Making the knowledge triangle work in the disciplines of Architecture and the Built Environment

Intellectual output 3

October 2020

CHALMERS
UNIVERSITY OF TECHNOLOGY

The Bartlett
UCL Faculty of the Built Environment

UCL

ETH zürich

TU Delft

Technical University of Munich

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PART I: Introduction

This is a report on the intellectual output 3 in the project Strengthening Architecture and Built Environment Research (SABRE) funded within the Erasmus+ programme 2017: KA2 – Cooperation for Innovation and the exchange of Good Practices/ KA203 – Strategic Partnership for higher education. The application for funding was initiated within the European alliance of the five leading research-intensive universities in Architecture and the built environment named Bauhow5.
Being part of creative industries that provide a large number of jobs and employment opportunities Europe-wide the partner universities identified the potential for a deeper embedding of research and development, but also teaching and learning, in acting together aiming to push the boundaries of current practice making impact upon research and innovation, higher quality of research-based education and establish partnerships between higher education institutions and various stakeholders.

The following is a summary and review of two(four workshops, which were held at Chalmers, TUM, UCL 2019, and TU Delft 2020. We here describe the workshops, the management of the events and compare and review the results of the workshops with the objectives and description of the project. The report was written by Johanna Eriksson, Göran Lindahl and Marie Strid, all three architects and researchers at Chalmers University of Technology.

General

The project set out to test and develop a model for collaboration between academia and practice in the knowledge triangle of research, education and innovation, with a special focus on how the disciplines of Architecture and the Built Environment are drivers of these activities.

The output will elaborate and refine a method for collaboration on complex, real-world problems in the built environment, called ‘Design Dialogues’. It will use existing knowledge and approaches, but also update, articulate and make these adaptable for current societal situations in different European countries.

The aims are, firstly, to support companies and public administration related to Architecture and the Built Environment in developing their research, and having increased exchange with academia, and secondly, to develop a communicable method for strengthening collaboration in the knowledge triangle, thereby enabling innovative solutions to complex societal problems in the built environment.

The project included design dialogue workshops at four participating universities, and they took place 2018-2020. In addition, a webinar on outcome and lessons learned was held as a multiplyer event in October 2020, hosted by Chalmers. Several project group meetings for planning and reviewing of events was performed throughout the project.

The topic, *health*, was identified and decided at a transnational meeting as a mutual topic of interest for all partnering universities. The workshops were then conducted with locally selected projects related to health or healthcare.

List of participating partners and departments

-Chalmers University of Technology, Department for Architecture and Civil engineering, (Centre for Healthcare Architecture.)
-Technical University of Munich, Department of Architecture
-UCL Faculty of the Built Environment, The Bartlett School of Architecture
-Delft University of Technology, Department of Architecture and the Built Environment

Timeline and location of workshops

January, 2019	Chalmers, Gothenburg
September, 2019	TUM, Munich
December, 2019	UCL, London
September, 2020	TU Delft

Short summary of workshops

The first workshop was held at Chalmers, hosted and facilitated by Marie Strid and Eva Ek. Documentation was made by Chalmers. The workshop was conducted and documented in Swedish. The workshop was conducted as two different events with a focus on surgery and ICU units respectively.
Participants: researcher, architects, nurses, facility planners, development managers, medical engineers, project leaders (from both facilities and healthcare)

The TUM workshop was hosted by Cristos Chantzaras and facilitated by Johanna Eriksson and Göran Lindahl. Documentation was made by Chalmers. Participating students had the opportunity to develop the workshop output and gain ECT credits.
Participants: researchers, teachers, student from architecture and management, administrative from a hospital, medical doctor.

The UCL workshop was hosted by Hina Lad and facilitated by Johanna Eriksson and Göran Lindahl. The overall management of the workshop was made by the facilitators in collaboration with the host. Hina Lad documented the workshop at UCL, which had a focus on the ideal model of care for day surgery.
Participants: Architects, health planners, researchers, medical doctor, artist, medical planners, Design managers and from IT Health care.

The fourth workshop took place at TU Delft and was facilitated and documented by Clarine van Oel. The focus was a healthcare hub and how immersive VR could support the dialogue. Participants: students and researchers and one medical doctor.

A webinar (The multiplyer event), Design driven knowledge production, was hosted by Chalmers and included presentations and lesson learned from the workshops.
Participants: from Chalmers; Other universities: Lund University, TU München, TU Dresden, Unifi/it, Polimi/It ,TU Delft, Norwegian government and Local Governments, private companies/architectural offices.

Workshop model

The applied methodology: ‘Design Dialogues’ is a method developed and used in the 1970’s and80’s in Sweden. The model brings the knowledge from different actors and disciplines into a process of producing joint knowledge concerning a current issue in the built environment. It is (usually) carried out as a series of 3-4 workshops but can also be done as a one-day or two-day event. A ‘Design Dialogue’ starts with an identified locally situated problem that includes different actors engaged in the situation – usually a so called ‘wicked’ problem. Besides the stakeholders involved, various architects, planners, researchers, firms and organizations with experiences and/or knowledge from similar situations are invited to participate and contribute. The workshop usually starts with input from some of the actors that are directly involved in the problem. After some short, focused presentations, the ‘Design Dialogue’ method is presented. The participants are divided into smaller groups (4-6 people) and start working with the problem in two or three steps. The first is by investigating the present situation through a set of basic tools identifying whatever problems and questions that can be found. A second step is to share the different answers from groups to gain a ‘bigger picture’. The last step is to explore the possibilities by co-designing one or more shared answers and/or solutions. This method allows an unfolding of a ‘wicked’ problem in a locally situated practice adding knowledge to all participants in the process of co-designing possible answers or solutions to the problem.

Based on this, the three first workshops followed a procedure adjusted for a one-day event, including activities as followed:

1 Introduction of the day and the model of design dialogue methodology.
2 Session 1A: Individual exploration of a concept with words.
3 Session 1B: Brainstorming in groups, in response to a question, through selecting important aspect using words and pictures.
4 Lunch break.
5 Inspirational input.
6 Session 2: Design game in new groups.

   To explore a locally situated real world problem on a game board with cut-out shapes of different colours and sizes, and thumbnail symbolic pictures of familiar images. A limited time of 1.5 to 2 hours was given. Then each group presented their collective discussion and boards with images to the other groups.
7 The workshop was closed by summary by the organisers and a final discussion on the output. Here comparisons between the different approaches and output was done.

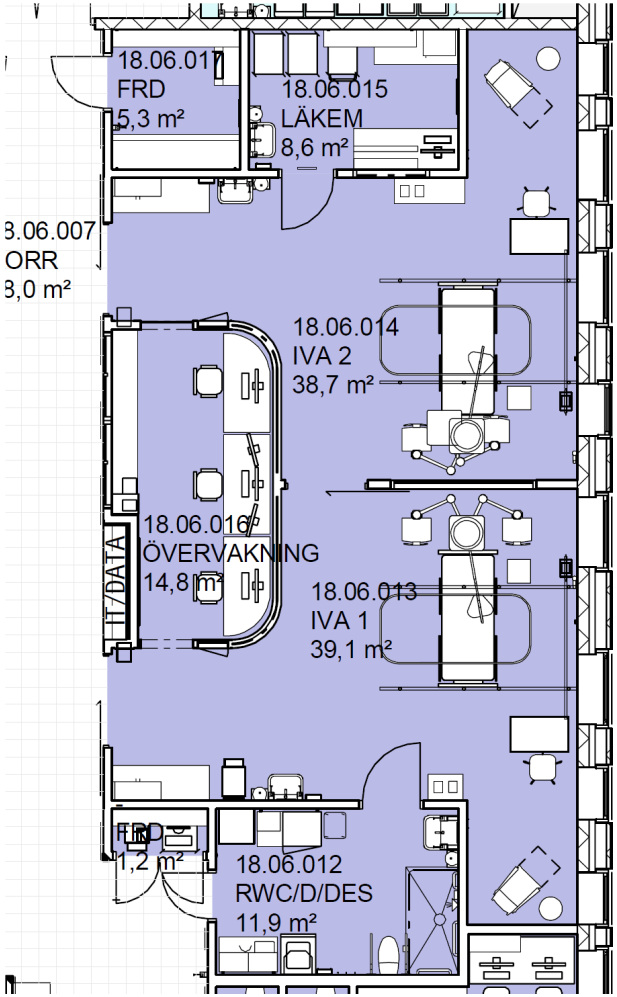
At Chalmers the workshop session started with an individual review of existing layouts of newly built facilities as an input for further discussion.

At TU Delft, the concept of design dialogue was explored through immersive virtual reality models as a boundary object and its potential to overcome information asymmetry and the hurdles in the collaborative, multi-contextual, design process. Therefore, the main question of the design dialogue workshop at TU Delft was whether immersive VR is a way to improve information asymmetry between users and designers.

Reviews and questionnaires
After the Chalmers workshop a review of documentation was made, with the possibility to add comments. In TUM a questionnaire previously used in other TUM activities was filled out after the workshop and the same questionnaire was used again at UCL.
A selection of output from the questionnaires is included in later parts of this report.

