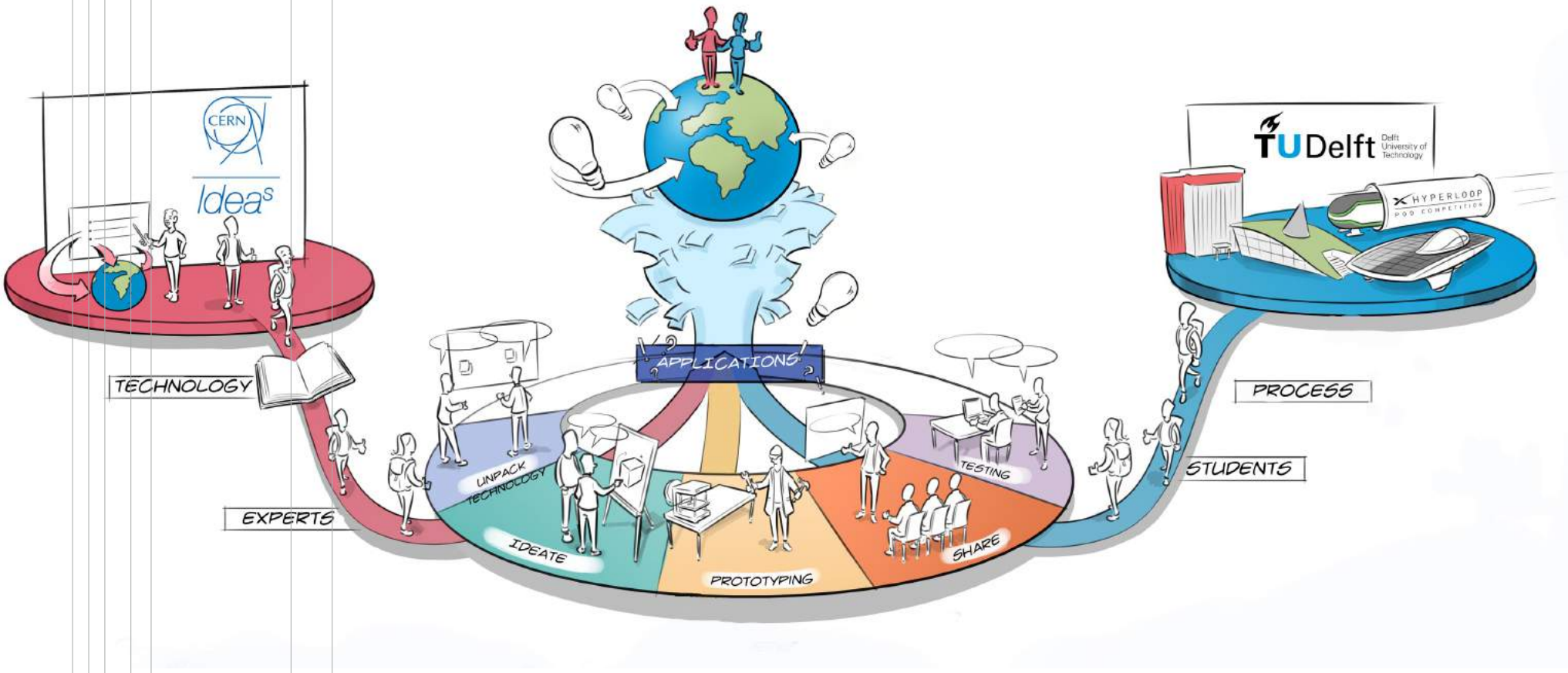
Concept

DELFT/ CERNIdeasquare SUMMER SCHOOL

Unleash the potential OF NEW TECHNOLOGIES AT IDEASQUARE CERN



ATTRACT

Nikhef

TU Delft
Delft University of Technology

CERN Ideas


9


INTRODUCTION
#IPSUMMER2018

CONTENT

PROJECT MANIFESTO

Educational institutes play a leading role when it comes to the development of creativity, decision-making and a fundamental curiosity in today's generation.

As freshmen take the first leap into their professional field, interaction with peers from diverse backgrounds aids in personal development. In café's, after study hours, norms and values are challenged and societies' needs and individual hurdles become vivid topics for discussion. And where new ideas are shared, innovation can occur.

As an institute that brings together people from all over the world, CERN as well fulfils the tasks of an educational institute and is a great breeding ground for innovation. Contrasting beliefs and methods are united with the sole purpose of generating knowledge. But education occurs in a much less conventional manner.

There is access to a platter of knowledge that is unique in the world. And the tests are not as standardized as in most educational systems, leaving many more degrees of freedom for and enhancing knowledge exchange.

COURSE INFORMATION

As advances in technology enable fundamental physics research, new technologies are developed for research at institutes like CERN and Nikhef. These technologies are **potentially valuable in other applications that serve society's needs**.

