startup Costs

The following is an estimation of startup costs for the DANA company.

- Preliminary patent application 2.000 EUR (2019 Q2)
- Cost in development and AI implementation 20.000 EUR (2019 Q3)

- Establishing a company (GmbH) + legal costs 5.000 EUR (2019 Q1)
- Marketing and sales material posters etc. 4.000 EUR (2021 Q1)
- Accountant 2.000 EUR (2019 Q4)
- Patent application 20.000 EUR (2020 Q3)

This brings the total cost to approximately 53.000 EUR, please note that this number is just a rough estimate, and a more precise budget will have to be developed, this will be done in collaboration with TUM . Since every cent counts, the founders of DANA will remain unpaid until DANA will start to create profit.

Revenue Model

The time from now until DANA is brought to market is approximately 27 months (24 months + 3 months as a buffer) in this period it is estimated to spend around 53.000 EUR on DANA. Which means we have to raise this money by partners, joint ventures, venture competitions, and personal savings.

However, when DANA is launched the revenue model will be based on a subscription base for each license to DANA is used in each company. The fees will be charged for each person who has a DANA license in the company

DANA will be priced at around 50 EUR pr. user pr. month, with a 10% discount if a company purchases more than 200 licenses and a 20% discount if they have more than 500 licenses. Which will give a revenue at 400.000 - 500.000 EUR pr. month at 10.000 Licences. This is a quite fair estimate since business analytical program Tableau charges between 40 & 80 USD pr license pr. month for their services [14].

Team

The founders of DANA are:

- Jonas - BSc. Strategic analysis & Systemdesign, and MSc student in Management. Jonas has experience in entrepreneurship, logistics, planning and management. With a BSc. in Strategic analysis & Systemdesign Jonas has a basic knowledge about programming and IOT.

- David - BA Architecture and MA student in Architecture. David has great experience in communication, along with design process and aesthetics. He has gathered professional work experience in architecture firms in Germany and abroad. Furthermore David can provide creative thinking and interface design.
- Susanne - MA graduate in Architecture and current MSc student in Industrial Design. She has great experience in architectural design, product design and as a research assistant. Furthermore Susanne has a strong specialization in innovative thinking and product development.

As can be seen from the team composition, the team will need to partner up with either a one or more corporate partners, or recruit new team members to the founding team. The new team members need to have competencies within programming, marketing and finance. The DANA team will likely be able to recruit these people from the university itself or through the universities networks. It is crucial for the DANA project to find partners with coding and programming as soon as possible, at a longer time horizon the team needs to find people with marketing skills.

Further Development of DANA

After initial introduction to the architecture market in Germany, the DANA team will slowly start to expand DANA to the rest of the architectural market in Europe while simultaneously working on new features for the key customer group (Architects/ Architectural Firms).

These new features of Architect DANA could include:

Interacting with BIM models and plans/drawings

Communicating automatically with other architects DANAs' in order to gather helpful and useful information.

Automatically run preliminary calculations on the structural integrity of the BIM models as well as costs and sustainability.

Modelling drawing in 3D VR which can easily be presented to the customer

However the DANA team is also planning of developing a mainstream DANA to the mass market, which can be used by employees in all industries. New features of a mainstream DANA could include features such as:

- Communicating with other DANA's to schedule automatic appointment for all users.
- Book flights, hotels and meeting rooms
- Control smart devices in the office, such a personal lighting, personal thermal comforting zones and ventilation.
- Motivate employees to work smarter.
- Optimize the working day and breaks.
- Help on-boarding of employees and on the job training.
- Do performance measurements and reviews.

However the DANA team recognizes that even though all the ideas above will significantly improve the everyday working day for a lot of people it will be very expensive and time consuming to develop.

Personal Statements

This part shows personal statements relating to interdisciplinary work and how it can foster creativity and innovation.

Jonas

This workshop has given me the opportunity to combine the knowledge I have gained in my studies in an interdisciplinary and international work environment. On a personal level, the workshop has broadened both professional and academic horizon and helped me establish an international network. The interdisciplinary teams help the creativity and innovation since everyone has different background-knowledge and therefore tends to focus on different perspectives. This gives a final product which is very thought through. The diverse backgrounds made the team more open to different aspects and helped the group to be more flexible and assignment of tasks more natural.

Susanne

Design Thinking and interdisciplinary teams can break up deadlocked thinking patterns and open minds for visions, in my opinion. Working as an interdisciplinary team can broaden the horizon and everyone can learn from each other. Besides, it is important that all team members are at least a bit familiar with the topic so that everyone can engage in the process. It can be hard if someone can't engage. During the workshop we learned that this can affect working of the group. Interdisciplinary work can help to form t-shaped people and cross-thinking which can help to develop innovations.

David

The workshop taught me that the architectural education provides a broad palette of skills that can be used in all different kinds of fields. Working with industrial designers and management students showed how interdisciplinary work can incubate creative ideas and foster innovation. It also gave a brilliant example of how setbacks during the design process and even leaving team members can ultimately lead to even a better result if they are dealt with correctly. I have also learned a lot from the facilitators who were able to teach new and unique approaches to problem solving and design thinking.

Final Summary

The workshop Design Thinking Lab 'Workspaces for DigitalYOU' was a great opportunity for us to get through a design thinking process in interdisciplinary teams together with professional experts. We could learn a lot from the experts as well as from all other participants. During the workshop we created DANA, an architectural needs assistant driven by an artificial intelligence.

We had to change to learn design thinking methods in practice as well as presenting our conceptual idea in front of a bigger audience. Winning the third place of the completion of the workshop shows us that our idea has potential and it gives us the opportunity to pitch our idea again at BCG and at the Munich Creative Business Week (in the format Design Connects).

We have had an amazing experience and have worked great together as a team. Our different backgrounds have contributed to an innovative and exciting learning process. We have improved our pitching and presentation skills and we had the possibility to add people from different backgrounds to our personal and professional networks.

All in all the Design Thinking Lab 'Workspaces for DigitalYOU' was a great experience for us and we gained a lot of experience!



Fig 30: Working Process

Bibliography

- [1]: IMB, 2018, Empathy Map, viewed 06 January 2019, <https://www.ibm.com/design/thinking/page/toolkit/activity/empathy-map>.
- [2]: IMB, 2018, As-Is Scenario Map, viewed 06 January 2019, <https://www.ibm.com/design/thinking/page/toolkit/activity/as-is-scenario-map>.
- [3]: IMB, 2018, Needs Statements, viewed 06 January 2019, <https://www.ibm.com/design/thinking/page/toolkit/activity/needs-statements>.
- [4]: IMB, 2018, Big Idea Vignettes, viewed 06 January 2019, <https://www.ibm.com/design/thinking/page/toolkit/activity/big-idea-vignettes>.
- [5]: IMB, 2018, Storyboard, viewed 06 January 2019, <https://www.ibm.com/design/thinking/page/toolkit/activity/storyboard>.
- [6]: IMB, 2018, Playbacks, viewed 06 January 2019, <https://www.ibm.com/design/thinking/page/toolkit/activity/playbacks>.
- [7]: IMB, 2018, Playbacks, viewed 06 January 2019, <https://www.ibm.com/design/thinking/page/framework/keys/playbacks>.
- [8]: Ted, 2009, Simon Sinek - How great leaders inspire action, viewed 07 January 2019, https://www.ted.com/talks/simon_sinek_how_great_leaders_inspire_action.
- [9]: DAB., 2017, Wer schreibt, der bleibt., viewed 5 January 2019 <https://dabonline.de/2017/02/01/dokumentation-wer-schreibt-der-bleibt-2-leistungsphasen-recht-hoai-transparenz-honorar-planung/>.
- [10]: Kotter J., 1996, Leading Change. Harvard Business Review Press.
- [11]: Everett M R., 2010, Diffusion of innovations. Simon and Schuster.

- [12]: Bernard B., 1963, Diffusion of innovations. everett m. rogers. Isis, 54(2):296–297.
- [13]: Tondem R., 2005, Organisational change management: A critical review. Journal of Change Management, 5(4):369–380.
- [14]: Levy N., 2017, Tableau unveils new subscription pricing model for data visualization products, viewed 07 January 2019, <https://www.geekwire.com/2017/tableau-software-continues-move-to-subscription-model-releases-new-prices-for-data-visualization-products/>.

List of Figures

Fig. 1: Empathy Map, own image.

Fig. 2: Working Process, own image.

Fig. 3: Empathy Map Ana, own image.

Fig. 4: As-Is Scenario Map, own image.

Fig. 5: As-Is Scenario Map Ana - Part 1, own image.

Fig. 6: As-Is Scenario Map Ana - Part 2, own image.

Fig. 7: As-Is Scenario Map Working Process, own image.

Fig. 8: Needs Statement, own image.

Fig. 9: Common knowledge about Ana, own image.

Fig. 10: First Ideas Needs Statements, own image.

Fig. 11: Needs Statements Ana, own image.

Fig. 12: Big Idea Vignettes, own image.

Fig. 13: Big Idea Vignettes Ideas Collection, own image.

Fig. 14: Redefined Idea, own image.

Fig. 15: Storyboard, own image.

Fig. 16: Storyboard from each of us, own image.

Fig. 17: Final Storyboard, own image.

Fig. 18: Working on Prototype, own image.

Fig. 19: Working on Prototype, own image.

Fig. 20: Working on Prototype, own image.

Fig. 21: Working on Prototype, own image.

Fig. 22: Golden Circle, own image.

Fig. 23: Final Presentation, LinkedIn Christos Chantzaras, viewed 07 January 2019, [https://www.linkedin.com/feed/update&urn:li:activity:6474038846655856640/?commentUrn=urn%3A-li%3Acomment%3A\(achtiivity%3A6472404119498817536%2C6474038813638291456\)](https://www.linkedin.com/feed/update&urn:li:activity:6474038846655856640/?commentUrn=urn%3A-li%3Acomment%3A(achtiivity%3A6472404119498817536%2C6474038813638291456)).

Fig. 24: Concept DANA, own image.

Fig. 25: IBM WATSON text-to-speech demo, Watson Text-to-speech, viewed 07 January 2019, <https://www.ibm.com/watson/services/text-to-speech/>.

Fig. 26: Ana to DANA, own image.

Fig. 27: Comparison of DANA's closest competitors, own image.

Fig. 28: Graphic illustration of Rogers theory of diffusions of innovation, Kotter J., 1996, Leading Change. Harvard Business Review Press.

Fig. 29: Gantt-Chart for implementation, own image.

Fig. 30: Working Process, LinkedIn Christos Chantzaras, viewed 07 January 2019, [https://www.linkedin.com/feed/update&urn:li:activity:6474038846655856640/?commentUrn=urn%3A-li%3Acomment%3A\(achtiivity%3A6472404119498817536%2C6474038813638291456\)](https://www.linkedin.com/feed/update&urn:li:activity:6474038846655856640/?commentUrn=urn%3A-li%3Acomment%3A(achtiivity%3A6472404119498817536%2C6474038813638291456)).

SpaceMatch

Providing new workspaces for a collaborative future



Summary

The subject of future Workspaces concerns all of us. In the age of rapid digitalization and fundamental societal changes, we have to ask ourselves how we can influence the development of such an important question. Each of us deals with working environments in our everyday lives, beginning with studios at university, to public libraries or our personal desk in a company we are working for. The question we tried to address during the workshop is how we could improve them according to the latest technological advancements as well as enhancing the way we work and interact, taking the social aspects into account.

Participating in the Workshop Design Thinking Lab – Workspaces for DigitalYou gave us the unique experience to work on a relevant problem without being limited in any way. The applied Design Thinking process was a new methodology to most of us. It allowed a solution-based approach to the problem solving, with a problem that we first had to define. Besides the intense group work in interdisciplinary teams of 5 students, the range of supporting lectures gave us a lot of new insight which we could directly take into consideration. The highlight was the pitch of the different group results after the three workshop days.

In order to find a solution for a problem that is ill-defined or unknown, it was necessary to carefully run through the stages of the Design Thinking process. By carefully reframing the problem in human-centric ways, generating ideas during brainstorming sessions and adopting a hands-on approach in prototyping, we defined the problem and developed our solution.

It was a real advantage for us to have the process supported by specific lectures and talks.

Dr. Kerstin Sailers' presentation about the impact of spatial design on social behaviour as well as the talk about "Comfort as a service" helped us explore the relation between the human and space. The lecture "How to prototype" by Laura Dahle and the presentation about "How to pitch" by a BCG consultant especially helped us during the design and presentations.

The solution we developed aims to enhance the output of interdisciplinary teams by focusing on spatial and sociological metrics. Our entry point into this topic was through a focus on the process of a consultancy collaboration. We believe that in order to be successful, a teamwork has to find a way to integrate the different specialities within the group, throughout its whole duration. Work collaborations can be of a long duration, and dynamics within the groups can have a serious impact.

We therefore imagined the intelligent and flexible space-matching service "SpaceMatch". Space-Match provides a working environment that adapts to the different needs of its occupants, depending on the stage of the collaboration. A constant observation of the situation through intelligent sensors and human input allows the system to recommend and initiate alterations. These alterations can concern the size of the workplace, the furnishing or equipment, thus also influencing the social situation.

The design process of continuous ideation resulted in a large quantity of ideas and it was startling to see all the groups come to very different results. The intense investigation into the future of workspaces was great and the methodology of the Design Thinking Lab will definitely be a strong asset whilst approaching future problems of similar complexity.

Detailed context and concept

Workspaces of the future

The way the workshop worked was that we established a very precise profile within a particular case study; this precise case study involved the working environment of the future, and according workspaces. We then looked to find a solution that would solve this precise case study, and how some of the ideas implemented into this precise case study could be applied on a larger scale. The process will be explained further into detail later; this precise case study is however already important in order to explain the concept.

The overall focus of the workshop was the workspace of tomorrow, and it was supported and accompanied by BCG, a renowned international consulting firm. We therefore investigated in a case that involved consulting, taking into account some of the potential difficulties that may be faced.

Our angle was interdisciplinarity and designing according workspaces. We believe this is relevant not only for the consulting world, which is already a huge industry today, but also for the general labour environment of the future. Indeed, there is already a strong belief within many experts that we are going towards a world where everyone is his own employee¹ and people work together but are no longer all attached to bigger entities.

We are already seeing this happening more and more today, and it is mainly due to technology and the new possibilities we have to communicate faster, connect and organise everything within clicks.

A term often used in France to describe this phenomenon, sometimes positively, sometimes, for example, to criticize E. Macron's politics, is "ubérisation"². The word stems from the company UBER, and it represents a new functioning of the economic world where everyone; both clients and customers, are directly put in contact through the help of technology. The people use services that are provided to give them short-term work but are no longer attached to big entities for which they have long contracts.

Whereas you could argue whether uberisation is a good thing, it is today partly inevitable, and it is not the question of this paper.

The question that we think is interesting to explore is what type of spaces are needed for this new world where people no longer have traditional 9to5 offices³. Technological advancements such as high-speed internet and ever-thinning laptops now make it possible to work almost anywhere and be in immediate contact with someone on the other side of the world. This was not the case twenty years ago, and a lot of office spaces around the world are still based on this older model. The needs of a workspace now evolve over the duration of their use, depending on how many people need to occupy it, or the nature of their work.

Our case study explored this within the world of consulting and its collaboration process, the idea could however belong to a larger context. We therefore believe it is strongly relevant to the future of the workspace.

1 Williams, M. (2017) **In the future, everyone will be an entrepreneur**
2 Oxbridge Applications (2019) **What is uberisation ?**
3 Business2Community (2016) **The Office Of The Future: How Technology Is Changing The Workplace**

Case study: Kim and BCG

The precise case study we imagined was one of a collaboration between BCG and an external company department facing digitalization. During the process, we decided to view the situation through the client's perspective. In this case, the client is the manager of the department facing digitalization. We named this manager Kim, and Kim's regard to this consultancy is different to BCG's. Kim works for a large firm mainly invested in the chemical sector.

He knows digitalization is soon going to be indispensable for his department as it will vastly improve their profits and help them stay competitive. He is however expressing a mix of emotions regarding this collaboration; he knows it is needed but does not want all his department to be aware of it, as changes will occur from this digitalization. He feels responsible for his department and the people he is in charge for. He is also expressing doubts over his role and power with this collaboration. Kim is also lacking an optimal space within his office for this collaboration.

In order for this collaboration to function, a new space would be needed. This space would address the question of confidentiality, the question of power (the space would neither be a company space or a BCG space.), and the question of space. During the design process, we identified one of Kim's main needs as being to find a way to integrate both the internal and external team into a single space.

The role of SpaceMatch is to provide a solution for Kim. With the system it proposes, it answers all the needs stated in the prior paragraph. The collaborative approach would be the main point taken into account; and

therefore the needs both sides face, as well as the challenges they may encounter along the way.

This is a precise case study; but you could imagine these reasons as common reasons for why a consultant-client collaboration would require a secondary space.

The concept of SpaceMatch is to provide a service where precise office spaces are set up for pre-cise cases. Every collaboration is unique and the space in which it happens should be too.

This tailor-made space is imagined based on several parameters; the nature of the work, the amount of people expected, the respective office cultures and dynamics, as well as the technological and material needs. A mix of sensors and human input helped by AI generates these spaces with very little time needed for design and construction.

The above parameters that define the spaces are very likely to evolve and be different at different stages of the collaboration. This is why the sensoring and input continues to work even after the collaboration has started and the space evolves alongside the evolution of the project.

In the design approach, SpaceMatch aims to incorporate both how technology has altered the social functioning of the workplace, as well as using technology to design and construct these work-places.

Marketing and distribution channel strategy

Due to the current phase of the project, the choice for a further strategy will be based upon what would fit our project purpose the best. In this case it would not bring a lot of valuable data to bring in economics and a forecast, due to a very weak knowledge base about the prices of this industry¹. However, the rest of the managerial topics could be fitted. Within this report the aim will be to look at the Marketing and distribution channel strategy and how it can improve the future strategy.

This topic is especially important since the company SpaceMatch would be a subcompany to Boston Consulting Group which will be mentioned as BCG further on. Therefore, a look into how this could help BCG to enhance their value for the customers and further to increase both their own and SpaceMatch revenue and help SpaceMatch to make a profitable competitive advantage.

Since SpaceMatch is the only business to deliver this service² a monopoly is expected. When dealing with a Monopoly the objective of making a profitable competitive advantage is not that hard, since you can control the Value/price ratio. However, the problem with the product on a strategic point of view is that it's easy to imitate and thereby make a substitute company which can provide the same service. This would create a competitive market whereas the relation between value and price would be lowered. Due to competition it would make the market less profitable for the companies and would hurt the competitive advantage that SpaceMatch had at the beginning, when it was alone on the market.

The role of marketing for this start-up is to decide how to make a bridge with people and turn them into our partners/customers to make them Cashcows³, resulting in a sustainable and reliable income. Moreover, SpaceMatch should think of a long-term perspective and incorporate their value proposition, which is used to describe which value SpaceMatch wants to create for the customers they serve (Competitive advantage). This can be explained in three points (Relevance, value and differentiation):

- SpaceMatch wants to solve the challenges of finding an accommodation for different work-projects. To do so, it proposes solutions that include parameters such as size, interior and other things to make it a great working experience. This is the question of relevancy.
- With a specific product/service, SpaceMatch can serve a specific area of clients and have a very clear purpose.
- After research, SpaceMatch will function as a monopoly (at least at the start) and provide a unique solution compared to what is available on the market.

If we develop these points further, it is known that distribution channels are a key element to market strategy and should help your own company but also the ones that you are co-operating with. In this case study, the strategy should help both the company owner and SpaceMatch, which in this case would be BCG. This partnership could help the companies to expand and reach a certain revenue or capacity goals.

¹ The true prices with discount and so forth have not been possible to gather.