Documentation, workshop at CHALMERS

Design dialogue at Chalmers University of technology, Gothenburg 24 October 2018
A review on surgical spaces and intensive care units (2 workshops)



CHALMERS | CVA Centrum för VÅRDENS ARKITEKTUR

Summary
Design dialogue at Chalmers University of technology, Gothenburg
A review on surgical spaces and intensive care units (2 workshops)

CHALMERS

Hosting Institution: Chalmers department of Architecture, Centre for Healthcare Architecture (CVA)

Workshop process leaders: Eva Ek, Marie Strid, Chalmers

Participants: The participants that were invited all had experiences (experts) from either designing or planning of surgical spaces (eg operating theatres)/ICUs and included professionals from both private companies (architectural firms) and governmental institutions (health care organisations). Participating were also researchers from Chalmers department of Architecture, Centre for Healthcare Architecture. (list of participants included as appendix)

Purpose (of workshop)

- Review and rethink newly built surgical spaces (operating theatres - OP) and intensive care units (ICUs)
- Gather experiences and perspectives to create mutual understanding on the topic
- Promoting collaboration between actors from both practice and research
- Test, develop and reflect upon methods to share knowledge between different stakeholders, with different stakeholders.

I

Time schedule and workshop content

10.00 Introduction to workshop and design dialogue
10.20 Session 1: Review of newly built surgical spaces (workshop 1) intensive care units (workshop 2)
Coffee break
Exercise 1 and 2
12.20 Lunch
13.20 Inspirational input
13.40 Session 2: Rethinking and developing surgical spaces (workshop 1) intensive care units (workshop 2)
15.30 Presentations of findings
16.30 Wrap up and evaluation

The workshop sessions start with a short introduction of participants, the event followed by an introduction to design dialogues and how the method has been developed.

Session 1 Reviewing
During the first session "Reviewing" the participants used drawings of two newly built surgical spaces (workshop 1) intensive care units (workshop 2) and reflected first individually then in smaller groups. The participants were divided into three smaller groups were formed with the purpose of having special competences in separate groups.

Exercise 1: Brainstorm,
Individual reflection
Based in your own experiences what are your reflections on newly built OP/ICU spaces?

Think of your own experiences with reference to activity, space and service delivery.
Write down your thoughts, one idea per post-it/sticky note.
Time: 5-10 minutes

Everyone presented their reflections to each other in each group respectively.
Reflections were sorted and attached to the drawings as a start of the second exercise.
Time: 15-20 min

Exercise 2: Reviewing existing plan lay-outs
Small group review
During exercise 2 the groups reviewed the plans together focusing on following questions:
- What are the Dimensions of the spaces? (A single patient care-unit)
- What are the department's Internal connections?
- What are the departments support functions?

In small groups
I. Choose one plan lay-out
II. Discuss each of the three questions/focus areas
III. Agree on the pros and cons of each question and write/ draw them on the plan lay-out.
Time: 45-60 min

All groups gathered and made a presentation of their findings/ discussions using the drawings they made as visual input.
Time: 30-40 minutes
The presentations were documented by workshop leaders both in notes and by video.

Lunchbreak

After lunchbreak there was an inspiration input by project leader Eva Ek on the topic of OP/ICU – needs or limits?

Session 2: Rethinking and developing

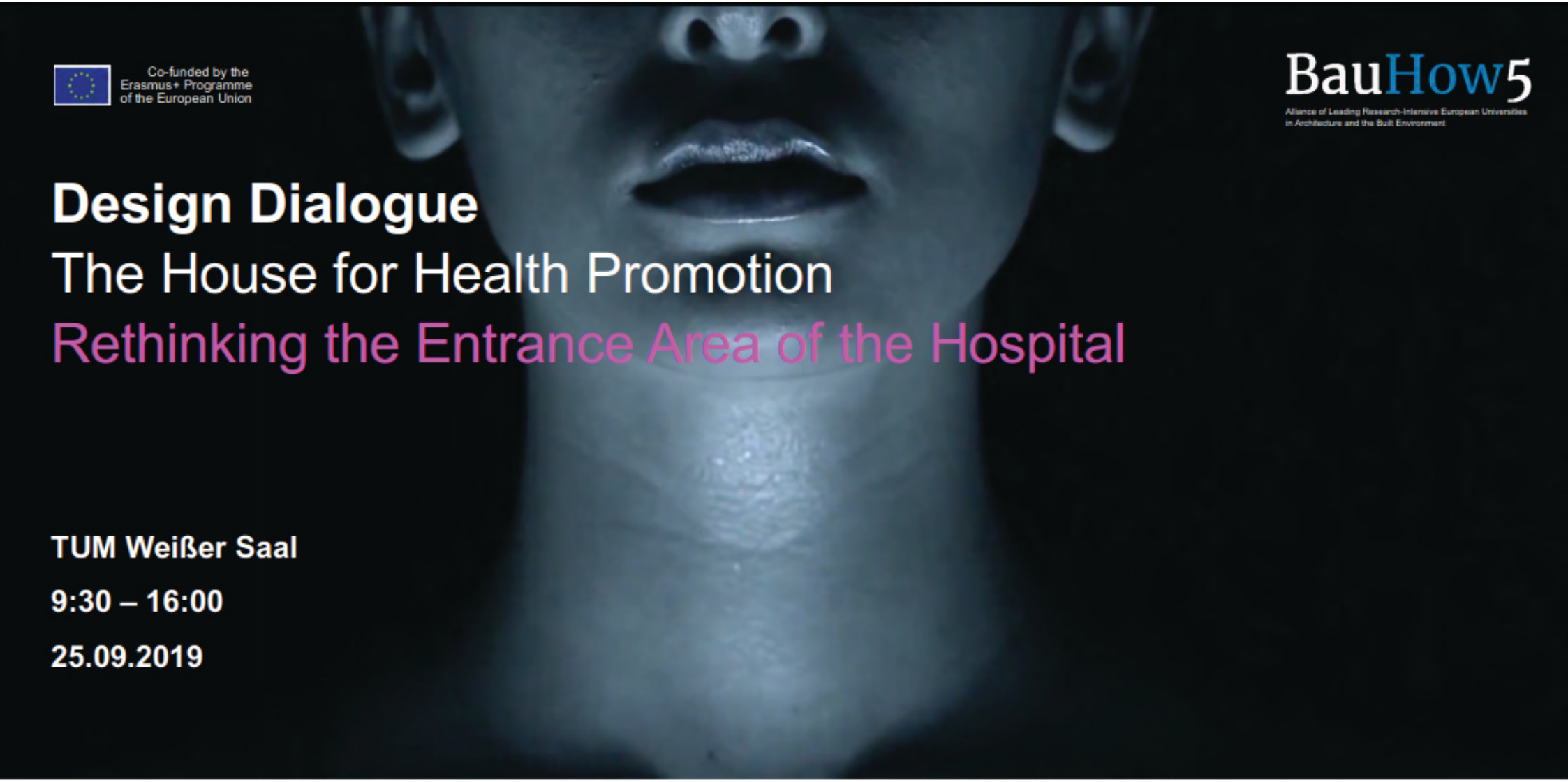
For the second session "Rethinking and developing" new groups were formed aiming for as mixed-competence groups as possible.

Exercise 3: Design game
Small group work
In rethinking the plan lay-outs of OP/ICU what would be an ideal lay-out? And What changes would benefit the existing lay outs?
Take the user perspective of patient, relatives, employees – medical, nursing, service.
Use the workshop material while discussing. For presentation glue the material on your plans.
Time: app 75-90 min including preparation for presentation

All groups gathered and made a presentation of their suggestions using the drawings they made as visual demonstration of the suggested changes as well as thoughts on ideal solutions.
Time: 30-40 minutes including conclusion and discussion

All the material was sent out to the participants after the workshop making added comments/reflections possible. A short questionnaire for feedback was also e-mailed. The presentations and discussions are documented in video recordings (Swedish only) and material were photographed. A short summary of the workshops is presented in a Swedish report published by Center for Healthcare Architecture: Pilot study on High-technology Care units – Intens and Operation theatres (Förstudie: Högteknol vårdemiljöer – Intensivvård och operation, 20

Documentation, workshop at TU Munich



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

BauHow5

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

Design Dialogue

The House for Health Promotion

Rethinking the Entrance Area of the Hospital

TUM Weißer Saal

9:30 – 16:00

25.09.2019

CHALMERS UNIVERSITY OF TECHNOLOGY

The Bartlett
UCL Faculty of the Built Environment

UCL

ETH zürich

TU Delft

Technical University of Munich

Summary Design dialogue at TUM, Munich
The house of Health promotion
Rethinking the entrance Area of the hospital

Hosting institution: TUM through Christos Chantzaras
Workshop process leaders: Johanna Eriksson, Göran Lindahl, Chalmers
Participants: students from architecture and management, some with medical or healthcare background, researchers from Germany, Netherlands, UK, Sweden; one participant from health care logistics, Grosshadern Hospital.