Earlier success stories of such technological advances, such as the capacitive touchscreen, medical imaging techniques and the world wide web, demonstrate the potential value and create a demand for the investigation of the potential value of these ever developing technologies in **other contexts.**

To address this demand during this e-course, 23 students from the Honours Programme Delft/ UVA/ Erasmus will work, in **interdisciplinary teams**, to investigate the potential value of these technologies and their performance in new applications. **5 Technologies of the Attract** program are chosen by the students to work on during the summer e-course. The process of **Design thinking** will be followed; a continuous process of reframing, ideation, testing with a human-centered attitude.

To cover the broadness of societal challenges, the students will receive support and **coaching** from representatives from CERN IDEAsquare, TU Delft, Nikhef, CERN and the Industry.

Additionally, if possible, we will plan a short trip to Geneva later this year to see the collider, build a prototype, meet CERN employees and pitch at CERN

AIM & LEARNING OUTCOMES

The main goal of this course is to offer the students the opportunity to profit from the knowledge available at CERN and to provide support in applying this knowledge to address society's needs. The students are asked to use their work to raise awareness for their societal challenges, for knowledge that is generated at CERN and how it can be valuable in applications in our society.

- Learn about state of the art technologies, used within high energy physics (at research institutes like CERN and Nikhef), and research their applications.
- Apply the expertise, gained in their individual studies, on the application of ATTRACT technologies in new contexts.
- Analyse a technology regarding societal impact and the performance of the solution regarding alternative technologies, design and regulations.
- Work in interdisciplinary teams digitally, explain reasoning of their own and take a critical nurturing stand towards personal reasoning as well as the reasoning of peers.
- An understanding of methodology regarding idea generation (Creative workshop design), human-centered design and team dynamics.
- Able to e-facilitate creative problem solving workshops, with participants of different backgrounds, to solve complex challenges.
- Able to digitally prototype, test and pitch own generated solution effectively to peers and others.
- An understanding of innovative behaviour in relation to Design Thinking, Entrepreneurship and Creativity (innovative behaviour compass).
- Communicate a technology and application to a diverse audience.
- Write a scientific paper for the CERN IDEAsquare Journal for Experimental Innovation (CIJ) that could be published.

TO be clear

- It will be interactive & fun
- It is an experiment and a one of a kind and first multiparty course
- You will work with amazing people
- Besides the scheduled hours, you might have to put in some extra to let your projects shine and make some progress
- We will not work directly with the collider
- We will bring the magic of CERN/ DELFT to you!

PRACTICAL INFORMATION

- UD1056 (5 ECTS)
- 20-25 students Honours Program Delft / UVA/ Erasmus
- 5 Multidisciplinary teams/ Technologies

5 Lectures Delft
1830-2030
(May 25th, 2nd, 9th, 16th & 23rd of June)

CERN Kick-off Lecture
Teambuilding & tools
Technology Unbundling
Design Thinking
Academic Paper

Design Sprint

THREE DAYS Delft Design Sprint (0900-1700)
Monday July 18th- Wednesday 20th

EIGHT DAYS Geneva Design Sprint (full days)
Saturday July 23rd- Saturday July 30th

DEFINE PHASE
DESIGN PHASE
DELIVER PHASE

After project

Academic Paper

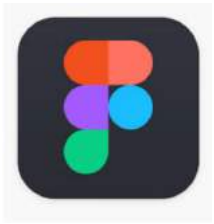
***only if agreed with Delft Health guidelines**

IMPORTANT DATES

Start lectures 5 in total	May 25th
Assign & Choose teams & project	June 2nd (and after 2nd lecture)
Technology Day to sum up learnings	July 18th
Summer school Geneva	July 23rd-30rd
Hand-in & pitch assignments week two (deliver)	July 29th
Submit paper after multiple revisions	1st of October

TOOLS

To brainstorm, run workshops, communicate, prototype, relax and many other activities.