² Based upon theory and group discussion

³ Based upon BCG matrix, Cashcows are groups of your portfolio which generates a lot of cash for the company without using too much investment capital and resources, as per: Jurevicius, O. (2013) **BCG growth-share matrix**

MARKETING CHANNELS FOR CONSUMER PRODUCTS

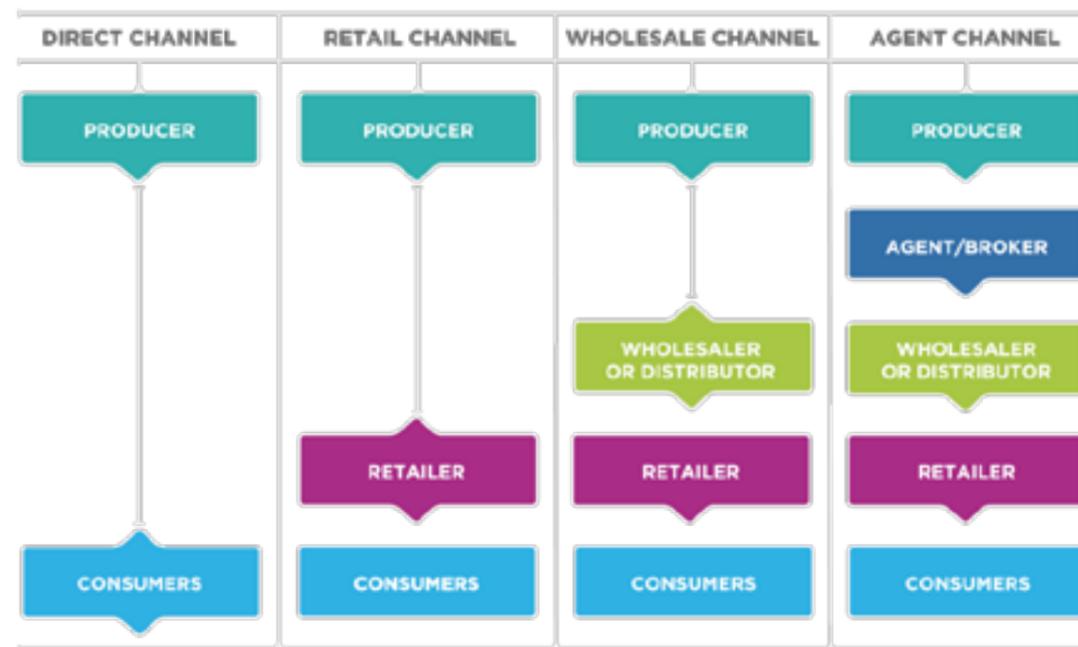


Diagram on marketing channels, accessed on :
Lumen Learning (2019) **Putting It Together: Place: Distribution Channels**

- Direct sale to end users**
Sales team who sell the product directly to the customers. This method means that different services are made to match the customer needs in the best way possible. This distribution strategy could be across different platforms; phone, website or email.
- Selling through network**
In this case, the products are chosen to be delivered through a network within the business area they aim to work with. Through this approach, partners are created and can also be used further on as distribution channels.
- Selling through VAR (Value-Added Reseller)**
The products of SpaceMatch are sold separately to customers such as BCG who then resells the product¹. With this configuration, BCG will be able to implement the system of SpaceMatch into their product portfolio and add value to the product.

¹ If any training is needed to resell or understand our concept it will be through to BCG and other distributors

In order to make an effective distribution channel program, SpaceMatch needs to focus on what the end users really need. The question could be “What do consultants and other industries need for a meeting/project room”?

Research on relevant literature¹ has given us a better understanding of customers and their needs. The idea of a middle space is however not hugely talked about, so we had to make some assumptions² in order to determine what SpaceMatch customers want.

The actual customer for SpaceMatch wants to have a specific/personalized space for their work project. Aiming for such a service makes the Network and Reseller programs very attractive for business. However, if customers should also be able to interact with the system directly, an online platform should be made to meet their demands. This channel would not need a reseller like BCG and could be operated by SpaceMatch. Besides that, SpaceMatch could aim for a dedicated sales department so they can close deals with less frequent customers.

Looking further into the concept of being a subcompany/joint venture, SpaceMatch can here capitalize from the benefits that consultant companies have gathered. Consultancies have the resources and knowledge to quickly expand your product/concept into the market. If you sell through the channel of BCG, the whole chain of users can be customers as customers. This brings more value for the end customers and BCG. By doing this, SpaceMatch does not need to interact with others than their main customers such as BCG or other consultancies.

¹ Spence, G. (2016) **Why Every Consultant Needs Office Space to Meet with Clients**
² The customers want a specialized configuration for their project work

By understanding the need of the users, SpaceMatch can provide consumers with services which will help them improve the working phase. Moreover, this concept could lead to a minimization in cost and time as well as using the potential of a neutral ground.

Going deeper into the mindset of the consumers, it's important to know how the actual buyers want to buy the product/service. Is it by website, app, salesman, etc. or something totally else?

According to the information we received within the three intensive workshop days, the consumers of a consultancy service often want to do things the same way. They want some to see each other in real life through consultations and personal face-to-face meetings in order to build up trust. However, the location for a certain project work can vary a lot, since there has been no solution to this challenge before SpaceMatch.

Even though BCG and other big firms might be partners, they should still purchase the products/services as everybody else within a sales process. However, in a strategic point of view, the contract of the partners should state some requirements in terms of different goals to be able to develop the future workspace for the better.

Using distribution channels things can result in different outcomes. SpaceMatch wants the best possible outcome and therefore aims to set up an efficient and good relationship with their customers before any competitors appear. The objective of SpaceMatch is to be successful in terms of partners, distribution channels, market position and revenue.

Recommendations and future distribution strategy

The previous paragraphs, although already thought with precision, describe initial marketing and distribution models for Spacemath. We believe these ideas could be developed further and have therefore established some recommendations and strategies.

Some recommendations would be to dig deeper into subjects that include revenue, pricing, sales and campaigns. These topics have the potential to maximize the number of potential customers, as well as channel opportunities.

SpaceMatch's goal should be to serve the collaborative process as this would serve their customers, increasing revenue in the process. This could be done by giving the partners the possibility to activate certain products of SpaceMatch in ways that they were not able to do themselves.

Moreover, SpaceMatch should investigate pricing and sales strategies, especially when setting up new distribution channels. A potential strategy could be to include publicity campaigns when distribution channels seem static. This can help SpaceMatch recruit potentially new distribution or new end users.

At a certain point, SpaceMatch should have developed and reached a substantial growth. This growth would mean they now have many partners or distributions. Taking this into account, it is important to map out the pricing of the products with, so that the end user cannot buy the same or a similar product for a cheaper price elsewhere.

Depending on how big the partner is, there should be different advantages within the value/price ratio in comparison to new customers or smaller partners. The pricing strategy is a critical point and SpaceMatch should be aware of it so that conflicts can be avoided. A good pricing strategy can help SpaceMatch to keep track of the overall strategy, which also takes the business and growth perspective into account.

Prototype concept and description

As explained earlier, the concept of SpaceMatch is to propose a tailor-made, interactive, innovative and modular space destined for collaboration. This concept could take place basically anywhere in the world, as its only default requirement is to be in possession of a vacant space.

Given the workshop was highly accompanied by BCG and our case study was also linked to BCG, we considered for our prototype that SpaceMatch could be a service launched by BCG. We therefore decided to use the BCG office as a test drive for SpaceMatch; in the case of consultancy firms like BCG, at least 30% of their offices are empty during the majority of the week¹. This represents therefore a great opportunity for SpaceMatch to be tested with very little risk and investment. It would also be located in a very well-placed area of Munich.

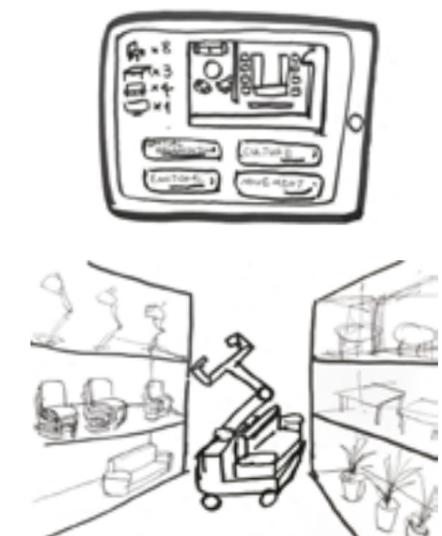
Heading now into the prototype; the SpaceMatch service would work in different phases. The first phase is the analysis phase, the second is the preparation phase, and the final would be the ongoing phase. In reality, all phases would constantly be working together.

If we go back to one of the keys of our concept and major needs of Kim, the main goal we had set for SpaceMatch was to find a way to integrate both the internal and external team in order to produce a successful collaborative work. The first phase consists therefore of a strong analysis of the needs of the teams that will be collaborating together.

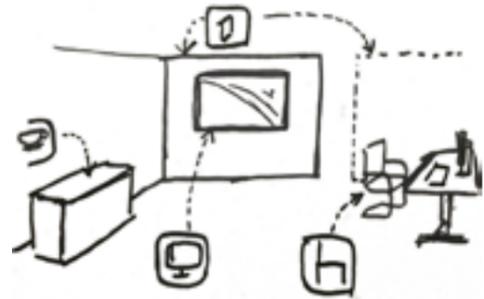


The analysis process works both with sensors that are inserted in the respective offices and human input. As shown on the image above, a very simple and discreet box full of sensors would be put in the office and analyse several things such as the spatial organization, dynamics, movement, temperature, emotions, and so on. The human input would be made easy through simple answers on smartphones and would help take into account factors sensors cannot sense, such as the inner needs of the people.

With this information, an artificial intelligence would propose an office disposition (below) which, once accepted would be set up through an automated process (second image).



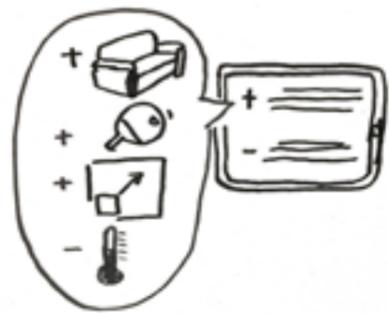
(1) The office is now set up with the particular needs of the collaboration. As we can see on the image below on the left, a good arrangement of standardized elements picked out of a smartly thought catalog creates a personalized space. This process, along with the two previous illustrations, consists of the preparation phase.



(2) The collaboration can now begin; we are now in the ongoing phase. As we can see on the right image, other factors such as the office culture, expressed through a ping pong table, are also taken into account, in addition to the traditional workspace elements.



(3) As the project evolves, different needs would appear given on how the collaborative work is going. The analysis phase, with the sensors and human input, would continue happening, this time analysing the actual SpaceMatch space.



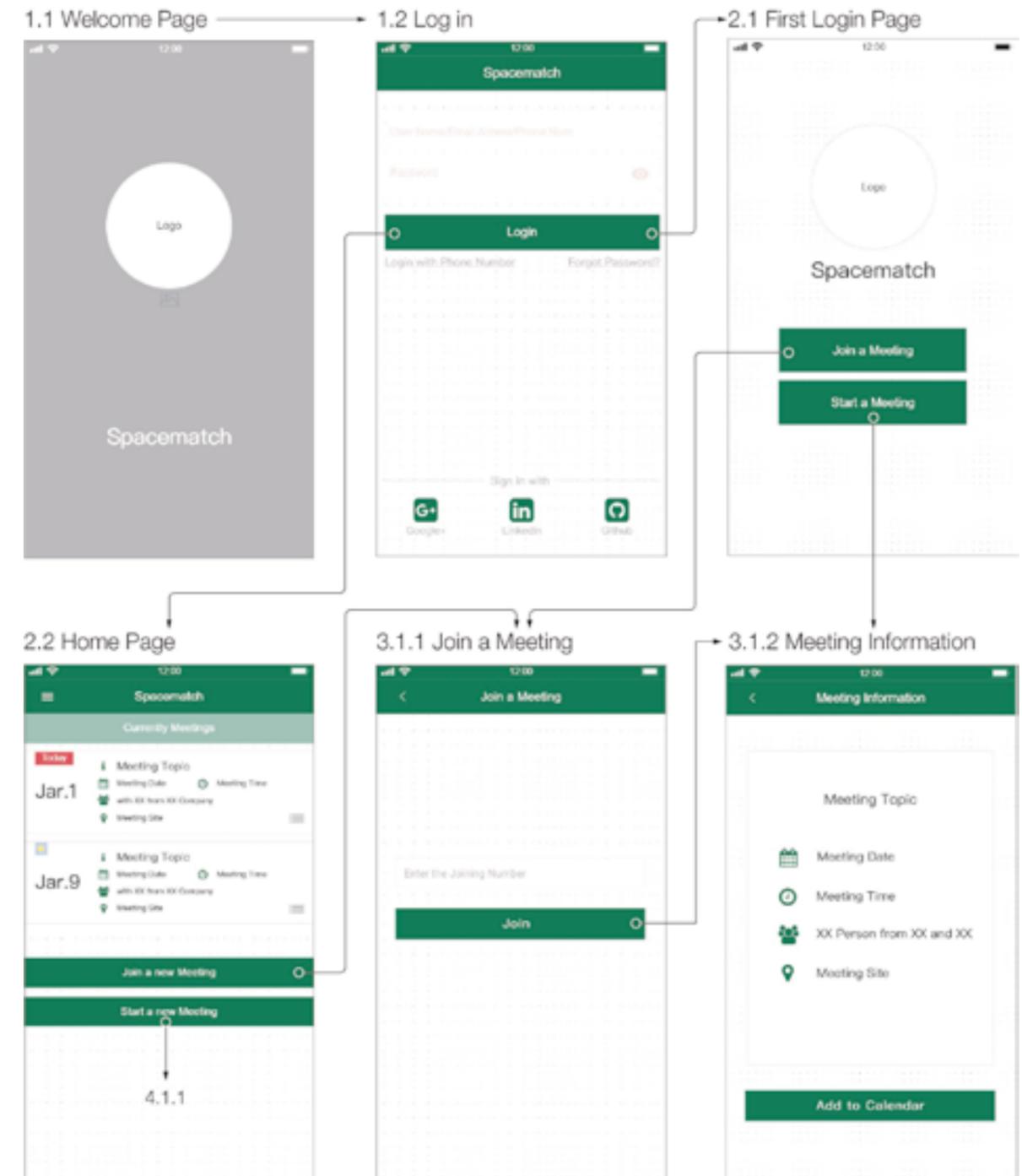
Over time, it could do some propositions (left image below) in order to always make the space best suited to the work being done. (4) On the right, we can see an example of how the space on the upper right image could become after a while, with the help of the analysis and preparation phases constantly acting in synergy with the ongoing phase.



Another strong ambition of SpaceMatch is to always incorporate the latest technological advancements in the office design. This is

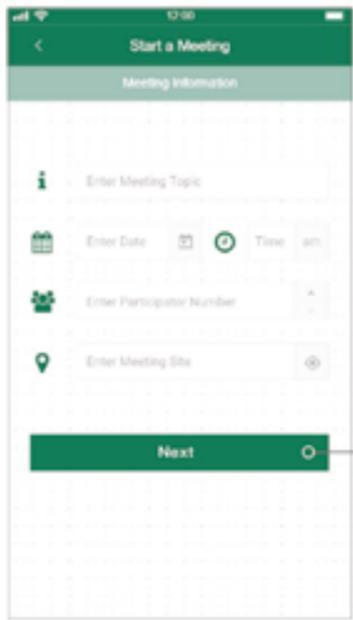
crucial for the concept to stay relevant over the years and it can also become a real advantage to constantly attract customers.

Paper prototype



Example of the SpaceMatch smartphone user application and its different possibilities, as a regular user.

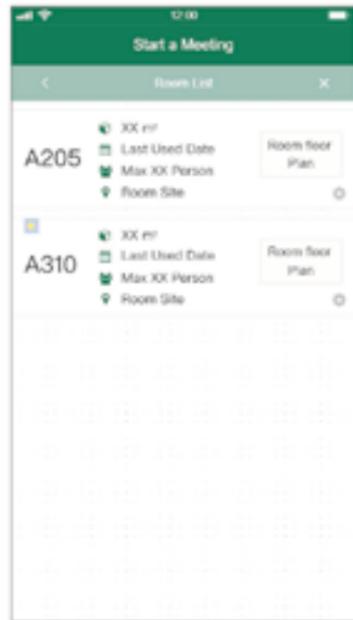
4.1.1 Meeting Information



4.1.2 Room Information 1



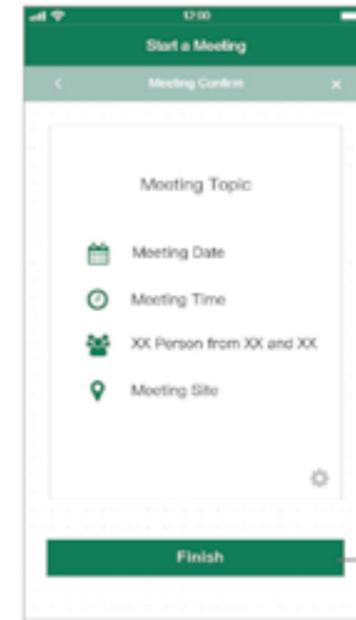
4.2 Room List



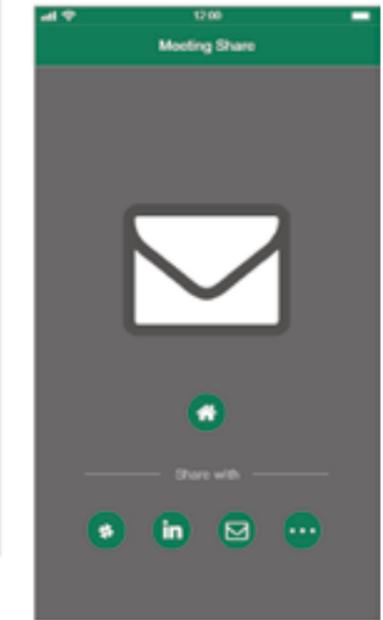
4.1.5 Room Plan



4.1.6 Meeting Confirm



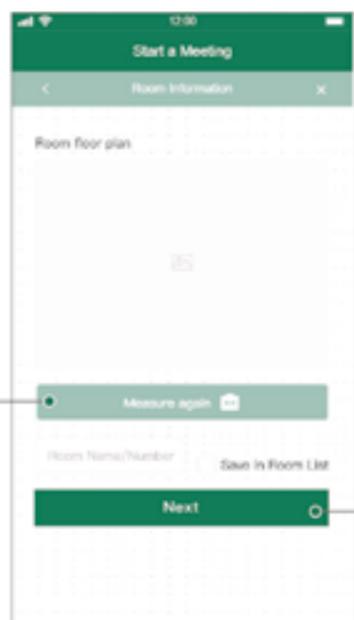
5 Meeting Information Share



4.1.2 Room Measure



4.1.3 Room Information 2



4.1.4 Room Setting



Documentation of workshop

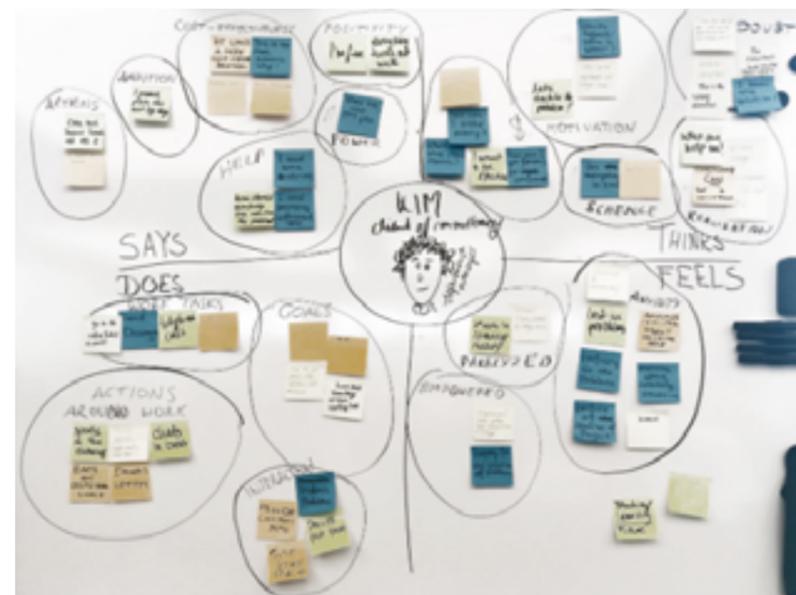
As stated earlier, the Design Thinking Lab's focus was on future workspaces, and developing potentially new solutions in this important field. In order to approach the problem in an appropriate, open minded and creative way, we used a design thinking process. This process is organised as a methodology that provides a solution-based approach to solving problems. As we firstly had to define our complex problem, and only after then the way we wanted to deal with it, this was an extremely useful method which helped us, for example, take the human needs into consideration.

In addition to the evolution of the group work which will be explained into more detail in the following paragraphs, we were also lucky to receive expert lectures which gave new input during this process. The steady review with professionals such as Dr. Pe-Ru Tsen, UCL Bartlett teacher Dr. Kerstin Sailer or Laura Dahle from IBM IoT gave us a lot of insight and new perspectives which made a real impact on our final design project.

As workspaces mainly affect humans and their daily habits, the first priority of the Design Thinking process is to gain an empathic understanding of the problem. We started off with the so-called **"Empathy map"** in order to set our own assumptions aside and to gain insights into the specific user. This empathy map evolves around a defined character and takes his or her special situation into consideration.

We decided to focus on the side of a client of consultancy, a male character called Kim who is responsible for a mid-sized department of a larger firm, in the chemical industry. As explained earlier in the context, he finds himself confronted with the need of consultancy, and it his final decision to set up this collaboration.

The empathy map is composed of four fields; what he is saying, thinking, doing and feeling. Through this introspection we took up feelings like anxiety but also responsibility and curiosity.

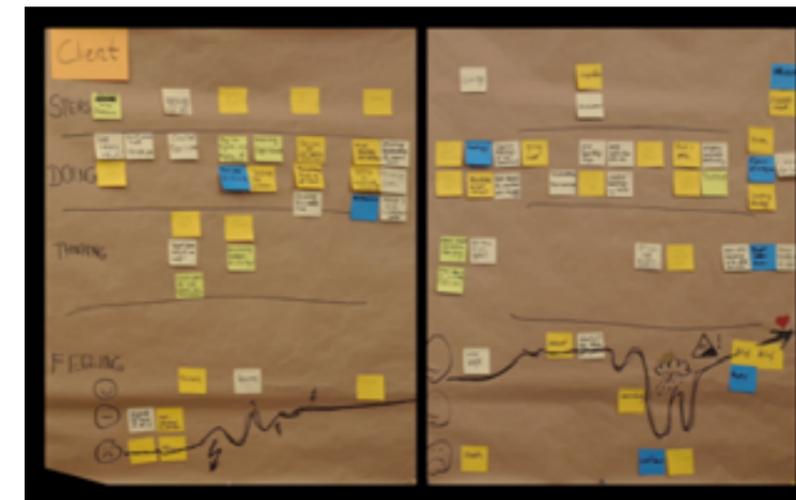


„Empathy map“

In order to further understand and define this speculative situation, the **"As-Is-Scenario"** pictures a timeline of the problem and makes a connection between single steps and particular thoughts during the process. The timeline is viewed from Kim's perspective and we can therefore see how his feelings evolve during the process.