Purpose (of workshop)

- Develop conceptual ideas of what a health promoting entrance hall could be
- Gather experiences and perspectives to create mutual understanding on the topic
- Test, develop and reflect upon methods to work collaboratively between different actors, with different experiences and relation to the task at hand
- Form a conceptual base/design brief for student projects

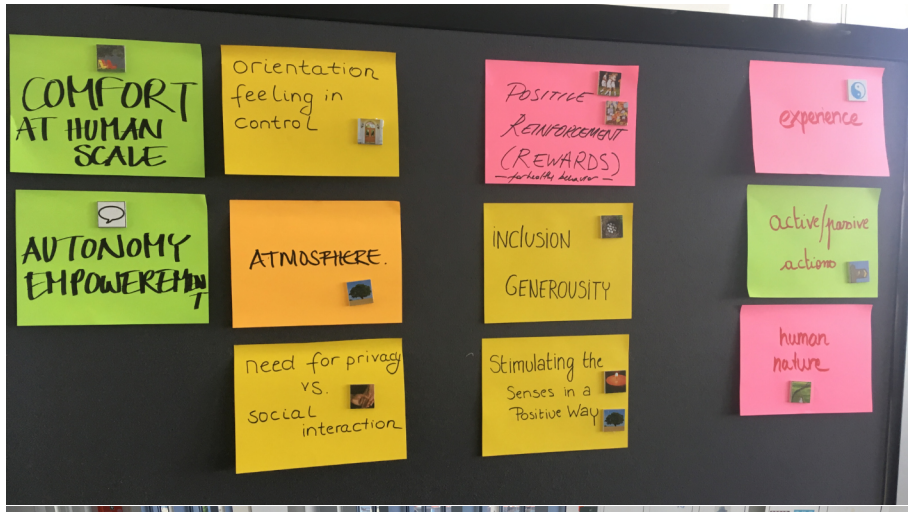
Session 1

The workshop session started with an introduction of participants and why they wanted to be a part of the day. After a short presentation (too short according to evaluation afterward) of what design dialogues are and in what context they emerged the first exercise started.
It was an **individual reflection** where ideas were noted on sticky notes handed out to the participants:

Brainstorm and reflect individually on the relation between health promotion and physical environment!
The whole group was then divided into five smaller groups for the second part of **exercise 1**:

1. Present your ideas to each other.
2. Discuss and select the three most important ideas, according to the group.
3. Select one picture for each idea.

All group gathered and presented their words and pictures to each other. Reflections on the result, facilitated by Göran Lindahl ended the morning session and there was a break for lunch.



Session 2

After lunch the workshop started with an inspirational input, held by professors Tanja Vollmer on the topic of user experiences and psychology of architecture.

For **exercise 2, Design game**, new groups were formed.
The topic for discussion was:

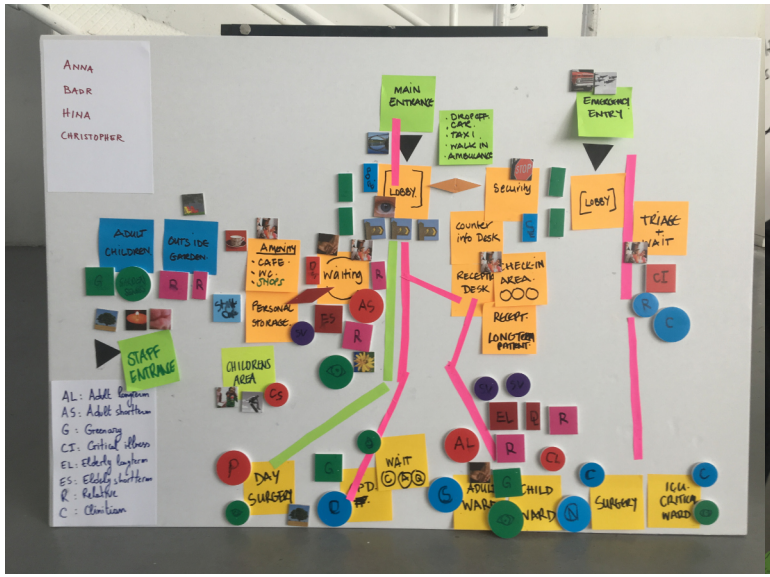
What is a **Health promoting entrance hall?**
Describe the relations between activities, qualities, symbols and flows by using the workshop material!
Questions to get you going:

- What existing activities in the hospital will be placed in the new hall? How will they be integrated with new ones? What belongs together? Side by side? Level of merging? Clearly separated? Make the sum bigger than the parts!
- Think about different type of visitors and users; patients, relatives, those working in the building, children, people in pain, people in a rush, persons with cognitive and physical disabilities…
- What role could greenery play?

Use the workshop material! The group decides what pictures and colours will mean; they could be activities, qualities, directions, signs, symbols… Glue them to the game board when you feel ready to present your ideas. Time: ca 90 minutes

All groups gathered and presented their discussions and boards to the rest of the participants. Short conclusion and end discussion. A questionnaire to all participants was also used. All presentations and discussion were recorded with a 360 GoPro Camera and output photographed.

After the workshop, researchers and organizers met for a short feedback on today's event.


ANNA
BADR
HINA
CHRISTOPHER
MAIN ENTRANCE
EMERGENCY ENTRY
LOBBY
SECURITY
LOBBY
TRIAGE + WAIT
ADULT CHILDREN
OUTSIDE GARDEN
AMENITY
CAFE
PHARMACY
SHOPS
WAITING
PERSONAL STORAGE
COUNTER INFO DESK
RECEPTION DESK
CHECK-IN AREA
RECEPT
LONG TERM PATIENT
STAFF ENTRANCE
CHILDRENS AREA
DAY SURGERY
WAIT
SURGERY
ICU CARDIAC WARD
AL: Adult
AS: Adult shortterm
G: Geriatric
CI: Critical illness
EL: Elderly longterm
ES: Elderly shortterm
R: Relative
C: Clinician

Health
s off Illness



ANNA MARIE
LAURA
PHILIP
JACK


Documentation, workshop at UCL

Bartlett School of Architecture, UCL

A one-day workshop which will bring together healthcare professionals, architects, designers and researchers to:

1. **Question the current environment for Day Surgery in UK**
2. **Create a future model of Day Surgery Care**

Organisers: BauHow5 Alliance

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

Session 1: Brainstorming Surgical Space:

Participants were asked to use one word post-it notes (selecting only two) to respond to the following question:
Qn: What are your main concerns about current UK facilities for day surgery? with reference to activity space and service delivery.

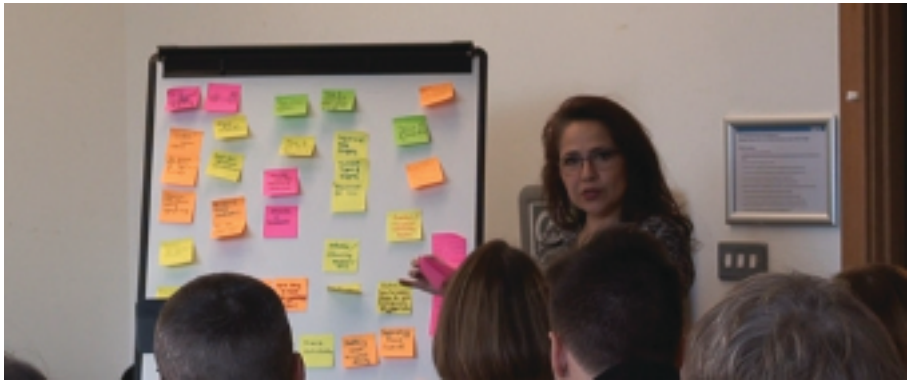


Figure 1: Film Still Design Conference 2019- Session 1

List of responses:

- **Aftercare**; a space for dignified recovery
- **Staffing**; lack of staff to support dignified recovery
- **Empathetic Design;** considering the benefit of space for patient's recovery
- Access to outside environment
- **Future-Change;** ability to adapt to changing user needs both individual and demographic change.
- **Experience of all staff**; beyond the nurse and doctors but all staff involved.
- **One-way flow**; journey of patient needs to be better considered, to stop blockage of the system.
- Wellbeing in high intensity environment.
- How we follow recovering phases.
- **Wayfinding;** how the patient follows the route and how this can be done more effectively.
- **Technology;** how spaces will adapt to technology
- **Adaptable;** how will the operating spaces specifically adapt to changes in tech.

Figure 2: Film Still Design Conference 2019- Session 1

- **What is day surgery**; can it be it 24hrs, what would this entail?
- Suitable aspects of day surgery; does it have an ICU?
- **Connection;** does the facility have connection to transport links
- **Infection control;** how can this be better achieved
- **User groups;** how different users react or find their way in the space
- **Awake patients;** should design of space reflect needs of an awake patient.
- **Isolated Staff;** how to improve for stretched and isolated staff
- **Carer experience**; Needs to be improved, since it can have a indirect impact on patients care
- **Energy inefficient;** Operating suites use a lot of energy to function could this be reduced.
- **Waste segregation;** how can we reduce waste and improve waste handling strategies.
- **System integration;** improving how information is passed between user groups
- **Patient information**; improving how information given to patient at each stage
- **Staffing levels;** ensuring right balance of staff to patient

- Separating clean and dirty clothes
- **Lean thinking;** adapting spaces to be more efficient through technology
- **Context**; how the day surgery will sit within the whole patient journey
- Bespoke architecture for different experience
- **Environment;** natural day light in operating and recovery areas
- **Pollution;** NHS appears to be one the largest polluters in the UK, how can this be changed?
- **After care;** understanding the different needs after surgery at home and in primary care settings
- **Unusable spaces;** improving design strategies
- **Flexibility in recovery;** providing spaces for different forms of recovery
- **Visitor experience;** how families are treated within the space
- **Location;** does day surgery need to be within an acute hospital.

Session 2: Brainstorming Surgical Space:

Participants clustered into small groups of 5 to 6 people to discuss the following question:

Qn: What is the experience or impression with which the patient should leave the day surgery facility with? What is the ideal?

Participants first discussed the topic in their groups and then asked to present three most important concepts using a single phrase and an image.