slack

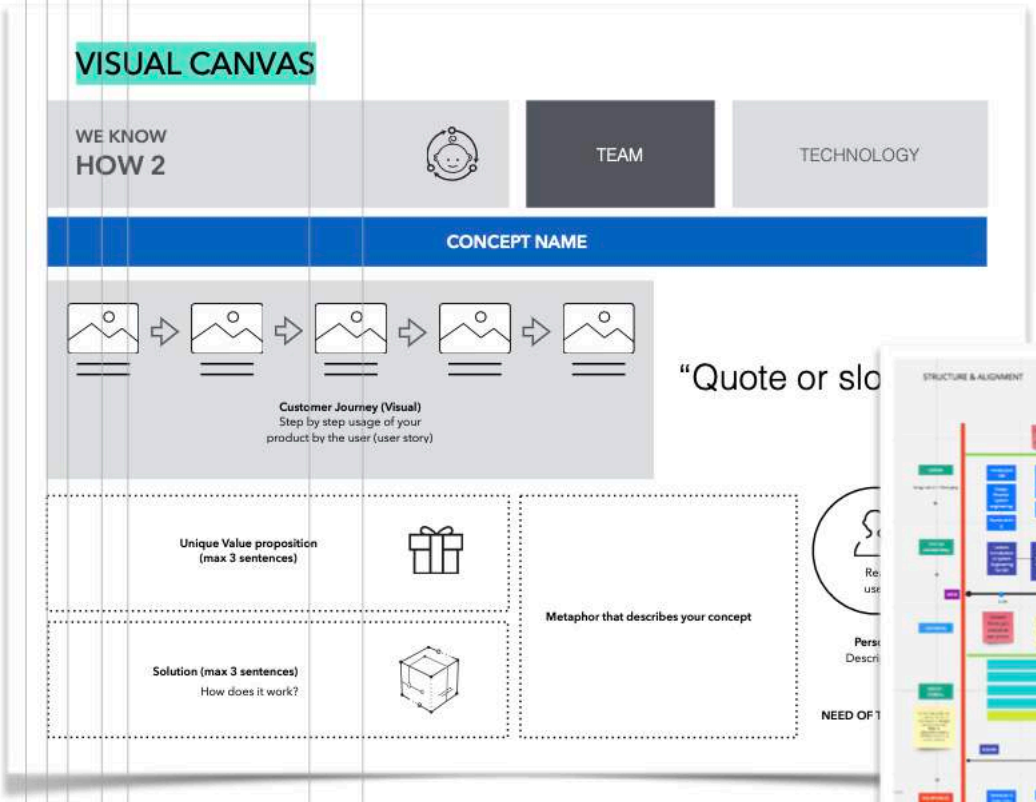
MURAL

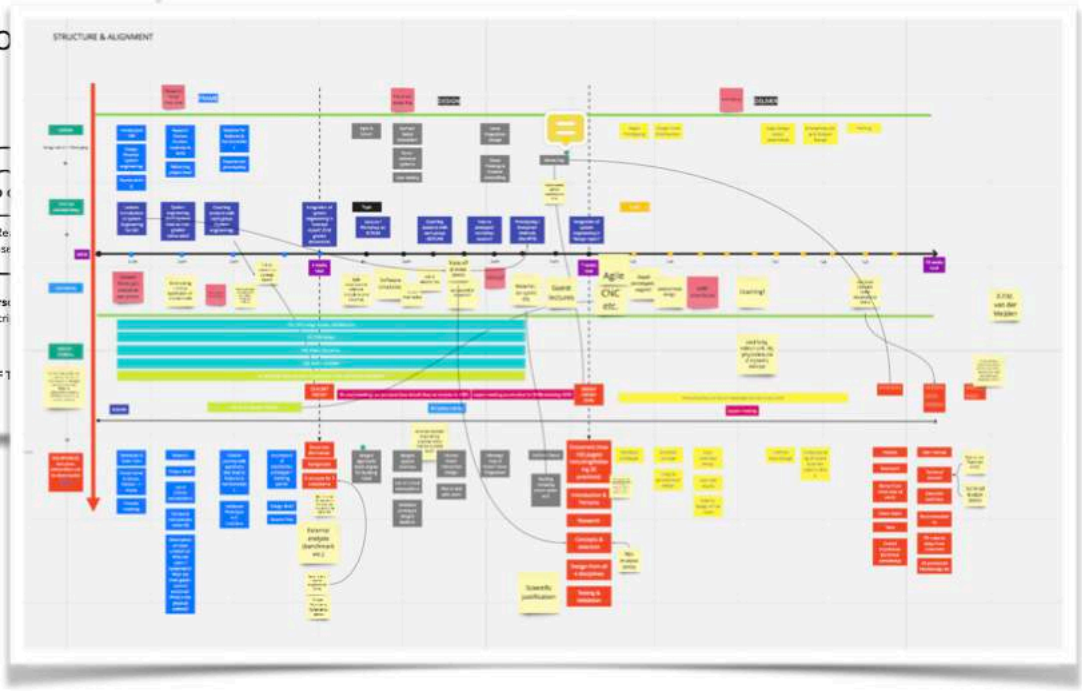
Thuisbezorgd.nl

headspace

CERN Ideas

CANVAS & COLLABORATION





PEOPLE & ORGANISATIONS

STAKEHOLDERS

Delft University of Technology (TUDelft) in Delft, the Netherlands, is the nation's largest technical university, with over 15,000 students, 2,700 scientists (including 200 professors) and 1,800 people in the support and management staff. It is a renowned state university specialized in the engineering sciences conducting cutting-edge research and providing first class education at graduate and post- graduate levels.

Delft is also a pioneer in educational innovation and an important source of cutting edge research in the field of engineering.

The CERN Summer Course has its origin at the **Honours Programme Delft**. The students of the Honours programme are selected and come from all the faculties of Delft University of Technology.

CERN, the European Organization for Nuclear Research, is one of the world's largest and most respected centres for scientific research. Physicists and engineers at CERN use the world's largest and most complex scientific instruments to study the basic constituents of matter – fundamental particles.

The purpose of **IdeaSquare** is to bring together people to generate new ideas and work on conceptual prototypes related to detection and imaging in an open environment. It brings together CERN personnel, visiting students, and external project collaborators from the domains of research, technology development and education, and contributes to KT Group activities in helping to shape and improve them further towards socially and globally relevant new product ideas and innovation.

ATTRACT is a pioneering initiative bringing together Europe's fundamental research and industrial communities to lead the next generation of detection and imaging technologies.