Our scenario considers the starting point of the collaboration, when the decision to work with a consultancy is made, up to a few weeks later when the collaboration is up and running.

As we can see in the scenario, this collaboration process is made of many ups and downs is drawn. As group collaborations in work are often difficult and subject to group dynamics, we came to the conclusion that the general integration of the two teams has to be successful, for the success of the consultancy and Kim's feelings.



„As-In-Scenario“

From this scenario, we then proceeded to create a **"Needs Statement"**. During this stage we sought to define the problem with a human-focused perspective through analysis and a brainstorming phase that pointed out the following needs:

positive attitude towards the work and the solving of a current problem,
transparent communication and inclusion during a phase of team work,
learning permanently, which is especially important when it comes to accepting and generating changes, all while keeping a balanced team spirit, and
resilience in order to bring an interdisciplinary group work to a positive outcome.

Firstly, we couldn't limit ourselves to one particular need and decide to develop strategies that considered both of inclusion and resilience.

In order to trigger the problems at a key point, we decided to focus on the aspect of the inclusion of the two teams of professionals. In our consideration those are the teams of Kim and his employees who are forced to work together with the consultants.

As the consultants aren't professionals like Kim we saw the danger that new ideas and strategies suggested by them wouldn't be accepted. If both sides would unite right from the beginning as one instead of working isolated for themselves the above-mentioned problem would perhaps not occur. The needs statement which served as a basis for the following ideation phase was:

"Kim needs a way to integrate the internal + external team so that the project is successful."



„Needs statement“

After we grew to understand our users and their needs the following phase in the design thinking process is to gather "Big Ideas". This means to think outside the box, identify new solutions and to look for alternative ways of viewing the problem. The approach was to brainstorm ideas for possible solutions in a very visual and conceptual way.

As it can be seen on the picture on the next page, we concentrated on a special solution which allows an atmosphere of trust for the collaborative work, in order to satisfy our character Kim's needs. Without limitations there were ideas for mobile solutions, modularity in the office design or even shared experiences.



„Big ideas“

In a next step, "Idea variations" were tested in small storylines. This last process before we went into the prototyping phase served as a first test of feasibility and developed the idea in detail.

With the storyline we imagined, we started to prototype our solution. We called it "Space-Match". This enabled us to refine the service and mechanisms we wanted to include, as well as the resources we wanted to use.

As the spatial aspect is one of our main topics, we decided that using unused spaces was a sustainable solution and low-risk starting point. From this idea, we looked at BCG offices, which aren't fully occupied for most of the time, as a possibility. We also considered other types of unused spaces such as old industrial buildings or others possible locations.



SpaceMatch storyline

Conclusion

Overall, the team was immensely satisfied by the workshop. The workspaces of tomorrow are a critical matter and the topic deserves to be continuously discussed, as labour is an inherent part of each of our lives.

We are currently at a stage of transition between our old ways of functioning and a fourth industrial revolution which will deeply modify society; and of course the way we work.

Through our research and design, we tried to take this change into consideration and take advantage of the technology available. With SpaceMatch, the goal was to imagine a system that could provide modularity and personification, helped by technological advancements such as AI, but also simply smartphones and the internet.

Collaborative and interdisciplinary work is the future of all work which will be more and more intellectual rather than manual. Collaborative processes require special spatial characteristics and SpaceMatch was imagined as a response to these needs.

If you look at the number of alternatives to traditional offices being set up in the last years such as WeWork¹ or the recent TWOSTAY², it is clear there is a growing demand for these alternatives. Traditional office spaces are being disrupted and we tried to negotiate with these new conditions through our design.

The three days we spent at the 'Workshop Design Thinking Lab – Workspaces for DigitalYou' were very intense and produced some already interesting results.

The case study approach with a human-focused approach allowed us to explore parameters we would not have imagined, had we for example worked only with an architectural or managerial approach.

In retrospective, we are already satisfied with project proposal we produced, but we do however believe that the topic is worthy of more than a three-day workshop. A deeper research combined with a long-term accompanied design process could provide some even more interesting results, and have a real influence on the workplace of tomorrow.

Personal statements

Personally, I was satisfied with the workshop and the new design process we were introduced to. All groups produced interesting results and the method employed is certainly one of the reasons why. Looking back, it would maybe have been nice to have a little background before jumping directly into the subject. For example, AI was present in every design proposal and a major subject of discussion, and rightly so. However, it could have been helpful for the design solutions if everyone had a clear of what AI was and how to use it in their designs. As a suggestion for the future, some light readings prior to the workshop on a critical topic like AI could be helpful. This comes only as a suggestion, and the overall experience was immensely positive.

Léopold

I believe the "Design Thinking Lab" teamwork and interdisciplinary knowledge have created a different but exiting working environment not only for us (students from different departments) but also for the outcome of the course. Whilst creating new and innovative ideas, I personally believe that the outcome has benefited from differentiated brain capacities and thereby become better. The thinking process became more alive since people were thinking in diverse ways. This enlightened the group with precise knowledge from their respective study lines. Groupwork with different intellectual capacities is the future; the visions, goals and outcomes of the course show us that.

Nicolai

I am glad to have participated in the "Design Thinking Labs"; a creative but also highly solution-orientated work process. For the first time, I came in touch with this special approach to challenges which showed me how interdisciplinary group work can maximize its output. Especially the careful process of reframing the question and redirecting possible solutions to the actual (human) needs, served as an example for dealing with future problems. The compact but very intense workshop schedule allowed a very focused collaboration without ever getting distracted from the key problem which always served as a motivation. It was a joy gathering input from all my group mates from different disciplines throughout the three days and developing a collective strategy.

Carsten

The "Design Thinking Lab" was a good opportunity for me to work with a diverse group and get to know people from different nationalities, fields and interests. During the workshop, our team had a good cooperation, we visualized all our ideas and said yes to any possibility. We worked as artists, designers, as well as business managers. We are aware that, design thinking is not a design method, but a way, in which we use the design method. That means we should not only solve the superficial problem, but also dig deep into the essence of the problem. Many thanks to this workshop!

Tianxi

References

These references helped us after the workshop, for the realisation of this paper and the development of our project.

The workshop provided an extraordinary amount of information and ideas that cannot all be referenced here as it is difficult to trace them back to a source, precise presentation or person. The fixed ideas stated in the text that do not have a reference stem from these workshop discussions.

Business2Community (2016) **The Office Of The Future: How Technology Is Changing The Workplace**

<https://www.business2community.com/brandviews/getapp/office-future-technology-changing-workplace-01467338>

Jurevicius, O. (2013) **BCG growth-share matrix**

<https://www.strategicmanagementinsight.com/tools/bcg-matrix-growth-share.html>

Lumen Learning (2019) **Putting It Together: Place: Distribution Channels**

<https://courses.lumenlearning.com/marketing-spring2016/chapter/putting-it-together-place-distribution-channels/>

Oxbridge Applications (2019) **What is uberisation?**

<http://www.oxbridgeapplications.com/kyc/what-is-uberisation/>

Spence, G. (2016) **Why Every Consultant Needs Office Space to Meet with Clients**

<https://www.intelligentoffice.com/blog/why-every-consultant-needs-office-space-to-meet-with-clients>

TwoStay (2019) General overview of a new startup that is very linked to SpaceMatch

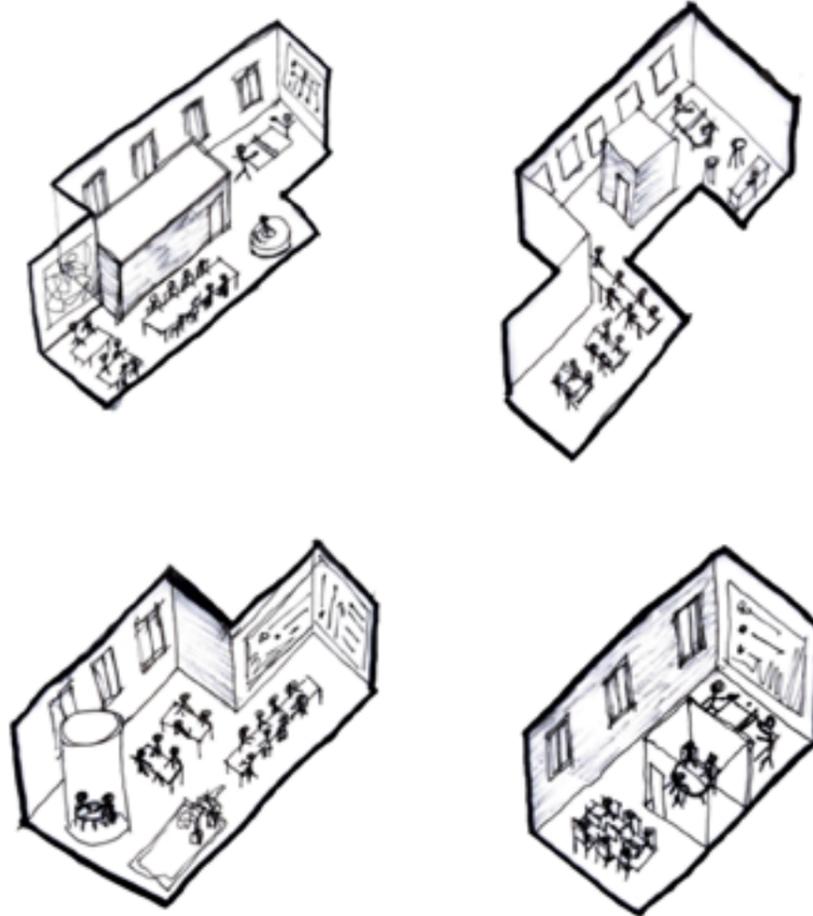
<https://twostay.work/>

WeWork (2019) General overview of a workplace concept, that relates to SpaceMatch

<https://www.wework.com/>

Williams, M. (2017) **In the future, everyone will be an entrepreneur**

<https://workischanging.ca/in-the-future-everyone-will-be-an-entrepreneur/>



Emoji Cup

Digital You Design Workshop

1.0. Executive Summary:

Project name: Emoji Cup	Participants: Christoph Koppmann Danqing Huang Julian Trummer Lubna Alsammak Philipp Cronenberg
Digital You Design Workshop	
Date: 10.01.2019	

This report provides a comprehensive overview on the proposal of Emoji Cup and the prospective applicability of this product as well as the conceivable benefits in terms of collecting data in order to enhance and improve the performance in the shared work space environment. The report includes an intelligible description of the product and explanation of the approach used to create this item depending on our observation and analysis of the needs and problems of shared working space through three days workshop in BCG building in Munich. The report demonstrates the potentials of utilization as well as the future of the product.

Description: The project proposes an every-day, easy-use element that enables the user to point out any disruption caused by undesirable noise level within the work sphere, this interactive item allows a direct free reaction by giving a lighting sign to the others notifying them that the noise level in the space is unacceptable at the same time this sign can be recorded and used in the future as an indicator to evaluate the comfort level of a specific working zone. The Emoji Cup is equipped with a positioning system to enable the user to give several feedbacks in different locations within the building, which helps in the future in the process of comparative evaluation of these spaces and the definition of desirable qualities.

Target Users:

- Companies that have open and shared work space system

Strategy and Objectives

Goals:

- Creating an interactive working environment and allowing direct action and response system by using this personal element to communicate in case of discomfort.
- Establishing a specific database for a certain environment depending on subjective periodical feedbacks from the occupants of the space.
- Giving the opportunity for one person to give feedbacks in different locations.
- Detecting problems and structuring future architectural and interior alterations depending on the recorded data of these individual areas.
- Encouraging employees to be engaged in evaluating their own working environment at any time.
- Improving the spatial and atmospheric qualities of shared working spaces in order to reduce disturbance levels and create a comfortable atmosphere where people can communicate and share their thoughts without affecting negatively the concentration of the others.
- Creating a reasonable tool for the architect to clarify for their client the need to do some architectural and interior spatial alterations

Outlook:

- Collecting data through a longer period of time in various architectural spaces in order to achieve more comprehensible comparative evaluation processes of these spaces and provide a convenient structured set of data to determine some architectural and design standards and configurations for shared work spaces in other firms in the future.
- The high potential to collect various informations about working spaces by using this product in different manners to evaluate different types of comfort

2.0 Detailed context and concept

2.1 Measuring Architecture

There is high economic interest in well-designed office spaces which enhance well-being and productivity. While architecture's impact on human's mental state can in principle be measured more easily in case of office buildings compared to other typology, there is high potential for collecting more data upon which spaces can be optimized.

At the same time, the open plan office comes with challenges, not only enhancing communication between workers but also exposing workers to disturbances and distractions.

We believe that technology can improve the atmosphere of modern offices and allow workers to conduct their tasks productively and create a healthy balance between communication and distraction within the office environment.

Therefore, the goal of this project is to enhance the quality of the office environment both by collecting data and giving the individual workers tools for impacting the office environment in a direct manner. This shall happen not in a big array of products but one single device:

The Emoji Cup.

2.2 Context: The economic impact of office design

On average, one year of paying salary for the people working in an office takes up 10 times as much money as erecting the actual office building. If an office can only increase productivity by 10%, its construction would have paid off already after one year. Therefore, it's not a great surprise that office interiors are usually designed in a comparably generous way beyond the absolute must, hoping to thereby increase the productivity of individual workers. Additionally, office design is a wide-spread tool for attracting new talents into the company. Thereby, detailed information on how to increase well-being and productivity has high economic value.

• The challenge of the open plan office

Open plan offices are increasingly implemented around the globe. Apart from saving space, they come with the promise of increased communication and productivity. As Gensler notes in their workplace surveys¹, this is only partially true. If well-designed, these promises are often validated, yet in the majority of open plan offices workers suffer a lack of concentration and inspiration, decreasing the economic output of the company.

Making an open plan office design a success requires a lot of factors, not all of which are in direct control of the designer and many of which vary between company cultures. Therefore, open plan offices put designers in front of great challenges with many uncertain factors involved compared to the traditional office buildings.

• Limited amount of data available

Given the limited amount of data, office (re)design is still today largely based on intuition rather than solid data, not only leading to uncertainty at the result but, more significantly, a hard stance when it comes to communicating with clients.

2.3 Concept: The Emoji cup

The Emoji Cup lets workers react when they feel disturbed by noise. By rotating the cup, they can a) signal to people in their environment how they are feeling like and whether they would appreciate a certain kind of change and b) provide scientific data on individual emotional stress level in relation to the spatial environment.

- **Direct impact on people in the environment (a)**

It usually takes a serious level of stress and disturbance before people actually walk over to other people and tell them that they feel disturbed by their behaviour and ask them to change it. For example, in an open office when two people have a loud/lengthy conversation, the people around are likely to remain silent, even when they feel disturbed and have been unable to focus on their task for dozens of minutes. Too great is the shyness of complaining to another person, likely presenting oneself in a hostile way, as well as the uncertainty whether the people around feel the same. Nobody wants to be seen as an unlikely character, therefore one must assume that conflicts of interest within the office will often remain unsolved, ultimately creating avoidable drops in well-being and productivity, unless counter-measures are taken.

By rotating the cup, a worker can anonymously communicate the way he feels to the other workers in the surrounding, who can then signal via the same method whether they feel this way as well or realize that they should change their current behaviour since it apparently disturbs the people around. That way, a subtle kind of voting system might be implemented, giving one a hint how the people around are feeling on average and what could be done in order to make them feel more comfortable.

This can be taken far beyond giving other people feedback on their behaviour. In the same way, people can give live feedback on air temperature (which can be directly connected to the heating system in order to raise/lower temperatures right away if enough people agree that the temperature is not comfortable), electric light, sun shading and many more factors; maximizing individual satisfaction.

- **Indirect impact: Collecting data**

Detecting in which kinds of spaces humans feel more or less disturbed, might turn out extremely valuable when it comes to (re)designing offices. Analysing data of the Emoji Cup user behaviour promises answers to questions such as:

- Which kinds of acoustic strategies work best in order for workers to feel as comfortable as possible?
- What characterizes a space at which people...
- ...feel (un)satisfied at?
- ...feel emotionally (dis)stressed?
- ...complain (in)frequently?
- ...communicate with each other?
- How can you facilitate communication without people getting distracted/annoyed?
- Which factors influence the subjective thermal comfort apart from the raw air data; e.g. does e.g. the wall colour play a role?

Apart from general scientific research, specific office buildings can be analysed this way, specific strong/weak points identified and solutions for optimizations being tailored much closer to the specific corporate environment than it is possible at the moment. Thereby, Emoji Cup can be sold both to give employees a tool for their everyday work-life as well as for optimizing the office spaces based on the data collected.

2.4 Scientific Background of the concept

With these two features, the Emoj-cup opens a whole new field of design-concepts for our future offices. As stated above, it has always been the architects responsibility to built spaces regarding his own knowledge about office-environments. The actual feedback through the emoji-cup actually empowers the people who are working in the space, to make suggestions. This is a huge benefit and could become a new trend in decision-making. The core concept of the cup is to break down discussions into simple yes-no votings. In this way we want to assure everyone participates in the discussion and also that a solution is found, that fits the most employees. Similar ways of organizing Groups and finding decisions in a collective can be found in nature. The movements of swarms are also the outcome of numerous yes-no-votes from each individual. To use this knowledge we aligned our concept with the newest research out of the field of swarm intelligence.

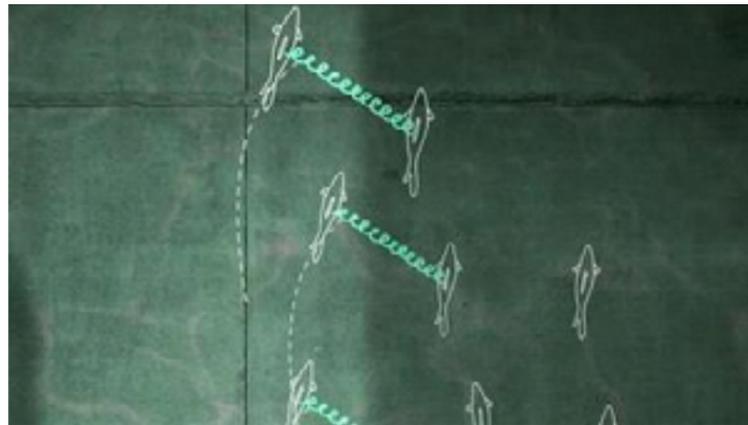
- **swarmintelligence-a way to design our offices**

With the emoji-cup we developed a product that could measure emotions towards spacial qualities and indicate how to improve them. Without the tool, we would basically need everyone to join a huge discussion about a certain space. This would be immensely time-consuming and people would not be willing to join said discussion. Therefore a concept needed to be implied that would break down this complex task of reflecting the emotions towards a space, into very small and simple tasks. In this scenario a parallel to the movement of young fish-swarms was made. ²(Quelle Bild: BR)



Prof. Iain Couzin ³ from the Department of Collective Behaviour at the Max Planck Institute was able to define a certain logic in the movement of the swarm: The swarms biggest interest is to swim in shaded areas. Since the fish cannot be seen by predators from above, in those areas. A single fish left with the choice to swim in the shadow or in the sunlight, does not define a difference for these two areas, it seems the knowledge about where to move is only accessible through the group. Prof. Couzin found out that the swarm moves according to very simple rules, almost as basic as computer language.

The fish know two states according to their surrounding. light and shadow, the fish swim fast within light areas and they swim slow in shadow areas. This fact alone is not helpful for the single fish, since he still does not bother to enter the shadow-areas more frequently than the light ones. In the group, interestingly, there is another basic rule that complements the „system of varying velocities“: The fish always keep the same distance to each other. This means that the part of the swarm entering a shadow-area slows down, while the fish in the sunlight are still going fast, thereby stretching an invisible rubberband between them and their colleagues. Very soon the fast swimming fish in the light area are dragged into the shadow by this invisible force. The group therefore is safe, each and every individual got better chances of survival. ⁴ (Quelle Bild: BR)



Fascinated by this knowledge we analyzed: The fish give an impulse that can only be 0 or 1 (fast or slow), by the basic law of „same distance at all times“ the fish thereby influences its closest neighbours. Once the information has started at one point it quickly moves through the whole group. As an abstract version of this amazing concept we implemented a very simple voting system for our cup (green or red) and used the rule that one cup can only inform the next four cups in its direct surrounding about its state.