Summary of Responses:

Patient pathway – Arrival
This starts from the point of being scheduled for surgery and how the patient feels like their needs are being considered, and how they are informed of everything going on.

Patient pathway – During
Embracing the efficiencies of day surgery operations without compromising the importance of human care.

Patient pathway – Discharge
Pain management after the surgery, how is this treated and how we must take into account how the patient will feel not only hours but days and weeks after the surgery.

Informative Aftercare
Patients are often most concerned with what happens when returning home; when can they drive again, will it be safe to walk the dog etc. Therefore, important that this is provided after day surgery takes place.

Supportive environment for all
In order to ensure that all the people involved in the care of others in taken into account, the day surgery should support all occupants from cleaners to doctors, to visitors, to patients.

Pain-free and happy
As an overarching objective the patient should feel that; the best has been done for them, by the best people who could have done it, in the best facilities.

Personalised experience
The experience of patients cannot be considered as homogenous, instead the experience of patients should be, where possible, tailored to the individual.

Well informed-reassured
The patient can often feel most reassured by both understanding and knowing what the steps are ahead and what will follow the surgery. Information at each step is key.

Overcome stress and anxiety
Patient needs to feel in control, to reduce stress and anxiety. One way to achieve this would be to inform the patient on the steps to be taken, who will be doing what and approximate times, including waiting times.

Empathetic journey
The experience of the patient journey is treated in a manner that ensures the security safety and enjoyment of the patient. Many will have repeat visits; therefore, this should be a positive place to be.

Touchpoints
How to personalise an institutional environment. Could this be done through patients choosing their own gown on arrival rather than being simply given one to wear.

Celebration
Completing surgery should be treated as celebration and is often of great significance to the patient and visitors. It is therefore important the efficiency of the system does not forget the importance of this gesture.

Care out-of-medical system/environment
Facilities such as Homes, Schools, GP practice; It is important to think of how these other spaces act in terms of supporting healthcare, how can these spaces be utilised to support the function of healthcare settings.

Balance of efficiency and experience
For Staff, Patient and Carers.

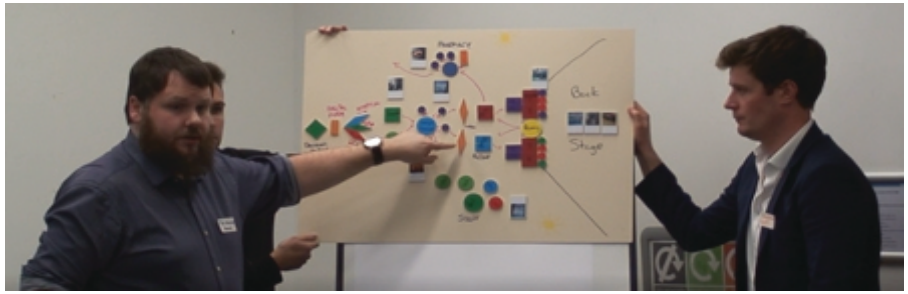
Session 3: Design Game:
Participants clustered into small groups of 5 to 6 people to discuss the following question:

Qn: By rethinking the surgical space for day surgery, what would the ideal 'model of care?'

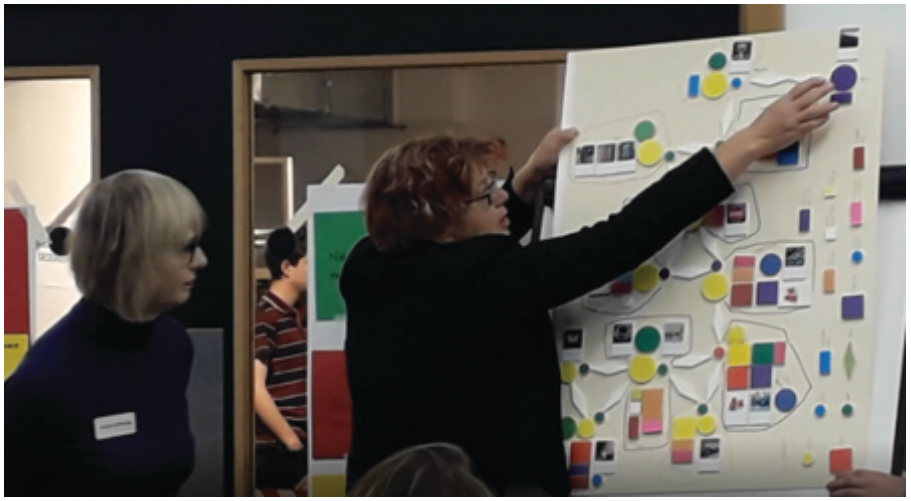
The groups were provided with an A1 board, a selection of shapes, colours and images and asked to produce a concept design.

Figures 4: Film Still Design Conference 2019- Session 3: Group Presentations

GROUP 1



GROUP 2



GROUP 3

GROUP 4

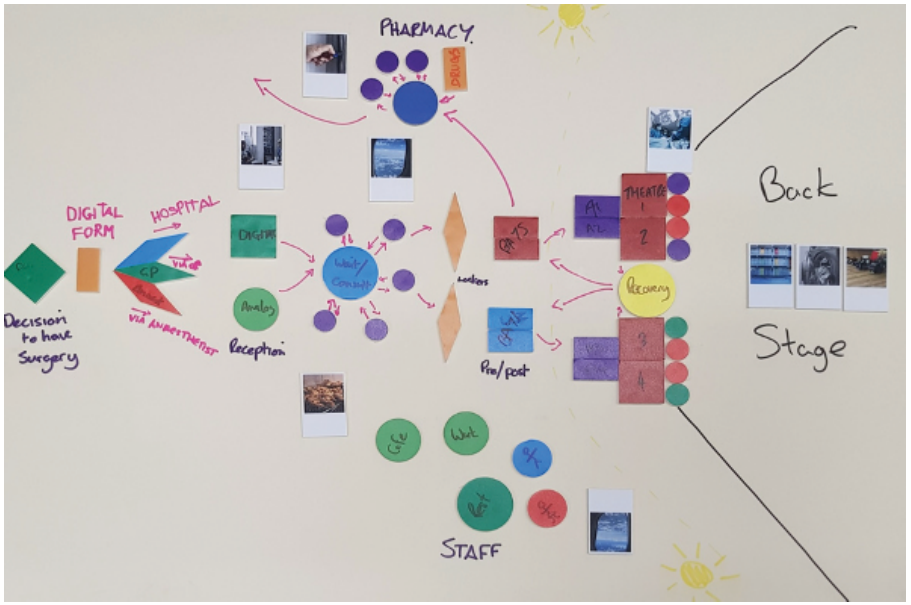


Figure 5: Day Surgery Board Design Conference 2019 Session 3: Group Presentation

Group 1 Proposal:

The focus of the first group was firstly to try and combine digital check-in services with the more traditional reception space, thereby freeing up the spatial requirements as this would be the first space you enter within a day surgery unit. This resulted in a circular reception space with smaller surrounding cubicles or 'nooks' that would allow for patients to be seen ad-hock by doctors when they had the time. It was noted that this flexibility was vitally important as inevitably doctors would be pushed for time and would not be able to stick to a strict schedule of greeting patients on a day to day basis.

The second improvement discussed was allowing for the building to operate as almost three distinct parts; 1) the light and flexible reception, staff, patient recovery spaces. 2) The changing and operating suite spaces and 3) the 'back of stage' spaces which

would act in a similar manner to operating suites housing all the 'props' for what would take place during surgery that could then be taken off stage after use thereby keeping the operating suite space clear.

Group 2 Proposal:

Figure 6: Day Surgery Board Design Conference 2019 Session 3: Group Presentation

The second group envisioned tech being fully integrated within the day surgery experience thereby creating a series on nodes from which functions could spin out from. This chain of nodes could then be made more or less complex, requiring a broadly plug and play approach to the way the day surgery operates. At its extreme the team imagined a fleet of autonomous vehicles that would contain these different components that might be called directly to people's homes allowing for the ancillary spaces of the day surgery to be removed.

The principal critique of this approach by the participants is that though it allowed for a greater level of flexibility it would require a huge number of mobile staff in order to operate, therefore in part sacrificing the wellbeing of the staff for the sake of the patient. The discussion that followed however did highlight the importance of access to information during every stage of the day surgery process and that this be communicated in a consistent manner particularly when considering the prevalence of the elderly using these facilities.