For the first time, a consortium of big research organisations will be explicitly leveraged to capture value and create jobs and growth. For this, ATTRACT will enlist large companies, experienced venture capitalists, and individual investors alike. The aim is to create an entirely new, European model of Open Innovation that can become an engine for jobs and prosperity for all.

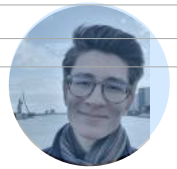
Funded by the European Union's Horizon 2020 programme, the project aims to help revamp Europe's economy and improve people's lives by creating products, services, companies and jobs.

Nikhef is the Dutch National Institute for Subatomic Physics. The institute performs research into the elementary building blocks of our Universe, their mutual forces and the structure of space and time.

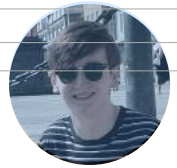
Scientists from all over the world come to the Netherlands to work at Nikhef in national and international collaborations. Research deals on the one hand with elementary particles that collide with each other in controlled experiments at high energy and intensity, and on the other hand with observing particles that travel from the Universe towards Earth.

Nikhef's expertise in these areas is praised and utilised worldwide, for example by the international CERN collaboration, which uses particle accelerators to perform research into elementary particles.

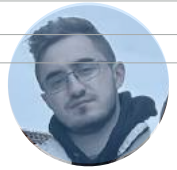
Class of 2022



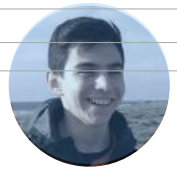
Andrei Tocui
Delft University of Technology
Computer Science



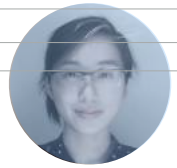
Luka Jelic
Delft University of Technology
Physics



Alexandru Dumitriu
Delft University of Technology
Next Generation Robots



Alejandro Breukelen Garcia
Delft University of Technology
Aerospace Engineering



Clio Feng
Delft University of Technology
Computer Science

Luc Thomas
Delft University of Technology
Aerospace Engineering

Joachim bron Jacobs
Delft University of Technology
Aerospace Engineering

Pleuntje Brons
Delft University of Technology
Nanobiology

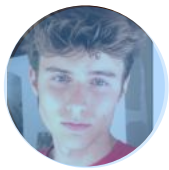
Quan Zheng
Delft University of Technology
Computer Science