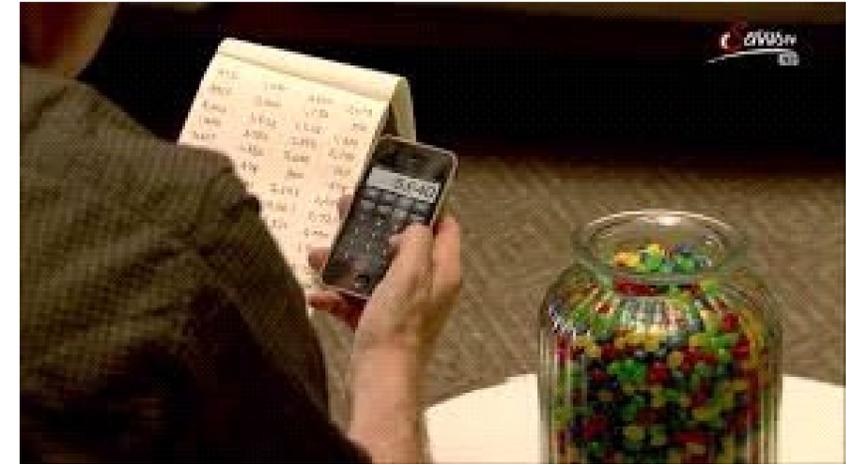
pict. 1 information distribution to 4 other



pict. 2 next distribution-circle is reached



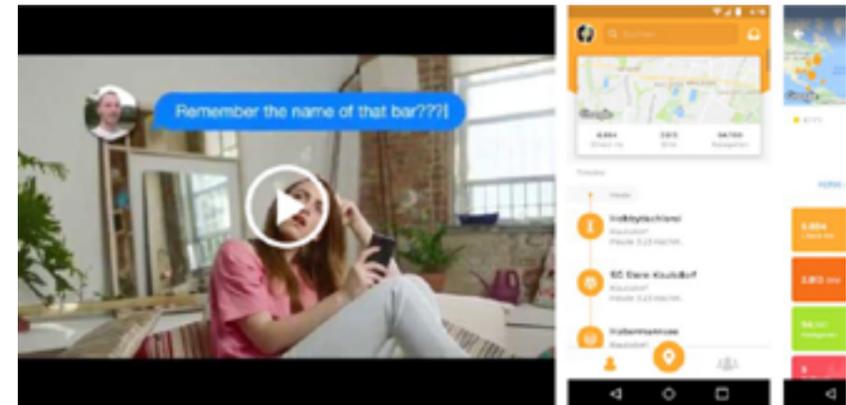
We later found another interesting experiment regarding the swarmintelligence concept we decided to use for our product. Frank Fraktalist ⁵, a scientist from ... had an unusual way to proof that swarmintelligence existed within human groups. For his book „Der Code - Die Berechnung der Welt“ he showed a glass full of beans to various people in an office-building. He asked each of them if they could guess how much beans would be in the glass. Most participants were insecure about the question and said numbers within the wide range of 400 until 30.000 beans. Most interesting: the number of people that guessed way to low was almost the same number as the ones that guessed way to high. In the end the average-guess of all people asked, was only 1.4% off from the actual number!



For our concept this meant great news, we had found a way to involve every single person in a rating-process and we would therefore generate an outcome that would be most rational. A concept that would go against the traditional concept of only the loudest voices being heard. A system of actual common sense for a hierarchically structured office-culture.

• The psychology of rating

In order to make emoji-cup a successful rating-product, it was essential to research more about the ratingsystems that are on the market today. The application „swarm“ ⁶ seemed to have used the swarm-concept for rating different restaurants and sharing it with a defined group of friends. ⁷ (Quelle Bild: Google Play)



As we found out, using the app, the rating process was very complicated and not intuitive. Many users complained about troubles during login-phase and whilst sharing information with their friends. We went further and took a look at the well known platform „tripadvisor“ a very easy to use rating-tool. As a curiosity we found that most users had given either 5 stars (perfect) or no stars (not satisfying at all), there seemed only to be a need to give a rating if the experience was way above or below expected.

According to an article from new-media guru Himanshu Khanna ⁸ there where several trends in the actual rating-industry. For the most important one being that users would tend to act in extreme or not react at all. This fed our theory of a 1/0-system. Khanna furthermore explains that users are rating amazingly frequent, once they see that their feedback is actually changing a product. We therefore understood that the emoji-cup needed to have a short-term effect as well as an actual long-term effect for the participants. This concept found its realization in the two different functions of the cup a) signal to people in their environment how they are feeling like and whether they would appreciate a certain kind of change and b) Indicate possible changes for the spacial environment. Emoj-cup considers therefore the newest trends out of the rating-industry and offers a user-interaction that is derived from the very natural movement of a swarm.

3.0 Strategy, value proposition and financial prospects

In the latter sections the context, background and concept for the need of an Emoji Cup in open workspace environments is described and reviewed. This knowledge is used in the following to design the framework and fit between our idea and customers. Here the business model canvas (BMC) is first presented in order to give an overview over Emoji Cup's current strategy. Next a more in depth analysis of the value proposition between the traits of our idea and the needs from customers is carried out. Finally a simplified finance and revenue plan is presented, together with a forecast of the future financial prospects.

3.1 Emoji Cup's strategy using BMC

In order to describe and analyze Emoji Cup's current strategy the business model canvas (BMC) is implemented and visualized in Figure 1 (Alexander Osterwalder & Yves Pigneur, 2010, p.15).

The essence of Emoji Cup is to create a better work environment and thereby better well-being for the employees. In the middle stands the 'Value Proposition' which includes the implementation and education services to customers, the monitoring and processing of data in order to provide recommendation for immediately impact and future actions on increasing the utilization of workspaces' using redesign. The relevance and usefulness of the value proposition to create customer gains and encounter their pains is analyzed further in Section 3.2.

In order to achieve the providence of the properties listed in the value proposition it is necessary for Emoji Cup to focus on some 'Key Activities'. First it is important to manage customer relations and become experts in the implementation of Emoji Cup in companies work environments. Since the concept of Emoji Cup is new, customers have no previous experiences with the use of it, why it is important to connect closely with customers in order to convince them to buy the product. Thus the core 'Customer Relationships' concern the collaboration through regular meetings with clients reviewing the implementation process. Further key activities consider the development of the software used in Emoji Cup to gather data, monitor and analyze them. Also the development of how the data can be used to redesign workspaces' is important to give future recommendation. However, because of limited resources this aspect should be a long term activity.

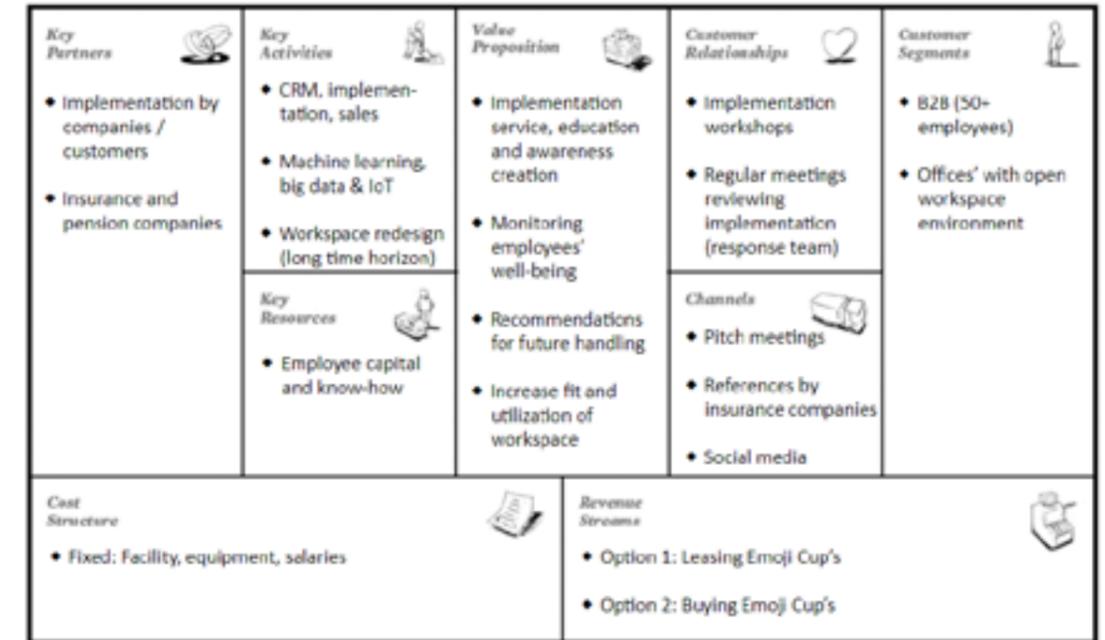


Figure 1: Business model canvas outlaying the strategy of Emoji Cup.

Since Emoji Cup is a start-up, only limited funding is provided which makes it difficult to almost impossible to use extern consultants to help achieving above. Thus the 'Key Resources' are employee capital and know-how which is developed intern. However, in order to succeed it is important to establish relationships with 'Key Partners'. As already mentioned earlier the close interaction with customers is necessary. Furthermore we think collaborations with insurance companies could be of great benefits for both parties. By successful implementation of Emoji Cup in companies work environment, the number of sick leaves decreases. Thus the insurance companies could benefit by paying less insurance money to their clients. On the other hand could Emoji Cup benefit from the huge customer base of insurance companies. Hence they can be used as a 'Channel' to distribute and sell Emoji Cup. Other channels include the use of direct contact to potential customers and the use of social media to create awareness. The latter is especially suitable for start-ups with limited recourses.

Finally should Emoji Cup's 'Customer Segments' target companies of medium and large size who uses or want to use open workspace environments. It is believed that a decent employee size is needed in a work environment for Emoji Cup to work efficiently, since smaller groups of employees do not have the same issues and possibilities of workspace improvements as larger groups.

Lastly we suggest two options for 'Revenue Streams'. First a leasing option and second a buy option. Again, since Emoji Cup is a start-up with low reputation customer would be reluctant to buy the concept without proper reviews. On the other hand does the 'Cost Structure' only contain expenses to rent, equipment and salaries, since no extern resources are used.

3.2 Value proposition

In the latter the general strategy of Emoji Cup is explained and analyzed briefly. Next we describe the value proposition more exhaustively. This is used in order to visualize the alignments and misalignments between a company's products & services and the customers' needs. This is also useful to determine customer gains and pains in order to measure how well Emoji Cup respectively creates and relieves those (Alexander Osterwalder & Yves Pigneur, 2010, p.28). An in depth analysis of the value proposition is shown in Figure 2.

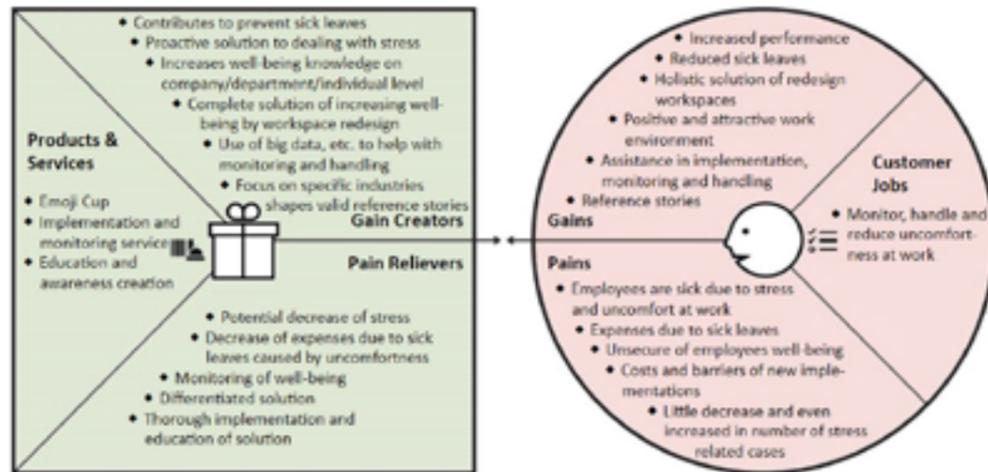


Figure 2: Value proposition to match fit between Emoji Cup and customers

Here the first part of the value proposition focuses on providing a proper implementation service towards customers, while also rising awareness as well as educating about the usefulness of Emoji Cup and well-being in general. These aspects are especially important because the use of Emoji Cup requires employees to actively interact in a new work environment (using the cup). Hence their behavior must be changed, which often requires the use of change management concepts. A stand-alone product without education and implementation services would most likely fail. This aspect relieves the pain of customers concerning the implementation barriers of new solutions. Furthermore do customers gain from assistance in the implementation phase which is also provided by the above.

Once implemented the values generated by Emoji Cup are the monitoring and processing of well-being data into useful recommendation. Recommendations which increase comfort level in the work environment directly and immediately by e.g. reduced noise level. Hence uncomforness is reduced leading to a decrease in sick leaves, a major pain reliever for customers. Furthermore do customers become more aware of the general well-being among employees which helps relieving another pain.

Taking a longer time horizon into account, customers gain greatly by holistic (re)design solutions for workspaces, which creates positive and attractive work environments. Thus we have decided that

another important recommendation feature of Emoji Cup should address this. Hence big data is used to translate well-being user feedback into data which can be used to create and design workspaces optimal for the customer's employees. Thereby performance is increased as well which creators gain to customers.

3.3 Financial forecast for Emoji Cup

The latter sections described the contribution and usefulness of Emoji Cup to create and relieve respectively customer gains and pains. Also it was explained how we suggest to translate this into reality by developing a suitable strategy for Emoji Cup. However, this might not be enough to convince potential investors to provide funding's which can help Emoji Cup roll out its product. Thus the following prepares a financial plan in order to give an indication of future cost and revenue leading to a financial forecast for Emoji Cup. This also benefits the team and other stakeholders behind Emoji Cup, by having a financial roadmap. However, remembering the resources available for this report only a brief analysis on cost, revenue and assumptions in relation to the financial situation is made. The outcome of this is visualized in Figure 3.

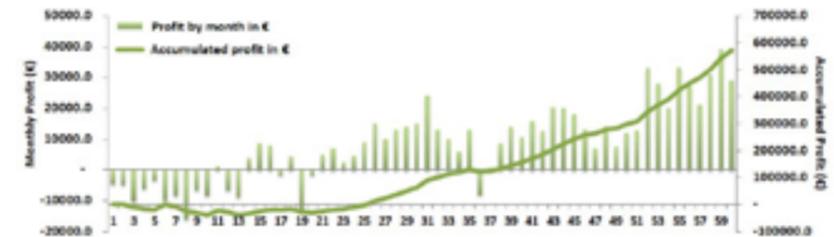


Figure 3 : Financial forecast for next five years with monthly and accumulated profits.

As seen does the initial phase cause loses since no revenue stream is generated. Instead capital is used to develop the software and hardware for a commercial Emoji Cup. Since our team does not have great competences within the development of software, two student software engineers are hired. The team we will work without payment the first year. Thus in order to survive the initial phase the project must be funded by public and private investors as well as loans. During the first year a collaboration with a customer is established in order to test the prototypes. The collaboration pays out as first orders are received during the first quarter of the second year. Hence the first positive net profits are obtained. Halfway into the second year further investments are made which causes net profit to decline heavily. Additional software engineers are hired and bigger production and research facilities are rented. As more customer orders are received, Emoji Cup becomes better reputation. This makes insurance companies willing to collaborate and suggest Emoji Cup to its clients. The collaboration becomes especially visible financially during the third year, where the accumulated profits for the first time rise above the break-even point at the end of that year. As demands increases other great investments are carried out at the beginning of year 4 & 5. This is noticed by declining net profits during these months. The investments were to hire additional human capital with the capability and development tasks to translate the data, gathered during the first 3-4 years, into useful information concerning the (re)design of workspaces. Thereby a second income source is generated. This solution produces great revenue causing the monthly profits during the fifth year to rise significantly, reaching a total accumulated profit above 500k €.

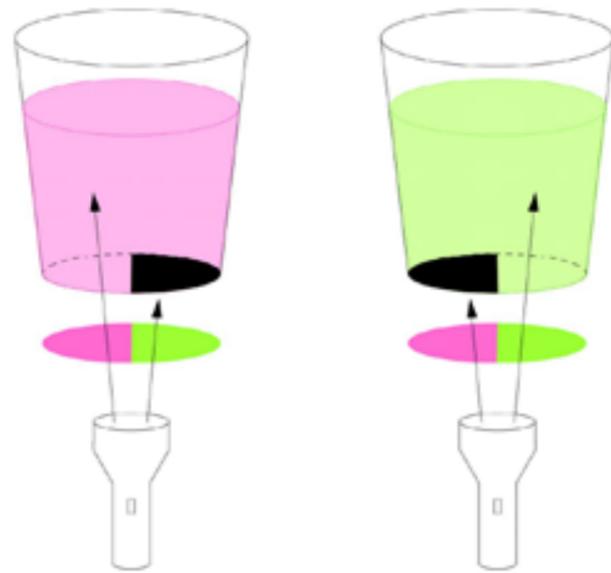
4.0 Prototype and concept description

The main purpose of the prototype was to make the concept clear during the presentation. It should be capable of both explaining the concept as well as entertaining. At the same time, it should come with pleasant aesthetic qualities. It is a concept prototype with no aim to test functionalities. Also, little focus has been put on longevity; its main purpose is to serve for one day.

The precise prototype concept was frequently altered during the design process. Less than changes on the concept itself, it was the availability of materials and components which played a significant role in the design of the prototype. There was never a complete, detailed plan of the prototype. Instead, design decisions were made on a running basis, often made based on the materials and components which could be found.

The prototype consists of several parts:

- Two glasses which present the emoji cups.
- The basis on which the cups are placed which represents the desk.
- Liquid in the glasses which has to provide specific visual characteristics.
- Light sources which illuminate the liquid in the glasses.



- **The glasses**

For reasons of both, easy availability as well as their neutral cylindrical design, the glasses of the buffet were chosen for representing the emoji cups. While the emoji cups in the concept are opaque and change their colour via LEDs on the outside, for reasons of both aesthetics and easy implementability it was decided to illuminate liquid in a glass.

Sticky coloured paper from the workshop equipment was attached to the bottom of the glasses for the sake of filtering the light coming from underneath for visually colouring the liquids in the glass. Purple and green paper was used, each colour occupying half of the glass's bottom. Thereby, switching the colour would easily be possible by rotating the glass or the light-source.

Issues involved the coloured papers becoming wet, thereby losing their stickiness which is why they had to be redone a few times throughout the testing.

- **The basis**

While it was originally intended to make the basis out of wood, we decided to switch to Styrofoam once we realized that we had it readily available in a suitable size and that it would be much easier to handle than wood, particularly considering the fact that the workshop downstairs was not available due to weekend closure.

It is basically a rectangle with two holes through which light can come through. It is placed on feet in order to be able to fit light sources underneath. Several adjustments were made during the testing for the purpose of dealing with the light sources including aids for being able to position the lights more easily. The base was placed on top of two pieces of plastic furniture again due to its easy mobility as well as the undisturbed perspective which is offered to the audience with this seating arrangement.

- **The liquid**

A liquid containing a very precise level of diffusion was required in order to let the emoji cup be illuminated in a visible colour. Water is too transparent, simply not taking up the colour effect created by the paper filter while most other liquids are too diffuse, not letting enough light pass through in order for the cup to be illuminated.

Therefore, a mixture of water and milk from the buffet was used for the sake of easy availability and neutral colour. The portion of the milk was extremely low; not more than a few drops taken with a small spoon. Several attempts, after each of which the dose of milk was further reduced, were necessary to get a fluency which shines bright in a saturated colour.



- **The light source**

While one original idea was to use coloured LEDs, we soon realized that there were much easier solutions. This is how we switched to white light sources with the colour tone being achieved by the coloured paper on the bottom of the glasses.

Initially, we planned to take smartphone flashlights as light sources. However, they turned out to be much too weak for this job. Instead, a bicycle headlight was used as well as high-performance torchlight. The headlight was matched with the person who changes the cup colour by rotating it since the hands can remain on the desk this way. For the person whose cup was turned red, a torch was used and the colour change performed by slightly rotating the light so that it would shine through the purple, respectively green part of the bottom. This way it should look as if the liquid had turned red by itself.

- **Prototyping process**

The actual prototyping started at approximately 2pm at the final day. Lubna and Julian were main responsible for creating the prototypes. While being under a very tight time constraint, progress was made surprisingly fast; by 3pm the main components were already ready. From 3pm to 4pm optimization was done, trying out different light sources as well as finding the ideal mix for the liquid in order to achieve bright and saturated colours in the presentation.

- **Final Thoughts and Lessons to take out of the prototype**

The prototype was designed to give the audience an aesthetic experience and an understanding of how the technology works. Thereby, little emphasis was given on how the cup might look like in its later design and conflicts between aesthetics/understandability and realism usually resolved in favour of aesthetics and understandability. In hindsight this seems to have been the optimal strategy since this allowed for a fast production process as well as a vivid and convincing presentation. While everyone was aware of the lack of realism, it did not matter at all and we do not think that our presentation would have been much better had we had a more realistic prototype.

It is a lesson to take away for the future, demonstrating how irrelevant the degree of realism and perfection of craftwork can actually be when it comes to presentation objects. Considering with how little effort a convincing prototype was achieved, this is a plea for seeing presentations from a spectator-centric view and carefully estimating which features are actually relevant for creating convincing effects and how a lot of effort can be saved.