Group 3 Proposal:

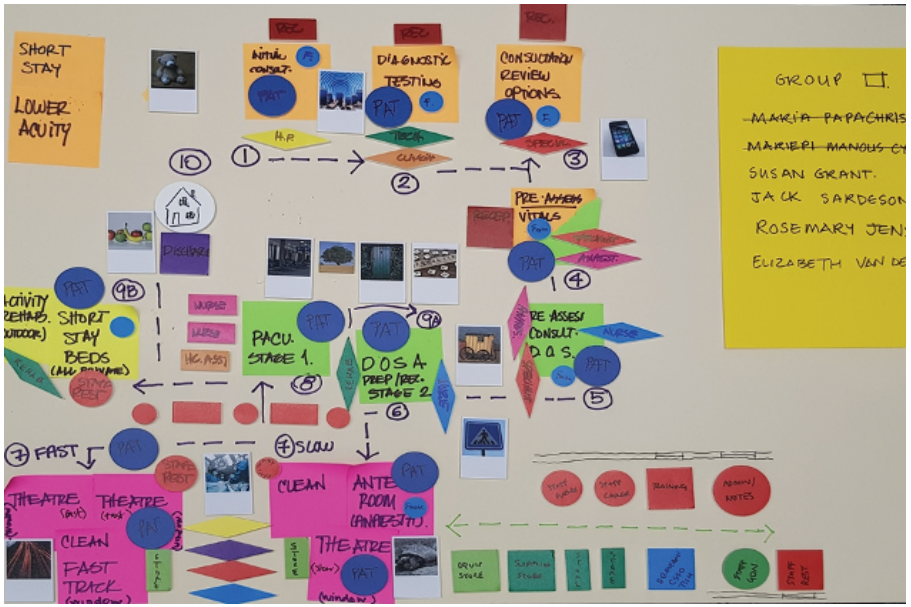


Figure 7: Day Surgery Board Design Conference 2019 Session 3: Group Presentation

The third group started with the premise that the future of the day surgery would likely be more than 24hrs and therefore would require an alternative series of facilities to support this change. They then mapped out the stages that this would entail and how they related to each other being careful to identify which specialist would be see the patient at each stage and whether the staff member would be seen at another step in the patient pathway. The diagram then organically grew into a circular and linear component, the former referring to the early stages and the latter to the theatre space. Interestingly, highlighting the somewhat divergent functional requirements of each component.

What this group illustrated, which was then picked up on in the discussion that followed, was the complex and arguably convoluted process that proceeds surgery and the need for this to be made more efficient in some manner. For example, the patient will often see 6-7 different healthcare professionals before surgery. If tech could be used in some way to create a one-stop-shop approach this might resolve some of the difficulties currently facing the NHS.

Group 4 Proposal:

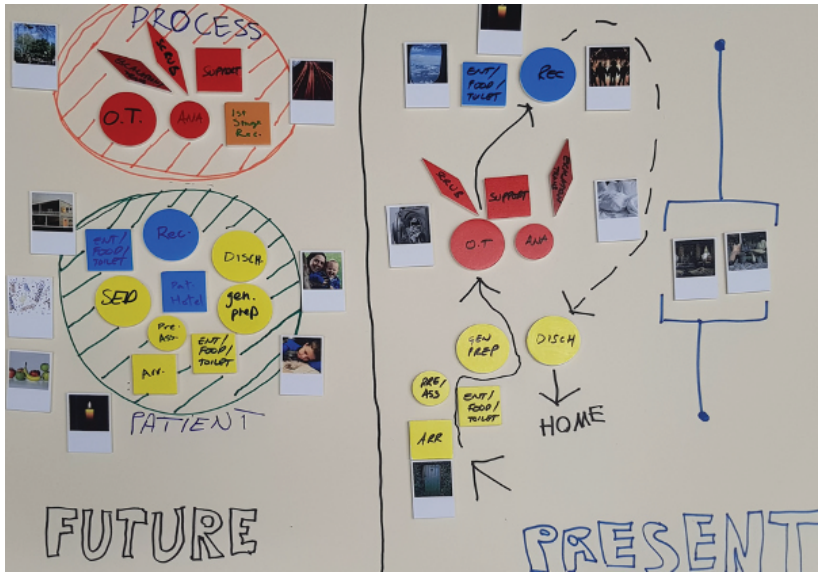


Figure 8: Day Surgery Board Design Conference 2019 Session 3: Group Presentation

The fourth group interestingly split the board to represent the present situation and what could be case in the near future, this allowed for a direct comparison between the two. Spatially the group focussed on the theatre space envisioned a more hotel-centric approach to care in which the majority on the non-theatre spaces would take place in a 'hotel' typology while the theatre would be a mobile industrial unit within itself. This would allow for the theatre to suite to be easily updated a moved to different locations as required.

This proposal led to a series of interesting discussions about the validity of 'hotel' models within the NHS. It was suggested that though the beds in a hotel model may be cheaper than a hospital bed and indeed frees up beds within the hospital for critically ill patients, when introduced in the early 2000's they did not work out as efficient as hoped. This is likely due to several factors, but it was argued that the NHS are not equipped to run hotels efficiently and introducing private partners can create issues in the long term. Step-up and step-down facilities were also highlighted as an important typology that could be used in a similar way.

Closing Remark

The most important point made in the discussion that followed was the relative slowness of the building profession when compared to the medical and technological world. It was noted that healthcare buildings become obsolete just as they are built, due to the rapid changes in equipment and medical technologies compared to the time taken to construct and occupy a new facility. Also, that there is a lack of current, continuously development of design guidance to support the changing nature of healthcare facility design.

Documentation and reflection workshop at TUDelft

Summary workshop Delft September 2020

- What happened after the workshop? (To workshop material? New collaborations or projects? Publication?)
- Reflections: What went well, what didn't? What did not turn out as expected?

Background

In healthcare design, there is a call for a person-centered approach to designing the physical healthcare environments. Based on research and referred to as evidence-based design (Elf, Fröst, Lindahl, & Wijk, 2015), healthcare environments that meet the needs of patients are expected to positively influence their health outcomes. This requires patients, or more generally users, to be involved early in the design as design decisions made early in the design phase, particularly during the conceptual design process, significantly impacts the quality of the resulting healthcare environment (Tizani, 2011).

Unlike the Nordic countries, in the Netherlands there is no strong tradition to involve users in in design processes as means to promote democracy (Binder, Brandt, Ehn, & Halse, 2015). Users may act as members of a design team and co-design solutions in the healthcare environments when it comes to product design, but in architectural design processes the typically take on an informative or eventually a consultative role (Caixeta, Tzortzopoulos, & Fabricio, 2019).

Informative	Consultative	Focus: Promotion of democracy	Focus: Building operability
• Users provide information about their requirements, needs and preferences	• Users can give their opinion on a set of predefined design options	**Participatory design** • Refers to a broad movement started in Scandinavia, in which users can actively involved throughout the design process.	**Co-design** • Users act as members of the design team and co-design solutions with the other members, such as architects and engineers
LOW	INTERMEDIATE	HIGH	HIGH

Figure 1 Levels of user involvement (after Caixeta et al. (2019))

Though design artefacts, such as various sketches, maps, diagrams, story and mood boards, mock-up models and prototypes maybe originating from the disciplinary tradition of participatory design, but are commonly used in (conceptual) design processes to enable communication on design (Pierre Johnson, Ballie, Thorup, & Brooks, 2017). For design artefacts to have value and significance, users need to interact with these objects and to discuss its different features.

For architectural design processes, collaborative design processes can be particularly difficult after the concept design, because the healthcare environments are complex design processes involving many experts from different professional backgrounds. An important barrier to involving users is their understanding of abstract design information. Whereas the design dialogue workshops facilitate communication about user needs during the design phase, participants in the study by Elf, Putilova, Von Koch, and Öhrn (2007) complained about the use of system dynamics in designing a stroke care unit as too abstract, technic and difficult to understand. This clearly highlights the importance of design artefacts to relate to a user's existing tacit knowledge. To facilitate understanding, design artefacts need to be flexible enough to adapt to individual needs of involved users, yet specific enough to

maintain a common meaning across all different actors to support decision-making in design processes involving users. Such elements are referred to as 'boundary objects', which are of high importance for communication in such a setting (Papadonikolaki, van Oel, & Kagioglou, 2019).

An important divide between users and experts in a building project, is that the latter group is highly skilled in retrieving information from visuals (Perdreau & Cavanagh, 2013). Architects for instance, have developed an extensive visual memory of reference projects, and because of their training they will retrieve more information from visuals than lay persons. For this workshop, it was argued that using immersive virtual reality models as boundary objects can overcome such information asymmetry and can overcome the hurdles in the collaborative, multi-contextual, design process.

Therefore, the main question of the design dialogue workshop in Delft was whether immersive VR a way to improve information asymmetry between users and designers?

Participants

Initially, stakeholders who were all related to an initiative to develop a healthcare hub for elderly people in the greater region of Delft and were targeted; a number of health care professionals, mainly from primary care; and SABRE project members. However, the workshop had to be cancelled because of the lockdown in March and April 2020 due to COVID-19. In September, the workshop was only allowed to take place with students, as part of a class in practice based research methods. In total, 8 group of 2-4 students in the last year of the master Management in the Built Environment participated in the workshop. Of these 22 students, 4 were international students of whom 3 had practising experience as an architect.

Outline of the workshop

The assignment for all groups was to outline a functional floorplan of a community healthcare center with multiple disciplines and to use visuals (f.i. from the handouts) to communicate what kind of emphasis the healthcare hub should have. Per session, one group started with the assignment and then had immersive VR; the other group then started with immersive VR and then did the assignment. Thereafter, both groups discussed the differences in floorplans and how immersive VR impacted their work, and experience.

The VR model could generate thousands of different configurations as it included over 13 different design factors For instance, the could be a patio or the patio was replaced by a room. Also the patio could be a small one and the remaining would then be a waiting room area. The healthcare hub could be either one or two storey high, the outside area could be either stone, or half stone half greenery, or mainly greenery (except for a pathway). To get used to VR and to learn about the differences, participants first started with a discrete choice experiment in which the first were guided through a first configuration and then through another configuration. Then, they could use a virtual IPad to configure the healthcare hub that they like the most.

To kick start the group that had the assignment first, photos to reference projects were provided. These projects were taken from community healthcare centres submitted to a best healthcare hub design competition. During the workshop, students received background information from the organizers either face-to-face or through online video conferencing (housing expert institutional care provider; architect and former general practitioner; researcher environmental psychology and before in public health).