Ad'o Beñ0
Delft University of Technology
Aerospace Engineering

Fleur Milder
Erasmus University Rotterdam
Strategic Management

Giorgio Serafini
Erasmus University Rotterdam
Finance and Investment

Josef Saranko
Erasmus University Rotterdam
Strategic Management



Samuel Hanssen
Delft University of Technology
Aerospace Engineering

Kamilla Dajani
Erasmus University Rotterdam
Information Management

Etienne Kant
University of Amsterdam
Analytical Chemistry

Evi Nikoloudaki
University of Amsterdam
Physics & Astronomy

Karla Rojas
University of Amsterdam
Physics & Astronomy

Tamira Neves Lopes
University of Amsterdam
Theoretical Physics and Mathematics

Wessel Garsten
University of Amsterdam
Chemical Sciences

1 2 3 4 5

Lecturers & guest speakers

Dap Hartmann

Delft University of Technology

Sem Carree

Delft University of Technology

Marc Tassoul

Delft University of Technology

Malik Ivan Tas

Delft University of Technology

Markus Nordberg

CERN IDEAsquare

Tuuli Utrianen

CERN IDEAsquare

Laura Wirtavuori

CERN IDEAsquare

Catarina Batista

CERN IDEAsquare

Pablo Garcia Tello

CERN

Han Dols

CERN

Jan Visser

Nikhef

Romy Welschen

Alumni Delft/ CERN

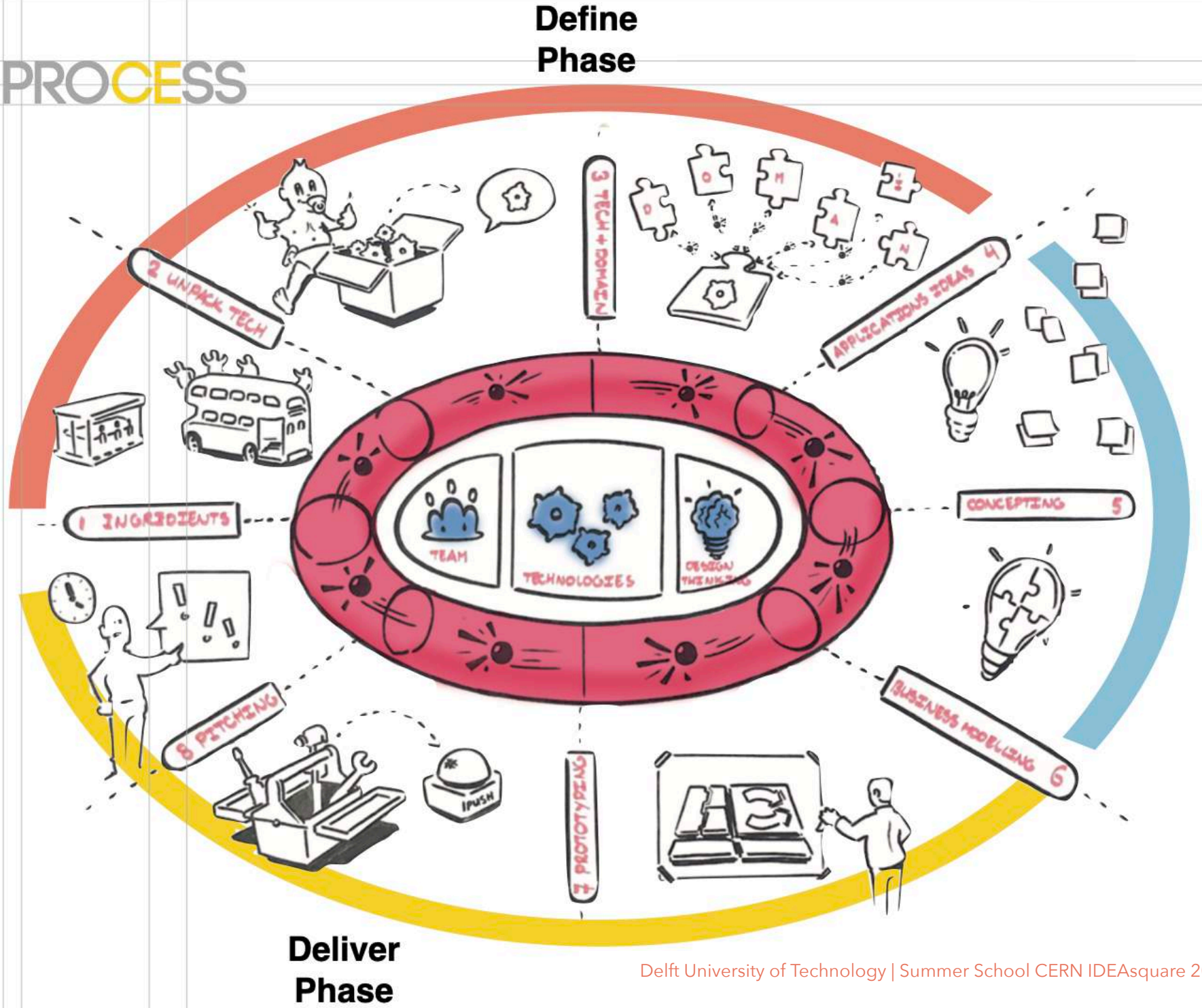
Many others

CERN

DELIVERABLES 6Ps

1	**PROTOTYPE/ PROOF OF CONCEPT**	(to show value of application)
2	**PITCH**	(5 minutes video pitch of ground-breaking applications to CERN - Bonus pitch at CERN campus)
3	**POSTER**	(to show your work to family, friends & people involved)
4	**PAPER**	(scientific paper for the CERN IDEAsquare Journal for Experimental Innovation (CIJ))
5	**PEOPLE**	(involve people in the process as experts or to validate assumptions)
6	**PROGRESS REPORT**	Progress report of the innovation work that you have done (approximately 5000 words)

PROCESS


Define Phase
2 UNPACK TECH
3 TECH + DOMAIN
APPLICATIONS IDEAS 4
1 INGREDIENTS
TEAM
TECHNOLOGIES
CONCEPTING 5
8 PITCHING
7 PROTOTYPING
BUSINESS MODELLING 6
Design Phase
Deliver Phase

EXAMPLE ONE: PROJECT PASSPORT

SEISMIC IMAGING & MONITORING SYSTEMS (SIMS)

Giel Wind
Architecture

Killian Dally
Aerospace Engineering

Survansh Sharma
Electrical Engineering, Mathematics & Computer Science

Vladislava Dinkova
Mechanical, Maritime and Materials Engineering

TEAM 3 2019

TECHNOLOGY

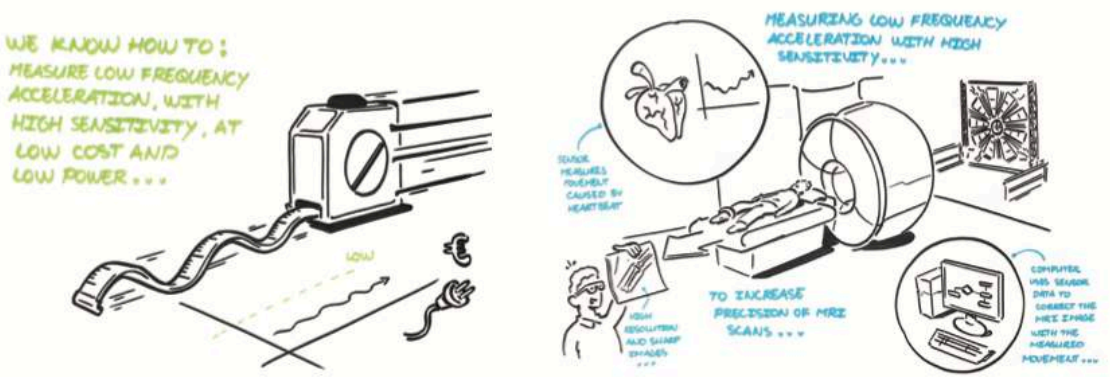
Seismic imaging & monitoring systems (SIMS)