5.0 System prototyping and scenarios

Zone 1



The Emoji Cup with a Location detector in order to define the current zone and lighting unit to give a direct sign, both inserted in the basic part of the cup, this essential part is provided with a

Zone 1



In case of discomfort or disruption the user can rotate the cup and notify the others that the noise level is not acceptable, the rotation of one's cup can change the color of other cups

Zone 1



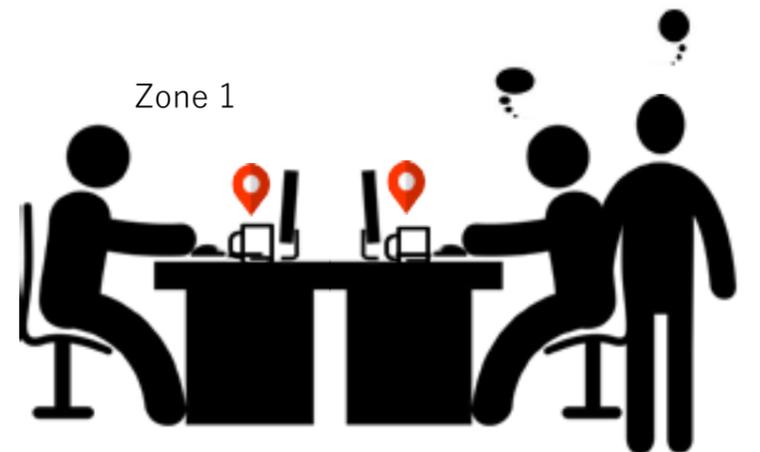
☺ Each user has his own Emoji Cup, the cups are not lighting in case of acoustic comfort

Zone 1



☹ The user reacts directly and gives a sign to the other colleagues that they are being too loud.

Zone 1

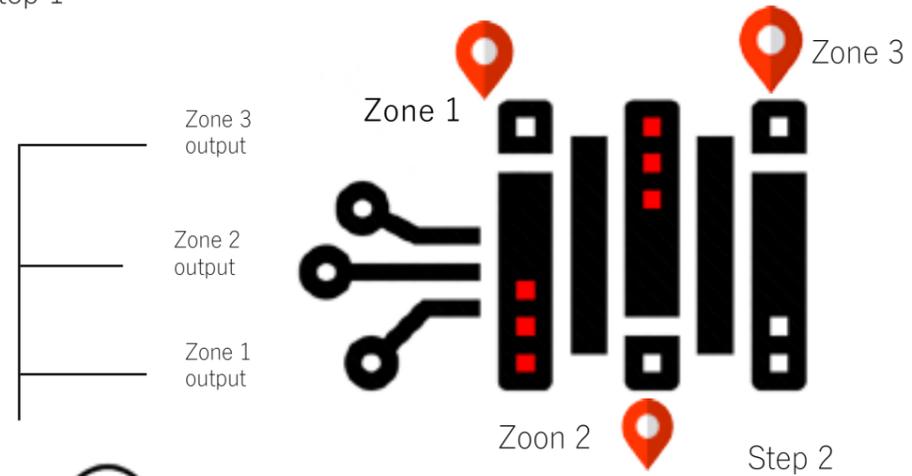


☺ The colleague notices the change of the cup's color and responds immediately by decreasing the noise level and rotating the cup again

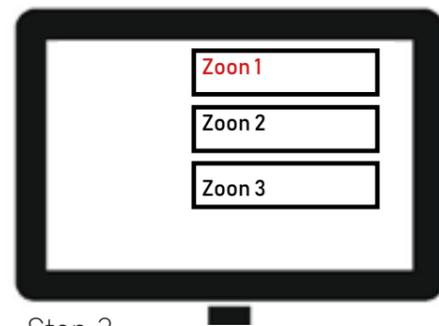


Step 1

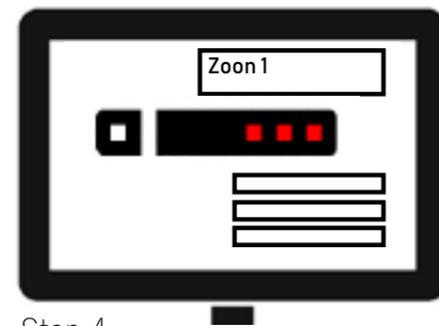
The open working area is divided into different zones to collect precise feedback and to facilitate the process of detecting critical areas where the sign of discomfort is often repeated.



Step 2

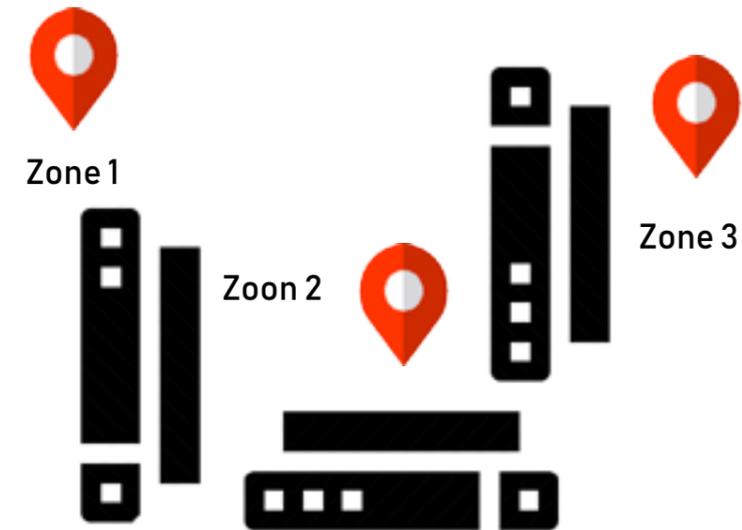


Step 3



Step 4

<p>When and How often?</p>	<p>Where?</p>	<p>How is the comfort level changing through time?</p>	<p>How many users are complaining about discomfort?</p>
----------------------------	---------------	--	---



Step 5

Make the Change

Using data to alter the spatial configuration of working space



Step 6

Store Data

Creating database as a reference to be used in designing open working spaces

Step 7

Re-evaluate space



6.0 Documentation of the Workshop

During the 3-days-workshop, we have followed the principles of the Enterprise Design Thinking of IBM to reach our goal. We conducted the iterative design process according to it using different approaches that have been taught in the workshop by the speaker from IBM Munich, and moved forward with our facilitator from IBM, Dawn Ahukanna (on the 1st day), Svenja Laing (2nd day) and Christoph (3rd day), to carry out our idea.

6.1 Day 1:

- **Briefing:** The background and purpose of the project was introduced through 3 lectures. We built our interdisciplinary team in 5 and kicked-off.
- **User Definition:** Who is our user? How can we get to know our users in a workshop lasts for just 3 days? The outcome of user points out the direction of our further work and serves as the criteria for evaluation throughout the design process. It is very important. After consideration, we have chosen the **“Architectural Consultant”** as our target user. Since 3 of us are architects, we can get useful information and relevant universal knowledge in the most convenient way within the limited time.
- **Understanding our User:** After defining a specific group of users, we have aligned the team around the understanding of them. We've done this in 2 steps. Firstly, we listened to the narrations from our team members. We asked questions and discussed various definitions together. Secondly, by using the Empathy Map, we try to figure out more concrete information about our user. 4 quadrants were listed: what he/her says, does, thinks and feels. A name for him/her was given (Julian) and sticky notes for the 4 points were written and were stuck around its profile picture. (fig.04) After the diverge phase, we classified and analyzed our outcome. At the end, all of us come to a point of view of who Julian is, and what is his actual task and the obstacles he faced in his work.



Figure 4. Using the Empathy Map



Figure 5. Interviewing the consultants from BCG

- **User Research Validation:** We considered that the user research shouldn't only rely on our own imagination. Our outcome from the Empathy Map should be tested and improved by our Sponsor Users. Therefore, we've interviewed 2 consultants from BCG, Antje Horn (Recruiting Coordinator from BCG) and Dr. Pe-Ru Tsen (Global Digital Workplace, Strategy Director) and asked for their opinion towards our user definition. (fig.05) With the help of their feedbacks, we were able to restrict the scope of our user group more clearly: They are consultants with architectural background working in consulting companies like BCG. Their task is to persuade the customer that architectural changes make sense, and a retransformation should be considered if it is found as the best solution to the aroused problems.

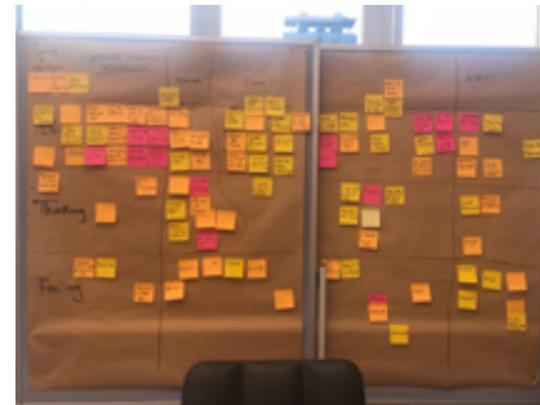


Figure 6. Using the Scenario Map

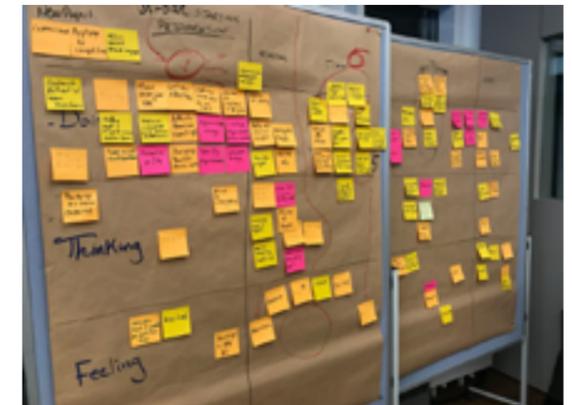


Figure 7. Evaluation of the user pain points

- **Understanding User Workflows:** We then went further for learning user's activities in the context. What is their task? How they behave in order to accomplish their task? How is their motivation and how they feel in the process? By using the As-is Scenario Map, we extended the 3 items from the Empathy Map, “Doing”, “Thinking” & “Feeling”, with concrete user activities and arranged them in chronological order. The user workflow was by this mean depicted. (fig.06)
- **Selection of Pain Points:** We highlighted potential pain points from the Scenario Map and scored them through discussions. We collected the ones with the highest scores and worked on them in the next phase. (fig.07)
- **Description and Presentation:** After Synthesizing and summarizing all the information, we were able to make a clear description to our target user and a presentation to this user-research phase was given. Meanwhile, some questions and assumptions were also be announced and were answered by other facilitators.

6.2 Day 2:

- **Needs Statement:** After defining the specific user, further questions came to our mind: How should we serve our user? What kind of problem should we solve for them? To make them clear, we have used the **Needs Statement** here. By forming the sentence, ___needs a way to ___so that___, for the most important pain points, we come closer to the user needs under the problems on the surface. (fig.08) After selecting the most vital pain point, “needs to translate between Architecture and Business”, we came together to a point of view of our design goal. (fig.09)

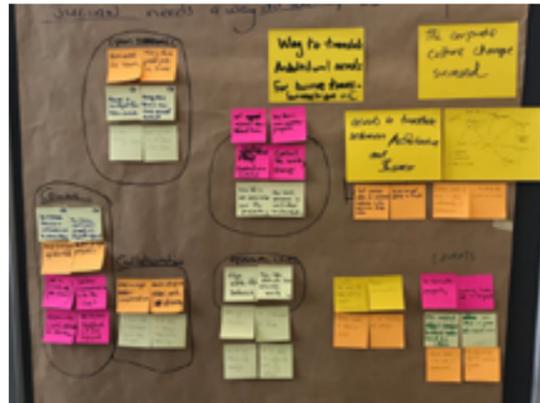


Figure 8. Need Statements

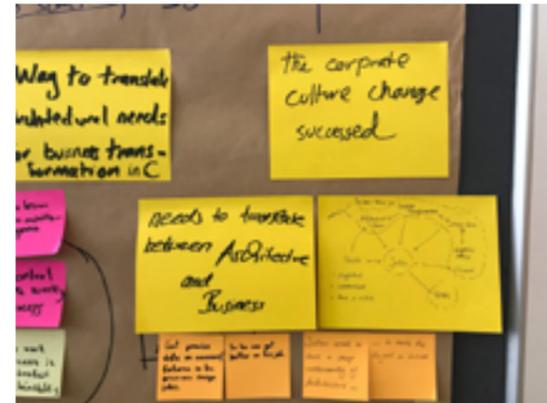


Figure 9 Selection of the Needs

- **Mission and Vision:** The mission and vision of our project was clear at this stage.
- **Vision:** Julian needs a way to translate architectural needs in C-Level language for the Business Transformation.
- **Mission:** Julian needs a way to measure the architectural impact on the business transformation, so that he gets better and convincing in his job.
- **Brainstorming for Possible Solutions:** We then set out on searching suitable ideas for solving the problems for our user. In the pre-development phase, instead of involving in concrete solutions, we tended to gather only rough ideas, including some fanciful scenarios. The “Big Idea Vignettes” method helped us with the exploration of ideas without dismissing or excluding any of them. By sharing the concepts on the board using sticky notes with titles and graphics, we gained a quick overview of what other members are thinking and could also extend their idea further. (fig.10, 11)
- **Selecting One of the Ideas:** We conducted 3 rounds of evaluation in order to find out the most important and most appropriate idea. After listening carefully to the arguments for each of the concepts, each of us voted 3 of the concepts. Then we selected the 5 of the most popular ones and discussed again. The progress was repeated for 3 times. At the end, we were able to select only one best idea and we aligned us around its development.



Figure 10. Brainstorming and evaluation in 1st round

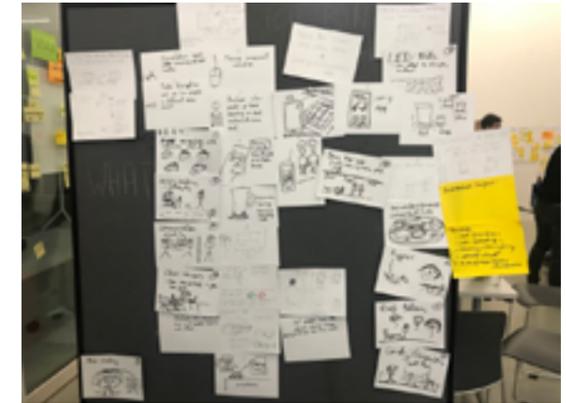


Figure 11. Brainstorming in 2nd round.

- **Presenting the Idea:** The next step is to tell our story for Julian in the to-be context. **Storyboarding** is a good method for this. We sketched the whole scenario, from who is Julian, to what problem does he face, till how the problem can be solved through our product, in 6 frames, so that everyone out of our team can also get our idea quickly and clearly. Each of us have tried to sketch out the story. (fig.12) By sharing the quick sketch, we get aligned around the concept again. The best part of each story was chosen and combined into the final story. (fig.13)



Figure 12 Story from all teammates

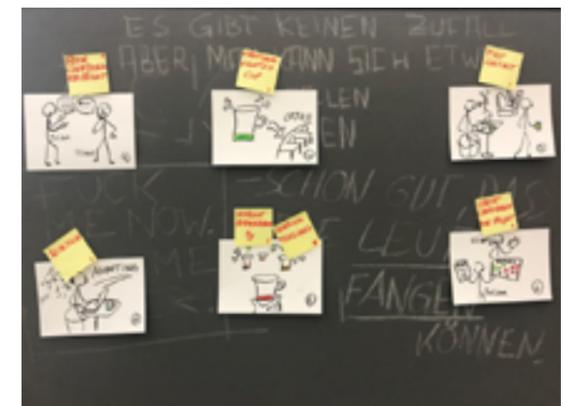


Figure 13. The end version of our story

6.3 Day 3:

- **Defining the Features:** At this stage, we dived into the details of our product. Functional features, like suitable for dishwasher, detachable and chargeable, were considered and discussed. (fig.14)
- **Prototyping:** While defining the detailed features, we also use the objects by the hand for prototyping and testing. So different assumption can be validated or invalidated quickly. (fig.15)



Figure 14. Discussion for the functions



Figure 15. Prototyping and testing

7.0 Personal statements:

Christoph

A great workshop with input from many different people, originating from different industries with different backgrounds. This gave occasion to foster creativity and innovation. Especially the help from facilitators were useful. The diversification within the group was less with four architecture students and only one management students. However, it seemed that the diversification among the architecture students was good which lead to intense discussion. Hence in the end a successful product was developed.

Danqing

The teamwork of us was successful. We tried our best to express and understand each of the others. We treasured every idea and every question. Each of us make his/her contribution to the outcome with great passion. I feel so lucky and happy to work in this team. And I believe that we have achieved what we wanted during the intensive 3 days in the workshop. There is also a small tendency, that we tried to take the tasks that are relevant to our background and more familiar to us. But in fact, I would say most of the time we just worked together very closely. The proactivity drove us to take part in every step together. And the “disordered” cross-disciplinary cooperation runs very efficiently.

Julian

In general I think we got very lucky with the group composition since we understood each other quite well with everyone knowing what the other person is talking about. Even more importantly, you could not possibly have made out one person as the team leader; everyone was approximately equally important, at the same time (or maybe because of that) the process happened in a very well-coordinated way. Except for Christoph, we come from the same field/related fields which is why I do not dare to judge the role of interdisciplinary in this context too much, though I think it was very useful.

Lubna

The harmonic interaction between the participants of our group was extremely beneficial in making decision from the very early stage of the process, the communication between each other facilitated the development task from different perspectives in parallel. Through constructive discussions, each one of us could point out different positivities and negativities in order to bring the concept to another level. This experiment helped me as an architect discovering some quick effective techniques of addressing, analyzing and solving complicated problems. The designing process was not conventional, we were able to provide solutions and alternatives in a highly fast rhythm, which gave me more confidence that the architect is actually a flexible intellectual and he is capable to adapt and and expand his profession limits way further when he is engaged into an innovative and collaborative environment.

Philipp

Brainstorming with this group of talented and motivated students was a blast for me. We got a very nice kick-off in the field of “design-thinking” by Shawn. After working with her, it was understood that we could only be successful if every opinion would be considered. Regarding our final product I think we can be very proud. We thought about something original and new and we were able to communicate our idea quite well. Seeing the actual potential of the product, I still wonder if it would actually be used, but before we haven’t tried out, we wont know. The interdisciplinary work was surely important, but regarding the fact that christoph had to work with four Architects as the only management-student, it can be said that it is difficult to state on the interdisciplinary effect. I am very happy I got the chance to work under the circumstances and I am thankful for having met my teammates.

8.0 Literature and Bibliography.:

1-<https://www.gensler.com/research-insight/gensler-research-institute/u-k-workplace-survey-2016>

2-<https://www.daserste.de/information/wissen-kultur/w-wie-wissen/schwarmintelligenz-100.html>

3-Iain Couzin <http://collectivebehaviour.com/people/couzin-iain/>

4-<https://www.daserste.de/information/wissen-kultur/w-wie-wissen/schwarmintelligenz-100.html>

5-<https://www.youtube.com/watch?v=WswlMbeuXfl>

6-<https://play.google.com/store/apps/details?id=com.foursquare.robin&hl=de>

7-<https://play.google.com/store/apps/details?id=com.foursquare.robin&hl=de>

8-<https://hackernoon.com/@sparklinguy>

Figure (1) (Alexander Osterwalder & Yves Pigneur, 2010, p.15)

Figure (2) Alexander Osterwalder & Yves Pigneur, 2010, p.28)

Icons: <https://www.flaticon.com/search>

(Figure 4_15) Huang-Danqing_Digital You Design Workshop

Design Thinking Lab

Team WOW



Team:

Yonne-Luca Hack, Jais Skovgaard Jørgensen, Ekaterina Vyrodova, Jose Pabon Andrade

Report developed by:

Jais Skovgaard Jørgensen, Technology and Management

Ekaterina Vyrodova, Industrial Design

Jose Pabon Andrade, Architect

Supervisor:

Christos, Chantzaras Engineer and Architect, Technische Universität München

Technical University of Munich

Words: 6.260

Hand-in date: 11/01/2019

Executive summary

The three-day Design Thinking Lab “Workspaces for DigitalYOU” was organized by BauHow5 alliance, The Boston Consulting Group (BCG) and IBM Watson, and provided interdisciplinary teamwork with multidisciplinary students. The focus was to create new radical ideas for workspace of the future. This group consist of two architect students and two engineer students with different specializations. The ideas are developed based on the methods provided by the facilitators, including general ideate methods, empathy map, need statement and storyboarding. The development of the ideation process is characterized of highly elaborative with strong focus on discussion between the groups. Several restructuring loops are developed to focus the concept to key issues, and the development of the concept. This also includes several playbacks in groups and open forum.

The concept developed consider consultants working in unfamiliar environments at client sites, where they need to inspire the client to maximize project value. The persona developed for advancing the concept development, is a fictive consultant named Oskar who need to develop an initial workshop at a client site with his team. And as-is scenario and need statement is developed to focus the ideation, and all ideas are proposed by the group and categorized. In the end, the concept is made into the WOW glasses, which is a pair of augmented reality glasses with an extensive software. The WOW glasses provide the consultant the possibility to adapt unfamiliar environment by scanning the room and provides suggestions for other setups based on project objectives provided by the consultant and client. The consultant and client WOW glasses are connected, making it possible to co-create and work on the same content in real time. Similar to people working on a cloud-synced document. However, the WOW glasses benefit from not being limited to a screen or a keyboard to create and visualize content.