During the workshop, systematic observations were made, and the floorplans and mind maps were collected from the participants.

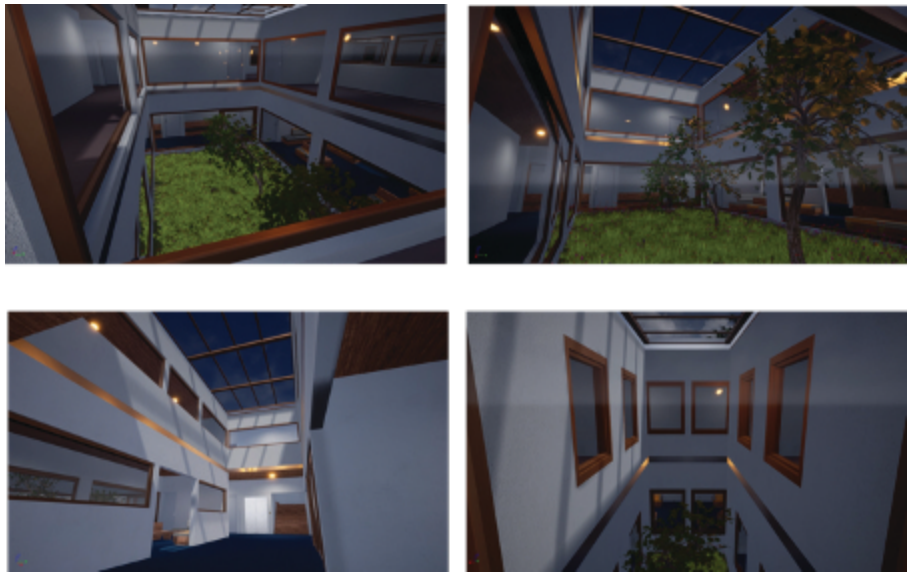


Figure 2 Stills from the immersive VR, showing the patio with greenery (top row) and the glass roof (bottom row)

Findings

At first sight, immersion in VR before working on the assignment had a major impact on the floorplans, because all had used either a smaller or lager patio. Participants also referred to this as being an important design element, although many mentioned that it would be costly. Also the glass roof was included in the patient areas by one group because that would add to a healthy environment.

However, by questioning the participants who started with the assignment of how they arrived at their floorplan, they mentioned that they used their own healthcare hub as a reference, and this was also clear from the observation. In one of these groups, there was a parent working as a general practitioner in a healthcare hub, and this participant explained and took the lead in outlining the floorplan. Furthermore, the court yard also appeared in the floorplan of international students, and it appeared that in their home country the court yard model was the most used layout. This lends support to the idea that information asymmetry can be a major issue in collaborative design with users.

VR helped participants in determining the scale of a project. Furthermore, immersive VR worked as a boundary object as like students mentioned, “we all knew what we were referring to”, and extends but not took over their own references. Indeed, all groups used the routing of a patient as a starting point and distinguished between public and semi-private parts of the building.

Remarkably, rather than pushing certain design outcomes, observations and discussions gave rise to the idea is that what made the difference between the groups is that having first immersive VR makes respondents much more aware of the patient perspective. That is, the immersion made them sensitive to what the positioning of the counter and the entrance, as well as daylight and greenery does.

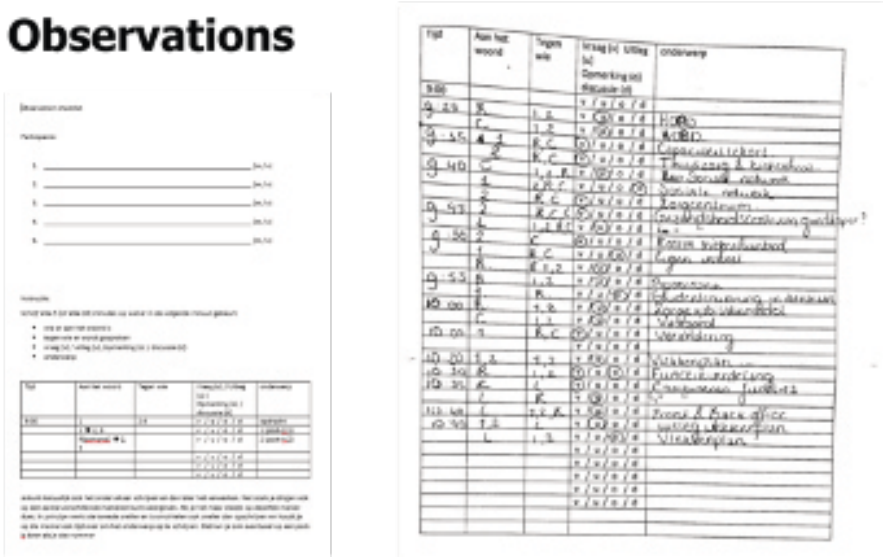


Figure 3 Observations were made at regular time intervals and focussed on who was making the communication and what was the content of the communication (question / clarification / remark, comment / discussion)

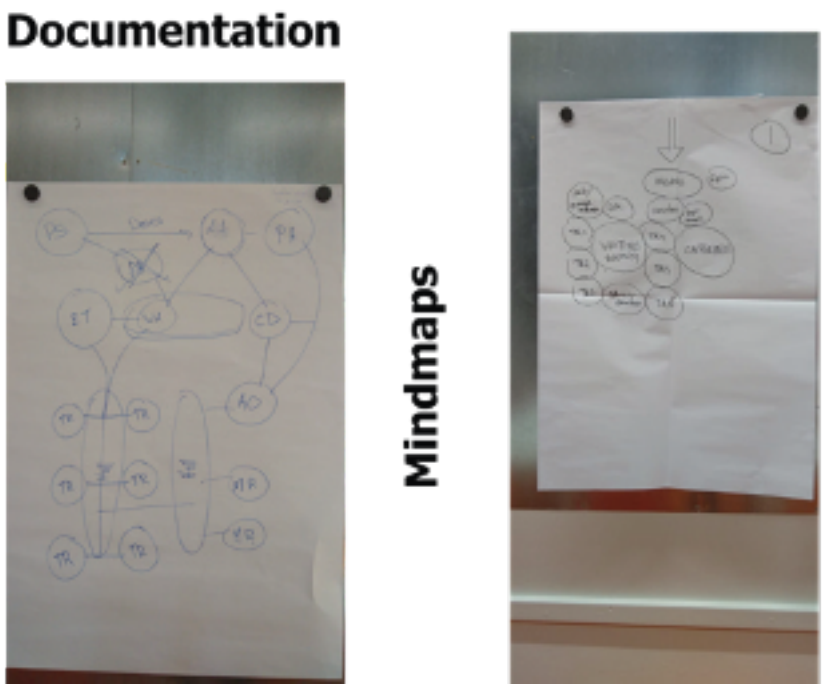


Figure 4 Left: international students with architects, right hand a group with a parent being a GP.

Conclusion

The main question of the design dialogue workshop in Delft was whether immersive VR a way to improve information asymmetry between users and designers, and we found some suggestive evidence that indeed there is information asymmetry as non-experts used their own experiences in developing the floorplans. However, as participants were all students with some training in architecture, the outcomes should be considered as pilot outcomes.

The most important but unexpected outcome seems to be the change in perspective that was noticed in the groups started in immersive VR. This change in perspective that immersive VR evokes, may be supportive in bridging information asymmetries as immersive VR also functioned as boundary object to discuss the impact of different design features amongst them.

Therefore, as soon as the COVID-19 pandemic restrictions are loosened, we will organize workshops to further investigate the difference with professionals.

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Documentation Multiplyer event, Chalmers

Designdriven knowledge production

09 10 2020

CHALMERS UNIVERSITY OF TECHNOLOGY | CVA Centre for HEALTHCARE ARCHITECTURE

Reflections and lessons learned

General feed back from questionnaires

- Model was appreciated and seen as having potential - with little or more adjustments.

Thoroughly enjoyable and revealing.

It was fantastic, I learnt a lot.

A lot of fun! Would do it again!

More on needs rather than activity management.

More information on current research/ scientific input.

This is not a one size fits all.

Agenda

Introduction and background of project

Workshop presentations:

- **Marie Strid,** Chalmers University of Technology – *Surgery/intensive care*
- **Christos Chantzaras,** Technical university of München – *Health Promotion*
- **Hina Lad,** Bartlett, the UCL faculty of Built Environment –*Day Surgery*

10 minute break

- **Clarine van Oel,** Delft University of Technology – *Health Centre*

Summary, reflections and lessons learned

Discussion

Reflections and lessons learned

Representation

Who showed up?

- Researchers
- Students
- Architectural firms
- Representatives from healthcare organisations (medicine, care, administration, real estate, government)

Wonderful spread of disciplines represented.

Why particpate?

Contribution, take-aways

Healthcare facilities can only be built together.

Reflections and lessons learned

Representation

Why is it hard to get certain groups to participate?

- Timing with ongoing processes at hospital
- The closer to healthcare activities, the less engaged in develepment of facilities
- Part of role to participate
- Personal contacts and existing university networks make it easier
- History and tradition of collaboration in research

Learn more from results/comments from clinicians.

Reflections and lessons learned

Artefact-driven dialogue

- The making of artefacts drives the process - a jointly constructed artefact conveys more than individual thougths
- All participants become experts

No pressure to draw pretty pictures!

Reflections and lessons earned

Interdisciplinarity and hierarchy

- The model fostered interdisciplinary collaboration.
- The aim of using the design profession as one of several others, did not always work.