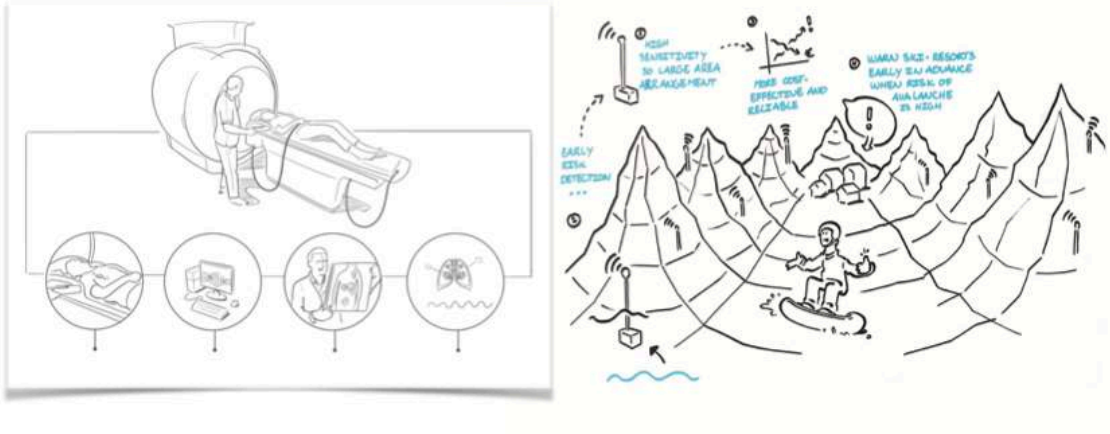
Means: "We know how to measure low frequency acceleration with high sensitivity at low cost and low power"

FINAL CONCEPT

SEISMO+: We help Irene by removing motion artifacts in PET scanners that makes diagnosis better, and faster while reducing the radiation dose for the patient. Our accelerometer based device is an add-on wearable to be used in conjunction with current PET scanners. It enables correlating the PET scan data in bins that correspond to the different phases of cardiac and respiratory motion. A post-processing software corrects the artifacts to produce a deblurred image.

- With a clearer image, doctors can detect tumors at an earlier stage.
- With a shorter imaging time, patients will experience less side effects from radiation, and hospitals will have a higher yield





PAPER

"Using a seismic sensor to improve PET scan imaging: A new product development case study" (Published)

EXAMPLE TWO: PROJECT PASSPORT

ULTRA-SENSITIVE OPTOACOUSTIC SENSOR FOR DOSIMETRY IN PROTON THERAPY (OMUS4PT)

TECHNOLOGY

Ultra-sensitive optoacoustic sensor for dosimetry in proton therapy (OMUS4PT)
Means: "We know how to detect very small vibrations"

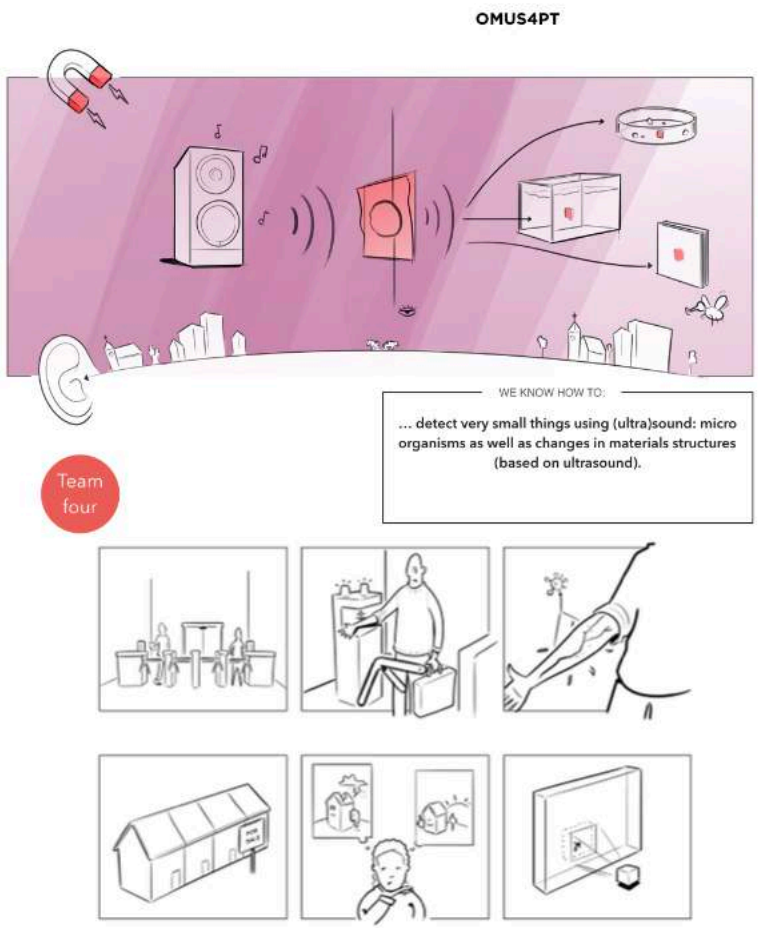
FINAL CONCEPT

Bridge Structural Integrity Checker (B-SIC): This device measured the state of the bridge real time, and will allow for timely repair.