Finally, the business development proposes an initial business model using the Business Model Canvas⁶. As the concept is very new and radical, the value proposition canvas is further analyzed by using the Value Proposition Canvas⁷. A simplified revenue and financial overview for the first five years is provided, considering a one-year development phase, required investments needs, cost and revenue, and setup of the potential start-up. Please find the complete financial overview in the Appendix and as a separate file in Excel.

Further development of the concept requires additionally prototyping, establishment of key relationships, funding, feedback from user group, and dedicated personal to develop the concept into a potential successful start-up.

Content

Executive summary.....	2
Content.....	3
1. Introduction.....	4
2. Methods.....	5
2.1 Ideate Methods.....	5
2.1.1 Workshop Rules.....	5
2.2 Empathy Map.....	6
2.3 As-is Scenario Map.....	7
2.4 Need Statement.....	7
2.5 Storyboarding.....	8
3. Concept.....	9
3.1 WOW Glasses - Vision of a co-creation space through Augmented Reality.....	9
4. Business Development.....	16
4.1 Initial Business Model.....	16
4.2 Value Proposition.....	17
4.3 Financial overview.....	18
4.3.1 Assumptions.....	18
4.3.2 Development phase.....	19
4.3.3 The simplified financial and revenue plan.....	19
5. Personal Statement.....	21
6. Literature.....	22
7. Appendix.....	23
7.1 Yearly financial overview.....	23
7.2 Pitch presentation at the final day of the workshop.....	24

1. Introduction

A three-day Design Thinking Lab “Workspaces for DigitalYOU” was organized by BauHow5 alliance, The Boston Consulting Group (BCG) and IBM Watson. The workshop is part of the 3-year Erasmus+ Strategic Partnership “Strengthening Architecture and the Built Environment Research” (SABRE), conducted by five leading European universities in architecture and the built environment (BauHow5), co-funded by the Erasmus+ program of the European Union.

The Design Thinking Lab took place the 22nd to 24th of November in the headquarter of BCG in Munich and at the Technical University of Munich (TUM). The working process was organized as an interdisciplinary teamwork with multidisciplinary students.

Our team consists of two architects and two engineers. The teams’ name is “WOW – We Organize Work”. The goal of our project is to create a different environment when a consultant is working on a client’s site. We are suggesting an implementation of an augmented reality glasses in the working process of a consultant with a client.

The report addresses our teamwork results on prototyping a vision of tomorrow’s workspaces and is divided on four parts: methods, concept, prototyping and further business development. The first part includes description of the methods used in the Design Thinking Lab: general ideate methods, empathy map, need statement and storyboarding. The second part outlines the developed concept by defining the problem and finding a solution. The third part focuses on the business side of our concept together with a simplified financial plan for the first five years.

The report is accompanied by personal statements of team members on the interdisciplinary work and its applicability to foster creativity and innovation. A presentation of the pitch hold in the final day of the design thinking lab is attached in the Appendix chapter of the report.



2. Methods

Most of the methods used during the Design Thinking Lab are developed by IBM’s Enterprise Design Thinking.

2.1 Ideate Methods

Ideation is the main part of the Design Thinking process. There is a variety of ideation techniques, for example brainstorming, mindmapping, prototyping and storyboarding. The ideation techniques, which were used on the workshop, are briefly described in this chapter.

Brainstorming

During a Brainstorm session, the synergy of the group is leveraged to reach new ideas by building on others’ ideas. As a result, ideas are blended to become one good idea. It is important, that “participants should be able to discuss their ideas freely without fear of criticism”⁵. Irrational ideas can appear in the process of brainstorming, but they can turn into an unexpected solution. This will allow the team’s members to reach further than they could, by simply thinking logically or working on their own about a problem⁸.

Braindumping

Braindump session is very similar to Brainstorm, however it’s done individually. “The participants write down their ideas on post-it notes and share their ideas later with the group”⁵. This method as a part of other methods was predominantly used during the workshop.

Provocation (What if?)

Provocation is “a lateral thinking technique, which allows a team to explore new possibilities of further developing of an idea or to find weaknesses of this idea”¹. The Brainstorm cards developed by a company “Board of innovation” were used as a provocation technique in the workshop. There are three steps of using the cards:

- start with a challenge or problem;
- use the cards for inspiration. (Start with an individual brainstorm.) Come up with ideas for 20 minutes;
- share ideas with the team and build further on the best ones.

Storyboarding

Storyboarding a visual story relating to the problem, design, or solution, that you want to explain or explore⁴. “Storyboarding can help a group to bring a situation to life. It can show what happens over time”⁵.

Prototyping

Prototyping itself can be an ideation technique. When you create a physical object, you need to make decisions, and this encourages the generation of new ideas. Prototyping allows to detail an idea³.

2.1.1 Workshop Rules

The next rules for the ideation process were used during the whole workshop:

- **Write before you talk.** Write or sketch many of your ideas on sticky notes before talking about them. During discussions, capture the main points on sticky notes and post to the wall.
- **There are no bad ideas.** Start big. Diverge to get everyone’s ideas out there. Come back together to discuss, cluster, and seek patterns. Then, converge to determine the strongest ideas.
- **Stay focused on your users.** Tell stories about users to keep them at the center of your attention.
- **Everyone participates.** Everyone has a marker and a pad of sticky notes.
- **Stay engaged.** Avoid side conversations. Use a “parking lot” to capture issues that are off-topic.
- **Start on time.** To meet our goals, we need to watch the clock and stick to the plan.
- Instead of dismissing the ideas that your teammates suggest, push yourself to build on them².

2.2 Empathy Map

The work on the project in Design Thinking Lab was started with an Empathy Map. This phase allowed the team to define the user of the product and discover the customer needs.

To archive an effective teamwork everybody should have a chance to express his / her opinion to others. "Empathy Maps is aimed to synthesize team's collective knowledge about users as a group and bring team closer to a common understanding of the user"². The empathy map was also used to refresh team's understanding before an important decision in each phase of work. Empathy Mapping is best treated as an ongoing activity. As an understanding of the team grows and evolves, the activity can be revisited periodically.

According to the IBM's method the work on an empathy map is divided on several steps:

Come prepared with observations

Team members should use just defensible data, for example an interview or contextual inquiry. Whenever possible users should be invited to participation.

Set up the activity

Drawing of four essential quadrants of the map: Says, Does, Thinks, and Feels. Sketching team's user or stakeholder in the center. Giving them a name and brief description of who they are and what they do.

Capture observations

Recording what everyone knows about the user or stakeholder by using one sticky note per observation. Placing it on the appropriate quadrant of the map.

Find patterns and identify unknowns

Combining similar or related items in groups within each quadrant. Imagining how these different aspects of your user's life really affect how they feel.

Playback and discuss

Labeling anything on the map that might be an assumption or a question for later inquiry or validation. Looking for interesting observations or insights.



Figure 1: Empathy Map "Young Talent Oskar"

2.3 As-is Scenario Map

The next step after empathy map was As-is scenario map. The method helped to identify opportunities for improvement.

Before starting working on the method the time framework of user's experience should be defined (for example a day, a business trip, a year). The method is done in five steps:

Setup

Preparation to brainstorming in form of drawing of four rows and labeling them: Phases, Doing, Thinking and Feeling.

Brainstorm

Each team member should do this step individually. Everyone should think about next questions: "What is our user doing, thinking, and feeling throughout their experience?". The corresponding rows should be filled using one sticky note per answer.

Review and cluster

Clustering similar stickies and refining the order. Identifying the unique phases of team's user's current experience during defined time framework. Naming the phases as they become clear.

Identify highs and lows

Labeling areas that are positive or negative for team's user. Blanking areas where information is missing.

Playback

Presenting results helps to define pain points in the user's experience, what becomes a starting point to developing the project. Besides the gaps in team's knowledge can be filled with feedback after the presentation.

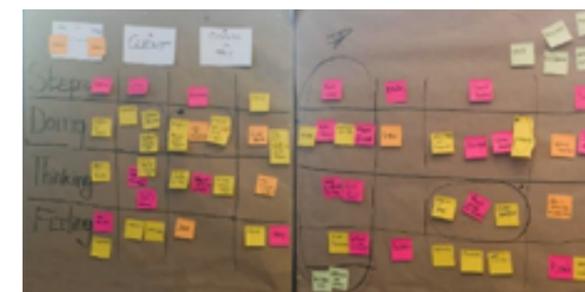


Figure 2: As-is Scenario Map "Oskar's day on a client's site"

2.4 Need Statement

The method was used to outline what user needs in order to focus on ideas that help to archive their goals. "This helps to be more user-centered and not to lose the main focus of the project"².

The work on need statement can be started after as – is scenario map, when the pain points of the user's experience are defined. The method includes five steps:

Gather

Preparation of defensible data based on real observation. Statements are only as reliable as the data team has.

Setup

Framing the activity by writing the following prompt: "[Our user] needs a way to [addresses this need] so that they [benefit in this way]".

Diverge

Diverging on the needs and benefits team is solving. It is helpful to stay away from writing features as best as possible.

Converge

Clustering similar ideas and discussing them. While converging a few Needs Statements that represent key elements can already be written.

Playback

Presenting the results, asking new questions based on this exercise



Figure 3: Need Statement Brainstorming

2.5 Storyboarding

After the opportunities for improvement have been identified, group work was started with a brainstorming to choose the best possible form for a generated idea. To define idea more certainly the provocation technique (what if cards) was tested. In order to understand how your idea fits into user's world the method of storyboarding was used.

Team can use Storyboards once it knows the "problem it is trying to solve, and for whom. Drawing a storyboard helps to share an idea for user's future quickly and visually" ² anytime when team needs it. A recommended time for this activity is 20 minutes.

The method has three steps, which are done individually:

Identify

Starting with a story. Identifying a character, a setting, and a plot. Then, picking scenes that shows plot development from start to finish. It is important to include any major events - a shift in setting, the introduction of a new character, or a plot twist in the narrative.

Illustrate

Making a storyboard like a comic strip. Combining quick sketches with speech and thought bubbles, action bursts, captions, and narration. Labeling anything on the storyboard that may be an assumption or a question for later inquiry or validation. Usually it is quite difficult to get it right the first time. It is helpful to iterate until you arrive at a story you are confident could come true.

Playback

Each team's member plays back their Storyboard. The next questions will help to create a final storyboard of the team, which is the most accurate ¹.

- What common elements are shared across multiple stories?
- How might you converge your stories into a shared vision of your user's future experience?
- What assumptions exist in your Storyboards that your team still needs to validate?



Figure 4: Four storyboards done by group members individually



Figure 5: Final storyboard

3. Concept

3.1 WOW Glasses - Vision of a co-creation space through Augmented Reality

The goal of the concept is to enable the consultant to inspire the client to maximize project value.

The following chapter will explain the customer and the process that led to the development of the concept.

Persona – Empathy map

The persona developed is a 28-year-old man named Oskar. He is a consultant working as a project manager at BCG. Part of his daily activities are talking with clients, organizing meetings with his colleagues and taking part in conferences with his superiors. He then reports the progress of his and his team work, which is mostly done at the client's site.

Oskar has a very busy schedule and must take care of his team tasks, as well as his individual work, which includes coming up with new and

creative strategies to ensure success at the work done by him and his team on their projects. Nevertheless, Oskar still finds time to meet his friends for a nice chat and a cup of coffee.

Oskar's daily work routine circles around a successful communication. He looks for advice from his mentors, gives feedback to his team members and tries to work as efficiently as he can to accomplish the project's deadlines.

He often thinks about his individual goals as well. Oskar is very career-focused and likes to plan his way up the professional ladder. Still, he has his feet on the ground and never loses sight of the team's workflow within a project.

Therefore, he loves it when he and his team are on the flow and manage to bring the projects further than what they expected. He's very self-confident and optimistic about the way he manages his work and the work of others. Even so, he can't avoid feeling stressed before a deadline and nervous when facing a new client in an uncertain environment.

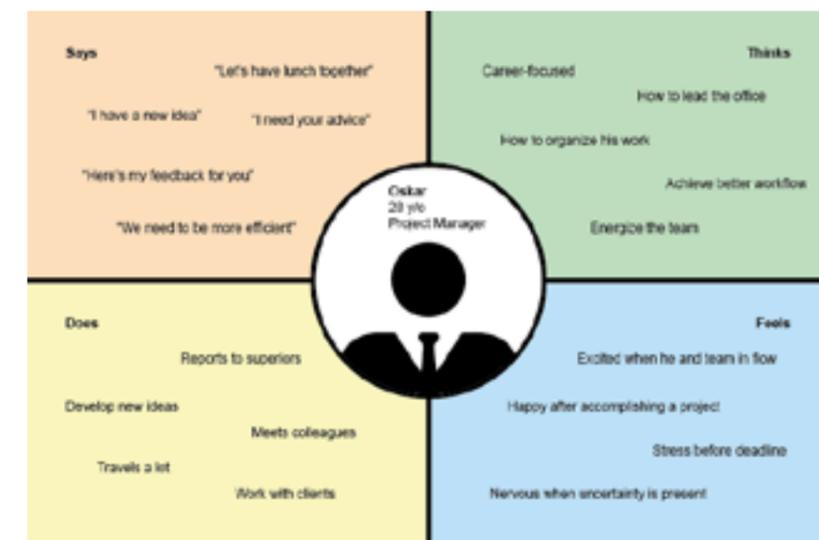


Figure 6: Extract from Empathy Map from Oskar

A day in the life of Oskar – As-Is-Scenario

In order to understand Oskar’s point of view, it is essential to step into his shoes and find out what are the greatest pain points in his daily activities. Hence, develop a solution focused on solving these issues.

In our case, it was decided to focus on a project Oskar and his team were preparing for a client. For this, they are getting ready for their first meeting at the client’s site and, after their first encounter, prepare a workshop to receive information from the client, so they can make analysis and further planning of the project.

Initially, the day in question was divided into subsystems which include activities, what Oskar are going to do, think and feel at each step of the day.

The day began with Oskar and his team arriving at the client site. He was getting the team together and thought about how to give a first good impression. When the meeting started, the

team began to collect data, while Oskar moderates. He was focused on the objectives of the project, but also consider the team dynamic. This includes if the team were comfortable within the client’s space. Resulting in mixed feelings between being nervous and motivated, which leads to a pain point during his daily routine.

The biggest pain point identified was when Oskar and his team have to prepare a workshop for collecting information. As the client site was an unfamiliar setting, they did not know which facilities they would have available and how the room would look like. This meant they could not prepare the facilities for the workshop. The team had little time to understand this new environment and prepare it for the workshop, which can lead to non-optimal decisions and failure when engaging the client.

Steps	Arrive	First Encounter	Preparing Workshop	Workshop
Doing	Gathering Team	Moderating	Organizing	Engaging team and client
Thinking	Good first impression	Goals for the meeting	“How do we deal with this new environment?”	“Is this going well?”
Feeling	Nervous	Nervous Motivated	Frustrated	Time pressure

Figure 7: As-Is-Scenario developed during the workshop

A solution for Oskar’s biggest pain point - Need Statement

From the pain points found in Oskar’s scenario, unfulfilled needs were derived, which lead to a potential value creation for him and his team. The situation of unfamiliar environment at client site could potential harm the workshop due to three variables: the physical environment, the team environment and the team management.

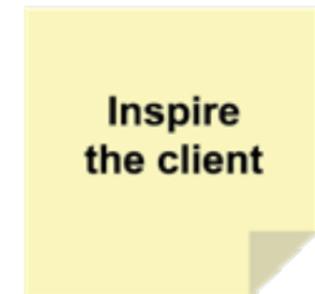
In order to focus on improving one specific variable, the following assumptions were made: Oskar is a young talent, therefore, a great project manager. This assumption made it possible to set aside all factors influencing the team dynamics and Oskar’s leadership. Furthermore, it was assumed that the team is highly efficient with good communication inside the team. Thereby, the challenge imposed and need stems from variable of physical environment.

It is important for Oskar to ensure that he and his team were able to work with the unfamiliar environment when preparing the workshop, to achieve the goal of engaging the client more efficiently and maximize the project value. However, the uncertainty regarding the environment and efficiently adapt this to project objectives, the following need statement was derived:

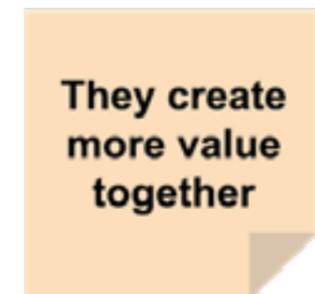
“Oskar needs a way to inspire the client, so that they create more value together.”



Needs a way to



So that



Big Idea Vignettes

Based on Oskar's need statement, different ideas and concepts were developed to solve the problem of uncertainty around the physical environment at client site.

One idea was to bring a physical space to the client. This eliminates the space uncertainty completely by enabling the possibility to prepare an environment for the workshop in advance. This could be done in different ways, such as a team container, where a workshop environment is prepared beforehand, a sprint space, with pop-up elements or even a virtual environment, created from scratch for this purpose.

Another idea was to influence the environment of each person and that way contribute to creating an inspirational environment for the client. This could be done by adapting light, temperature or sound individually to improve comfort. Possible solutions in this direction are personalized inspiration kits, specially made for the client, a portable light and heater for each person or even a cushion, that suits individual needs.

The final idea developed, was to create an environment within the client space. It was something that adapts to the setting faced by the team at the client's site. This can be a device that scans the place and maps content within the found boundaries. With Augmented Reality (AR), the environment can be adapted electronically, where the client and the team work together in an interactive way. Different to Virtual Reality, it connects more efficiently with the familiar environment for the client but adapts it enough to maximize the setting for increasing project value.

The final concept developed was after extensive discussion decided to be further developed.

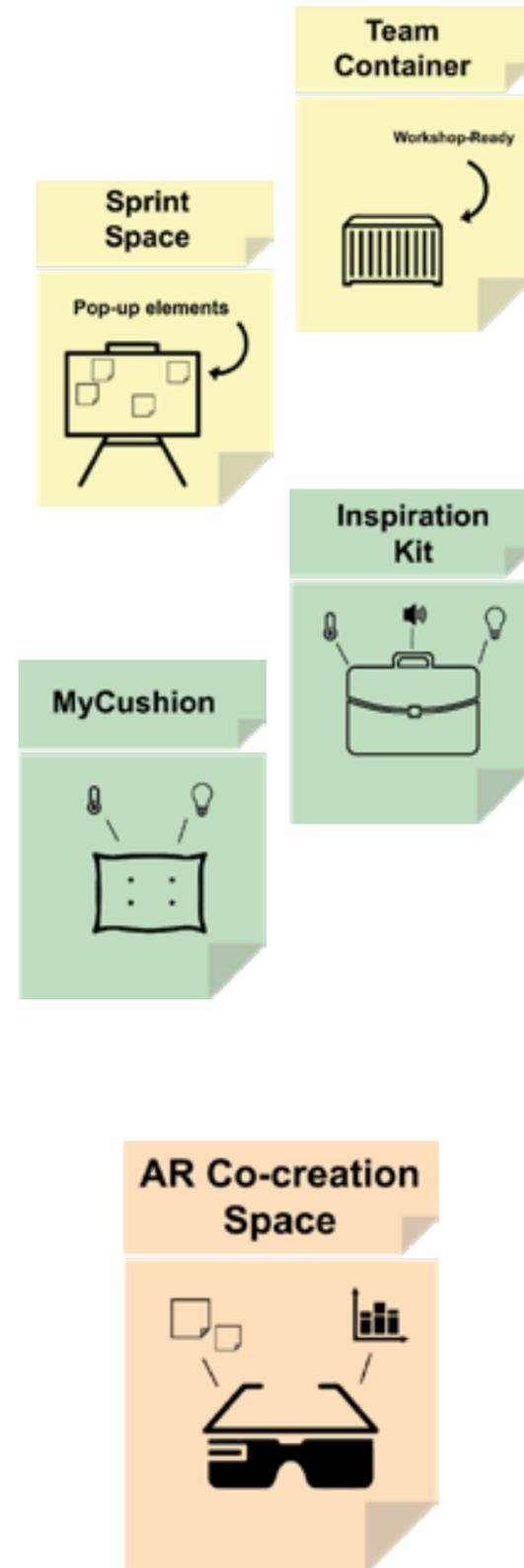


Figure 8: Big Idea Vignettes

WOW Glasses

The WOW Glasses were developed to support consultants in engaging their clients more efficiently and maximize project value. The product used AR glasses with specialized software, which provides the user a more interactive possibility to discuss the project, share information and utilize back-office support.

The key feature is the possibility to adapt unfamiliar environment in order to increase creativity or other project needs. The WOW glasses scan the room and provides suggestions for other setups based on project objectives provided by the consultant and client.