Generally worked well though very difficult to get architects to not think in purely spatial terms which would have been more interesting.

The interdisciplinary work was a little bit challenging as I was one of the younger persons in the group. The hierarchy played a big role in the group work.

Reflections and lessons learned

Time and timing play important roles

- Preparation take time
- Time management of workshops
  – flexibility, facilitating
- Group work take time
- Complex questions take time to elaborate

Over 2 days may be less hurried & more in depth

Too short time to get to know other ways of thinking.

Spend more time on various subject- done as a 2-day workshop if possible.

PART III. Review

Did the project meet the overall objectives?

1. The aims were, firstly, to support companies and public administration related to Architecture and the Built Environment in developing their research and having increased exchange with academia.

This aspect of the project is still an undeveloped possibility and the aim was not met.
However, gathering stakeholders at a university offers participants to take part in a setting with the sharing and producing knowledge as the main foucs has a strong potential in relation to other actors than universities who also take on this role also, but seldom with a non-commercial framework.

2. Secondly, to develop a communicable method for strengthening collaboration in the knowledge triangle, thereby enabling innovative solutions to complex societal problems in the built environment. On developing, elaborating and refining the model Design Dialogues for collaboration on complex, real world problems in the built environment, 'update, articulate and make these adaptable for current societal situations in different European countries.

By using the model in different settings, gathering experiences and challenges, the potential of the existing structure and how and when I could be applied and adjusted. Several parts already work very well for communication.
Stressing:
- "Time to prepare the way" is needed when there are no prior examples of design dialogues.
- Identify what makes a stakeholder participate, for example what words to stress. (ie democracy, innovation, participation …)
- Longer workshops, two-day events or series of workshop
- Letting the industry suggest the topic
- Conscious use of medium bridging the knowledge asymmetry and avoiding repetition of "what is usually said".
- Artefact driven dialogue is a way of working with complex issues with a diverse stakeholder group.

Expected results during the project and upon its completion:

Expected result: Better understanding of the needs, opportunities and restrictions within Architecture and Built Environment disciplines in Europe in terms of activities in the knowledge triangle, as well as collaboration and links to industry and public partners.

Could you describe how your university/department works with external stakeholders like industry, architectural offices, government.
At Chalmers, the department of ACE work with external stakeholders in different ways. In research the department cooperate in applications for funding, researching together with different stakeholders. In education there is a tradition of working together since the early 1980´s both in urban planning and architectural design. Examples are finding projects that the students will work with, engaging lecturers and supervisors. There is a long tradition in doing workplace projects where students make design proposals for – or together with, an organization including using design dialogues. There is a Centre for housing and Centre for health care architecture that are formed together with industry.
The TUM Department of Architecture has multiple ways to work with external partners. Through joint research applications, third party funding, by integrating topic from industry in the curricula of higher education as student's projcects, by master thesis. Further, the department conducts various network event and workshops with stakeholders, to work on new projects. The workshops last from half-day to three days.
In general, there are warm, strong ties between the department of architecture at TU Delft and architectural offices. Many firms are (were) involved as guest teachers, and supervision of graduate students at Architecture requires currently practicing as an architect.

What kind of systems and platforms are there and what are they based on?
Chalmers uses both personal contacts and platforms organized/ started by the university; Chalmers Innovation, Chalmers Industrial technology and Chalmers professional education. Platforms that all works together with industry in relation to their different areas.

There are several initiatives at TUM as cross-disciplinary centers with specific topics as wood or building constructions or digitalization in the built environment, which work as platforms for collaboration. Furthermore, the single chairs have a strong network themselves to work with external stakeholders. The Architecture Research Incubator ARI is a central facility at the department for coordinating interdisciplinary research and development competencies in the design, engineering, urban development and IT sectors. It organizes development partnerships with businesses and institutions in the municipal region of Munich.
At MBE (TU Delft) there are strong ties with housing associations, consultancy firms, both because of personal contacts, through co-financing research projects, having internships over there, and because staff members participate in boards etc. The urban area development also has strong ties with municipals, as have others. Unlike general universities, TUD has a strong tradition to collaborate with the market. Certain firms – including TNO have a strong market oriented tradition in doing research and there are also close ties with these. Furthermore, we have regional collaborative networks like Medical Delta etc.

Is there a consciousness about ongoing research outside academia?
Chalmers: Both personal contacts and platforms organized/started by the university; Chalmers Innovation, Chalmers Industrial technology and Chalmers professional education. Platforms that all works together with industry in relation to their different areas.
TUM: It depends on the field of research, regarding construction, digitalization, design and urban developments a consciousness exists, but could be strengthen. Regarding emerging topics as future of living, mobility, health care and future of work and collaboration, external stakeholders tend to focus on other disciplines than architecture.

Expected result: Raised awareness among the partner institutions in this alliance, as well as target groups inside and outside of academia in European countries, of the need for and possibilities of successful work models and support structures for collaboration.

Expected result: Established network between the partner universities and stakeholders for collaboration in the knowledge triangle. Increased cooperation and exchange between schools/ faculties of Architecture and the Built Environment and business and industry.

- Swedish experiences from this and similar projects where academia and industry stakeholder have worked together in knowledge production has proved well. It is still too early to make conclusions on results at other locations.
It has strengthened the collaboration and cooperation between partnering departments, but to sustain it, there is a need for a more stable arrangement and long-term funding.

Expected result: Greater awareness of collaboration opportunities and new career paths in research & development outside of academia.
Expected result: Better understanding of what research in the field can offer to business and industry, and vice versa.
- This was not achieved during the project and was possibly too much to hope for within the scope of time and focus, since it would take time to build relationship with relevant stakeholders.

Did the project convey elements of innovation?

Elements of innovation:

- The model was tried out in different countries and different settings. The model was developed using our partners' existing knowledge and network and thereby increased the development of the model.

- The model showcased new perspectives at local complex problems, and the combination of stakeholders and design methodology produced proposals, knowledge and understanding otherwise not reached, within traditional processes.

- Bringing together students with researchers and practitioners. Prior applications of Designs dialogues have not worked with including students in this way. However, there is a challenge of including a group (students) occupied in other compulsory credit activities.

- The sharing and producing of knowledge are set in a relevant and urging issue though not in direct relation to specific any planning /building projects.

- According to the questionnaire several of the participants considered using Design dialogues in more situations, having potential.

- Design as a method for understanding and developing new ideas together has rarely been used in the studied contexts.

- Using design methodology to collaboratively work with health care related facilities in a mixed group. Crucial are the design approaches that manage complexities in graspable wholes.

- The method enables co-creation from different perspectives in new ways using interactive digital media together with designers' tools of modelling, visualisation and communication through artefacts.

Design approaches used during the workshops were:

−Design artefact driven dialogue: The making of artefacts drives the process - a jointly constructed artefact conveys more than individual thougths.

−When offering new "boundary objects", be it an analog set of cardboard cutouts or, immersive VR, the hierarchy and information asymmetry decreases. All participants become experts on their perspective and experience and there is "no pressure to draw pretty pictures".

- Another purpose with introducing new material or models to work with collaboratively, there is also the purpose of going beyond what is commonly done and not repeating what is commonly repeated, setting the stage for possible innovation.
- Design Dialogues' contains the possibility of proposing innovative solutions for current societal problems using existing knowledge of different actors that in collaboration produce new knowledge.

- Immersive VR – supports the change in perspectives.

Have the project achieved the expected impact?

Expected impact:
-Output will enable more developed and efficient structures and formats for collaboration between academia and professional practice in industry and public administration.
-The developed method will be showcased as a concrete model for collaboration in the knowledge triangle, to be used in different settings and situations across Europe. It will contribute to the needed development of new methods for co-creating knowledge concerning Architecture and the Built Environment.
-It will also support public administration in implementing academic knowledge and create new business possibilities for architects and designers.

The developed method has shown the potential of being such a model, by being applied in different contexts (country, universities, topics). It has increased understanding of the problems and the involved participants standpoints and experiences. When the workshops take place within an existing context of collaboration like a network, a course, and workshop material is developed and presented perhaps with feedback to participating stakeholder, the impact is larger.

On supporting public administration in their implementing of academic knowledge and creating new business possibilities for architects and designers: The workshop could provide a platform for discussion for these issues.

Are the results transferable?
Developmental potential

Transferability potential:
- Core aim is to make the output usable to universities, public bodies
and companies that have a need for developing their collaboration in the knowledge
triangle.

In response to the statement “The process should be used more often” 30 out of 32 answered that they were in *agreement* or *strong agreement* and 29 answered *agreement* or *strong agreement* regarding if they would use some of the applied methods in their studies or work.

Most participants would like to see this model applied more often, and a general respond was that the events were fun and enjoyable. When asked about what could improve, some of the comments in TUM were: time management, making goals clearer, more on current research, more of a mix of disciplines.
This was taken into considerations in the planning of the event at UCL and some elements were incorporated and adjusted.
The participants at the UCL workshop also agreed that there was a strong potential in using this model and several suggested that a 2–day workshop would be a better way of managing time, getting in-depth insights in each other’s way of thinking and a better setting for covering more aspects.
Participants at Chalmers would also like to see this model applied more often. They expressed the sharing of knowledge as the most important outcome. One group concluded “this is a unique situation

where we are not competitors (of a project) but instead reflect together, creating a mutual understanding".