- Inspects Consistently (save time)
- Predict Maintenance (save costs)
- Prioritize need (save lives)

PAPER

"Identifying the Relevance of Sustainable Development Goals in Steering Innovation Decision Making"



PROTOTYPE

A hybrid between the four

Feasibility Prototypes

These are written by engineers in order to address technical risks during product discovery before we decide whether something is feasible or not. Sometimes the engineers are trying out a new technology. Sometimes it's a new algorithm. Lately it is often about assessing performance (think mobile app transitions, or Big Data). The idea is for the developer to write just enough code to be able to answer the feasibility question. It may be throwaway, or it might turn out to be something you can leverage if you decide to proceed.

Low-Fidelity User Prototypes

Fidelity has to do with how realistic the prototype looks. A low or even medium-fidelity user prototype doesn't look real – it is essentially an interactive wireframe. "User prototype" means that it is a simulation and not something real. In other words, you can enter your credit card info as many times as you want, you won't actually buy anything.

Balasamiq is pretty much everyone's favorite low-fidelity user prototyping tool as they have made it so quick and easy to create this form of prototype. Low-fidelity user prototypes are typically created by the interaction designers. Many teams use these as a way to think through the product among themselves. For certain situations you can also identify usability issues right at this very early stage.

As great as they are, low-fidelity user prototypes only represent one dimension of your product – the information and the workflow – there's nothing there about the impact of visual design, or the differences caused by the actual data, as just a couple important examples.

High-Fidelity User Prototypes

A high-fidelity user prototype is still a "smoke and mirrors" style simulation, however, now it looks very real. In fact, with many good high-fidelity user prototypes you need to look close to see that it's not real. The data you see is very realistic, but it not real – mostly meaning it's not live. For example, if I do a search for a particular type of mountain bike, it always comes back with the same set of mountain bikes, but if I look close, it's not the actual bikes I asked for. And I notice that every time I search it's always the same bikes no matter what price or style I specify. Now if you are trying to test the relevance of the search results this would not be the right tool for the job, but if you are trying to come up with a good overall shopping experience this is probably just fine and very quick and easy to do.

There are many tools for creating high-fidelity user prototypes – for every type of device. The tools are generally designed for designers. It's also the case that some designers prefer to hand-code their high-fidelity user prototypes, which is fine as long as they are fast and are willing to consider the prototype as disposable.

The big disadvantage of a high-fidelity user prototype is that it's not good for proving anything – like whether or not your product will actually sell. It is good for testing out usability, and it's great for communicating the proposed product to key stakeholders, and it's great for rapid learning. Where a lot of people go sideways is when they create a beautiful user prototype, and put it in front of 10 or 15 people that say they love it, and then they declare victory. Unfortunately, that's not how it works. People say all kinds of things and then go do something different. We have a much better tool for proving whether something actually works (described next).

But my favorite use of a high-fidelity prototype is not to see if users like it, but rather, to try to learn why they don't. When you test with a high-fidelity user prototype, you don't get your answer from any one user, but every user you test with is like another piece of a puzzle, and eventually you see enough of the puzzle that you can see where you've gone wrong.

Live-Data Prototypes

Live-data prototypes are a little tougher to explain, but they are absolutely critical and the cost of producing them is dropping rapidly so I'm loving them more all the time. The main purpose of a live-data prototype is to actually prove something – normally it's to prove whether an idea (a feature, a design approach, a workflow) really works. In order to know this, we typically need to do two things. First, we need the prototype to access our real data sources – like actually search our live inventory and show products that are really available right now. Second, we need to be able to send live traffic, in quantity, to the prototype.

The key is that we sure don't want to have to build, test and deploy a real product in order to do this. That would take far too long, and cost far too much, and yield huge waste. And we don't. A live-data prototype is a very limited implementation – typically just the critical use cases, and none of the "productization" that's normally required like full use cases, test automation, SEO work, internationalization and localization, performance and scalability, etc. A live-data prototype is a fraction of the effort, but you get big value. You do have to keep in mind two big limitations. First, this is code so it requires your developers to create the live-data prototype and not your designers. Second, this is not a product, and you can't run a business with it, so if the tests go well, you'll still need to allow your engineers to take the time to productize the code.

But today the technology for creating live-data prototypes is so good that we can often get what we need in a couple days to a couple weeks. And once we have it we can iterate very quickly.

Normally we'll test a live-data prototype in an A/B test, but we can also do an opt-in test or an invite-only test. The key is that real users will use the live-data prototype for real, and this will generate real data (analytics) that we can compare to our current product to see if this new approach actually performs better.