Figure 10: WOW Glasses

Furthermore, the consultant and client WOW glasses are connected, making it possible to co-create and work on the same content in real time. Similar to people working on a cloud-synced document. However, the WOW glasses benefit from not being limited to a screen or a keyboard to create and visualize content. Instead, the glasses recognize the movement

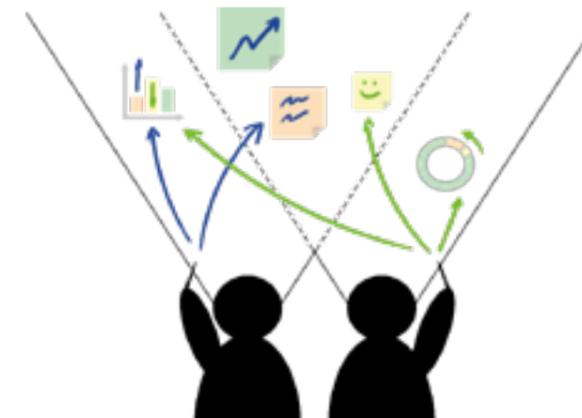


Figure 11: Interaction examples in the digital space
Copyright © 2018 by Team WOW

actions, such as handwriting, swiping, etc. as illustrated by figure 11.

To increase the "wow"-effect and inspire the client, the complete user journey was analyzed. This includes the unboxing experience, which is combined with individualization of the product to create a unique inspirational experience from the very beginning.



Figure 12: Personalized WOW Box

With the WOW glasses, uncertainty of physical environment is limited and provides the consultant team the confidence to develop any kind of workshop setting they need. The immersive experience created through the glasses support the client engagement and inspired to co-create with the consultant team. Most importantly, the WOW glasses interact with the user and guide him through this experience, making it intuitive and easy to learn. Limiting the training need with the client and allows voice and gestures to interact with the digital space.

Storyboard – Oskar meets the client

To relate the concept to our user-case with Oskar, a common scenario was displayed that Oskar and his team might encounter.

They are on their way to a client from BMW named Jan for the first time, who oversees the merger and acquisition of a 3D Printing company. They want to develop a workshop to gather as much data as possible from their first meeting, and at the same time inspire Jan to engage in the process and add as much input as he can. That way both can be sure that their involvement and productivity in the project is high.

As Oskar expected, the facilities offered by the client do not support creativity, which in previous times would have led to the team having to come up with non-optimal solutions to somehow create the environment needed for the workshop.

Nevertheless, Oskar has foreseen this and acquired WOW Glasses for everybody. He is now able to adapt the environment to his needs and work within a digital space with the client together.

For this purpose, Oskar and his team prepare the room according to the glasses recommendations and leave Jan's personalized WOW Box for him to find when he enters the room. This is the first step into impressing the client and motivating him to engage in the process.

After a quick introduction, Jan can start to generate content and engage a discussion with Oskar and his team. In an intuitive way, the client can access previous generated data, upload and share content with his colleagues and other team members, edit and build upon previous collaborations and, most importantly, work in the same digital space together with Oskar's team through an immersive experience.

Happy client, happy Oskar.



Copyright © 2018 by Team WOW



Copyright © 2018 by Team WOW

4. Business Development

This section will provide an overview on how to accelerate the We Organize Work (WOW) company by determine an initial business model for the established company, analyze the value proposition imposed to the consumer group, and provide a financial overview for the next five years. This includes a development phase of a year, cost structure, revenue generated, and required loans and investments for establishing the company.

4.1 Initial Business Model

The business model for WOW is developed based on the framework Business Model Canvas⁴. It is an illustrative way to determine how to setup the business model to create, deliver and capture value based on the product. The development of the business model is an iterative process. Figure 13 displays the business model canvas after first iteration of this process.

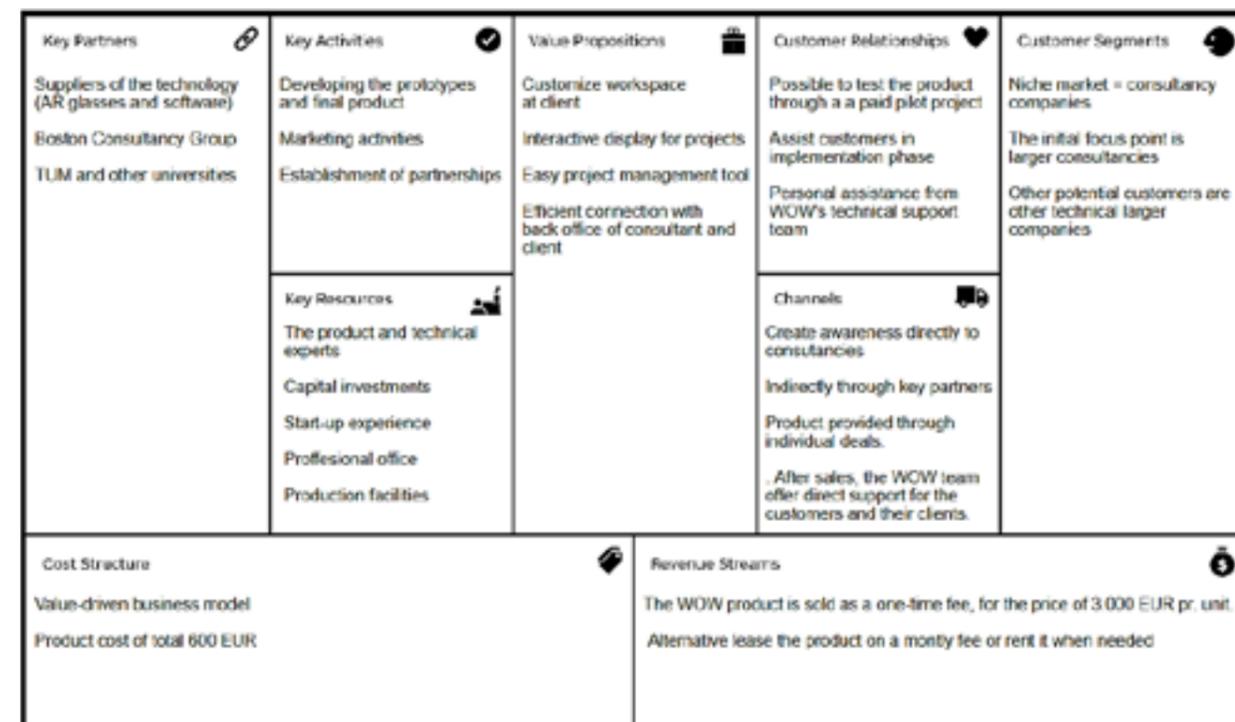
Value proposition

WOW aims to create value by empower the consultant to develop the workspace at the clients' office to increase the productivity and successful rate of the meetings. It also provides an interacting display for both the consultant and the client, making it possible for them to pull out data, determine objectives, and send to the consultant or clients back-office for analysis. The idea of dealing with space development and provide the consultancy service through this modern solution has an attractive newness⁶.

As the value proposition is essential for a successful start-up, it is further analyzed in section 4.2

Customer segments

WOW business model is focused on a niche market by offering the product to consultancy companies that wants to improve their interactions with clients through technology. The initial focus point is larger consultancies with focus on more innovative processes and need to adapt the spaces at the client. Larger consultancy might also have more desired applications. Other consultancy might use it as a competitive advantage if it aligns with their expectations. Other potential customers are other larger companies, but especially technical driven



companies can be easier to convince in investing in the product.

Customer channels

The awareness of WOW should be raised both directly to consultancies, but also indirectly via establishment of key partners, investors and consultancy. The purchase of the WOW product is done through individual deals with each client and it is delivered with a training program to introduce the product. After sales, the WOW team offer direct support for the customers and their clients.

Customer relationship

WOW will offer new potential customers the option to test the product through a paid pilot project for only a part of the customer company. The WOW team assists the customers in the implementation phase, after which there is a trial period with a limit number of clients. The users have the possibility of getting personal assistance from WOW's technical support team.

Revenue stream

The WOW product is sold as a one-time fee, where the customer pays 3.000 EUR pr. unit. The price includes services by the WOW support team and two years warranty.

An alternative model could be to lease the product to the consultancies for a monthly fee or just for the time of the projects where it is beneficial. However, before implementing one of these alternative models, an extensive research should be performed to understand the dynamics and potential. Finally, after sale service could also be provided for a fee, but considering the large price of the product, it was decided to be automatically included.

Key partners

The most essential partner is the suppliers of the technology (AR glasses and software) to develop a high-quality product. Another potential partner is the BCG and TUM, in terms of sparring, development of product, potential investments, and feedback of application feature. Both BCG and TUM would have an interest in developing a new start-up focusing on making improving their physical environment to empower their clients/students.

Key activities

Activities of developing the WOW product and the contact between the company and customers are essential. The product development relies on the technical key activity of software development together with implementation in AR-glasses. The WOW team marketing activities of acquiring customers should initial be focused on developing partnerships to provide inputs to the product.

Key resources

The product will be an essential resource of the business model. However, for develop the product both initial investments and other sources of capital is a necessity. The estimated amount is provided in section 4.3. The start-up experience of WOW's management is another resource. Finally, technical experts from consultancies or employees is essential.

Cost structure

The business model can be described as value-driven, hence producing a high-quality product, large capital requirement, and have professional office space and production. Price total of 600 EUR

4.2 Value Proposition

The WOW product is focused on value creation. The value proposition has been further analyzed using the value proposition canvas⁷. Figure 14 displays the value proposition canvas applied to the WOW product, based on the workshop, and further development of the idea.

As seen in Figure 11 the most essential part of the product is to solve the issue with developing better workspace for the consultants in unfamiliar environments. To fully understand the gains and pains of the customers, additional interviews is required to determine which other aspects should be included to improve the application of the product.

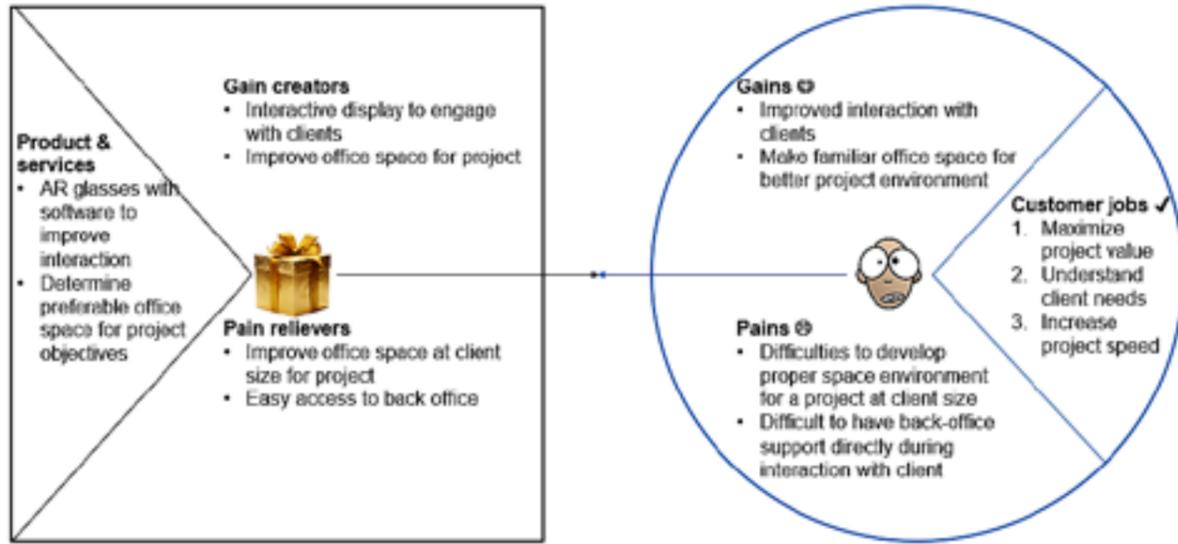


Figure 14: Value proposition canvas for WOW customers

4.3 Financial overview

The following section provides a financial plan for the development of the WOW company together with the economic potential after five years. First, assumptions on cost structure, selling price, distribution, and wages to staff is provided. Then, the required investments, and loans for the development phase is presented. Lastly, the overall financial potential of developing the company and product is presented on a five-year plan, including the generated profit and liquidity pr. month.

4.3.1 Assumptions

As the company WOW is in the first phase, many assumptions need to be applied before making a simplified finance and revenue plan for the company. These assumptions should then be tested by both investigating the cost of required resources and the potential selling price for customer.

Assumptions on selling price and product cost structure

As mentioned in 4.1, the company is structured with a value-driven business model with a high-quality niche product. Therefore, it is assumed that the end user price will be 3,000 EUR, which can be considered high. Assuming distribution will charge 5 % of the price, the revenue generated is 2,850 EUR.

The final product will be based on some top AR-glasses, which are normally in the price range of 200-800 EUR. It is assumed that ac-

quiring these will be 600 EUR pr. unit. Additional material to produce the product is assumed to be 300 EUR.

Based on these assumptions, the profit generation of each product will be $2,250 - 300 = 2,250$.

Assumptions on organizational cost

The burn rate of the WOW company varies over time, but it is assumed that there is a minimum of 10 EUR in the beginning even though there is no wages to the employees initially. The first-year focus on development of the product, which will primarily be handled by the founders, hence the no-wage-policy the first months. It is assumed that there over the five-year period, there will be hired a total of 6 people. These people will have an increasing level of wage-level to ensure continue motivation and employment.

An office will be rented after the first year, and production will be handled by renting the production facilities which is linked to increasing sales. The cost of these starts at 1.000 EUR for the office and 2.000 for production in a month. The production cost will increase depending on the time required to produce the product. In year five, it is expected to rent the production line on a monthly basis.

As the product is very innovative with no similar products in the market, there is a high cost of legal and marketing in some months from year 2. These are used to seek patenting of the product, protect the patent, and promote the product. Furthermore, administration and travel expenses are included in some limit extent.

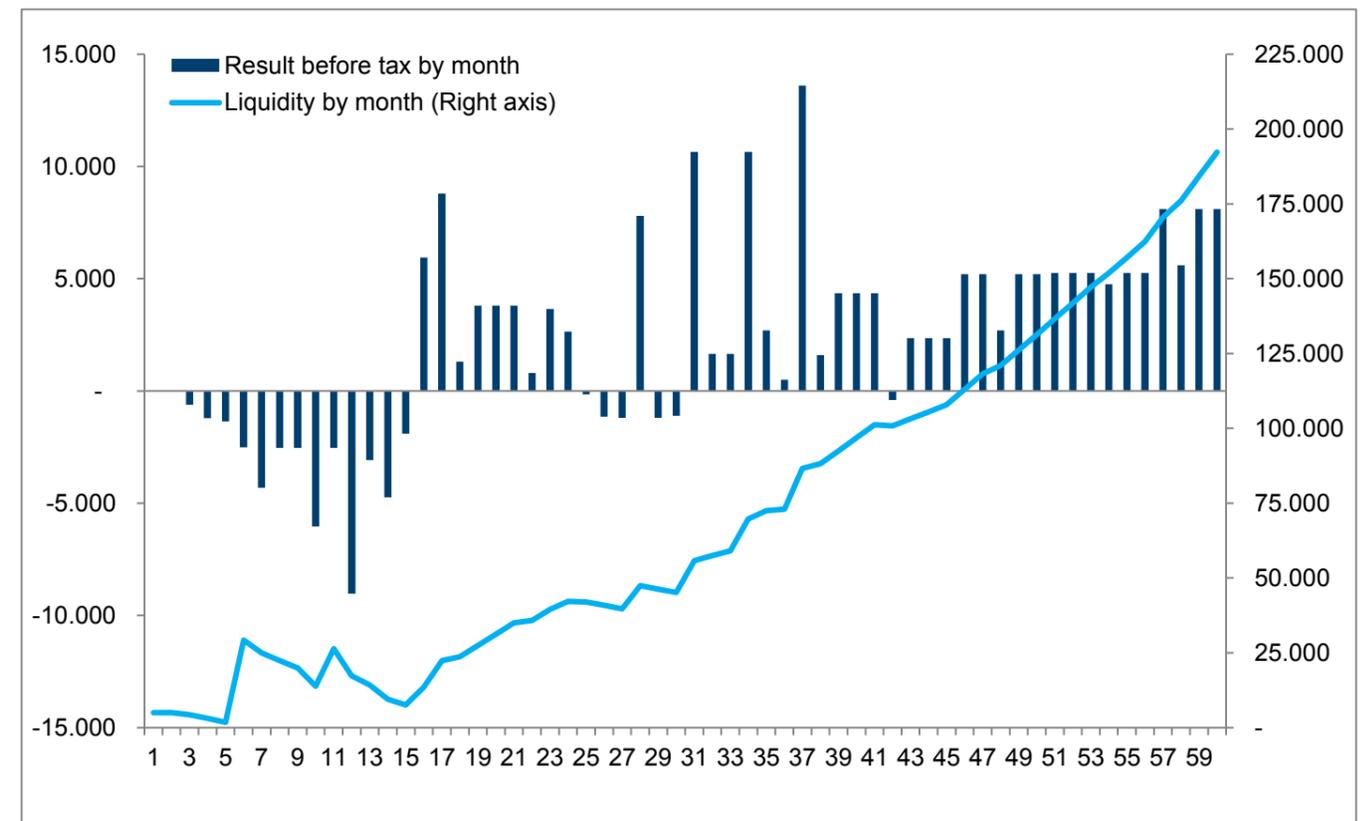
4.3.2 Development phase

There is no similar product available in the market. It is expected to develop the product based on existing technologies such as AR and software. The development phase for providing a go-to-market product is estimated to take one year. During the time, two people will be employed working on development and establishment customer relationships and engage in key partnerships with suppliers and backers. It is estimated that a total of 21 prototypes will be produced during this time. The prototypes are assumed to have similar cost structure, as the final product but no revenue is generated from sales. Therefore, it is vital, that WOW receive investments from public funding and loan money for the development. An estimate of 20.000 EUR needs to come from public funding and 30.000 EUR are provided by the founders through loans. The reasoning behind the high level of capital needed, steams from a long development phase where there is a need to dedicate two people, cover production cost of the prototypes, and produce the first batch of

ready-to-market products. It is ambitious investments targets, and a large sum of own capital is required from the founders.

4.3.3 The simplified financial and revenue plan

From year 2, the sales of the final product start generating revenue to the company. Due to the estimated large profit gained from the product and an assumption that most products being produced are also sold, the company quickly becomes profitable. The interest of the loan is assumed to be 4 % and is included in the financial plan. It is also assumed that there are products being sold every month and the product is primarily produced in batches. Finally, it is assumed that the level of products being sold increases over time, hence starting with selling 1 product pr. month until 12 products pr. month in year 5.



Year 2 (1st year in market)

First year in market is characterized as making the first sale and starting to develop stronger organization. As the first year is important for establishment, an investment of 500 EUR on marketing material, and the hiring of a dedicated marketing person is made. To ensure service minded aftersales, a technical support person is also hired. Additionally, office space is rented for 1000 EUR pr. month together with an additional 100 EUR pr. month on administrative equipment and office supplies. Finally, 2500 EUR is used on patenting the product to limit new competitors and protect the product. A total of 52 product is estimated to be sold.

Year 3 (2nd year in market)

The second year is characterized of increasing the production capacity and increasing level of sales. The profiting increases largely, so the amortization of 2500 pr. month is made for loan invested by the founders. A total of 3700 is used each month on loan interest and amortization which equals that the loan is paid end of year. Furthermore, a small increase in wages are included to maintain employers. A total of 81 products is estimated to be sold.

Year 4 (3th year in market)

The third year in market is characterized by scaling up the business by producing larger batch more frequently. A sales director is hired to increase the level of sale and maintain customer relationships. Marketing cost are estimated to be 2500 EUR and 109 products are sold.

Year 5 (4th year in market)

Year 5 is highly profitable, with 134 products being sold and a profit of 71.300 EUR is generated before tax. The employees' wages are increased again together with legal protection of the product. Development of second generation of the product is being made. An overview of the financial development is displayed in figure 15, and the yearly financial overview is displayed in figure 16 in the Appendix including all assumptions and requirements.

5. Personal Statement

"I think the Design Thinking Lab is a great way to bring people from different faculties together, and get them to think out of the box. Within three days, we got the chance to develop an interesting concept but, most importantly, we learned methods, which can be applied to many creative processes for user-centered development

- Jose, Industrial Design

"To my mind, interdisciplinary work allows not only to produce interesting unexpected ideas and to achieve higher results, but also to understand other people's points of view better. I believe it is very important for an architect, who designs buildings, where a variety of processes is planned for absolutely different users."

- Ekaterina, Architecture

"I believe, that the interdisciplinary work made it possible to explore new ideas and perspectives on product development. Despite some frustrations on not having similar focus, it developed into a high-quality idea in the end. Finally, the workshop was an excellent tool for product development which I intent to use in other projects."