The innovation and developmental potential lie in that the model has been used in four different university contexts, with a diverse set of participants and with various topics. Stakeholders has joined the process of producing knowledge about a local complex problem in an early stage, just because they all belong to professions or are actors involved with the specific problem. Other commercial actors or design offices, such as IDEO, work in similar ways, but with the main difference that there isn't a group of multidisciplinary participants representing several organizations, instead mainly one, developing and innovation, a product or a way of working.
In the diversified knowledge development lies the innovation potential, looking at different solutions as a base for developing almost everything from societal challenges to new products. Universities work as a neutral platform for this exchange and development. One way of further closing the gap between academia and industry would be to invite industry stakeholders to give suggestions about topics that then could be worked with during workshops using the applied model.
This could be a way of involving stakeholder in a longer commitment where there is little prior history of collaboration in design driven dialogue. Experiences from this project show that more and longer preparation is needed under these circumstances. It takes time to establish a model and how it is used, to get participants familiar with working visually and with design (not just another design thinking event. Activities like this will develop relationships to stakeholders, especially those who in decision positions.

The different focuses of interest at a university- and department-level as well as the unexpected corona pandemic can be identified as (minor) distinctions in how the workshops has been implemented. This could be seen as a problem but interesting when it comes the question of developing the model.

The innovation potential of these workshops is the fact that they open up new arenas and avenues for knowledge exchange. In times of discussion on cross- and trans-disciplinary research and work these workshops are examples of that. For most participants the approach to problem solving and co-creation is new, and for those familiar with the approach, the professional setting is always new.

There is a potential for creation of an embodied experience of co-creation that carry beyond the workshop in itself. This experience can be fed into innovation processes also in other context. The workshop illustrates concretely that different views and stakeholders can co-create innovative solutions. An artefact driven process is also always new, there is of course not uncommon that repertoires develop, but given the context for the artefacts in focus, the process will entail new data, information views, restrictions etc. that all will contribute to the innovation challenge.

Reflections on factors of success and failures

CHALLENGE: SETTING THE STAGE FOR A DESIGN DRIVEN MULTIDISCIPLINARY KNOWLEDGE PRODUCTION

The legitimacy of using a model like design dialogues is different in the studied contexts and affects how stakeholders participate. In Sweden the model had been used before and the product of the workshops (ie conceptual programs) was a well-known format.

When introducing the model at new universities not only was the way of working itself new and needed explaining, the whole setting and combination of stakeholders and the purpose of gathering together in a knowledge producing dialogue need time to establish.

Furthermore, what works in one situation may have to be adjusted in the next, due to cultural differences. For example, what words are used when describing the model and the reasons for participating, play a role and attract different stakeholders.

Stressing for example the knowledge production and sharing, democracy and possibility to influence outcome, attracts certain stakeholders, whereas effectiveness of process or innovation attracts others.

In Germany there appears to be a skepticism towards “dialogue” and “user centered”, words with a more neutral association in Sweden. I is therefore suggested that when continuing the development of design dialogues leaves a period of identifying how to “set the stage” in the new context.

CHALLENGE: GETTING STAKEHOLDERS TO PARTICIPATE

A total of 94 persons (29+17+23+25) were involved as participants in workshops. 7 of those participants were funded by the Erasmus project. The multiplyer event involved 35 webinar participants, making in total 129 involved.
In all that, the knowledge triangle stakeholders covered in a proportion of what is pictured below.

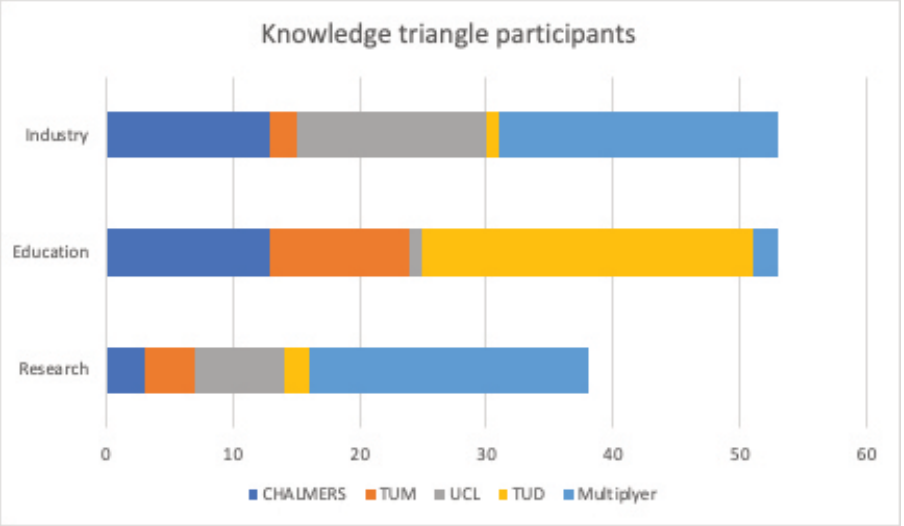

Figure 1 Number of participants from knowledge triangle

The participants in the two workshops at Chalmers had been invited due to their experience from either planning and/or designing of healthcare facilities. Invitations aimed at gathering different knowledge and perspectives. They were mainly healthcare professionals (few) and architects/designers (most). Researchers and PhD-students from Chalmers focusing on healthcare were also participating. The workshops had a strong focus on both evaluating and rethinking newly built facilities for operating theatres (first Chalmers workshop) and intensive care units (second Chalmers workshop). The participants different experiences had importance for both the outcome and for their appreciation of the event.
TUM workshop had an initial aim of including more representatives from the hospital, but there was a limited response from those

groups. Still, the sole participant from the hospital (Klinikum Grosshadern from Construction and Communication Department) was really appreciated by all. The workshop was instead characterized by the participation of students, from both architecture and project management, some with working experience from healthcare. More focus was given to the introduction on the following workshop at UCL, since it was voiced that it wasn't enough at TUM.

At UCL, there was a strong focus of participants working as architects and health care planners. Other consultants, researcher as well as policy makers also took part in the workshop. Participants representing the medical profession was scarce, with one anesthetist, participating. The combination of stakeholders enabled an initiated discussion.

At the first three workshops external participants for workshops were invited through flyers at campus (students), personal contacts, professional and research networks and associations. It is apparent that the invitation and participation of stakeholders depend strongly on the two latter together with the history and tradition of collaboration in research.

The workshop at TU Delft, initially planned for spring 2020, followed a similar recruitment patterns as the others, but when it was postponed due to Covid-19, it also affected the participants list that ended up consisting of students in smaller groups.

There is a challenge in getting especially clinicians interested in participating. Chalmers' experiences tell that those in a position where they could take the time, saw it as a part of their job to share their experiences, in order to make future projects better. Also effecting is timing with ongoing processes at the hospital. A general observation is that the closer to healthcare activities, the less engaged in development of facilities you will be.

CHALLENGE: BRIDGING HIERARCHIES

Bringing a diverse group of people together, like those in the knowledge triangle, means that there are very different abilities and knowledge of and perspectives on how to solve a problem. Hierarchies play a role and may stand in the way of collaboration. In the follow up after the workshop some participants expressed dissatisfaction on the collaboration within the group during first session, due to differences in argumentation or hierarchy. When meeting at only one occasion hierarchy or information asymmetry might hinder listening in on each other.
A student participant stated: "The interdisciplinary work was a little bit challenging as I was one of the younger persons in the group. The hierarchy played a big role in the group work."

TU Delft worked with a series of small groups with a positive outcome. A group with the size of 4-6 persons helps participant s to be more active.
A participant in the UCL workshop noted: "Generally worked well though very difficult to get architects to not think in purely spatial terms which would have been more interesting." Practicing architects were intentionally not invited to the Munich workshop, to avoid them hurrying ahead of the group with their fast way of visual and spatial thinking. Architects are trained and skilled to quickly get an idea and initiate a solution.

Dissatisfaction in group work is reoccurring in prior experiences of design dialogues but is generally rectified when changing group participants for the second session and collaboration usually improves during the workshop, as was the case here as well. In a questionnaire 28 out of 32 were in *agreement* or *strong agreement* with the statement "the quality of groupwork increased over time"
Another participant said: "It was very interesting to get a deeper insight into the opinions of the different persons with different backgrounds."

31 out of 32 was in agreement or strong agreement with the statement "The workshop fostered interdisciplinary collaboration". (The last one opted for either or agreement/refusal).

In response to the statement “I learned something new”, 30 participants opted agreement or strong agreement.

It is part of the model to let the participants use the design artefacts produced work as boundary objects, models with enough “elasticity” that they could be seen from different perspectives and adapt to different interpretations without losing their identity.
When offering new ”boundary objects”, be it an analog set of cardboard cutouts or, immersive VR, the hierarchy and information asymmetry decreases. All participants become experts on their perspective and experience and there is “no pressure to draw pretty pictures”.

CHALLENGE / OPPORTUNITY: CORONA EFFECTS

The final workshop at TU Delft was highly affected by societal restriction during the Covid-19 pandemic. The initially planned workshop got postponed and when actually performed it was w with participant restrictions; no external participants, only students and in small groups.

On the more positive note, when inviting participant to the Multiplying event, the webinar **Design driven knowledge production**, more people and from diverse stakeholder background and countries had the possibility to attend. By October 2020 most of us are really used to attend activities through digital applications, such as zoom, hosted almost anywhere in the world.

There is a strong, but still undeveloped potential as well as challenge in how a model like design dialogues could work when several or all participant attend digitally.