Goal: to display the movement from a concept plan to a tangible solution - with deeper levels of understanding and explanation about the working of the concept.

Example 1: a working prototype where a substitute sensor is used with e.g. a clickable interface.

Example 2: Heimdall
https://phase1.attract-eu.com/showroom/student-projects/project-heimdall/

MILESTONES & KICK_OFF

1 **End of week of lectures**

(1) Shaped team spirit (purpose), logo, name and team video
(2) Technology Unpacked - technology canvas and technology video (meet & greet with technology expert)
(3) Context of technology- >100 potential domains + sub domain combinations
(4) Style of Scientific paper, conceptual outline & main research questions
(5) Potential people for big end event
(6) Arranged everything for trip

LEARN & IGNITE

	CERN E-COURSE KICK-OFF	TEAMBUILDING	TECHNOLOGY UNBUNDLING	DESIGN THINKING	WRITING A PAPER
Lectures	1830-2030	1830-2030	1830-2030	1830-2030	1830-2030
Lectures	Setup Course, program, technologies & teams	Team building exercise & reflection	Tools to understand technology	Design Thinking crash course	Introduction to writing a paper
Homework	Getting to know parties/ people involved	Team video	Choosing & researching Attract Technology	Design Thinking Process >100 (sub) sectors	Topics
Homework	Check Playbook	Team/ Digital Tools Setup	Date with Attract Expert	Technology Canvas	Academic Paper Canvas

MILESTONES

2 **End of first 3 days design sprint**

(1) Search fields connected with societal trend of challenge

(2) Real understanding of Technology

(3) Bunch of interesting Opportunity fields (5-10)

(4) Paper Prototypes

(5) Scientific paper introduction (topic)

EXPLORE & FRAME

WEEK 1	DEFINE 18th of July	EXPLORE 19th of July	FRAME 20th of July
0900-1000	Kick-off & Share	Reframing Technology (Tuuli Utrianen)	Validated Learning (experiment card)
1000-1100	Technology unbundling (Deep dive)	Scientific paper	Interactive Group work
1100-1200		Interactive Group work	Cern Ideasquare Pop-up
LUNCH (1200-1400)	lunch arranged by Delft	lunch	lunch arranged by UVA
1400-1430	Domain Exploration	Exploring potential sectors & users (systems)	Force-Fit Domain Tech
1430-1530	Interactive Group work	Interactive Group work	Interactive Group work
1530-1630	Cern Ideasquare Pop-up		
1630-1730	Technology frame	Speed dating with experts	Share Opportunity fields
1730-2100	Optional	Optional	Drinks & Pizza

MILESTONES

We will celebrate our achievements on Friday 29th of July at the Big Demo, Pitches & Party!

3 End of second 8 day design sprint

(1) (Tested) Prototype/ proof of concept
(2) Poster (A1) - digitally
(3) Pitch (5 min video)
(4) Paper summary (DL for final version of academic paper is half September)
(5) People (2-3) that attend the big demo
(6) Progress Report (5000 words)

WEEK 1

	IGNITE Saturday	RECAP & PREPARE Sunday	CONCEPTING Monday	TOUR Tuesday
0900-1000		Dive into Lake Geneva 0700	CERN IDEASQUARE kick-off	Wise crowds
1000-1100	Starts 1000	Tour CERN Ideasquare		CMS Visit
1100-1230		Deep Dive Opportunity fields	Building a concept	Scientific paper
LUNCH (1230-1330)		lunch/ Shared Lunch	Meet people lunch @ CERN	lunch
1330-1430			SDGs	Antimatter Factory
1430-1530	Kick-off lake Geneva 1500	Scientific paper	The power of numbers	
1530-1630		Preparation Research	Interactive Group work	Session NRG (Romy)
1630-1730		Share Outline	Share Concepts	
1730-2100	Optional	Cheese Fondue Lake Geneva	Speed-dating Experts Optional	Beers @ CERN

PROTOTYPE & DELIVER

WEEK 1

	CONCEPTING Wednesday	PROTOTYPING Thursday	PITCHING Friday	EXPLORE Saturday
0900-1000	Lean Canvas session	Reflection	Pitching	Optional lazy brunch
1000-1100		Build prototype/ Work on 6 Ps	Scientific paper	
1100-1230			Work on 6 Ps	
	Exponential Thinking (Pablo Garcia)			
LUNCH (1230-1330)	Meet people lunch @ CERN	Group lunch	Staff Free Lunch	
1330-1430	Prototyping (Hans Boe)	Build prototype/ Work on 6 Ps	Work on 6 Ps	
1430-1530				
1530-1630	Prototype Build plan/ Work on 6 Ps	Testing	DEMO DAY	
1630-1730	Value Proposition Design (Han Dols)			
1730-2100	Optional	Optional	Drinks	


ATTRACT


CERN
Ideas


TU Delft
Delft University of Technology


HPD
Honours Programme Delft


Nikhef


Erasmus
ERASMUS
UNIVERSITEIT
ROTTERDAM


UNIVERSITEIT VAN AMSTERDAM