- Jais, Management and Technology

6. Literature

1. Board of Innovation. (2018). *Brainstorm cards - Board of Innovation*. [online] Available at: <https://www.boardofinnovation.com/tools/brainstorm-cards/> [Accessed 19 Dec. 2018].
2. Brown, B. (2018). *The Total Economic Impact™ Of IBM's Design Thinking Practice*. [online] IBM. Available at: <https://www.ibm.com/design/thinking/static/media/Enterprise-Design-Thinking-Report.8ab1e9e1.pdf> [Accessed 19 Dec. 2018].
3. Budde, R., Kautz, K., Kuhlenkamp, K. and Zullighoven, H. (1992). *Prototyping*. 1st ed. Berlin, Heidelberg: Springer Berlin Heidelberg, pp.33-46.
4. Carney, T. (1992). Storyboarding. *ACM SIGDOC Asterisk Journal of Computer Documentation*, 16(3), pp.27-40.
5. Dam, R. and Siang, T. (2018). *Introduction to the Essential Ideation Techniques which are the Heart of Design Thinking*. [online] The Interaction Design Foundation. Available at: <https://www.interaction-design.org/literature/article/introduction-to-the-essential-ideation-techniques-which-are-the-heart-of-design-thinking> [Accessed 19 Dec. 2018].
6. Osterwalder, A. and Pigneur, Y. (2013). *Business model generation*. 1st ed. New Jersey.: John Wiley & Sons.
7. Osterwalder, A., Pigneur, Y., Bernarda, G. and Smith, A. (2014). *Value proposition design*. 1st ed. New Jersey: John Wiley & Sons.
8. Sutton, R. and Hargadon, A. (1996). Brainstorming Groups in Context: Effectiveness in a Product Design Firm. *Administrative Science Quarterly*, [online] 41(4), p.685. Available at: <http://www.jstor.org/stable/2393872?origin=JSTOR-pdf> [Accessed 19 Dec. 2018].



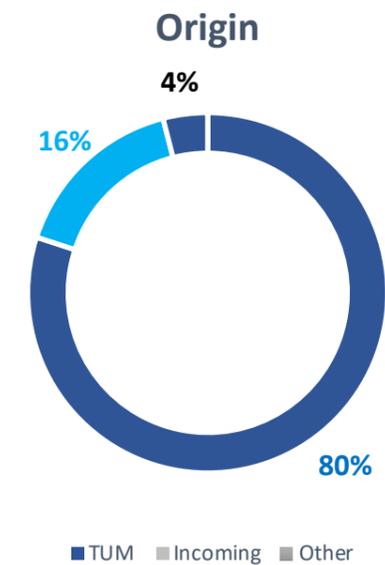
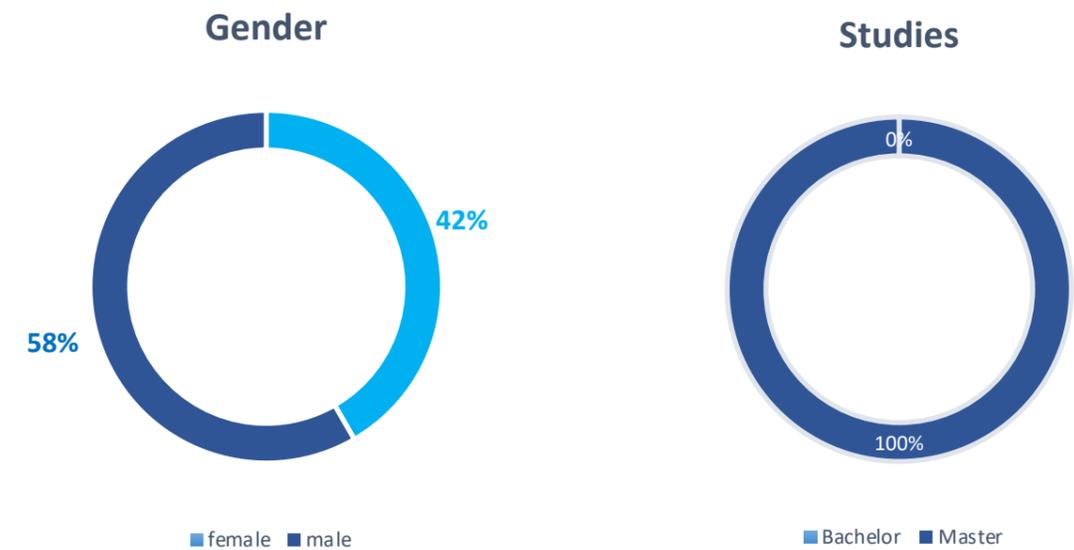
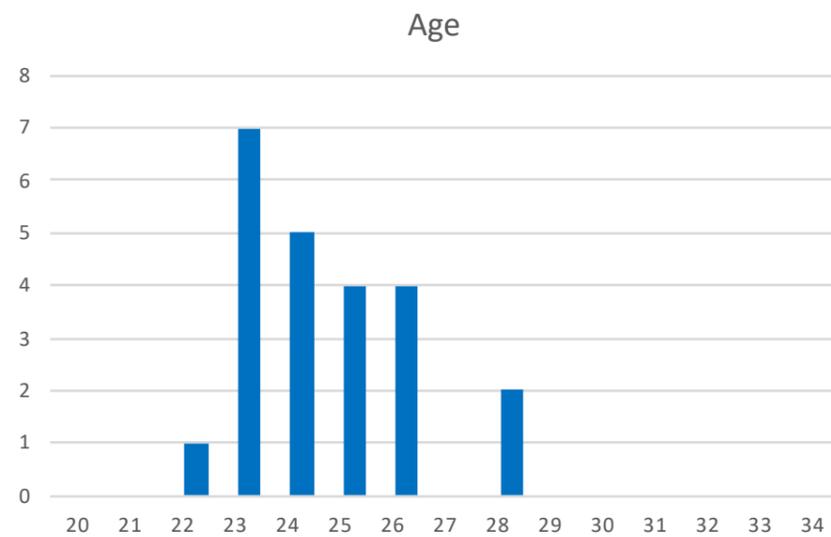
Chapter 04 Design Thinking Lab Evaluation

Summary of Evaluation

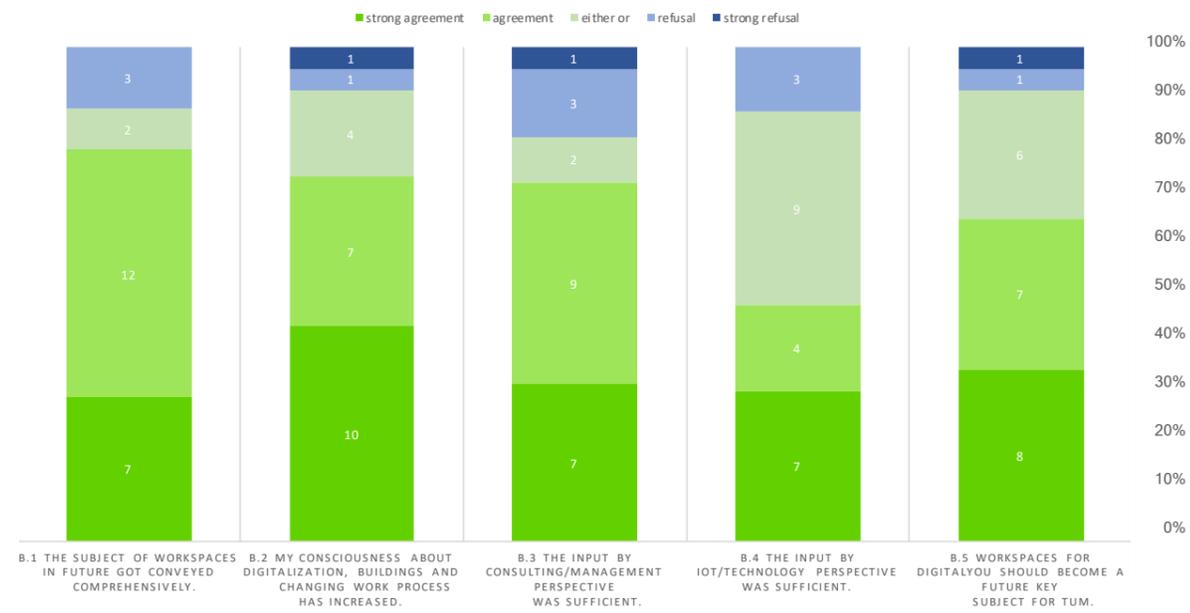
The evaluation showed a high satisfaction rate with 24 cumulated replies of “agreement” and “strong agreement” (number of participants n=24):

- Concept and challenges** for future workspaces increased: **68%**
- Workload, process and future implementation** were feasible: **63%**
- Collaboration, interdisciplinarity and integration** increased: **83%**
- Results and willingness to pursue idea further** were satisfying: **67%**
- Benefits to apply skills and use new insights** occurred: **71%**

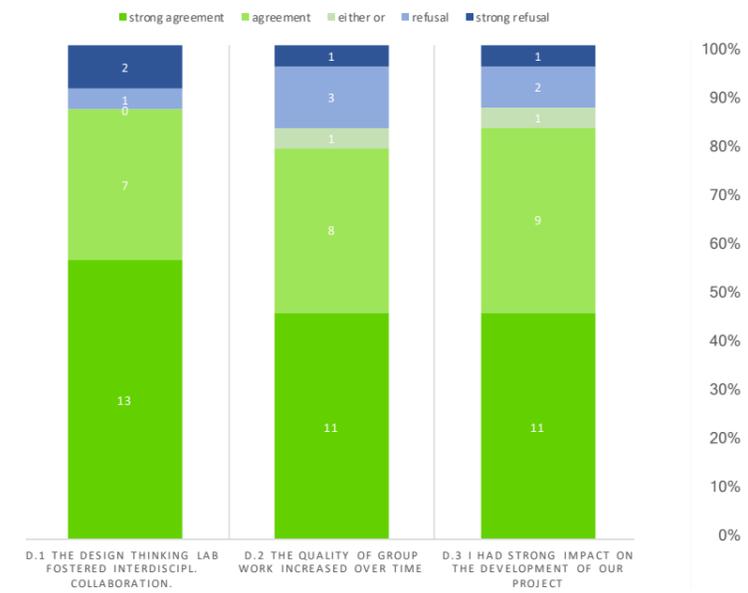
The strong user focus and work with people offered a new approach for architects, but limited on the other side more visionary and alternative approaches. The graphical tools used (e.g. post-its) constrained to some extent the visual skills of the architects. The strong facilitation by experienced designers had a very positive impact on the results and shall be considered in future formats.



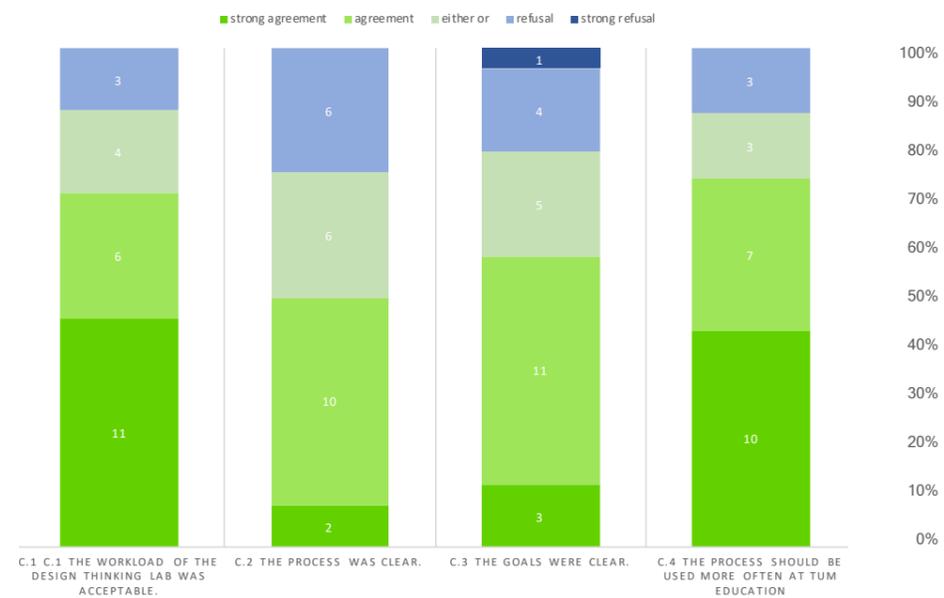
On Challenges



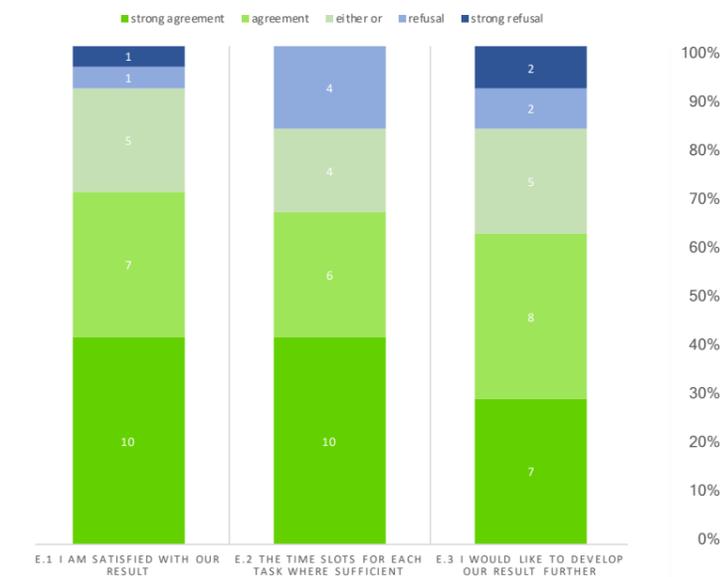
On Collaboration



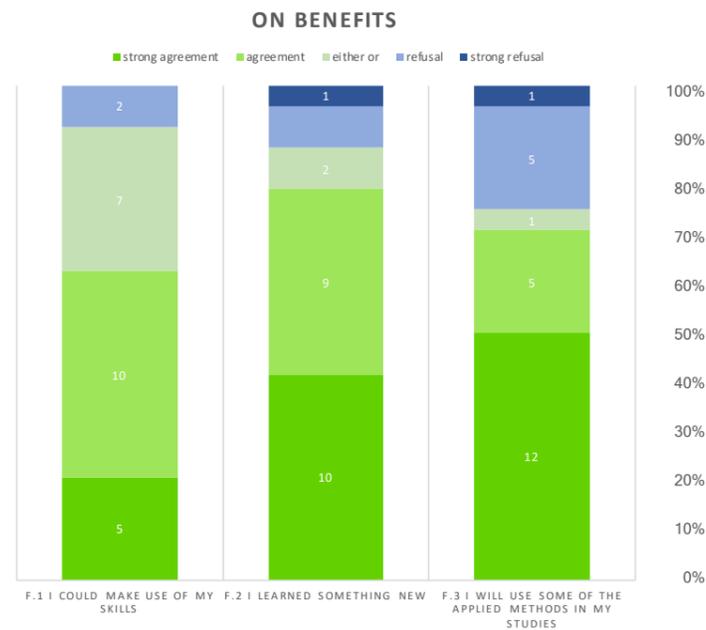
On Process



On Results



On Benefits



Did the Design Thinking Lab meet your expectations?

Open answers to questions within evaluation, n = 23 / 24 answers.

- Yes!
- Yes!
- Yes!
- In terms of workshops, I hadn't done any so had nothing to expect. The process of design was however interesting as never experienced before.
- Yes! It was fun & intense!
- Overall yes
- the inputs were great > definitely learned there
- Yes and not
- almost
- yes, but there were a bit to less insights into consultancies and their actual task
- I expected a more concrete outcome towards future workspace. We partially made wrong assumptions, which lead us wrong way
- Yes!
- It was a very good experience
- „More architectural stuff than expected more management like BMC, value, cost, profits like one would do in a real business case“
- totally new approach at working
- Yes!!
- Sort of. I was expecting more technical aspects and less architecture
- Yes, but I felt for some people the outcome wasn't clear, or couldn't identify with the way of working without real goal in the beginning
- No
- Yes it did, next time I would like to have a practical phase after those 3 days, to develop further
- I had different expectations in the beginning so I wouldn't say so, but it still was super interesting
- Yes. It actually exceeded expectations
- Not completely

If not, what did you miss?

- Was a bit too abstract
- Learn more about the backgrounds, instead of just apply it, more focus on the process
- Changing facilitators. More diverse input
- The readings that were suggested prior to the lab seemed to me very interesting but there was not a lot of discussion/ interaction about them during the lab.
- See above
- Very architecture focused
- TECH
- Motivation among students
- More practical information... (lunch on the 3rd day)
- More abstract and visionary thinking about the future
- I thought it could be more about FUTURE, more visible (?), but the process was still very interesting. A break in the middle days. The communication between team members.
- more interdisciplinary teams.
- I missed 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.

Open answers to questions within evaluation, n = 11 / 24 answers.

What worked in the process, what did not?

- Maybe 8 AM - 6 PM was too long since we were trying to be creative all the time, it was tiring.
- The collaboration between the „designers“ and „management“ perspective had first to be developed because the methods were all completely new to us and the expected output was accordingly not that clear.
- The methods of innovation were good but if we go in wrong direction in one step the process is going hard
- The process guided us fairly well although at times it wasn't always obvious what was the end goal, but maybe that was the aim.
- „Finding a problem to solve on our own was difficult as we are no consultants > We might have needed more insights. + Being 1 day at the company for work“
- Sometimes the facilitators were not as much involved > also gave us time to continue, sometimes a bit unstructured
- Not enough info as input, task is too abstract
- Often stuck in our development
- Prototyping did not really work with us
- We started with 5 people in the team and ended up with 4
- Learning new things from the supervisors
- Choosing topic/persona of our proposal was not very easy and left some people disappointed as they did not know about that specific persona.
- „WORKED: creative work, food, consultants & IBM; lectures NOT WORKED: confusing process; hard to see the point with some of tools“
- A lot of time used on in group discussion, without reaching to an agreement
- Team work was good. Time management, recaps, process moving forward took too much time/slow
- Methods worked pretty well
- Lots of consultancy, maybe too much - no team development
- Brainstorming. Information - Action loop. (The presentations of the specialist should be spread about the whole period of the workshop.)
- Working in the group worked, working in time didn't work. „WORKED: well-organised, various input, great amount at feedback & guidance NOT WORKED: time was a bit short sometimes“
- Less playback. Maybe only 3 each time
- Everything worked well

Open answers to questions within evaluation, n = 22 / 24 answers.

What can be done better?

Open answers to questions within evaluation, n = 16 / 24 answers.

- Perhaps it would be good to define/address the topic more directly at the start of the workshop, especially the methodical approach should be briefly explained in the beginning.
- Maybe more time
- A bit more time to reflect the final product & presentation.
- Providing a more specific problem to solve
- Agenda has to be taken seriously
- Bins, electricity at each table, order enough pizza :), not so many lectures at the beginning
- Better introduction into technology and things that have been invented so far, or having research-time
- „Lunch on the last days
more advices/help on the last day“
- Maybe split the group work for some time to individual work or work in parts. Not always group work
- „Make the end goal more clear
too many presentations - fewer presentations next time
people from café often disturbed the presentations“
- Not clear in the beginning what the end-result/output could look like
- Less recap. Stress better by moving faster (okay to fail)
- Give people an idea of a goal in the end
- Our group had 3 different people to guide them ... some progress got lost on the way.
- More food
- The frames of the goal: When can it be applied?

Do you think this format should be applied more often?

If yes: 5 days, 3 days, 1 day?

Open answers to questions within evaluation, n = 21 / 24 answers.

- Yes, 5 days
- All in all I really liked the working atmosphere and the outcome! 3 days though are enough in order to keep up the intense and inspirational working atmosphere.
- no :)
- 3 days seem like a good timespan.
- 3 days was great, but enough when it comes to intensity
- 5 days to have enough time for prototyping
- 2 days
- more 1 day workshops
- 3 days is just. Not longer
- 5 days
- Yes. 3 or 5
- Yes, 5 days but the less intense
- very work intensive! 3 days
- Yes 5 days.
- Depends on aim. This aim = 3 days
- 5 days > I think it should be applied more often, it's especially for architects a good way to see new methods how a design can be created
- 5 Days!
- Yes 3 days
- Compared to a 2-day workshop 3 days seem like a good balance. (You'd need a lot of food & drinks for 5 days :D)
- 5 days
- Yes, brainstorming workshop and teamwork are very effective. But if it will be longer than 5 days, it is better to reduce working time of one day to 5 hours. And better to do it on holidays/weekends. Do not want to miss my lectures

Imprint

TUM Department of Architecture
Office of the Dean
www.ar.tum.de
  @architecture.tum

www.bauhow5.eu
info@bauhow5.eu

Conception
Christos Chantzaras
Martin Luce
Yolande Schneider

Assistance
Kasimir Forth
Uta Leconte
Svenja Nevermann
Sophia Pritscher
Kerstin Sailer
Klaus Scheuenpflug
Antal Strausz
Marie Strid
Gabriele Zechner

Cover and Chapter Pages
Photo: Boston Consulting Group

Print
Online Publication

Publisher
Technische Universität München
Fakultät für Architektur
Arcisstr. 21
D-80333 München

www.ar.tum.de
verlag@ar.tum.de

ISBN 978-3-948278-16-8

Copyright of presentations by partners included in this publication remain with the authors, all rights remain with the authors. No part of the slides, images, pictures may be reproduced, distributed, or transmitted in any form or by any means, without the prior written permission of the respective author. The authors are responsible for their content.

Copyright of documented works remain with respective teams. All rights remain with the teams. No part of the presentations, concepts, slides, images, pictures may be reproduced, distributed, or transmitted in any form or by any means, without the prior written permission of the respective author. The teams are responsible for their content.





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

BauHow5

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

ISBN 978-3-948278-16-8

Technical University of Munich
Department of Architecture
Arcisstrasse 21
D-80333 Munich

www.ar.tum.de
ari@ar.tum.de

www.bauhow5.eu
info@bauhow5.eu